ASCILITE 2022

AUSTRALASIAN SOCIETY FOR COMPUTERS IN LEARNING IN TERTIARY EDUCATION

reconnect

Reconnecting relationships through technology

The University of Sydney, Australia

4 – 7 December 2022

39th International Conference on Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education

ASCILITE
SHAPING THE FUTURE OF TERTIARY EDUCATION

THE UNIVERSITY OF SYDNEY

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39TH International Conference on Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education

Australasian Society for Computers in Learning in Tertiary Education

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The ASCILITE 2022 Conference is ASCILITE'S 39th International Conference on Innovation, Practice and Research in the use of Educational Technologies in Tertiary Education. This year's conference was hosted by the University of Sydney from 4 to 7 December 2022, in-person and online.

The conference took place at the University of Sydney, Australia's oldest university, with excellent event spaces, restaurants, cafes and iconic architecture. Sydney is renowned for its summer weather, natural beauty, multiculturalism, and historical significance, with many thousands of years of Aboriginal history. The University of Sydney is minutes from the central business district, where tourist attractions such as the Sydney Opera House, Sydney Harbour Bridge and Sydney Tower can be found. Sydney also has a strong cultural presence, with galleries, museums, sport and shopping attractions available.

We acknowledge the Traditional Owners of the Country on which The University of Sydney stands: the Gadigal people of the Eora Nation. We pay our respects to Elders past, present and future — those who have cared for and will continue to care for Country. Our educational practices are part of this rich and enduring legacy.

The focus of ASCILITE 2022 was on the value and importance of connecting, of strong relationships, empowered by educational technologies. It's a central part of higher education; relationships between teachers and students, within student groups, with our core purposes and campuses, between professional and academic staff, and even between all of us and technology.

Foreword

The importance of relationships in higher education has never been more pronounced. Relationships between teachers and students, students and students, professional and academic staff, and even between staff and technology play a key role in student success. This year's proceedings present papers that critically explore a diverse set of pedagogies and approaches that draw on the potential of technology to support quality relationships in education across a range of learning environments. In collectively exploring the conference subthemes of reconnecting students with educators, each other, purpose, educational technology and the future campus, the proceedings cover diverse topics and perspectives in higher education. These include assessment and feedback, interprofessional education, academic development, learning spaces, co-design of curricula, learning analytics, large class teaching, use of AI and VR, educational psychology, microcredentials and mobile technologies, to name a few.

An analysis of the most frequently used terms across the full and concise papers included in this year's proceedings provides further insights into the themes explored. A word cloud (Figure 1) reveals a student-centric focus, with the terms 'student' and 'learning' being the most frequently used terms. While the term 'technology' is prevalent, as expected given ASCILITE's focus in this area, it is noteworthy that we see other terms used more frequently. The prevalence of the term 'design' represents a strong focus on areas including design for learning, curriculum and course design, technology design, co-design, human-centred design, and design thinking. The rapid shift in mode to online, blended, and HyFlex learning brought about the COVID-19 pandemic may help to explain this increased awareness of and focus on design.

Also noteworthy is visibility of the work that often happens in the background by educational developers, technologists, and learning designers. This work is often focused on redesigning assessment, integration of various technologies, and implementation of strategies for student engagement and enhancing student experience. All of these terms are aptly represented in the cloud.

Figure 1: Most frequently used terms in full and concise papers (size of words represent frequency of use)

With the rapid shift to online teaching, greater attention was paid to learning management systems to help students navigate their unit of study content, communicate and collaborate with their peers, and form communities of learners across time and space. Again, we see all these terms represented in the cloud. Many educators designed and implemented innovations in teaching which prompted them to conduct research into the effectiveness of these interventions and we thus see the terms study, data, and participants illustrated strongly.

As suggested by Felten and Lambert (2020), the importance of peer-to-peer, student-faculty, and student-staff relationships cannot be underestimated, and represent “the foundation of learning, belonging and achieving” in higher education (p. 5). The papers in this collection contribute to our understanding of ways to create a relationship-rich environment “where students will have frequent opportunities to connect with many peers, faculty, staff and others on and off campus” to support their learning and experience (p. 6).

Reference

Felten, P. & Lambert, L. M. (2020). *Relationship-Rich Education: How Human Connections Drive Success in College*. John Hopkins University Press.

Conference sub-themes

Reconnecting students with educators

The relational nature of education is arguably more important than ever as relationships mediate a strong sense of belonging and promote student engagement. How is technology helping educators to meaningfully (re)connect with students, at a distance and at scale?

Reconnecting students with each other

Students' experience of tertiary education is enriched through peer relationships that are formed throughout their journey. From collaborative work and assessments to co- and extra-curricular activities, how can technology help students build stronger relationships with peers and grow their sense of belonging and connectedness?

Reconnecting students with purpose

A clear sense of purpose improves student persistence and outcomes. How are we using technology to enable and strengthen meaningful partnerships between students and educators, the university, the community, and industry?

Reconnecting people with educational technology

The past two years have forced tertiary educators to rapidly engage with a wide range of educational technologies. What lessons can we learn from this process, and how can we reconnect students, educators, administrators, and other tertiary education stakeholders more meaningfully, equitably, and sustainably with technology going forward?

Reconnecting the community with the future campus

Interfaces between the virtual and physical campuses are more critical, but less visible, than ever before. The tertiary education community has a complex and integrated relationship with 'the campus', and building a sense of place is central to how we learn and teach into the future. How do we collectively achieve sustainable development goals, strengthen diversity and inclusivity, and provide a technology-enriched educational environment for an increasingly diverse student cohort?

Conference Organising Committee

The University of Sydney 2022 Conference Organising Committee was led by co-convenors Eszter Kalman and Danny Liu. Committee members included Adam Bridgeman, Alix Thoeming, Dewa Wardak, Dominique Briones, Hazel Jones, Jennie Hill, Jessica Frawley, Kathryn Bartimote, Kimberley Baskin, Laura Heron, Marianna Koulias, Natasha Arthars, Pippa Yeoman, Rebecca Denham, Rebecca Goldsworthy, Ruth Weeks, Samantha Clarke, Samantha Poulos, Sareeta Zaid, and Stephanie Wilson.

Invited speakers

Peter Felten

Peter is professor of history, executive director of the Center for Engaged Learning, and assistant provost for teaching and learning at Elon University (U.S.). Peter has published six books about undergraduate education including (with Leo Lambert) Relationship-Rich Education: How Human Connections Drive Success in College (2020). His next book, a student guide to relationship-rich education, is co-authored with Isis Artze-Vega, Leo Lambert, and Oscar Miranda, will be published by Johns Hopkins University Press in early 2023 (with an open access online version free to all readers). He has served as president of the International Society for the Scholarship of Teaching and Learning (ISSOTL), is on the advisory board of the National Survey of Student Engagement (NSSE), and is a fellow of the Gardner Institute, a U.S. foundation that works to advance equity, social justice, and upward social mobility through higher education.

Dominique Parrish

Dominique is Pro Vice-Chancellor (Learning and Teaching) at Macquarie University. Her key responsibilities in this role include leading the cross-institutional advancement of excellence in digital and face-to-face learning and teaching to promote student success and graduate outcomes; overseeing the provision of students' learning support and skill development; leading university initiatives in employability and work-integrated learning; and leading the advancement of academic staff capability.

Dominique has managed and led numerous sector, institutional and faculty learning and teaching initiatives. She has worked with industry and teaching teams to design competitive, specialised courses. Dominique has been the project manager of three National learning and teaching grants and the President of ASCILITE (Australasian Society for Computers in Learning in Tertiary Education) from 2015-2019. Dominique's research interests include higher education leadership and leadership development, emotional intelligence, quality in online learning and student experience and engagement.

Ella Kahu

Ella Kahu is a Senior Lecturer in the School of Psychology at Massey University in Wellington, New Zealand. She also holds an Adjunct Senior Research Fellow position at the University of the Sunshine Coast in Australia. Her primary research focus is student experiences in higher education with a particular interest in student engagement. Ella's conceptual framework of student engagement, developed in 2013 and extended in 2018, is used to inform both research and practice at universities around the world. In her teaching practice, she co-developed and teaches an innovative inter-disciplinary course on identity and citizenship to first-year online Bachelor of Arts students.

Review process

A total of 174 submissions were received for the 2022 conference. With the exception of workshops and panel discussions (which were single-blind reviewed) all other submissions were double-blind peer reviewed by at least two reviewers. The OJS Conference Management System was used (for the first time) for the submission and review process. An interesting range of scholarly papers were received across the five different conference themes.

Table 1: Summary of paper submissions and acceptances ASCILITE 2022.

Type of Paper	Number Accepted*	Declined	Withdrawn
Pecha Kucha	32	7	5
Poster	31	4	1
Panel Discussion	4	1	0
Concise paper	41	13	1
Full paper	22	5	2
Workshops	5	0	0

*Acceptance rate (78%)

The ASCILITE 2022 Conference Organising Committee acknowledge and thank the ASCILITE Executive for their guidance and support ensuring that this conference was a success.

List of reviewers

The ASCILITE 2022 Conference Organising Committee and Conference Program Committee wish to gratefully acknowledge the efforts of the international body of reviewers for contributions to ASCILITE 2022. Their work in reading and reviewing the 174 submissions was appreciated greatly.

Name	Affiliation
Adam Bridgeman	The University of Sydney
Adrian Norman	James Cook University
Alix Thoeming	The University of Sydney
Amber Moore	Torrens University Australia
Arindam Basu	University of Canterbury
Asma Alzahrani	Middle Tennessee state University
Barbara Hanna	University of Queensland
Belma Gaukrodger	Australian College of Physical Education
Beth Beckmann	Independent
Bruna Contro Pretero	Australian National University
Cheryl Brown	University of Canterbury
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Claire Brooks	Australian National University
Clare McNally	University of Melbourne
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Danielle Eden	The University of Sydney
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David Bruce Porter	Independent
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Table of contents

Full papers

Concise papers


reconnect
Full papers

reconnect
Reconnecting relationships through technology

The influence of personality traits and basic psychological needs on emotional engagement: An exploration in WeChat discussion

Bing Xu, Jason M Stephens, Kerry Lee
The University of Auckland

Online discussion is often adopted to facilitate students' interaction and communication in higher education. Student engagement, which is a prerequisite of the expected outcomes in online discussion, has been conceptualized as a multi-component construct with behavioural, cognitive and emotional aspects. Compared to the first two aspects, emotional engagement has received the least empirical investigation. Nonetheless, previous research has proposed emotional engagement is related to student's motivation and personality traits. This study adopted an exploratory approach investigating the associations between students' basic psychological needs (BPNS, i.e., autonomy, competence and relatedness), personality traits (i.e., the Big Five) and emotional engagement during WeChat-based discussions. Participants included 94 Chinese university students who voluntarily completed an anonymous online survey measuring the aforementioned factors. As hypothesized, results indicated extroversion, agreeableness, openness and BPNS were positively related to emotional engagement in online discussion. Further mediation analyses indicated BPNS had mediation effects on the relationship between traits and engagement. This is a sign for researchers and practitioners that BPNS might be more important for improving emotional engagement in online discussion settings. The practical suggestions for teachers, research limitations and future work are also offered.

Key words: Big Five, basic psychological needs, emotional engagement, online discussion

Introduction

During the past three decades, the world has witnessed remarkable changes triggered by the advancement of information communication technology (ICT) (Palvia et al., 2018). In education, online communication tools enable students to learn collaboratively with peers without the restrictions of space and time (Cleveland-Innes & Wilton, 2018; Garrison, 2011), and are routinely adopted in both traditional campus-based education and distance education in university courses (Ding et al., 2017; Srba et al., 2019). In China, the most popular instant message software, WeChat, has been utilized by university students to support their academic discussions (Xu et al., 2020), especially during the COVID pandemic lockdown when they had no chance to meet classmates in person. Online discussion can not only provide convenience, it also benefits students' academic and social development (J. Chen et al., 2018; Hew et al., 2010), such as improving academic achievement (Kollöffel et al., 2011; Le et al., 2018) and cultivating collaboration skills (Ku et al., 2013).

Nevertheless, online discussion is not a panacea–learning does not happen inadvertently due to the access to technological tools (Wang, 2019). Student engagement is a critical prerequisite for effective learning (Guo et al., 2014; Hew, 2015a). Student engagement, as a meta-construct, comprises of three components–behavioural, cognitive, and emotional engagement (Fredricks et al., 2004; Kahu, 2013; Reschly & Christenson, 2012). Among three components, emotional engagement, which is defined as "students' affective reactions in the classroom, including students' interest, enjoyment, happiness, boredom, and anxiety… and students' feelings of belonging and value to the school" (Fredricks et al., 2004, p. 63), has been paid relatively less attention by practitioners and researchers compared to behaviours and cognition (K.-C. Chen & Jang, 2010; Cleveland-Innes & Campbell, 2012; Junco et al., 2011; Zhu, 2006). It should be noted that three dimensions of engagement dynamically interrelate with each other and simultaneously support students' learning process (Fredricks et al., 2004), it is implausible to neglect any single component.

Due to the importance of emotions in learning (Fredricks et al., 2004) and the inadequacy of research on it, the present study aimed to address this gap by investigating student emotional engagement in online discussion tasks and explore how factors, including students' personalities and basic psychological needs (BPNS), influence emotional engagement. In doing so, this study intended to yield a deeper understanding towards learners' experience and emotions and provide relevant instructional strategies to improve their emotional engagement.

Literature Review

Student engagement and basic psychological needs

In higher education, Kahu has developed a framework that demonstrates the antecedences of student engagement from the perspectives of sociocultural context, structural influences and students' psychosocial factors (see Kahu, 2013). This framework has proposed that student engagement could be influenced by motivation (Kahu, 2013; Kahu & Nelson, 2018). Such a position has been echoed by the empirical studies that explored related motivation factors, such as self-efficacy (e.g., Kuo et al., 2014) and personal interests (e.g., J. C.-Y. Sun & Rueda, 2012). The present study intended to go deeper than motivation by investigating the resource of intrinsic motivation–students' basic psychological needs (BPNS; autonomy, competence and relatedness, see Deci & Ryan, 2004 for a review). To be specific, *Autonomy* refers to "being the perceived origin or source of one's own behavior" (Ryan & Deci, 2004, p. 8). It describes the individual's need for acting according to their own intrinsic interest and integrated values. The need of autonomy can be satisfied when people feel their behavior as an expression of the self. *Competence* refers to people having the need to "feel effective in their interactions with the social environment" (Ryan & Deci, 2004, p. 7) and to feel competent and confident (K.-C. Chen & Jang, 2010). *Relatedness* is the need for feeling connected with others and having the sense of belonging with others as well as in the community (Ryan, 1995).

Ryan and Deci (2004) claim that BPNS link with human emotions. It means that in education, when their needs are fulfilled, students tend to experience positive feelings and achieve psychological well-being (K.-C. Chen & Jang, 2010). While if the needs are thwarted, students might have negative feelings and disaffection (Deci & Ryan, 2008). In traditional learning environments, students' basic needs are regarded as the positive predictors of emotional engagement (Reeve, 2012; Skinner et al., 2014). However, such relationships have not been adequately confirmed in the online learning settings, as highlighted by Hew, Lan, Tang, Jia & Lo (2019). Although researchers have conducted similar studies in online learning, some limitations and conflicts can be identified. For example, Y. Sun et al. (2019) adopted a self-report survey to measure students' emotional engagement in online courses, while the survey contained only four items and no items were related to students' feelings of belonging and value to the learning community, which should be important elements of emotional engagement (Fredricks et al., 2004). Moreover, Hew (2015a, 2015b) and Lan and Hew (2020) showed that participants' relatedness was slightly negatively associated with engagement in MOOCs, which was controversial to the literature proposing that the satisfaction of relatedness needs can improve engagement (e.g., Reeve, 2012; Skinner et al., 2009). Such a conflict may be due to the differences of the context (i.e., traditional or technology-enhanced learning). Thus, the present study highlighted the necessity of exploring student emotional engagement in online discussion and proposed the fulfilment of needs is positively associated with it.

Student engagement and Big Five personality traits

In addition, Kahu (2013) has also suggested that students' personalities would have an impact on engagement. Some researchers believe that personalities affect people's perceptions of the environment (Jonason & Sherman, 2020), their behaviours, cognitions and emotions (Bidjerano & Dai, 2007; de la Fuente et al., 2020). The main-stream of studying people's personalities is the Big Five model (Tempelaar et al., 2007). Big Five identifies five major dimensions of personality traits (i.e., OCEAN), including Openness (open to adventure, creative and inquisitive), Conscientiousness (persistent, reliable and self-disciplined), Extraversion (outgoing, energetic and sociable), Agreeableness (friendly, compassionate and likeable) and Neuroticism (sensitive, nervous and insecure; see Costa & McCrae, 1988; Poropat, 2015). Among these five elements, the present study focuses on openness, extraversion and agreeableness since these three factors are more likely to associate with students' **emotions** in a **social collaborative** discussion setting than the other two.

Literature has discussed the effect of openness, extraversion and agreeableness on educational outcomes while the conclusions are varied. For example, some studies have proposed that **extraverts** have the nature of sociability and help seeking, which can support them in learning (de la Fuente et al., 2020). While others found negative associations between extroversion and grades (Furnham & Monsen, 2009) and online learning performance (Altanopoulou & Tselios, 2018). Similarly, previous research has also shown mixed findings regarding the relationships (i.e., significantly positive, significantly negative or non-significant) among openness, agreeableness and learning outcomes (e.g., Cohen & Baruth, 2017; Downs, 2019; Kelsen & Liang, 2019; Poropat, 2015). Furthermore, the majority of related studies were conducted in the traditional face-to-face learning contexts (Cohen & Baruth, 2017), while only a minor part have focused on the online discussion settings and even less considered student emotions. Thus, this study addressed such a gap by exploring how openness, extraversion and agreeableness correlate with their emotional engagement in online discussion.

Student engagement is not the outcome of one single factor but the complicated interplay among factors (Kahu, 2013). Although personalities and psychological needs are conceptually different, they may impact engagement collaboratively (Kahu, 2013). In fact, studies in traditional face-to-face learning (e.g., Zhou, 2015), psychotherapy (Leow et al., 2016) and sports exercising (e.g., Ingledew et al., 2004; Ramsey & Hall, 2016) have claimed that personalities are related to the fulfilment of needs (Ryan & Deci, 2001; Şimşek & Koydemir, 2013). However, less has been investigated in online learning. To bridge such a research gap, the present research investigated interactive relationships among personality traits, BPNS and student emotional engagement in online discussion. Specifically, this research started with detecting the associations among personality traits, three psychological needs and emotional engagement and then tested how needs mediate the effects of the traits on engagement. In summary, the research questions (RQs) are:

RQ 1: What are the relationships between students' personality traits, including Openness, Extraversion and Agreeableness, and their emotional engagement in online discussion?
RQ 2: What are the relationships between students' basic psychological needs, including autonomy, competency and relatedness, and their emotional engagement in online discussion?
RQ 3: To what extent do the needs mediate the relationship between the traits and emotional engagement in online discussion?

Methods

Participants

In the present study, participants included 94 first-year (mean age 18-19) undergraduate students in the Faculty of Education at a Double First-Class university in Beijing, China. The participants were enrolled in two courses, with 46 students (9 males, 37 females) in the course the Developmental Psychology and 48 students (16 males, 32 females) in the course of Educational Psychology. These two courses were compulsory for the students who major in education and were led by one lecturer, who delivered face-to-face lectures, uploaded relevant learning materials and quizzes on the online Schoology platform, and designed online discussion tasks for students. All participants were invited to answer a survey on a voluntary basis, with no compensation. All of them had their own smartphones and WeChat accounts and were familiar with using WeChat for discussion.

Instruments

The instrument for the present study was an anonymous survey that contained four parts for getting participants' demographic information and measuring three variables of interest: basic psychological needs, Big Five personality traits and emotional engagement.

Basic psychological needs
The general basic psychological needs scale was developed by Gagné (2003) and translated into Mandarin by Yu and his colleagues (2012). The scale includes 21 items concerning the three needs, competence (6 items, e.g., "Most days I feel a sense of accomplishment from what I do"), autonomy (7 items, e.g., "I generally feel free to express my ideas and opinions"), and relatedness (8 items, e.g., "People are generally pretty friendly towards me"). Five-point Likert scales were used for all items, ranging from "1=strongly disagree" to "5=strongly agree". The Cronbach's alpha values (Cronbach's alpha= $0.66_{(competence)}$, $0.70_{(autonomy)}$ and $0.75_{(relatedness)}$) showed the high reliability of the instrument.

Big Five personality traits
The Chinese version of NEO-FFI (Neuroticism Extroversion Openness Five-Factor Inventory) was utilized to measure participants' Big Five personality traits (P. T. Costa & McCrae, 1989; Luo & Dai, 2011). It contains 60 items in the five-point Likert scale, with 12 items in each personality. The Cronbach's alpha coefficients for five factors were above 0.75, showing its high reliability.

Emotional engagement
The emotional engagement survey developed by Skinner et al. (2009) was adopted in the present study. In the original scale, there are 17 items in two dimensions (i.e., engagement and disengagement), while in the current study, only 10 items were adopted and the other 7 items focused on the classroom settings rather than learning activities (i.e., discussion) were removed. The first author and another master student in the same research team were in charge of the translation and back-translation of the survey. Cronbach' alpha coefficient (0.717) was calculated to ensure the reliability of the revised survey.

Procedure

The online discussion tasks, which accounted for 5% of final score, was originally included in the syllabus. The lecturer took the responsibilities of randomly dividing students from each course into discussion groups of 5-6 people (8 groups in each course) and created a WeChat group for each discussion team. The lecturer assigned two discussion sessions for each class. The discussion topics for Developmental Psychology course were "*Analysing the reasons that may cause underweight of new-born babies"* and *"Comparing the advantages and disadvantages of breast feeding and formula feeding"*; the topics for the Educational Psychology course were *"Imaging you are a teacher in a kindergarten, how do you handle if some children cannot stop crying when their parents are going to leave after sending them to kindergarten"* and *"Please give some principles (or theories) and the corresponding strategies (or methods) that can be used to activate Year 5 students' motivation in a science class".*

The teacher published the discussion topics in WeChat groups at the same time, and the participants had opportunities to ask questions about the topic. Students had 24 hours to finish the task and they could use all five forms of messages in WeChat: text, stickers, images, weblinks and voice/video calls. The researcher was invited into the team and introduced the present research aims and distributed an anonymous online survey. All participants answered the survey by their willingness. One week later, since there were no more new responses, the researcher disabled the survey link and finished data collection.

To answer the RQ1 and RQ2, the Pearson correlation analysis was applied to analyse the relationship between students' basic psychological needs, personality traits and their emotional engagement. Following that, for answering the RQ3, linear regression models were constructed to test the mediating effects of needs on the relationship between traits and engagement. All these analyses were conducted in software SPSS v27.

Results

Descriptive and correlation analyses

Due to the low percentage of missing data (<3%), missing values were replaced by the variable mean. Shapiro-Wilk test showed the data was normally distributed (|skewness| <2.00 and |kurtosis| <7.00). The counts of validated discussion messages in group 1 to group 8 (G1- G8) during two sessions are presented in Table 1, and the results of descriptive statistics and Pearson's correlation among traits, needs and engagement are shown in Table 2. Generally, the mean count of validated messages (Table 1) students posted and the mean engagement score of two sessions (Table 2) showed they actively participated in the tasks and experienced a moderate emotional engagement. Pearson's correlation showed students' extraversion, openness and agreeableness were moderately and positively associated with emotional engagement (r= 0.44, 0.42, 0.46 respectively, p<.05). In addition, BPNS were also positively related to engagement, especially the autonomy and relatedness which showed strong relationships (r= 0.78, 0.80 respectively, p<.05).

Table 1. The counts of validated messages in each group's discussion

Courses	Sessions	G1	G2	G3	G4	G5	G6	G7	G8	Mean
Developmental	1	81	138	31	86	46	102	99	110	87
Psychology	2	65	105	55	36	40	53	32	72	57
Educational	1	85	123	25	46	24	59	54	62	60
psychology	2	40	42	38	47	27	61	31	56	43

Table 2. Intercorrelations among emotional engagement, basic psychological needs and personal traits

Variables	EE	Aut	Com	Rel	Ext	Ope	Agr
EE	—						
Aut	.78**	—					
Com	.49**	.50**	—				
Rel	.80**	.76**	.46**	—			
Ext	.44**	-.37**	.40**	.44**	—		
Ope	.42**	.45**	.37**	.39**	.29**	—	
Agr	.46**	.38**	.35**	.42**	.46**	.25*	—

Note. EE: emotional engagement; Aut: Autonomy; Com: Competency; Rel: Relatedness; Ext: Extraversion; Ope: Openness; Agr: Agreeableness; **p*<.05, ***p*<.01

Mediation analysis

The prerequisite for the mediation effect (significant bivariate correlations among the predictors, outcomes and mediators; see Baron and Kenny, 1986) was met according to the Pearson correlation results. The mediation models were constructed following the process proposed by Baron and Kenny (1986). As depicted in Figure 1**,** the paths labelled *b* and *c* represent the direct effect of traits and needs on engagement, respectively, the path *a* denotes the correlation between traits and needs, and the path c′ shows the correlation between traits and engagement after controlling for the mediator needs. The results are presented in Table 3**.**

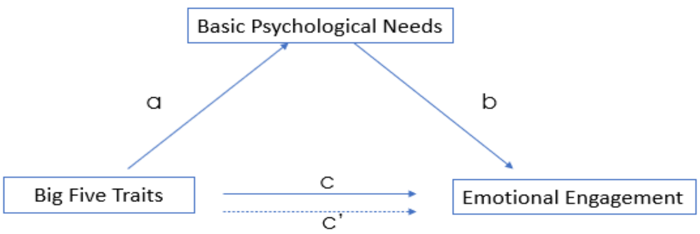

Figure 1. Mediation test model for the effect of basic psychological needs on emotional engagement.

Table 3. Standardized regression coefficients for the mediation paths

Model No.	Big Five factors	BPNS	*a*	*b*	*c*	c′ (controlled mediator)	indirect effect	95%CI for indirect effect
I	Ext	Aut	.37**	.59**		.18**	.30	[.13, .48]
II	Ext	Com	.40**	.37**	.44**	.34**	.17	[.06, .31]
III	**Ext**	**Rel**	**.43****	**.75****		**.11**	**.38**	**[.21, .56]**
IV	Agr	Aut	.38**	.71**		.18**	.32	[.12, .53]
V	Agr	Com	.35**	.37**	.46**	.32**	.16	[.06, .29]
VI	Agr	Rel	.42**	.74**		.14*	.38	[.21, .56]
VII	**Ope**	**Aut**	**.45****	**.74****		**.08**	**.37**	**[.23, .52]**
VIII	Ope	Com	.37**	.38**	**.42****	.27**	.16	[.06, .27]
IX	**Ope**	**Rel**	**.39****	**.76****		**.12**	**.34**	**[.20, .49]**

Note. EE-emotional engagement; Aut-Autonomy; Com-Competency; Rel-Relatedness; Ext-Extraversion; Ope-Openness; Agr-Agreeableness; **p* < .05. ***p* < .01.

The results showed that 95% confidence intervals of the indirect effect were above zero and the c′ values were less than c values, indicating significant mediation effects in **all models**. Specifically, relatedness fully mediated the effect of extraversion (Model III, c′=.11, *t*=1.67, *p*>.05) and openness (Model IX, c′=.12, *t*=1.78, *p*>.05) on engagement, and autonomy fully mediated the effect of openness (Model VII, c′=.08, *t*=3.64, *p*>.05) on engagement. The tests of the other six triads showed significant c′ values indicating partial mediation effects of these needs on the relationship between traits and engagement.

Discussion

The present study explored the relationships between students' emotional engagement, BPNS and personality traits, in the online discussion settings. A sample of undergraduate students were recruited to fill in an anonymous survey about the variables of interest. The results showed that the traits of Extraversion, Openness, Agreeableness and BPNS were positively correlated with emotional engagement. In addition, autonomy and relatedness showed full mediation effects on the relationships between traits and engagement.

It was not surprising that openness, agreeableness and extraversion were positively correlated with emotional engagement. The students with openness are receptive to various learning formats (Bernard, 2010) and tend to adopt positive attitudes towards new knowledge and learning challenges (Bruso et al., 2020). They are also more likely to avoid negative emotions (e.g., anxiety and frustration), enjoy the discussion task, and experience higher emotional engagement than their counterparts (Jonason & Sherman, 2020). Likewise, agreeableness and extraversion have been associated with the abilities to develop and maintain positive relationships with peers in groups (Poropat, 2015). These three traits enable students to have a positive attitude towards online learning, help students connect and cooperate with peers and could further improve emotional experience and engagement in the online discussion settings.

Consistent with previous findings in traditional face-to-face learning (e.g., Reeve, 2012) and in MOOC learning (e.g., Hew, 2015; Lan & Hew, 2020; Sun et al., 2019), results from the present study indicated that students' autonomy, competence, and relatedness were positively related to their emotional engagement in online discussion learning. Specifically, as students' reports of autonomy and relatedness increase, so too do their reports of positive achievement-related emotions (e.g., interest), being valued by peers in the learning group (sense of belonging), and level of emotional engagement (Fredricks et al., 2004). In the online learning setting, relatedness and the sense of belonging were more treasured since students could not physically present and might encounter the challenge of low social presence (Garrison, 2011). Competence was also positively linked to emotional engagement, although the correlation was not as strong as autonomy and relatedness. When the need of competence was met, students felt effective and confident in the interactions with the environment and in the academic tasks. This could provide a motivational basis (e.g., self-efficacy) for conducting the tasks, but it might not as significantly predict the core elements of emotional engagement (i.e., achievement-related emotions, value and the sense of belonging) as the other two needs.

The findings also reflected and explained the mechanism why some instructional strategies, such as providing multiple tasks, promoting positive peer interaction (Johnson & Johnson, 2009), instructor accessibility (Hew, 2015) and formative feedback (Harks et al., 2014; Hattie, 2009), are beneficial to students' perceptions and emotions. To be specific, various task options ensure students to find the one which suits their personal interest and intrinsic motivation and fulfill the need of autonomy; instructor accessibility and formative feedback can improve students' confidence and perceived competence; positive peer interaction could enhance students' feeling of being connected and supported by others thus satisfy the need of relatedness. It is reasonable to claim the effectiveness of the above strategies in online discussion, because they are aligned with students' BPNS and can enhance their emotional engagement.

Beyond what has been shown in literature, this study also found that autonomy and relatedness fully mediated the effects of traits on emotional engagement. One possible explanation for such results is the integrative model of personality traits and BPNS proposed by Prentice, Jayawickreme and Fleeson (2019). In their article, they presented a framework showing the interactive links between **goals, traits** and **needs**. Reflecting in the present study, in online collaborative discussion, students' main **goal** was to finish the discussion task with their peers. Their **traits** of extraversion, agreeableness and openness were more likely to be enacted and these traits further facilitated the fulfilment of the needs of **autonomy** and **relatedness.** Thus, the path linking traits and engagement was actually via the particular needs. The present research findings also imply that there might be an overestimation about the influence of traits on engagement shown in previous literature and also echo to Major et al.'s (2006) claim that the personality variables may be less important when the situational support is strong (i.e., when the needs are satisfied).

Conclusion and Implication

Online discussion has been widely applied to support learning in both distance education and traditional (face-to-face) classes. A high level of student engagement is critical for the expected outcomes of discussion, such as academic and social development (J. Chen et al., 2018; Hew et al., 2010). However, one of the three sub-components of engagement, emotional engagement, has been paid relatively less attention by the previous literature in online discussion learning settings. The present paper addressed this research gap by exploring the relationship between students' emotional engagement, Big Five personality traits and basic psychological needs. By analyzing the data collected in a Chinese university, this study found students who showed the traits of extraversion, openness and agreeableness, or the students who reported the fulfillment of the basic needs of autonomy, competence and relatedness, were more likely to emotionally engage in online discussion. In addition, autonomy and relatedness have mediation effects on the relationships between personality traits and engagement.

The present study had several limitations. Firstly, the participants were from one university and the tasks lasted for one day, which limited to generalize the findings into wider contexts. However, the results drawn from the present data set are validated and trustworthy to provide references for other Chinese university teachers who also include WeChat-based discussion in their courses. A similar sample bias is also present in other research (e.g., Cohen & Baruth, 2017), thus, it is suggested that future studies recruit participants with comprehensive backgrounds and characteristics. Secondly, this study only adopted the quantitative research approach and utilized a cross-sectional self-report survey as the instrument. The limitations of quantitative methods and survey tools cannot be ignored, such as self-report bias, lack of individual's voice. Multiple research approaches (i.e., quantitative and qualitative), assessment methods and longitudinal study design are recommended for future studies. Thirdly, this study only explored traits and needs, however, according to Kahu's (2013) framework, there are more than these two factors influencing engagement. Future empirical studies are suggested to investigate how other factors affect student engagement in online discussion settings. In doing so, it is possible to gain a comprehensive picture of the antecedents of engagement based on empirical evidence.

Though with the aforementioned limitations, this research has contributed the literature in the following ways. It focused on emotional engagement which has not been paid enough attention in online discussion. It also proposed more research to consider students' emotions since they correlate with, even play as the resources of, other respects (e.g., behaviors and cognition). In addition, the results confirmed Kahu's framework in China context and in online discussion settings, where related work has hardly been done by previous research. Moreover, this study considered the stable personalities and flexible needs simultaneously and contributed to knowledge by giving empirical evidence of the mediating effects and stronger predicting power of needs. Thus, it emphasized the importance of fulfilling their flexible needs over propensities.

Some implications for instructional practices can be drawn from the findings in the present study. For example, collaborative learning activities should 1) provide various discussion topic options so the students can choose the one they are interested in (autonomy), 2) utilize extra team-building activities to help improve collaboration skills and build the sense of belonging (relatedness) and 3) provide constructive feedback to enhance competence. Additionally, online discussion might be less supportive for a particular part of students, such as those who are introverted, less social or less open to online group learning, and might have the potential risks of impeding engaging them emotionally. Introverted students prefer the feeling of distance from teachers and peers, and enjoy concentration and deep-thinking without interruptions from others. Therefore, teachers should provide opportunities for students to summarize the groupwork at the end of discussion (Offir et al., 2007). Antagonistic (less agreeable) and/or close-minded students may dislike the new online-based collaborative learning compared to traditional individual learning (Poropat, 2015). Teachers can ensure the tasks are aligned with their intrinsic motivation and emphases the importance of the tasks. Such strategies could enhance students' positive affect and perceptions towards tasks in turn could be enhanced their emotional engagement (Pekrun & Linnenbrink-Garcia, 2012).

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reconnect
Reconnecting relationships through technology

Towards Supporting Dialogic Feedback Processes Using Learning Analytics: the Educators' Views on Effective Feedback

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Feedback plays a crucial role in learning. Yet, higher education continues to face challenges regarding facilitating effective feedback processes. One of the challenges is the difficulty to track how students interact with feedback and the impact of feedback on learning outcomes. Learning analytics (LA) has opened up opportunities to enhance feedback practice with a wide array of data. However, most research seeks to deliver data-driven feedback rather than understanding how students make use of feedback and how educators can use learning analytics to support students in this process. As a first step to address this gap, our study investigated educators' views of challenges and elements of effective feedback processes in addition to their perceptions of data-driven feedback. The study found that feedback design (e.g., feedback purpose, content, and structure), educator-related factors (e.g., time constraints and resource limitations), and student-related factors (e.g., disposition, self-regulation, and sense-making) can have positive or negative impacts on the feedback process. It also highlights the need for the development of student feedback literacy. Based on the findings, we proposed ideas for an LA-based feedback tool that can be used to facilitate a dialogic feedback process and address challenges with feedback.

Keywords: learning analytics, feedback literacy, dialogic feedback, traceability, feedback impact

Introduction

Feedback has a significant influence on a learner's performance and achievement (Hattie & Timperley, 2007). In recent years, studies on effective feedback tend to shift the notion of feedback from a traditional transmission-focused model to a student-centred model, which emphasises shared responsibilities between students and educators in the feedback process (Boud & Molloy, 2013). Accordingly, many scholars have argued that feedback needs to be dialogic so as to enable two-way communication, cultivate trust, and motivate students to engage with feedback (Sutton, 2009; Yang & Carless, 2013). However, various studies have highlighted students' difficulties in interpreting feedback and taking action, as well as their lack of satisfaction and engagement with feedback (O'Donovan et al., 2019; Price et al., 2010). Such challenges suggest the need to develop student feedback literacy since students' recognition of feedback value and interactions with feedback such as sense-making, action-taking, and active engagement are important components of feedback literacy (Carless & Boud, 2018). Student feedback literacy, however, is relatively low in higher education (Carless & Boud, 2018). Due to this, scaling up student feedback literacy is essential to an effective feedback process because it directly affects how feedback makes a positive impact on their learning (Carless & Boud, 2018; Sutton, 2012). On the other hand, traceability of feedback impact, including student interactions with feedback has been a lasting challenge in higher education (Winstone, 2019), which impedes educators from supporting students to develop feedback literacy or improving their own feedback practice.

Learning Analytics (LA) has received considerable attention in the higher education sector because of its potential to facilitate a dialogic feedback process and track feedback impact (Winstone, 2019). By utilising advanced computational methods and technological infrastructure, LA can collect, analyse, and report on data about students and their learning. Such data-based insights allow educators to provide personalised feedback to large-sized classes in a timely manner, which serves as a stimulus for a dialogic environment to strengthen the relationship between educators and students (Winstone, 2019; Yang & Carless, 2013). However, studies raised concerns about the lack of actionable insights and student action on feedback generated by LA tools (Pardo, 2018; Tanes et al., 2011). In addition, predominant research in the LA field focuses on using technology to facilitate feedback delivery (transmission-focused model) with limited capacity for tracking feedback impact (Carless & Boud, 2018; Winstone, 2019). Furthermore, learning analytics is regularly criticised for its lack of grounding in educational theory (Joksimović et al., 2019).

To address these issues, this paper presents a qualitative study that explores educators' current feedback practices, including their perceptions of challenges, feedback effective elements, feedback impact and interaction traceability, and data-driven feedback. This is part of a larger study that aims to develop a Learning Analytics (LA)-based feedback tool, which aims to scaffold the development of feedback literacy and inform feedback pedagogy by addressing the challenges associated with sustainable feedback, particularly in terms of impact traceability. The findings presented in this paper are based on fourteen group or individual interviews with twenty educators in higher education. The investigation is grounded in feedback theories and attempts to answer the following research questions:

- RQ1: What do educators perceive as challenges or effective elements in facilitating effective feedback processes?
- RQ2: What kinds of data about student interactions with feedback would be useful to educators when it comes to teaching design, feedback provision, and student support?

Literature review

Feedback is an essential part of the learning process. It aims to help students close the gap between their current and desired understandings by providing clarification of misconceptions and identifying issues with their learning strategies and skills (Sadler, 1989). However, studies have shown that students can struggle to make sense of feedback or respond to it (Price et al., 2010). This issue can be worsened in a traditional feedback model which considers that feedback is transmitted one way from the educator to the student instead of facilitating a two-way process that invites students to take an active role in sense-making and taking action based on the feedback (Yang & Carless, 2013; Nicol, 2010). In this regard, Yang and Carless (2013) proposed a framework of triangular feedback dimensions, namely *cognitive, social-affective*, and *structural*, to facilitate a dialogic feedback process in order to promote students' productive learning. In the c*ognitive* dimension, the feedback content is the key element to improving students' ability to cope with disciplinary problems effectively and increase their self-regulated learning skills (SRL) to utilise the feedback productively. For feedback to be effective, the content of the feedback should have clear purposes and serve to answer three questions: Where am I going (feed up)? How am I going (feed back)? Where to next (feed forward) (Hattie & Timperley, 2007)? The first notion of f*eed up* is about clarifying learning goals and objectives; the second notion, f*eed back*, is about reporting on a learner's progress toward goals and objectives; and the third notion, f*eed forward*, is about setting the stage for future learning opportunities. Each feedback question works at four levels: task level (FT), process level (FP), self-regulation level (FR), and self level (FS). The feedback about task (FT) focuses on how well the task is performed, while the feedback about process (FP) focuses on how it was completed. The feedback about self-regulation focuses on providing cues or prompts to encourage self-monitoring, directed and regulated learning, and feedback about self (FS) is about learner's personal evaluations, which is irrelevant to students' performance on the task. Feedback is most effective when it targets at the appropriate level based on the needs of the students, especially when it moves from the tasks (FT) to the processes (FP) or self-regulation (FR) to lead students to engage and develop effective skills to learn more. The feedback about self (FS), on the other hand, is the least effective form of feedback according to Hattie and Timperley (2007).

In the *social-affective* dimension, feedback is perceived as a social and relational process that impacts learning through emotional management. The management of emotions can foster trust and balance the power relationship between educators and students, which could encourage them to share meanings and resolve misunderstandings through dialogues (Steen-Utheim & Wittek, 2017). Boud and Molloy (2013) also emphasise the importance of educator and student relationship in learning, which is an enabler of dialogues between two agents and can make feedback more effective and sustainable. As part of dialogic feedback, students can engage with feedback actively and therefore learn from it in a trusted relationship because positive and negative emotions affect their willingness to participate in and engage with given feedback. However, many concerns arise about how to strike the right balance between support and criticism with an appropriate tone while not discouraging, demoralizing, or demotivating students, because the emotional impact of the feedback is crucial for promoting positive learning dispositions, self-regulation, and feedback effectiveness (Robinson et al., 2011).

The s*tructural* dimension concerns the way in which feedback processes are organised and administered by educators and institutions. The feedback timing, frequency, technology, and modes are the key components associated with the resources to generate and provide feedback. Feedback is now acknowledged as an integral part of learning design (Harvey, 2003). However, students often find it difficult to receive timely and helpful feedback due to educators' availability to provide and sustain support on a timely basis, especially when students are looking for the following elements of feedback: helpfulness, timeliness, individuality, specificity, clarity and quality (Bailey & Garner 2010; Jonsson, 2013; Winstone, 2019). In many cases, the issue is less about educators' availability, but the learning design. For example, integrated multi-stage assignments is an essential element for delivering timely and continuous feedback to students; in turn, this promotes their uptake of feedback (Carless & Boud, 2018; Gibbs, 2006). Nevertheless, tracking feedback engagement and impact is an inherent challenge in the feedback process in terms of understanding how students exactly interact with the feedback (e.g., reading, making sense, taking action, etc.) (Winstone, 2019). Therefore, the feedback loop remains open when we fail to understand how students interact with feedback and how this process can be used to inform teaching and further support students. In this feedback process, student feedback literacy is essential because it brings students' active roles in facilitating their own learning by actively seeking feedback and making effective use of it (Carless & Boud, 2018).

Many studies have highlighted that student feedback literacy affects the impact and uptake of feedback (Carless & Boud, 2018; Sutton, 2012). However, students with a low level of engagement and satisfaction, along with high variability in their expectations, beliefs, and interpretations of feedback have been raised as the main barriers to effective use of feedback (Boud & Molloy, 2013; O'Donovan et al., 2019; Price et al., 2010). This is mainly due to the low level of student feedback literacy, which involves understanding and managing feedback effectively; developing capacities and dispositions to make use of the feedback productively; and appreciating feedback. More specifically, students should be able to recognise the value of feedback and understand their active role in the feedback process (*Appreciate feedback*), make judgements about their own works (*Making judgements*), be emotionally capable of dealing with feedback (*Managing affect*), and know the strategies necessary to act on feedback (*Taking action*). In order to make feedback effective, learners' sense-making and action-taking are critical in the feedback process, which requires students to have a certain level of feedback literacy and the educator to facilitate a dialogic feedback process that encourages students to take active roles in making sense of feedback and benefiting from this process (Price et al., 2010). On the other hand, a recent study argues that learner-centred feedback can enhance the sustainability of the feedback by placing learners as a key agents in the process (Ryan et al., 2020). The authors proposed three key conditions to be met in order to make the learner-centred feedback effective: sense-making, agency and impact.

Technology-enabled feedback, such as LA-based feedback has been introduced since it can address some of the above-mentioned challenges, especially timeliness and frequency, in addition to providing opportunities for a meaningful dialogue between educators and students (Hattie, 2012; Tsai, 2022; Yang & Carless, 2013). As an example, OnTask is an LA-based feedback tool that provides personalised feedback to large cohorts of students on a timely basis throughout the semester (Tsai et al., 2021). However, their pilot study on OnTask has shown that it lacks learning strategies to improve students' domain knowledge and self-regulation skills despite showing evidence of improving students' overall experience and appreciation of data-driven feedback by facilitating continuous dialogues. Similarly, several studies have shown that LA fails to effectively provide students with actionable knowledge or effective learning strategies, resulting in their apathy to take action based on the feedback given to them (Matcha et al., 2020; Pardo, 2018). The implication is that the LA-based feedback does not only require attention to foster a trusting relationship between educators and students in a dialogic process but also constructs feedback in a way that captures feedback effective elements (e.g., feedback purposes and levels, two-way process) to target students' individual learning.

Using learning analytics to facilitate an effective feedback process requires purposeful design grounded in feedback theories that may enable opportunities for further learning, including facilitating dialogue between educators and students and scaffolding the development of feedback literacy among students. To this end, our study is framed by the feedback theories discussed above with the goal to develop an LA-based feedback tool that allows educators to better track students' interactions with feedback, scaffold feedback literacy, and enable a dialogic feedback process.

Methodology

In this study, a qualitative research method is adopted with interviews to investigate the educators' perceptions of the challenges in feedback processes and what kind of learning data or information educators desire for a better understanding of students' interactions with feedback. Twenty educators (7 females, 13 males) from higher education worldwide consented to participate in a one-hour-long semi-structured focus group or individual interview. The participants were recruited from those who consented to participate in a previous survey study[1] on educators' views of feedback effectiveness and impact in addition to additional recruitment through the researchers' professional networks. This research received ethics approval from the ethics committee at Monash University and consent from each participant was obtained before conducting interviews. In total, we conducted six focus groups (two educators per group) and eight individual interviews. Participants were from different universities in the following countries: Australia (9), China (4), Brazil (1), Canada (1), Ethiopia (1), Indonesia (1), Pakistan (1), and South Africa (2). The interviews were facilitated with 7 main semi-structured questions along with corresponding prompts or follow-up questions to explore educators' perceptions of various aspects: current practice, challenges for educators and students, effective feedback elements, impact and action tracking, desired data/information, perception of data-driven feedback approach, etc. (Interview questions are accessible here). All interviews were transcribed verbatim.

Following the completion of the data collection phase, a thematic analysis was conducted using the NVivo software. A coding scheme comprising seventy-two codes in total was developed based on relevant literature and emergent codes from interview data (Grbich, 2012). These were further grouped into four levels of themes, with the top-level themes being **feedback impact & interaction tracking**, **data-driven feedback**, **perception**, **feedback design**, **student-related factors**, and **educator-related factors** (The coding scheme is accessible here). The main coder conducted three rounds of inter-rater reliability tests with two other coders; one of them was involved in the first two rounds, and the other coder was involved in the final round. Cohen's Kappa results for the three rounds of inter-rater reliability tests were 0.62, 0.52, and 0.66 respectively. The second round resulted in a Kappa score lower than that of the first round due to a major change in the coding scheme; more specifically, we added the **perception** theme in order to differentiate references that were related to challenges and effective elements. After the coders resolved disagreement over the coding scheme with some revision of code descriptions, the third-round of inter-rater reliability test reached Cohen's Kappa 0.66, which is considered a 'good' agreement (0.61 - 0.80) according to Mabmud (2010). Following that, the main coder carried out the coding process for all interview transcripts.

In the following section, quotes from the participants are labelled as Int (interview), with a number to differentiate between interviews, followed by P (participant) with a number to distinguish between participants in the same group. For example, Int1P1 indicates participant 1 from individual interview/focus group 1. All the numbers cited in the findings (e.g., n=10) represent the number of participants who expressed a given idea, unless it explicitly states the number of *references (e.g., f = 12)*, meaning the frequency of a particular code being applied in all interviews. Lastly, codes are bolded in order to improve readability.

Findings

In this section, we present our findings in response to the two research questions based on high-level themes. The first sub-section presents educators' perceptions of challenges and effective feedback elements in facilitating the feedback process, including feedback impact traceability, feedback design, educator-related and student-related factors. The second sub-section presents educators' perceptions of data-driven feedback based on their current feedback practices and what types of data they are interested in learning about in order to support students better.

Educators' perceptions of challenges and effective feedback elements

Feedback impact and interaction tracking
Tracking the feedback impact and interaction has been raised as one of the main challenges in the feedback process. About half of the educators (55%, n=11) stated that they either did not track or did not have a way to track students' interactions with feedback, making it impossible to determine whether their feedback was effective. It led to a challenge in providing further support to students. As a result, educators desired data or information that shows students' interactions with feedback, including whether they read and understood it, how they felt, and what actions they took.

> 'Basically, it's very difficult to tell what students have done with feedback because it lives within their own minds…I would definitely like to know things like what they feel, it was clear to them, it gave them direct guidance, and it felt like it was about them. And to a sense, whether they feel confident in taking the next steps?' – Int10P1

[1] The survey study was distributed broadly to educators in all sectors via social media and the researchers' networks, whereas our interviews focus on educators in the higher education sector.

The most commonly used method for understanding how students interact with given feedback was investigating **student engagement** (90 %, n=18), either online or in class. The first method was to observe students' **class participation**, which includes their attendance, class engagement, online engagement (LMS metrics and forum posts), and changes in their attitude and behaviour in the classroom through direct observation. Another approach was to observe **student inquiries**, whether they were seeking additional feedback or clarification. Although student engagement has a broad definition, we describe it as a category that emerges from interview data.

More than half of the educators (55%, n=11) tracked students' **direct feedback** and **follow-up activities** (e.g., subsequent assignments) in order to understand students' improvement and their interactions with feedback. In most situations, students' evaluations on the educators were embedded in the course design to allow students to comment on their educators' teaching and feedback practice in higher education settings. However, it could be challenging for educators to determine students' real needs due to anonymity and a lack of details, timeliness and response rate. Thirty-five percent of educators (n=7) also utilised **students' performance** data to track feedback impact and interaction, such as their improvement of assessment results or the correction of errors based on feedback. Despite using a variety of data sources to determine whether their feedback made an impact on students' learning, educators were still dissatisfied with their current practices due to their limitation to provide an accurate representation of how students interact with feedback. Due to this, educators were keen to have a more frequent and direct way to receive feedback from students on their feedback. For example, Int9P1 commented that the standard course survey at the end of a semester was not effective in soliciting detailed feedback from students and suggested instead: *'we could get feedback on the feedback that we give, like each assignment or each test.'* (Int9P1)

Educator-related factors

Educators expressed various challenges they encountered during the feedback process in their teaching experience, including challenges that are related to **feedback design**, **student-related factors** and **their own factors**. In terms of educators-related factors, the most common challenge that educators face was **time constraints and resource limitations** (65%, n=13) due to an unmanageable workload, the volume of the feedback, and their multiple roles in the institution. As a result, many educators (60%, n=12), particularly in China (20%, n=4), expressed a desire for a feedback tool that would assist them in automating or semi-automating feedback in order to deal with a large number of students. On the other hand, educators also perceived that their **time constraints and resource limitations** (25%, n=5) hindered students' learning by not being able to provide enough support and attention to their students, especially in a hectic clinic environment. Int11P1 would like to spend more time on helping individual students regarding their performance, but he stated that: *'I would like to talk longer to a student about things that went wrong and right and whatever but then there's another student waiting, the attention is sort of shared between or amongst the different students.'* (Int11P1)

In terms of **feedback design**, educators expressed their difficulties aligning feedback with learning design to allow students to benefit from feedback. From educators' perspectives, the **learning design** (50%, n=10), including issues related to the marking rubric, the inability to apply feedback further and receiving inconsistent feedback from multiple educators could be barriers for students. For example, Int8P2 commented that: *'Other times, there are multiple people giving them feedback, and those people might not agree.'* In other words, students might not be able to benefit from feedback if the learning design does not consider the feedback as a reciprocal process for clarifying their misconceptions and practising feedback further.

Student-related factors

Student-related factors have been raised as challenges for educators in facilitating the feedback process, such as **student attitude** (60%, n=12), **personality** (40%, n=8) and **self-regulation ability** (35%, n=7). Students' lack of engagement and motivation towards learning was one of the biggest challenges for educators, as they observed students making repetitive mistakes that were highlighted in the feedback and were unwilling to take the second chance to submit their works that educators allowed. Consequently, Int3P1 expressed his disappointment and irritation after putting so much effort into the feedback: '*I have already given them [feedback], but they didn't take it seriously. This is also my concern, because why should I give you feedback if you are not going to take the feedback seriously in the end? They even didn't read it.'* (Int3P1)

On the other hand, the educators believed that **student-related factors** can be main barriers that prevent students from benefiting from feedback. For example, **Student self-regulation capability** (70%, n=14) has been highlighted as the most essential ability that students lack. This includes time management skills and the ability to adopt strategies to take actions based on given feedback. Additionally, **students' attitudes** (55%, n=11), such as a lack of engagement and interest in their learning activities, have been considered as a major challenge for students to make use of feedback in their learning processes. Furthermore**, sense-making** (50%, n=10) was a common issue in their learning processes as well. Eight of them believed that students were unable to understand feedback due to a lack of understanding of the assessment requirements and marking criteria. In some cases, students even carried out tasks in a completely wrong direction: *'And then they're surprised when they get this score back that they didn't get the mark they want, but because they didn't look at the criteria, they went the completely wrong direction.'* (Int1P1)

Feedback effective elements
The concepts of challenges and effective elements are intertwined because some challenges that educators or students face during the feedback process can also be seen as feedback effective elements on the other hand. As an example, **learning design** (50%, n=10) was one of the prominent barriers that prevent students from benefiting from feedback if it is not planned properly for effective feedback process; however, 14 educators (70%) considered it a critical element for making feedback effective through subsequent assessments, allowing students to have the opportunity to improve. Besides the above-mentioned challenges that were perceived as effective elements, **feedback on process** (90%, n=18), **feedback on self-regulation** (85%, n=17) and **feed forward** (85%, n=17) were commonly identified as elements of effective feedback. The participant Int11P2 emphasised on the feedback content to improve students' self-regulation by guiding students to reflect and make further improvements: *'You have to ask the question, 'what do you think is wrong?' so that the student starts to reflect on why? After a while, they start thinking why they are struggling and how to improve it.'* (Int11P2)

Additionally, educators also placed an emphasis on the social-affective dimension, such as **feedback tone** (60%, n=12), **educator and student relationship** (40%, n=8), and **reciprocal process** (40%, n=8). In terms of student-related factors, educators perceived that **student appreciation** about the feedback (30%, n=6), **self-regulation capability** (30%, n=6) and **sense-making** (20%, n=4) also play an important role in making feedback work for students. Int3P1 showed his preference for using face-to-face feedback to have a discussion with students and ensure that students understand the feedback: *'I always try to meet them via Zoom, and then we discuss the feedback so that they can understand from the humanistic side, because if it is in writing, sometimes it's lost the non-verbal cues.'* (Int3P1). On the other hand, Int10P1 stressed the importance of balanced power between educators and students in order to better manage students' emotions and encourage feedback uptake.

> 'And I think ideally, you want it to be something where the students feel like they can actually continue the discussion. I would say if they feel like there's a flatter hierarchy where they feel like they are kind of on the journey together.'– Int10P1

Overall, there were a variety of challenges that have been raised by educators, including feedback design, educator-related and student-related factors, and impact traceability, which impede students making use of feedback. On the other side, challenges can turn out to be effective feedback elements if they are taken into consideration and addressed properly.

Data-driven feedback

- *Perceptions and current practice*

Over half of the educators (55%, n=11) believed that data-driven feedback was **useful** in their current feedback practice, because it not only allowed them to better understand their students with various data sources, but also increased students' appreciation for the feedback that they receive:

> 'When I was teaching in the physical classroom, I tended to provide feedback based on their behaviours and other data, which was very helpful for students to learn better. Students appreciated this kind of data-driven feedback, and they were surprised, felt special because you know them, and about them.' – Int14P1

On the other hand, about one-third of the educators (35%, n=7) perceived that data-driven feedback was only **semi-useful** because of concerns about **accuracy, ethics and privacy, bias,** and **security.** The **accuracy** issue (20 references out of 40) of the data-driven feedback approach was a major concern. The participants were not only aware that data cannot thoroughly represent one student's performance and status, but were also concerned about the quality of the data models and algorithms being used.

Furthermore, the concerns about **ethics and privacy**, and **bias** were raised twelve times (*f* = 12) among participants respectively. For example, educators may unconsciously provide biased feedback and make personal judgements about a student based on the data that they have. Similarly, Int7P1 emphasised the issues with the data-driven feedback approach due to a negative experience with a student who was strongly opposed to being judged by data and believed the data collected by educators was not an accurate representation of their actual engagement. Therefore, the educator proposed student-led data-driven feedback, believing that it could facilitate the feedback process by allowing students to play an active role in the process and engage in dialogue about their learning.

> ‘So, if the student collects that information of her or his own accord and brings it to me, we have a conversation around that. That can be very powerful. You see, this is the other way around.’ – Int7P1

Student acceptance
In terms of how students responded to the data-driven feedback approach, several educators (40%, n=9) indicated that most students accepted or trusted the feedback they received based on their learning data, such as attendance, log activities, engagement matrix from learning management systems and so on. Occasionally, students expressed their appreciation for data-driven feedback because they felt their educators were caring and attentive to them, ‘*So I think generally students do know that the tutor cares and is noticing their performance, even if it is a bit of a poor performance*.’ (Int1P1)

In contrast, four educators stated that a handful of students showed resistance to data-driven feedback due to its inaccuracy and unreliability. It was argued by students that the online learning data is unrepresentative because they used many offline resources, including reading, researching, and searching for alternative materials online. The result was that educators avoided collecting data and using it to provide feedback, despite the fact that they believed data-driven feedback to be valuable in their teaching practice. For example, Int7P1 believed that postgraduates have their own time management strategies, and it is important to provide data-driven feedback with caution as he observed that some students responded offensively: *‘I did it on a couple of occasions, but I kind of regretted doing it, I was collecting information like especially from Moodle about engagement. But again, I haven't...That was a negative experience because he was a [sic], that wasn’t done in the right way.’* (Int7P1)

Desirable data
The interview questions also asked for data or information about students that educators would like to have in order to better understand whether students took actions in response to feedback or how they exactly interacted with it. More than half of the educators (55%, n=11) strongly expressed a desire for information about the **students’ interactions with the feedback**, including how well they read and understand it, whether they accept or reject it, how they engage emotionally, and implement it accordingly.

> ‘That’s what we need to learn from it, I think the biggest thing for me is to see whether the students actually go and engage with the feedback that’s available on the computerised system and actually see whether they look at it and they reflect and say: Well, can I improve in this area or what should I do to improve my independence or what can I do for the next step?’ – Int11P2

However, three educators were interested in knowing **students’ offline activities** so they could understand how much time they spent on completing the assignment and understanding a certain content of their unit, how many articles they read, and how they digested them. In addition to that, three educators were interested in **students’ background information**, especially their language level, cultural nuances, and more personal information. In terms of personal information, they were particularly interested in knowing whether students have any disabilities (e.g., hearing impairment), since they believed that feedback could harm students with disabilities in some situations when not considered.

Overall, the interview data revealed that educators perceived the importance of data-driven feedback with its related concerns in their feedback practice. Educators showed their desire for more data about students, especially their interactions with feedback, in order to facilitate the feedback process and support students more effectively.

Discussion

Twenty educators from higher education participated in this study, which aimed to gain a deeper understanding of their current feedback practices. The study intended to interrogate educators' views on challenges in the feedback process, their perceptions of the data-driven feedback, and the types of student data they need for effective feedback. In response to the RQ1 (*What do educators perceive as challenges or effective elements in facilitating effective feedback processes?*), our data highlights that various factors might hinder an effective feedback process, including feedback design, educator-related and student-related factors, and feedback impact traceability. Considering student-related factors, several educators believed that students were reluctant to engage with feedback due to negative learning dispositions towards learning, such as different expectations in the feedback or results, grade-oriented personality, a poor attitude towards learning, and lack of engagement and motivation. This implies that ***appreciation*** plays a critical role in engaging students in the feedback process through the recognition of the feedback value and their active participation in its process (Carless & Boud, 2018; Sutton, 2012). The participants believed that their students' inability to make sense of feedback was mainly due to a misunderstanding of assessment criteria and requirements, which further led to different expectations between educators and students regarding feedback and results. The issue is also related to the challenge of aligning the feedback mechanism with the learning design, where the learning design should enable students to understand the purpose of feedback, develop ***evaluative judgement***, and apply feedback in the following tasks (Carless & Boud, 2018). In addition, the educators expressed their concerns that their feedback might discourage students, particularly those who are shy, introverted, and afraid of criticism (student personalities). This implies that the disposition to ***manage feedback affect*** should be developed because studies have shown that students' disposition to interact with feedback is often not optimal in higher education, and feedback tones can easily provoke affective emotions, which directly affect students' participation and engagement in the feedback processes (Carless & Boud, 2018; Steen-Utherim & Wittek, 2017). Moreover, participants in our interviews reported that some students tend not to ***take actions*** despite receiving repetitive feedback. They perceived that students lacked self-regulation capability to manage their time productively and apply strategies and tactics to resolve issues that were identified in the given feedback. This highlights the importance of student feedback literacy as it can help students to develop their dispositions and capabilities to act upon the feedback and make use of feedback effectively.

In terms of educator-related factors, educators' time constraints and limitations were the most commonly highlighted issue in their teaching practice. In our study, we found that the increased volume of feedback and unmanageable workload due to the large class sizes and their multiple roles (teaching and researching) in the institution resulted in insufficient student support. This is also aligned with Yang and Carless (2013) who emphasise the structural constraints that impede educators from providing effective feedback to their students. In light of this, technology-enhanced feedback could be the potential solution to provide timely and personalized feedback in a non-labour-intensive way through a dialogic feedback process. Additionally, educators have expressed challenges related to the feedback design, such as constructing feedback content to enhance students' learning as well as aligning feedback with learning design, and more importantly, pinpointing effective feedback elements including clearly defined purposes, and appropriate levels with clarity to foster engagement and self-regulation. In other words, if the feedback content is not constructed in alignment with the learning design (e.g., marking rubric, subsequent assignments, meaningful dialogues), the feedback might not be effective enough to influence students' learning (Hattie & Timperley, 2007).

Another key finding is that educators encountered challenges to track feedback impact and interactions, which is essential for providing effective and sustainable feedback to students (Winstone, 2019). A lack of synthesis of multiple feedback processes, invisibility and inaccessibility of feedback impacts, as well as diversity among students, may cause difficulties in tracking feedback impacts and interactions (Winstone, 2019). To tackle those issues, effective learning and feedback design with technology-enhanced feedback (LA-based feedback) could be implemented (Yang & Carless, 2013).

In response to RQ2 (*What kinds of data about student interactions with feedback would be useful to educators when it comes to teaching design, feedback provision, and student support?*), our data showed that educators desire to have a data-driven feedback tool to track student interactions with feedback and whether their feedback is effective in student learning. Specifically, the information about students' emotional responses, their detailed action-takings, types of additional support they need would be desirable in assisting educators to identify students' real needs and provide individualized support. Similarly, Winston (2019) argued that making feedback impacts and interactions tangible can facilitate a holistic and ongoing feedback process, which would encourage students' engagement and uptake of feedback. However, teaching staff also expressed their concerns regarding data-driven feedback: accuracy, ethics and privacy, bias, and security, which should be taken into consideration when designing an LA-based feedback tool, otherwise, it will lead to students' resistance to making use of LA-based feedback (Tsai et al., 2020).

Based on all of the above findings, we argue that dialogic elements and student feedback literacy are important to an effective feedback process. In this process, LA can be leveraged to enable dialogue between students and educators and provide opportunities to scaffolding feedback literacy. For example, we may seek to use LA to improve students' *appreciation* through timely and personalised feedback (Carless & Boud, 2018), as well as improving student ability to *make judgement* by aligning LA with learning design (e.g., learning outcomes), *manage affect* by cultivating a trust relationship (e.g., balancing power relationships), and *take action* by guiding students to make sense of feedback and reflect on further learning opportunities. All of these rely on a two-way feedback process in which educators can better understand students' interactions with feedback and provide support accordingly.

In light of all findings, we posit that an LA-based feedback tool for educators should address challenges in the feedback process with the ability to scaffold student feedback literacy by facilitating dialogic feedback processes (User cases have been identified in this mapping table). We thereby designed a low-fidelity prototype of an LA-based feedback tool that consists of three main interfaces to realise five major functionalities: feedback content construction (A), communication enhancement (B), impact traceability (C), student feedback literacy development (D), and feedback scalability (E) (Full view of the prototype is available here).

The first interface is intended to provide timely feedback by overviewing students' feedback with the status and urgency levels, which could encourage students to actively participate in the feedback process (B, D). In the second interface, students' individual needs can be visualised by providing a more detailed understanding of their interactions with feedback (e.g., read, understand, feelings) (B, C). In addition to that, students' detailed future action plans with their progress will be presented, which allow ongoing dialogues between educators and students based on data (A, B, C, D). The third interface is intended to help educators to manage feedback effectively by dealing with feedback in bulk (A, B, E). In all areas (The second and third interfaces) for educators to provide feedback, a natural language processing system will be integrated to assist in composing feedback with an appropriate tone, thus facilitating feedback process (A, B).

Conclusion

In this qualitative study, we synthesised the challenges and effective elements that inhabit feedback processes, along with educators' perceptions and concerns about data-driven feedback, which were then used to inform our LA-based feedback tool. The tool can potentially contribute to scaffolding student feedback literacy by encouraging dialogues and their active role in the feedback process, along with an opportunity to track feedback impact and interactions. Our next step is to validate the prototype by seeking further feedback from both educators and students, including the need for training to ensure ethical and effective use of data in facilitating feedback processes.

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reconnect
Reconnecting relationships through technology

'Made good connections': Amplifying teacher presence and belonging at scale through learning design and personalised feedback

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While online learning offers much flexibility for students in terms of time and place, students' experiences of online learning have been less than positive. A sense of belonging is key to students' success and retention in any learning environment. Teaching or teacher presence is significant for setting a climate for belonging. However, few studies have documented how teachers can foster students' sense of belonging in online settings and students' experience of these initiatives. This paper presents an exploratory case study of a teacher's initiatives to foster students' belonging in an online subject by amplifying teacher presence through technology-mediated, personalised feedback embedded within interactive, engaging subject design. Students' experiences of the subject and perceptions of their personalised feedback were captured through surveys and focus groups. Together, the findings indicate that the primary role of personalised feedback in fostering belonging was building connectedness between the teacher and students, thereby enhancing students' motivation to learn in the subject. The findings also resonate with other research highlighting the importance of teacher presence throughout the subject, not just during synchronous classes.

Keywords: sense of belonging, online learning, learning analytics, feedback

Introduction

Online learning offers students the flexibility of learning in their own time and place. However, it can be perceived by students to be an isolating experience (Arslan, 2021). Without a sense of belonging or connectedness, students may be less motivated to persist with their studies when faced with challenges such as managing workload or mastering content. Hence fostering a sense of belonging is critical for students' continued engagement in their learning, especially in online courses. Research has shown that teacher presence promotes student engagement and learning through a sense of connection, belonging, and feedback and guidance opportunities (Stone and Springer, 2019). Nevertheless, how can connection and belonging be fostered in online learning contexts with large enrolments? Current literature on belonging highlights the importance of engaging and interactive course design, together with regular and timely feedback and communication (Delahunty et al., 2014; Stone & Springer, 2019; Peacock et al., 2020). Learning analytics approaches to feedback offer a viable solution to scaling timely and personalised feedback (Pardo et al., 2017). However, few studies show how learning analytics can be harnessed to foster belonging in online learning. This paper presents a case study of how a teacher employed engaging and interactive course design, and harnessed learning analytics to personalise feedback and support to students to foster belonging in an online subject. This case study contributes to the emerging research and practice of fostering belonging in online courses through technology by documenting an innovative approach as well as the students' experience especially concerning their sense of belonging.

Background

Learning and belonging in online learning

Belonging is an integral part of students' subjective experience that influences their success at University (Araujo et al., 2014; Tinto, 2003) and is an important factor for retention (Meehan & Howells, 2019; Thomas, 2012). While many definitions of belonging have been proposed (e.g., Thomas, 2012), we rely on Goodenow and Grady's (1993) influential definition, which emphasises students' sense of 'being accepted, valued, included and encouraged by others (teachers and peers) in the academic classroom and of feeling oneself to be an important part in the life and activity of the class' (p.25). Online learning can present significant challenges in fostering a sense of belonging. Belonging is inherently relational (Kahu & Nelson, 2018), but students in online learning settings learn remotely from each other and the teacher. Recent empirical evidence indicates greater feelings of isolation and, accordingly lower sense of belonging (Garrad & Page, 2022) and higher attrition rates for online courses (Shelton, Hung, & Lowenthal, 2017).

In addressing the poverty of students' experience in online learning, literature has emerged in recent years, introducing evidence-based strategies for fostering belonging in a fully online context. Essentially, the research indicates that students' sense of belonging in online courses can be fostered by two critical elements perceivable by students in the learning environment: teacher presence and interactive course design (Fiock, 2020; Peacock, et al., 2020; Stone & Springer, 2019). When these are present, students feel a sense of belonging that enhances greater motivation and engagement, leading to academic success, a positive learning experience, and ultimately, retention. At the classroom level, emerging research indicates that the critical factor in fostering belonging is the teacher (Kirby & Thomas, 2022; Stone & Springer, 2019), who demonstrates care and support for student learning, and who orchestrates features of the learning environment to provide a strong community of learning with clear expectations. However, the challenge of fostering belonging through teacher presence is exacerbated with large cohorts (Stone & Springer, 2019). How can teachers sustain students' engagement in their learning from week to week, given large enrolments in online courses and the limited time for interaction?

Learning analytics: Using data to personalise feedback and support

Learning analytics has the potential to foster belonging in students by enabling teachers to tailor support and feedback according to students' progress at a scale hitherto unachievable. Feedback for students 'is seen as a relational process through which teachers may encourage positive motivation and help learners build confidence and self-esteem' (Khosravi et al., 2022, p.3). Given that online courses can see enrolments in the hundreds of students, the communication of feedback to every student, in a personalised way, presents considerable challenges for teachers. Learning analytics offers a technological solution to scaling feedback that is personalised to students' progress and ongoing performance in a course (Pardo et al., 2017).

Learning analytics feedback interventions can be categorised into two types. *Fully-automated feedback systems* in the form of dashboards and recommender systems are prevalent in the literature due to technological advancements and educational data-mining approaches (e.g., Sahin & Ifenthaler, 2021). However, dashboards are silent, visual displays, and as such, may be unable to foster in students a sense of belonging. On the other hand, *learning analytics feedback interventions* that involve humans in the loop are mediated by the teacher and delivered in the teacher's voice. These systems may therefore be more able to augment teacher presence and foster a sense of belonging in students. One example of a human-in-the-loop learning analytics feedback system is OnTask (Pardo et al., 2018).

Emerging research in learning analytics feedback interventions has shown benefits for students' self-regulated learning (Lim et al., 2020) and performance (Lim et al., 2021) in blended learning settings. Evidence has also emerged showing students' appreciation of the relational value of this novel feedback approach (Tsai, et al., 2021). However, less is known about the specific role these automated, data-informed interventions could play on students' sense of belonging in online learning. Indeed, the literature is limited in documenting how teachers can leverage these technologies effectively to foster belonging in fully online courses.

Aim and research questions

Given the research gaps outlined above, the present paper reports on a case study to foster student belonging in a fully online subject through interactive learning design and supportive student-staff relations. The intervention involved using OnTask, together with interactive and engaging learning design, to create and communicate regular, personalised messages of feedback and support to all students in a fully online postgraduate subject. In this paper, we report on the students' perspective of personalised feedback and support on their learning experience and belonging in this context. The following questions guided the study:

RQ1. To what extent were students satisfied with their personalised feedback sent by the teacher using OnTask?
RQ2. From the students' perspective, what was the role of their personalised feedback emails in enhancing their learning experience, especially their sense of belonging?

Methodology

Context

This study was carried out in an online postgraduate subject in the IT discipline at an Australian University during the Spring 2021 semester. The subject was enrolled by 101 students, of whom 86 were international. Due to the COVID-19 pandemic, many of these students were learning remotely from their home countries. The cohort was mostly male (67%), and between the ages of 26-30 years old (62%). The subject was structured around a weekly 3-hour collaborative synchronous class conducted over Microsoft Teams, supplemented with pre-readings, post-class formative assessments and group work. The learning design consisted of the following elements. Before attending the weekly class, as pre-reading, interactive H5P activities were designed to gamify learning related to the weekly topic. During the synchronous class, interactive, collaborative activities were specifically designed to promote engagement with the material, maintain student interest, provide opportunities for peer-to-peer interaction, and reinforce the student's opportunity for learning. The class began with the teacher's 'check-in, check-out questions' to interact more personally with the students. This five-minute activity involved the teacher posting a friendly question on the chat and inviting students to respond informally to it; this activity intended to help the teacher know more about the students at a personal level, as well as for students to know each other. After this activity, the teacher delivered a short teaching session on the week's topic. Following this, students worked through small group collaborative activities conducted within online breakout rooms (referred to as 'virtual tables'). They then presented their group's discussion to the class after the breakouts. Post-class formative weekly quizzes assessed students' understanding of the content and included open-ended text to encourage students to record self-reflections of their learning. The summative assessment comprised weekly case study discussions, a blog post, and a final group project, facilitating peer learning and feedback, reflexivity, and student presentations. Additional learning support was given through weekly drop-in sessions for students to approach the teacher with subject-related questions, and an online subject discussion forum was provided to facilitate ongoing student discussions and to provide feedback to the teacher to highlight student learning progress.

Regular, personalised feedback was integrated into the learning design through OnTask, a web-based platform that helps teachers create rule-based messages informed by students' learning data to trigger personalised feedback at scale. These messages are then sent out as personalised emails to all students at appropriate times as deemed by the teacher. In this subject, feedback emails were personalised based on class attendance, completion of weekly learning activities, and performance on assessments. In this way, students received regular communication from the teacher about their ongoing progress to support their engagement and belonging. Figure 1 shows the design of personalised feedback within the curriculum across the 13-week semester (including the mid-session study vacation). Figure 2 shows an example of personalised feedback generated after the first assessment, highlighting the rule-based conditions for messages to: 1) students who passed the first quiz and 2) students who failed the first quiz. The feedback for students who had failed the quiz was carefully worded to convey the teacher's concern for the students' success and belief in the students' ability and to provide actionable advice on how to improve their performance.

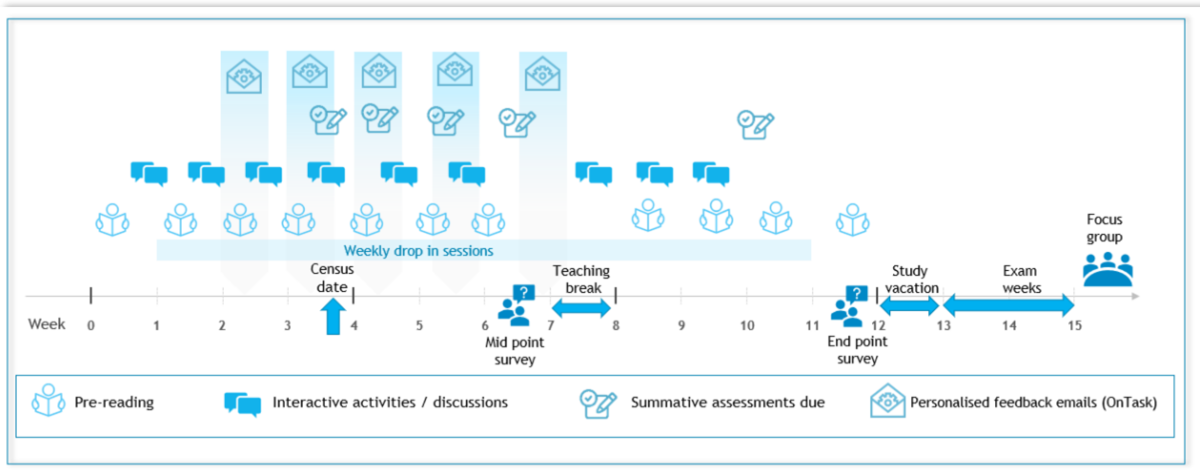

Figure 1: Personalised feedback within an online learning design to foster belonging

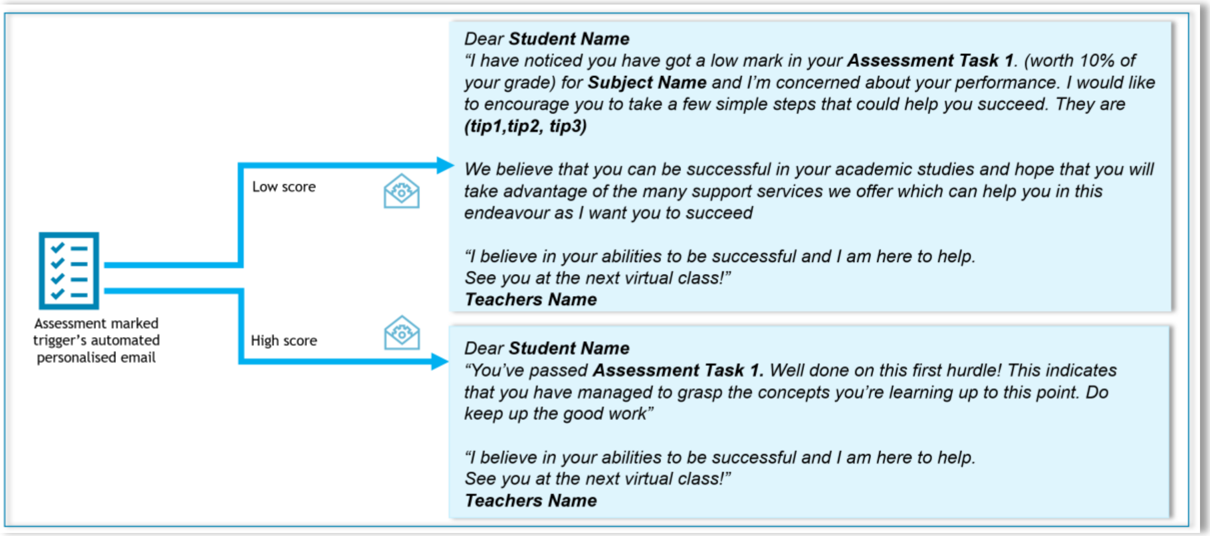

Figure 2: Example of a rule-based personalised feedback email using OnTask

Data collection

This study received ethical approval under a wider project evaluating the implementation of personalised feedback at the institution. Students were invited to participate in the study through voluntary participation in anonymous surveys and focus groups. Data were collected at different points of the semester to understand students' experiences with their personalised feedback (see Figure 1). The first was a short survey disseminated at the midpoint of semester, to capture students' early perceptions of their feedback in order to redress any possible negative experiences that may arise for the student receiving feedback based on their learning data. The second survey was administered towards the end of the semester, and comprised four questions asking students to rate the extent to which their personalised feedback supported their learning. The four items, rated on a 6-point Likert scale (1 = Strongly disagree, 6 = Strongly agree), were informed by principles of effective feedback (Henderson et al., 2019). A fifth item on the survey was an optional, open-ended question where students could add additional comments about their feedback experience. The survey also invited students to participate in focus group discussions to discuss their feedback experience with the researcher.

Five students (3 males, 2 females) volunteered to participate in the focus group discussions. Approximately a week after the semester had ended, two focus groups were conducted online over Zoom. The first focus group comprised two students, while the second group comprised three students. The focus groups, which ran for approximately an hour each, took the form of a semi-structured interview to facilitate the collation and analysis across the two groups. The guiding questions centred around students' experiences of learning in the subject, as well as of their experience with their personalised feedback. These two central foci were important for answering RQ2 to obtain an in-depth understanding of the role of feedback in enhancing students' learning experience in this context. The researcher facilitated discussions about what students enjoyed and found challenging in the subject, their perceptions of their feedback emails and their response to them, and how they perceived the influence of their feedback on their study habits and performance in the subject.

Data analysis

To answer RQ 1, quantitative data from the mid-point and semester-end surveys were analysed to obtain simple descriptive statistics, while the qualitative data from the open-ended questions in the surveys were analysed using open coding to identify main themes. To answer RQ 2, student interview data were transcribed before being imported to a NVivo 12 Pro[1] for thematic analysis adapted from Braun and Clarke (2006). We chose thematic analysis for this case study as it was guided by both the study aim (deductive) and interpretations for subjective information, which is students' experiences of learning in the subject and personalised feedback (inductive). Two researchers (also authors) independently performed the coding based on Strauss and Corbin (1998). Open coding helped to group the transcribed text from the student interviews into categories. After open

[1] QSR International Pty Ltd. (2018) NVivo Pro (Version 12), https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home

coding, both researchers developed a mutually agreed coding scheme and cross-coded one random transcript to check coding agreement. The coding agreement, also known as inter-rater reliability, was measured by the statistical method of ‘percentage agreement’. Later, both researchers, in various collaborative sessions, performed the axial and selective coding and finalised the themes, sub-themes, and descriptions.

Results

RQ1. To what extent were students satisfied with their personalised feedback sent by the teacher using OnTask?

Mid-semester survey results
52 students (51% of the cohort) responded to this survey asking them to rate the extent to which they found their personalised feedback helpful. Students responded with a mean rating of 4.6 (SD = 0.8). An overwhelming proportion of survey respondents (71%) rated their personalised feedback as being very helpful at this stage.

All respondents answered the open-ended question. Four major themes were identified through open coding. The most frequently occurring theme (n = 23, 37% of all themes) was that of feedback helping students to understand their current progress, for example: ‘It helped me understand where am I lacking and what are my strong points’. The following frequently occurring theme (n = 18, 29% of all themes) described students’ perception about the role of their personalised feedback in fostering a sense of belonging. Especially, students described the motivational effect of their personalised feedback, for example: ‘you encouraged me a little to strive for better’. Students also commented on how their personalised feedback enhanced connectedness: ‘I feel more connected in this subject than any other due to the feedback provided on time to time basis’. Students also sensed the support of the teacher through the feedback: ‘Feels heard, observed and taken care of by teacher’. The next theme described how the feedback improved the learning experience (n = 10, 16% of all themes), by facilitating the understanding of the content, improving the class experience, and alleviating stress. A few responses described the feedback as not helpful (n = 3, 5% of all themes). In this theme, students expressed that the emails did not provide information about how to improve or did not give them insights into their progress in additional to what they already knew. For the remaining responses, six responses merely reiterated that their feedback was helpful without giving further elaboration, while two responses were irrelevant.

End of semester survey results
41 (41% of the cohort) students responded to this survey. Similar to the mid-semester results, students held positive views of their feedback at this stage. Students’ ratings were highest, on average, for the item *This feedback made me feel more supported by my teacher* (M = 5.24, SD = 1.2). Students also held a high level of agreement that *The feedback and support improved the quality and standard of my work* (M = 4.83, SD = 1.4).

Sixteen respondents answered the open-ended question i.e., *Do you have any other comments about your feedback experience?*. Four main themes were identified from the open coding. The most frequently mentioned theme described how the students perceived that their personalised feedback fostered a sense of belonging (n = 6, 35% of all themes). Similar to how this theme was described in the mid-point of the semester, students felt the care of the teacher through the feedback emails, which enhanced their belonging: ‘I like how we use to get the emails from our professor making us look valuable and the efforts given by the professor’. The second most frequently mentioned theme described negative perceptions of the personalised feedback, specifically, that the feedback was insufficient to support their learning, in particular, that the emails did not provide information on how to improve their performance, for example, for future assignments. The third theme described how the feedback enhanced the subject experience, especially in making the learning experience more personalised: ‘The feedback… gave a more tailored feel to taking this subject’.

RQ2. From the students’ perspective, what was the role of their personalised feedback and support emails in enhancing their learning experience, especially their sense of belonging?

After the open-coding based on the focus group interview protocol, two researchers (R1 and R2) defined categories as shown below. Inter-rater reliability was measured by using the coding comparison queries in NVivo 12 Pro. The percentage agreements for researchers R1-R2 is 99.18%, and R2-R1 is 99.53%, respectively, indicating that the codes and categories were reliable (Saldana, 2013). The researchers identified 9 categories and 33 main themes from this iterative process. The nine categories are: 1) learning experience [from the <subject code>]; 2) predicaments [with the <subject code>]; 3) perceptions of the personalised feedback emails; 4) action/s taken in response to the feedback; 5) impact on performance; 6) feedback emails, affect and learning; 7) feedback emails and motivation to study in <subject code; 8) factors influencing the way students performed; and 9) edification (i.e., how the personalised feedback could be improved).

Next, through selective coding, the main themes in each category were reviewed and organised into 1st and/or 2nd order sub-themes (shown in Table 1). In this paper, we report our thematic analysis of the transcribed student interviews focusing on the four main themes (1, 6, 7, and 8) relating to RQ2. In Table 1, the number in parenthesis describes the frequency of the theme.

Learning experience [from the <subject code>]

Students frequently commented on the teacher's frequent interactions with them during the weekly synchronous classes, especially in terms of the check-in, and check-out questions. Students appreciated how this particular strategy fostered connection and made them feel valued, as illustrated in the following quote:

> it *made us feel connected to the professor* even though we're not onshore. So that's helped us. Like, this was the one subject throughout the three semesters I did with [institution blinded] is that I felt that this professor actually cared for us enough, even if we're not in class, and she can see us every day, she made an effort *to make sure that we feel valued*' [Respondent 3]

The quote above highlights that the sense of connection and belonging was particularly significant for these students who were learning remotely from their home countries. Students also frequently expressed appreciation for the subject design, particularly the weekly case study activity post-class: 'because every week could provide a different perspective, from the case study for us to learn about business intelligence, big data, or data visualisation, all about data, which is expanded my knowledge a lot, actually' [Respondent 4]. This quote highlights how students recognised the value of the collaborative exercise in terms of their understanding of the subject content. Students' comments also expressed perceptions of interactive and engaging subject design, which was instrumental for their attendance at the weekly synchronous class, for example: 'I like to attend the classes, because the classes were pretty interactive and I liked the way [the teacher] designed the classes [summary of weekly content followed by] group work and learning variety of tools for various purposes' [Respondent 2]. In fact, for some students, the highly interactive session 'felt like it's an actual classroom' [Respondent 5]. Taken together, students' desire to attend classes as well as the perception of being in an actual classroom provide evidence that the students had felt that they were a part of a community.

Feedback emails, affect and learning

Students frequently expressed appreciation for the encouraging tone of the personalised feedback, which was necessary for their motivation. For example,

> I can just remember the last line she wrote, and it was really amazing. She said, [R3], I believe in your abilities, and I believe you will be successful, and I will see you in the next virtual class. And that that line is like was really motivational for me. [Respondent 3]

From the students' perspective, the feedback emails made a visible difference to students' sense of belonging in this subject as opposed to other subjects: 'In this [subject], … we have made good connections throughout the [subject] with our peers, and especially with our professor' [Respondent 5].

Students also frequently noted how the subject learning design played a significant role in fostering iterative cycles of learning, as illustrated in the following quote: 'I think it's like mostly *the weekly discussions, which was driving me towards learning more about this subject* rather than the emails. … And it was just that *weekly activities, which ensure that I actually take part in the subject* and study and learn new stuff' [Respondent 5, italics added]. This quote clearly illustrates the role of well-structured, interactive subject design in fueling students' active engagement in the subject. In comparison, students felt that the feedback emails did less to foster independent learning or make them more independent, mainly because they felt they were already performing well, or because they perceived the emails to be generic. In regard to the latter, students felt that there was no clear feedback about strengths and weaknesses or information about resources to improve learning.

Table 1: Students' experiences of learning in the subject and with the personalised feedback

Main-Themes	Sub-Themes (1st Order)
Theme 1: Learning experience [from the <subject code>]	
Description: How students perceived that the subject design, subject matter, means of teaching (pedagogy), teacher presence, enhanced their learning individually and collaboratively in the subject.	
Main-Themes	**Sub-Themes (1st Order)**
appreciate subject design (4)	
interesting and applied content (4)	weekly case study is interesting (2); learned variety of tools for different purposes (1)
teamwork (2)	interactive collaborative classes and group activities (2)
student characteristics	self-learning (5); revisits lecture recordings (1); positive in-class feedback (1); contrast with other subjects for less/no interaction between students and teacher (1)
teacher was really interactive-(inside the class) (6)	check-in check out questions made us feel connected (6)
teacher was very approachable-(outside the class) (2)	
Theme 6: Feedback emails, affect and learning	
Description: How students perceived their personalised feedback through the emails, the role it played in their learning, and their affective response to it.	
Main-Themes	**Sub-Themes (1st Order)**
Positive tone of feedback	emails were motivational and encouraging (7); emails opened a dialogue with the lecturer that encouraged the student (1); constructive feedback (1)
feedback emails did improve learning	spent more time studying this subject than others (1)
feedback emails did not improve learning	student performed well without attending the classes (2); learning did not change - learning design fostered iterative agile cycles of activity (2)
feedback emails fostered independent learning (2)	
feedback emails did not make student more independent	because emails were very generic (3) **[2nd Order**: there could be more feedback about strengths and weaknesses (1); there could be more resources to help improve learning (1)**]**; because already pretty independent student (1); because only received email at the beginning (1)
Theme 7: Feedback emails and motivation [to study in <subject code>]	
Description: How students perceived the impact of the feedback emails on their motivation.	
Main-Theme	**Sub-Themes (1st Order)**
feedback emails enhanced motivation to learn in the subject	teacher-approachable, comfortable to talk to and willing to help (6); a good reminder (1); someone watching me- giving a more personalised learning experience (2)
Theme 8: Factors influencing the way students perform	
Description: How students engaged and responded to the learning design and pedagogy, and how they felt the teaching practices fostered a sense of belonging and inspired re-engagement.	
Main-Themes	**Sub-Themes (1st Order)**
learning design influenced performance positively	well-structured weekly content (2); learning material, drop-in session, check-in and check-out question (1)
learning subject related knowledge influenced performance positively	learning new BI related tools (1); learning new content (1); relevant case studies (2)
learning domain related knowledge influenced performance positively	related recent news and current events (2)
timely feedback influenced performance positively (1)	
teamwork and collaboration influenced performance positively (3)	
teacher presence influenced performance positively	care shown by the teacher made me want to have a good impression on the teacher (3); can feel the effort the teacher put in - so I want to perform well (1); teacher's advice (not email) was really helpful (1); teacher's weekly drop in session (1); learning design foster student-teacher relationship (1); appreciate the coordinator's effort for feedback emails (1)

Feedback emails and motivation [to study in <subject code>]

The impact of the feedback emails was most keenly felt in terms of enhancing students' motivation, as evidenced by the frequency of occurrence of motivation-related themes. Notably, there were frequent comments about the teacher being approachable, comfortable to talk to, and willing to help: 'when I received the email, I can think like, the lecturer was already there. And she's always willing to help out with every matter. So I think *it makes me feel like, if I have any questions, I always can go [to] her*. So yeah, I feel like comfortable with it' [Respondent 1]. Moreover, students also expressed that the feedback provided them a more personalised learning experience: 'it was good to see that *the faculty is taking as much interest as you are taking in the subject*. I mean, in terms of *personalising it and focusing on me*. … So it did motivate me' [Respondent 2]. Again, both these quotes clearly illustrate how the teacher's presence – demonstrated through her approachability and regular personalised feedback –fostered a sense of belonging in the students, by making them feel valued, thereby enhancing their motivation.

Factors influencing the way students perform
From the students' perspective, teacher presence is the most significant factor influencing their performance in the subject. Students frequently commented on the care and effort shown by the teacher through the personalised feedback emails as well as through other interactions with them; for some, this made them want to leave a good impression on the teacher: 'I can feel the effort the professor put in, …so I want to perform well' [Respondent 4]. Students also credited the interactive course elements as being important for their learning while recognising the teacher's role in orchestrating collaborative learning: 'hats off to [the teacher] that she'd set up (virtual) tables for us, so that we could like, talk to people' [Respondent 3].

Above all, students were well aware of how the teacher had orchestrated various pedagogical elements to build strong connections with students, enhance motivation, and therefore foster belonging in the subject. This is well-summarised in the following quote:

> all the things the professor did, like a case study material, learning material and drop-in, check-in question and check-out question is small, small piece… but is *make a link between the professor and student*. So every time professor say- is saying something, we get more concentrate on that. And I think that is a benefit for students, for us to improve, to gain the knowledge. … because I think it's common if people by motivation or encouraged by someone you want to show yourself to perform well [Respondent 4].

Discussion

A sense of belonging is central to students' continued motivation, engagement, and success in learning. Belonging is inherently relational and is fostered within the context of a community. As online learning tends to offer fewer opportunities for interaction and lacks a shared physical space, fostering a sense of belonging in such settings can pose a significant challenge. In this case study, we described how one teacher attempted to foster belonging in an online subject by augmenting teacher presence through the use of technology-mediated, personalised feedback, within the context of interactive and engaging subject design.

Taken together, the survey responses and focus groups provided evidence from the students' perspective, of the role of the personalised feedback emails, on their experience of belonging and connection in the subject. The main recurring themes related to the perception of care and support conveyed through the feedback, as well as the resultant enhanced motivation felt by the student. The motivational and relational impact of personalised feedback has been demonstrated in other research (e.g., Lim et al., 2021, Tsai et al., 2021). The present study has added further insight to this area of research by documenting more specifically how students experienced a greater sense of connectedness through personalised feedback, thereby enhancing belonging and motivation. The findings from this study also resonate with the work of Peacock et al (2020) on what students deem important in fostering belonging. A frequently mentioned theme was observed in this study of the teacher's care, which demonstrates that the teacher was 'pivotal to the development of students' sense of belonging' (Peacock et al., 2020, p.25), especially in the online space. Moreover, students frequently described how the collaborative and other learning activities kept them engaged and motivated their attendance at the synchronous classes. This finding further demonstrates the importance of interactive, engaging pedagogy to foster belonging in online learning (Peacock et al., 2020; Stone & Springer, 2019).

Implications for teaching in online spaces: strategies to foster belonging

Overall, this case study illustrates that fostering a sense of belonging entails a curriculum-wide approach, an approach that involves a community of students supported by strong teaching presence (Garrison, 2011). This study identifies three possible strategies for fostering belonging in online learning. The first strategy involves leveraging learning analytics to personalise feedback and support and therefore amplify teacher presence in the online learning setting. In this study, tailoring feedback to students' learning data facilitated 'regular and prompt communication between teacher and students' (Stone & Springer, 2019, p.164), and helped students to feel the teachers' care and to know that they were valued (Atif et al., 2020). The second strategy is the use of weekly check-in, check-out questions at the start of each synchronous class. For the students taking this subject, these questions played an important role in connecting them to the teacher because they helped the teacher know more about and understand her students not just at the start of the subject but in a dynamic way over the semester. This interactive element created a sense of belonging by building connections between the teacher and students, which fostered student motivation to learn. A third strategy that was enjoyed by students and fostered their belonging in terms of a desire to attend every synchronous class, was the use of collaborative learning activity around 'virtual tables'. This strategy involves small group work where students collaborate on in-class activities to learn the content. It allowed for thinking time and encouraged students to present and share their work. By giving students advance notice about who would be sharing and presenting in the large group, students were encouraged to participate as part of the learning community.

Limitations & Future research

The exploratory case study presented in this paper is not without its limitations. Foremost, we acknowledge that the evidence of belonging came mainly from a small number of students' self-described experiences. The findings, therefore may not be generalised to all online learning settings. However, the research was intended to be qualitative, with the focus group discussions drawing out the intricacies of students' experience of the subject and the personalised feedback therein to obtain deep insights into the distinct role of personalised feedback in fostering belonging. The additional survey data gathered from half of the cohort also lent some support to the experiences described by the handful of students who volunteered for the focus group. Future studies could be carried out in different contexts, using validated instruments to measure students' belonging, feedback experience, and motivation to explore more systematically the relationship among the different factors and antecedents of belonging. Future work could also explore in more detail, teachers' perspectives of their pedagogies to foster belonging, and how their intentions aligned with students' perceptions.

Conclusion

Undoubtedly, online learning will continue to be a mainstay in contemporary HE, along with the challenge to keep students connected and having a sense of belonging to persist in their studies while learning remotely. The present study has described the use of a learning analytics approach to personalise feedback and support for students in a large online subject to facilitate 'regular and prompt communication between teacher and students' (Stone & Springer, 2019, p.165). The findings from this study highlight that the combination of personalised feedback and support with an interactive and engaging learning design fostered a sense of belonging and enhanced students' motivation to stay engaged and do their best in the subject.

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reconnect
Reconnecting relationships through technology

'We've become a little family now': Maximising rapport in an accelerated, fully online learning environment

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Online learning spaces are generally considered low-interaction environments. The loss of synchronous time in an online course is balanced by additional flexibility. As such, there are limited opportunities to build rapport with students. This is especially true for online programs that are also accelerated. However, students still view opportunities to engage with educators and peers as extremely important. As a result, there is a need to identify strategies to maximise rapport building within a limited time frame. A Thematic Analysis of data sources relevant to teaching and learning activities in the Monash University Graduate Diploma in Psychology is presented. Four themes emerged and included 'humanising' the learning space, fostering opportunities for student-to-student interaction, reducing the power imbalance between teacher and student, and maintaining rapport beyond individual subjects or units. The individual strategies that were employed are discussed in detail. These findings provide a resource for educators to increase rapport within an online learning environment.

Keywords: teaching strategies, student rapport, rapport, connected teaching, higher education learning, student experience, online learning

Introduction

The Monash University Graduate Diploma in Psychology (GDP) is a full-online, accelerated program of study consisting of 6-week units over six teaching periods a year. Asynchronous learning is managed through Moodle, with synchronous live classes and instructor consultations held weekly through Zoom. Our learners seek flexibility but are time- and contact-limited, and constrained through technology. The commitment to embedding a human presence in virtual classrooms, and empowering students with choice are key elements in the GDP vision statement.

Adam (2020) reports that the majority of Monash GDP (online) students have only a "little time" to socialise with peers (p. 202). The majority (51.5%) reported that this connection is very, or extremely important. It is our responsibility to maximise the limited opportunities to build rapport amongst students, and between educators and students in the online environment. Peer interactions are the most important factor for student learning in face-to-face and online learning environments (Astin, 1993; Bernard et al., 2009). As such, there is a need to explore strategies to facilitate structured peer interactions and rapport in the online environment to enhance student learning (Mayhew et al., 2016). It represents a high-stakes endeavour as maintaining rapport increases student satisfaction and wellbeing, as well as reducing attrition (Schaeffer & Konetes, 2010; Shackelford & Maxwell, 2012; Thomas, Herbert & Teras, 2014). Research comparing online programs with on-campus programs has shown that whilst enrolments in online programs are increased, student retention was much lower compared to equivalent on-campus programs (Brown, Keppell, Hughes, Hard, & Smith, 2013).

The identification of factors that increase rapport in the learning environment should be considered against possible mechanisms that negatively impact rapport. As such, the Monash University GDP presented in this study must be considered from an online versus face-to-face contrast, and also as an accelerated program of study. A fully online and accelerated course can be viewed through the lens of deficits, i.e., that this learning experience could be conceived of as 'less than equal' to the face-to-face, full-length program. However, the literature offers evidence to the contrary. Harwood et al. (2018) challenge the notion that traditional-length courses produce superior student outcomes, compared to intensive programs (such as the GDP presented in this study). Harwood et al. (2018) reported no significant difference in the length of courses in terms of student performance.

In relation to learning format, Jaggars and Xu (2016) compared both online and face-to-face formats. In terms of student outcomes, their results were mixed. Jaggars and Xu concluded that the human educator is the deciding factor between these settings, and that mode of course delivery alone cannot account for perceived student difficulties. Similarly, Mayhew et al.'s (2016) review of higher education research acknowledges the difficulty in identifying which technologically-enabled tools contribute more to student learning. Mayhew et al. (2016) report that more research needs to be conducted to determine the impact of "availability of online tutors, practice assessments, or web-based information and resources" on student learning (p.46).

One challenge is to limit the transactional distance that can be experienced in a fully online learning environment. Transactional distance is the difference in understanding between teacher and learner in distance education that is exacerbated or reduced through technology (Moore, 2018). The exacerbation or reduction of distance is the result of the learner's capacity for autonomy, and the quality of dialogue (between educator and learner). The quantity of dialogue can also be considered. Student engagement in the online environment can be mediated by a daily commitment from educators to "student-faculty contact, and active and collaborative learning" (Kuh, 2001, p.13).

This research seeks to outline the ways in which rapport can be facilitated in the online learning experience, and identify ways to reduce transactional distance (as understood by Moore, 2018). This research aims to explore the strategies that educators and students believe build rapport in the online learning environment. Glazer and Harris (2021) identified these areas as underexplored, and a focus for future research. To address the research gap, this study will aim to identify the specific strategies that online educators can employ to "mitigate transactional distance and improve rapport" (Glazer & Harris, 2021, p. 91). To extend Astin's (1993) seminal research, this study also aims to identify strategies to facilitate peer interactions in a fully online environment. As such, our research question is: what technology-enabled tools/strategies facilitate rapport in an accelerated, online learning environment?

Method

Participants

Participants consisted of students from the Graduate Diploma in Psychology at Monash University. The collection of survey data received ethics approval from the Monash University Human Research Ethics Committee.

Data collection

This study utilised the James Cook University's (2017) '4-quadrant model' of education evaluation (4QM) to determine sources of data appropriate for investigating this issue. A formal survey of online Monash University GDP students was conducted (*n* = 97). An analysis of unsolicited student feedback via email, live class recording transcripts, and the online discussion board ('Ask Your Instructor' forum) provided the 'student experience' data (according to the 4QM). A review of instructor guidelines offered 'peer review' data (as identified in the 4QM). Peer discussions and personal reflections on teaching (during teaching periods) provided the 'self-reflection' component of 4QM.

Methodology and Analyses

Due to the rich, text-based nature of these data a Thematic Analysis (TA) methodology was employed, following the process defined by Braun and Clarke (2021). TA is a commonly used qualitative method of coding data into categories, and analysing these categories for an overall, emerging theme. According to Braun and Clarke, TA "is a method for identifying, analysing, organizing, describing, and reporting themes found within a data set" (Braun & Clarke, 2006, p. 78). Quantitative considerations for 'reliability' and 'validity' are not applicable to qualitative analyses. Qualitative concepts that represent equivalence in terms of rigour are 'reflexivity' and 'trustworthiness' (Tracy, 2010). An audit trail is a traceable and logical documentation of reflexive thinking and emerging themes (Nowell, Norris, White & Moules, 2017). This commonly used TA tool ensures the rigour of the analyses, and the trustworthiness of the emerging themes. Importantly, it is used to identify when saturation has been achieved (Tracy, 2010). Saturation refers to the point in which any new data continues to be coded into existing categories. As a result, no potential new themes will be generated. The coded, text-based data is then refined and formalised as a theme.

Results

Themes were identified, following thematic analysis as defined by Braun and Clarke (2021). The emerging themes are presented, alongside the specific strategies or technological affordances that were perceived to promote rapport.

Theme 1: Humanising the technology-driven learning space

The first theme that emerged was that of the 'human' educator, which concerned student-teacher connections. In the student survey, students were clear that they wanted to simulate 'real-world interactions' as much as possible, which included a preference for the use of microphones and web cameras being turned on throughout any synchronous learning experience. Students spoke highly of educators when they shared aspects of content that educators connected to their life. The process of educators' sharing their research and study experiences was also appreciative, with students noting the importance of 'sharing experiences in class, not just covering content'. At the heart of this process is acknowledging opportunities to demonstrate to students that the educator is a lifelong learner. This can be achieved through synchronous discussions but is extended in the asynchronous space. An example of student feedback which evidenced the benefit of this approach is presented: 'I have felt quite connected with [educator] because she is always willing to talk about other topics in her office hours (her research, honours, careers, etc.)'.

An important strategy of reducing transactional distance is increasing intellectual candour (Molloy & Bearman, 2019). This aligns with the 'pedagogy of care' principle of pastoral care and shifts the perception of the online educator as a person that they can trust. Students' willingness to also engage in the process of voicing their intellectual vulnerabilities can be seen as evidence that rapport is being fostered. In one live class, the instructor claimed that they also used to struggle with writing lab reports, which resulted in one student sharing that 'I'm a little bit anxious approaching this assignment'. Strategies that students commented built rapport in this area were 'check-ins' with students, and through online tools such as Zoom reactions, to then initiate 'real' conversations about illness, topics that are confusing, or whether they require additional support. Students also appreciated a follow-up through private email or conversation in office hours, and/or extra support provided in the online discussion boards.

There appeared to be multiple mechanisms to humanise the educator within the online learning space. Educators utilised the online space by expressing their personality by embedding memes and gifs into forum posts and educator-student emails, emoticons into assignment feedback, and photos into the 'meet your instructor' section of the Moodle page. Another method to allow a two-way sharing of personality was through the use of Zoom backgrounds. Providing students with a weekly Zoom background theme allowed students to show more of themselves as well as build team identity. The sum of these approaches over a teaching period is that the educator is described in the following ways: 'enthusiastic', 'kind', 'approachable', 'friendly', 'honest', 'encouraging', 'welcoming', and 'supportive', with one student describing the student-teacher relationship as: 'you always made it clear you were here to support us and not just to teach a class'. The cumulative effect of these efforts is a dedication to building and maintaining rapport with students.

Theme 2: Maximising opportunities for student-to-student connection

The second theme relates to providing opportunities for students to connect with each other in the online learning environment. Students' appreciated time for unstructured discussions in synchronous classes, but also equally valued structured online experiences to share opinions and seek peer feedback, which can be enabled through the use of 'breakout room' functionality in Zoom. In particular, the ability to practice skills and knowledge in front of each other was deemed an asset to the learning experience. Apart from Zoom breakout room functionality, Kahoot can also be employed in team mode. Asking students to participate as a team (and especially when utilising a team name) increases a sense of in-group identity and builds rapport within small groups of students.

The thematic analysis process revealed some technology-enabled asynchronous experiences that were identified as useful for building rapport. First, there are specific assessments that facilitate student-student interaction and allow for collaboration on group oral presentations. One student expressed that 'the group oral presentation was actually quite pleasant and created a sense of connection'. The challenge with this assessment format was that students required flexibility in their availability to work together and in the times they are available to connect online. It is suggested that this can only be effectively managed by students and supported by teachers (if a breakdown in communication occurs). Another strategy is to embed smaller, low stakes collaborative work experiences into the learning management system (Moodle), which are not necessarily moderated or marked by instructors. An example of this was the inclusion of a student-developed Wiki, based on weekly module content.

An important aspect of online learning was the ability to utilise social communication channels. This led to a range of grassroots initiatives among students to connect with each other. Students often initiate a student-run Facebook group, but this has negatively impacted on the student experience in the past. For example, there was a body of feedback that raised concerns with the level of fear that built up through the echo chamber of the student-run Facebook group, with comments such as 'I had a much better experience when I wasn't a part of the [Facebook] group…when they got worried about a task I got unnecessarily worried'.

A positive grassroots initiative was the creation of study groups. Through the use of study groups throughout a teaching period, there was a noticeable difference in the language that was used to refer to each other in discussion forums, transitioning from 'students' to referring to each other as 'colleagues'. One particular cohort was encouraged by the educator to utilise a specific evidence-based format to counter procrastination in their study group, called the 'pomodoro technique'. This format allows for bursts of silent, focused writing (called 'writing sprints'), along with short breaks to connect with others and set goals for the next writing sprint. One student commented that 'there are huge benefits to collaborating, including increased learning, sense of community, helping each other out', although it should be noted that there is a difference between 'collaborating' and 'colluding'. Previous cohorts had expressed concerns with study groups, with the fear that they would be inadvertently engaging in collusion, and not being sure where the 'line' is (in relation to an academic integrity breach). It is recommended that educators support students with official guidelines to encourage more students to engage in study groups, whilst avoiding collusion. One student noted that this could easily be managed by actively avoiding any discussion around the assignment in the break between writing sprints, and simply commit to 'talk about other things'. A benefit to encouraging student-led online study groups was the increased motivation and connection with each other, which also increased online forum participation and synchronous class engagement.

Theme 3: Equalising the communication exchange in the online learning environment

The third theme was about utilising technology to minimise the power imbalance in the student-teacher relationship. This can be done utilising polling technology to vote on class format, or survey students to gauge their ideal class times or days. Related to this concept, is the increase in co-creation opportunities and space for co-created learning spaces. The online learning technology is maximised to enable a more equal two-way exchange of ideas, with the educator shifting their role to that of the facilitator. Utilising 'gallery view' in Zoom learning spaces (and therefore avoiding the use of PowerPoint slides), was said to reduce the perception of 'us [students] versus them [educators]'. Student survey responses show that students prefer 'seeing a face instead of a static PowerPoint slide'. Similarly, hierarchy is minimised in the gallery view, which then mimics a round table discussion. In this online space, the educator can learn from students as well, by acknowledging the wealth of life experience each learner offers. This approach can help with the co-construction of the learning space, as one student explained: 'sometimes stuff comes up that makes me want to find out what other people think or feel, or tell people about my experience with something'.

Another online mechanism that allows students to co-construct the learning space is through the use of technology-enabled problem-based learning (PBL), or case-based learning (CBL) experiences. Students felt that the use of breakout groups to provide a space for small-group problem solving allows for 'meaningful time on video chat to work towards a common goal', whilst also increasing active learning in the online environment, as specific roles are allocated. An added benefit came from teacher reflection on this activity, identifying that if a different scenario was given to each group then the role of student can be shifted to teacher. Student-led facilitation (such as reporting back on their problem solving, or teaching something they learned about a key concept) can be enacted following the PBL/CBL activity. Educators perceived that a reduction in the power imbalance between teacher and student would result, along with an increase in the amount of student voice and contribution in the online learning space. At the same time, it is acknowledged that at times the educator could lean into a mentorship relationship with students, when it is clear that some guidance is needed to progress the conversation. It also provides the opportunity to address any misconceptions that arise through synchronous class discussions, or in asynchronous forum discussions.

Theme 4: 'Continuing the conversation': maintaining rapport for the whole learning journey

Students and educators voiced the belief that whatever rapport is established, must be maintained for their whole learning journey. There are strategies to build rapport before students begin individual units of study, and methods of developing this rapport both after synchronous activities and after the unit has concluded. Engaging students in rapport-building strategies prior to unit commencement was the result of welcome webinars that allow connection and enthusiasm for the subject. These webinars are held the week before the unit begins and allows educators to share their personal interest in the subject, any connections to their research, and ask students to discuss their career interests and progression in the course. Prior to any class selection, students are introduced to their instructors through videos, photos, and short biographies.

Another strategy identified by students as important to retaining a sense of connection to others in their units was the provision of recordings of all synchronous experiences. One student noted the benefit of being able to revisit class discussions, stating that 'there were times when I was really down, and looking at you through the video… I've got you always there'. This is supported by additional multimedia embedded into Moodle, including video walk-throughs of assignments, which was viewed positively by students as their educator acting 'supportively'. This relationship is supported by a specific forum for discussions between students and educators, called the 'Ask Your Instructor' (AYI) forum. The key issue for students in all communication with their online educators was timeliness and access, and a 24-hour turnaround time was appreciated.

Beyond the set synchronous hour, an additional office hour (that immediately follows the class) is also recorded and takes the form of an unstructured discussion time. Both the AYI forum and recording mechanisms for continued student-teacher discussion were said to encourage students to 'continue the conversation'. The sharing of related or interesting articles and videos outside of formal class time was seen by students as knowing that their educator was 'interested in talking with us', and 'not seeing us as just a number'. In several cases, educators expressed that this enabled students to seek educators as referees for further study and in volunteering positions.

Webinars to build students' career literacy were provided between teaching periods. The webinars, focusing on career development, were devised as an opportunity to maintain the educator-student relationship upon concluding the unit. Student survey data reported that 'attending some outside professional development webinars…gave the opportunity to discuss what we'd learned and what we thought afterwards'. Another student noted that 'the recent webinars on professional psychology have been good, as we've been able to discuss together afterwards [what we want to do with our career]'. As such, discipline-specific employability webinars remain a viable tool to maintain rapport within the fully online learning environment.

An aspect of this theme which should be discussed was the idea that there could be 'too much of a good thing' when it came to technology-enabled communication channels. If there were too many communication channels, students believed that the rapport built between student and teacher (as well as student-to-student) was compromised. With multiple communication channels, it can result in a frustrating experience for the student as they become 'hard to keep track of'. A consequence of this is a reduction in interaction in any one space. The researchers suggest that a commitment to quality communication channels should be prioritised over quantity.

Discussion

The research aimed to identify strategies that not only reduced the transactional distance between educators and students in the Monash University online GDP but fostered rapport. Data was drawn from a number of sources, following James Cook University's 4-quadrant model of evaluation (4QM; JCU, 2017). Four themes emerged from thematic analyses and included the importance of 'humanising' the learning space (theme one); fostering opportunities for student-to-student interaction (theme two); reducing the power imbalance between teacher and student, and increasing student voice (theme three); and maintaining rapport beyond individual subjects or units (theme four).

High interaction instructors use strategies to increase 'instructor presence' as "the ability of the instructor to project themselves in the learning environment" (Laves, 2010, p. 24), There is an explicit link between increased presence and increased perception of care (Jaggars & Xu, 2016). The literature supports the strategies listed in theme one to build rapport, by increasing instructor presence listed under theme one. These strategies include the use of microphones, cameras, and reactions in synchronous interactions. Also, the expression of personality through memes, emoticons, gifs and photos in asynchronous interactions not only increases instructor presence (through an increase in communication activities) but projects their personality into this communication. Glazier (2021) advocates for the use of informal rapport-building strategies to humanise the online environment, such as check-ins, memes, and sharing animal pictures. These seemingly minor additions add up to a perception of a connected learning environment. Similarly, these kinds of humanising (or personality-sharing) strategies mirror the kind of interpersonal communication that students already engage in, so there is merit in communicating to students "using online language [gifs, memes, and emoticons], that students will appreciate and understand" (Moffitt et al., 2010). Moffitt et al. (2020) experimented with different feedback formats and concluded that online non-verbal paralanguage features (three smiley faces, specifically) increase perceptions of warmth and emotionality (in markers) without impacting perceived professionalism or competence. As such, these methods minimise transactional distance in relation to students' experiences of feedback.

Similarly, when intellectual candour (Molloy & Bearman, 2019) is fostered in the online learning space (both synchronously and asynchronously), students can feel comfortable demonstrating their own intellectual vulnerabilities and an increase in trust, thus reducing transactional distance. A key constraint is time, with Carless (2012, p.90) explaining that "with limited time and space for the development of interpersonal relationships, trust may be in short supply". However, Bearman and Molloy (2017) offer a shortcut to the development of trust: the intentional display of educator vulnerability, known as 'intellectual candour' (Bearman & Molloy, 2017). Intellectual candor can be defined as "verbalisation of thinking with respect to a genuinely complex problem or situation" (Molloy & Bearman, 2019, p. 36). Bearman and Molloy explain that the process of displaying vulnerability in academic thinking builds trust and leads to reciprocity (i.e., students are also more willing to engage in the process). Intellectual candour can be achieved by modelling in discussions with students such as "I don't quite understand this yet, but what I'm thinking is…or, what I struggle with in my own [research/learning] is.." (Molloy & Bearman, 2019, p. 36). Projecting the 'human' into the online learning environment using these strategies builds rapport, and ultimately aims to reduce transactional distance.

Aligning with theme two, interpersonal interaction may reduce transactional distance between student-student (Jaggars & Xu, 2016; Moore, 2013), and permit the building of rapport that can extend from the student-led study group and into the online learning space. The strongest impact on learning comes from interactions that increase student-student contact (Astin, 1993; Bernard et al., 2009). As such, initiatives to increase opportunities to foster rapport between students can be pre-structured, or led by students. In theme two, an example of student-driven study groups was presented. In addition, structured learning experiences can be provided to facilitate student-student connection, which is advocated by Mayhew et al. (2016). These experiences should allow for flexibility in interactions and joint co-construction of knowledge, such as the Wiki example in theme two. This tool is supported in the literature, with Brack et al. (2010) advocating for student co-constructed Wikis to foster relationships between students, as well as developing collaborative learning skills.

Theme three introduced approaches to building rapport by increasing student voice in the online learning space. Also, theme three identified ways to balance the perception of hierarchy through peer facilitation of learning. One approach was the use of PBL (or CBL) in breakout group sessions. A key aspect of the PBL model is the process of assigning roles to students. This has implications for building rapport, as providing students with roles increases their shared responsibility within the learning environment. When students are able to lead the discussion the educator is able to focus on facilitating discussion, as well as being seen to be more interested in the opinions of students (Schwartz, 2019). This process shares power between teacher and student (Zydney, deNoyelles, & Seo 2012). Mayhew et al. (2016) advocate for this method of peer-to-peer teaching, with their review showing that students obtain "benefits from both teacher and learner roles" (p.100). Whilst theme two discussed online PBL in the synchronous Zoom class, there is also literature to support the use of assigning roles to students in asynchronous discussions to build rapport between students (Olesova, Slavin & Lim, 2016).

Theme four discussed ways to develop rapport before a unit that is supported by the literature, such as welcome webinars and a space for educators to introduce themselves and their research interests (Glazier, 2021). Then, a discussion of ways to maintain rapport between synchronous experiences within the unit (including the use of the Ask Your Instructor forum, and the sharing of related resources between educator and students). Literature advocates for the use of these informal forums to build rapport between students with educators (Wegmann & McCauley, 2014). However, this rapport depends on a timely response to students in the maintenance of teacher-student rapport, with Jaggars and Xu (2016) specifically endorsing the 24-hour turnaround time. Daily educator behaviour (maintaining student-educator contact) is reported to enhance student satisfaction (Kuh, 2001).

One limitation of this study was the collection of data from a single university. Similarly, data was based on one specific program of study, and a single discipline. Future research could extend this study design to include multiple disciplines and universities. The benefit of such an approach would be the development of a larger evidence-base. It is hoped that these findings can be integrated into any future research study, to develop a broader understanding of rapport-building in an online, accelerated learning environment. Future research could evaluate student retention rates prior to employment, and after employing the various strategies and tools provided in this paper. Conducting these evaluations would provide 'student learning' quadrant data, according to the 4QM (JCU, 2017), and offer additional insight into the impact of these strategies on student outcomes.

The research identified several strategies to reduce transactional distance between educators and students in the online learning space. Increasing opportunities for students to build rapport with each other was also found to be beneficial to the online learning environment, with an increase in participation in both asynchronous communication (forum posts) and synchronous class discussions. Perceptions of educators as being 'approachable', 'warm', and 'caring' were discussed by students as positively impacting their educational experience. Utilising strategies presented in the four themes (for building rapport) may minimise attrition, whilst increasing the perception that the educator cares for each student. The specific strategies that underpin these themes can act as a resource for educators to employ, in order to increase rapport in the online learning environment.

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reconnect
Reconnecting relationships through technology

'There's a pandemic coming, get yourselves some tablets': Lessons from the pandemic on a community of practice approach to learning technology diffusion

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A well-planned program for disseminating good practice in teaching with tablet computers within a large science, health and engineering faculty of an Australian university fortuitously came to fruition just in time for the switch to emergency remote teaching triggered by the COVID-19 pandemic. For teachers in disciplines which rely on symbolic representation systems and hand-sketched diagrams, the tablets proved indispensable in overcoming the challenges of teaching under pandemic conditions. Our dissemination strategy was based on an initial phase of voluntary adoption supported by a well-resourced, academic-led community of practice, alongside the establishment of a library of some 80 devices. Using analyses of loan records, a survey of tablet borrowers, and in-depth interviews, we investigate the diffusion pathways of the decision to adopt, as well as tablet teaching know-how. We draw the preliminary conclusion that our community of practice approach to dissemination has wider applicability beyond our pandemic experience.

Keywords: Tablet teaching, learning technology, diffusion of innovation, pandemic teaching

Introduction

> It's like you consulted with a group of scientists and they said, yeah, there's a pandemic coming, look, get yourselves some tablets (Early Adopter 1).

The above quote from one of the interviewees for this study underscores the serendipity of the decision in our faculty to invest in a large library of tablet computers mid-2019. For many academics these devices considerably eased the difficulty of the sudden transition to online teaching brought about by the COVID-19 pandemic (Bridge et al., 2021).

In 2019 when planning a strategy for the dissemination of tablet teaching in a large faculty of a multi-campus Victorian university spanning science, health and engineering disciplines, we were of course unaware of the disruption the pandemic was about to cause. Our dissemination strategy was informed by recent experience with technology rollout at our institution, and the literature. Both of these alerted us to the challenges associated with the dissemination of teaching technology innovations in higher education. Even when benefits are universal and well-documented, the adoption of teaching technology innovations seldom proceeds smoothly throughout the academy (Musarrat, 2019; Loch & Fisher, 2010).

Teaching with tablets has particular application in disciplines which make use of symbolic representation systems and hand-drawn diagrams, for which the combination of touchscreen and stylus is ideal. There are many such disciplines in our science-based faculty. Our dissemination strategy consisted of the following elements: funding was secured for a large library of Microsoft Surface Go and Pro tablet computers (80 in total); participation was to be entirely voluntary; and tablet borrowers would be encouraged to participate in a 'tablet teaching' community of practice (CoP) to learn about various teaching applications of the tablets, share experience, and workshop solutions to difficulties encountered. A tablet teaching innovator, herself a junior teaching academic, was invited to lead the CoP, and a small amount of workload buyout was provided to her in return. The CoP was launched 14 June 2019 and initially met monthly, then later two-monthly. CoP meetings consisted of practice-sharing presentations by one or two members followed by 'hot topics', when staff were encouraged to discuss challenges they were facing. One issue which immediately became apparent was the difficulty of wireless presentation with a tablet in most of the university's teaching spaces. The CoP leader was also provided with modest administrative support, chiefly in the form of a secretariat for meetings, but also for the creation of support resources, such as short how-to videos, and in the administration of the tablet library. As a faculty-level project, the central information services unit was not authorized to provide any technical support; the central learning and teaching unit did provide some pedagogical support in the form of workshop activities in CoP meetings. The main form of support, however, was peer-to-peer.

Initial uptake of the devices proceeded well, CoP meetings were well attended and participants enthusiastic, but after a few months dissemination appeared to stall, with many devices yet to find an owner. Early in 2020 however, in the weeks before lock-down when teaching staff were scrambling to work out how they were going to teach completely online, demand for loan devices peaked, and quickly exhausted the library. The CoP meetings continued online, but later in 2020 the CoP was wound up when attendance dropped off, and it had become clear that the demand for tablet teaching know-how had been satisfied. The final meeting was held 19 August 2020, after 8 meetings. The how-to resources that had been developed remained available for future tablet adopters, as tablets changed hands over time due to staff leaving or changing roles.

Anecdotal evidence indicated a high degree of satisfaction amongst tablet borrowers using their devices for teaching. This was confirmed by the data gathered for this study. It was clear that dissemination had proceeded extremely well and only the finite number of devices in the library had prevented further uptake.

The question we wish to address here is whether the success of our dissemination strategy has broader applicability in more normal times, or whether it was simply a special case brought about by the peculiar circumstances surrounding the pandemic. We have broken this broad question down into three research questions:

1. Did dissemination result in the devices being used appropriately – and perhaps even innovatively – for learning and teaching?
2. Did our community of practice approach play a role in the full uptake of the devices?
3. What evidence is there that our dissemination strategy would have been successful had COVID-19 not intervened?

Literature review

As mentioned in the introduction, our tablet teaching dissemination strategy was informed both by previous suboptimal institutional experience with teaching technology roll-outs and the scholarly literature. A starting point for designing our dissemination strategy was the diffusion of innovation approach of Rogers (2003). Understanding the adoption of innovation over time in terms of a normal distribution with the sextiles labelled as innovators, early adopters, early majority, late majority, and laggards (covering the final two sextiles), is broadly accepted and these terms are in common use in higher education contexts. The significance of interpersonal networks, and the value of subjective recommendations from someone who is 'socially close' are sometimes overlooked, however (pp. 19, 35). Particularly noteworthy is Rogers' finding that the earliest adopters, the 'innovators', have little direct influence over broader adoption, rather it is the next category, the 'early adopters' who are much more likely to act as 'opinion leaders' and influence others to bring about broader adoption (pp. 26, 293, 301). The crucial phase for widespread adoption is thus the transfer from innovators to early adopters; we therefore surmise that an important function of a community of practice is to bring these two groups together to cement this transfer.

A number of studies have reported on programs aimed at disseminating tablet teaching in higher education settings. Simply providing devices to academics does not appear to be sufficient to embed changes in teaching practice. Aiyegbayo (2015) reported on a scheme in which university teaching staff were provided with iPads. Only about half were used for teaching, however, and then only as an 'enhancement' to existing teaching approaches rather than in transformative ways. Among those who did not use the iPads for teaching, one reason given was that they did not know how to. Aiyegbayo concludes that "academics need pedagogical training and support from their institutions if they are going to embed iPads in their academic practices or use them in 'transformational' ways" (p. 1330). While Aiyegbayo proposes traditional training and support as the solution, others have studied the possibility of learning from peers in communities of practice.

Communities of practice as mechanisms for social learning are well-established in higher education in general, and learning and teaching in particular (Wenger, 2010; McDonald, 2014). While the community of practice literature has identified a number of features of successful CoPs, we highlight a few of particular relevance to our study. Firstly, leadership comes from within the community; however, while there are common leadership roles, such as coordinator, thought leader, or networker, these need not all reside with a single person, rather they can be shared amongst core and active members (Wenger 2000; Wenger, McDermott & Snyder, 2002). Secondly, Wenger conceptualises large social learning systems as consisting of many interrelated CoPs. In this context, what goes on at the boundaries between CoPs is very important. A properly functioning social learning system needs brokers who are able to move between different communities, but also artefacts, or 'boundary objects' which facilitate the transfer of learning across these boundaries (Wenger, 2000). Finally, unlike institutionally controlled teams, CoPs require a certain 'aliveness' to thrive: this occurs when a sense of 'excitement' or common adventure co-exists alongside familiar faces and processes (Wenger, McDermott & Snyder, 2002). We describe below how these elements were incorporated into our CoP model.

We found several examples in the literature of research relevant to our study. Drouin et al. (2014), for example, used a community of practice model to introduce tablets to teaching academics and found both participation and satisfaction with the way the scheme was organised were high. In particular, the authors reported that "most participants felt that the support services provided were sufficient or helpful" (p. 242). In a similar vein, Harvey and Smith (2014) reported on the establishment of an iPad 'Coffee Club' at the University of Southampton to support the uptake of teaching with the devices. The initiative received overwhelmingly positive evaluation from participants, who testified that participating in the Club had improved their practice. There was a steady increase in the uptake of iPads coinciding with the existence of the Coffee Club, accompanied by requests for Coffee Clubs to be established at the university's other campuses.

The significance of voluntariness in the adoption of technology was highlighted in an earlier study (Anderson et al., 2006), which investigated the acceptance of tablet PCs issued to teaching academics in a business college. The study found that along with perceived usefulness, voluntariness bore the strongest relationship to acceptance:

> The more voluntary the faculty believe the technology's use, the more successful the program will be. Administrators need to insure that participation is voluntary (p. 437).

This finding has relevance to our study, as it appears to indicate that if the introduction of a new teaching technology is perceived as a top-down decision rather than a matter of individual choice, the rate of the technology's dissemination may be affected.

We also searched the literature for other examples of emergency-mandated technological changes, for comparison with the COVID-19 shift to online. In New Zealand, the Christchurch earthquakes of 2010 and 2011 furnish the example of an institution (the University of Canterbury) being forced online by a natural disaster. One study (Ayebi-Arthur, 2017) concludes that the institution was ill-prepared for the 2010 quake, but that the experience of needing to shift rapidly to remote learning resulted in improved preparedness for the 2011 quake. Key issues following the first earthquake included the absence of some courses from the LMS, the lack of IT infrastructure to support student and staff access to online resources, the low level of online teaching skills among academics, and insufficient support staff. The consequences of poor institutional dissemination strategies (relating to LMS use and online teaching skills), are highlighted in this example, which also reveals the significance of structural issues as blockers to uptake (inadequate IT infrastructure and support staff). A number of more recent studies of the Christchurch experience of the disruption caused by the natural disaster have highlighted the importance of maintaining a sense of community and supporting peer-to-peer information exchange, in addition to structural preparedness (Dohaney et al., 2020; Richardson et al., 2015; Dabner, 2012).

The available literature therefore provides support for our voluntary, community of practice approach to the dissemination of tablet teaching.

Methodology

The experience of staff who had borrowed a device from the tablet library was investigated via a mid-2021 survey. Follow-up interviews were carried out with survey respondents who had volunteered to discuss questions in more detail. Ethics approval had been granted by the university's human research ethics committee (reference number HEC20487). Taking into account significant staff reductions in the wake of the pandemic, 75 staff members were invited to take part in the survey. The survey was available 23 March – 25 May 2021. There were 18 completed surveys (24% response rate). Semi-structured interviews were conducted with 6 academics 7-15 July 2021, of 15-25 minutes in length. Tablet library loan records were also used to map device uptake by school. Below, survey quotes are referenced by an anonymous numerical identifier.

Results

Survey results

The survey commenced with demographic questions. Seven respondents were Teaching and Research academics, 8 were Teaching Focussed academics and 3 were sessional staff members. All but one of the schools in the faculty were represented, the exception being Nursing and Midwifery, to which no particular significance is attributed. Tablet users therefore represented a range of teaching positions and disciplines. Two-thirds of respondents had no more than 10 years of teaching experience, and one-third less than or equal to 5, possibly indicating that tablet users were more junior teaching staff. Respondents were then asked whether they had engaged with the community of practice, followed by a series of textual questions prompting reflection on their tablet use, then a Likert-scale rating of the extent to which tablet teaching would form part of the 'new normal' for them. The survey divided respondents into two groups: those who had borrowed a tablet prior to 2020, and those who had done so under the influence of COVID-19. Seven survey respondents had taught with tablets before 2020 (39%). For the other 11, the COVID-19 year 2020 was the first year of use (61%). Those who began using a tablet before 2020 were much more likely to have participated in the community of practice (6 out of 7) than those who began using tablets in the COVID-19 year (5 out of 11).

All respondents agreed that it would be likely or extremely likely that teaching with a tablet would become part of their new normal. Fourteen survey respondents indicated they were still using a tablet in 2021 (78%). Of the remaining 4 who were not using a tablet in 2021, one was teaching online and apparently only interested in tablets for untethered face-to-face classroom teaching; another was expecting to be teaching face-to-face and preferred writing on the board; and the other two provided no explanation, though both had rated the likelihood of tablet teaching becoming the new normal as 4, so possibly had simply not taught yet in 2021.

Twelve of the 18 survey respondents (67%) indicated in their textual answers that they felt the tablet had helped with student satisfaction, though none had made any formal measurement of this. Comments included the following:

> I believe the students are understanding my material better with the tablet. I don't have any written evidence but students are doing much better in my section and I think it's due to teaching with a tablet (105865910).

> During a Zoom tute session last year some students indicated in the chat that my annotations helped them understand the content … Some students have indicated verbally and in SFTs [Student Feedback on Teaching] that my lectures are very clearly presented but they didn't mention the use of the tablet specifically. I am sure though that the use of the tablet enhanced the recordings I have produced (106335891).

> A great deal of positive anecdotal feedback from students and also in SFS/SFT [Student Feedback on Subject/Teaching] supporting particularly asynchronous help videos but also the real-time annotations in synchronous online classes (112682829).

A wide range of uses of the tablets for teaching purposes were identified in the textual responses. The results are displayed in Table 1, where each count represents an individual. A count was only registered if the survey respondent explicitly identified that activity in response to the open-answer question: How did you use the tablet computer in your teaching?

Thus users put their tablets to a broad range of uses, when teaching online, in the classroom, or both simultaneously (hybrid). There was no obvious difference in usage patterns between pre and post COVID-19 outbreak adopters, except that earlier adopters had used their tablets for a greater variety of activities than 2020 adopters (13 uses compared with 9). The obvious explanation for this, however, is the much more limited possibility of face-to-face teaching during 2020 and into 2021.

Table 1: Tablet teaching uses

Tablet teaching use	No. citing use		
	pre-2020	2020	total
to explain something by handwriting or drawing using the stylus	4	6	10
for synchronous online teaching (e.g., via Zoom or MS Teams)	3	6	9
for recording screen-capture videos (lectures or lecture vignettes, worked solutions, help videos)	3	3	6
to annotate slides in synchronous teaching	2	3	5
projected onto multiple screens in pracs or face-to-face tutorials	2	0	2
for marking assignments by annotating them using the stylus	1	1	2
for teaching wirelessly (to roam the room) in face-to-face teaching	2	0	2
in online teaching to elicit or encourage student input	2	0	2
for face-to-face teaching	1	1	2
for simultaneous face-to-face and synchronous online teaching (hybrid)	1	1	2
for editing videos	0	1	1
in face-to-face teaching to elicit or encourage student input	1	0	1
as a mobile Zoom (or MS Teams, etc.) participant to capture experiments or demonstrations during synchronous teaching	1	0	1
software demonstration	0	1	1
to plan the layout of recorded lightboard presentations	1	0	1

Borrowing patterns

The tablet library lending records permitted the mapping of the pattern of device uptake over time. Although there were 80 devices in the library, for some devices loan data are not available and so these have been excluded from the analysis. The library was fully assigned by the end of March 2020. It should also be noted that the numbers shown on this graph are adoption *events*: the growth after March 2020 represents devices being assigned to new owners that had been returned by staff leaving the university. We would have preferred to map the cumulative device uptake by department, as we would argue that that is the primary social and organizational unit that academics identify with, however numbers were too small at the departmental level to allow for a meaningful comparison. As a proxy for this we have mapped the cumulative uptake over time by school. Figure 1 displays the results of this mapping. These results appear to show that in schools where pre-pandemic diffusion was more established, uptake was stronger with the onset of COVID-19 restrictions.

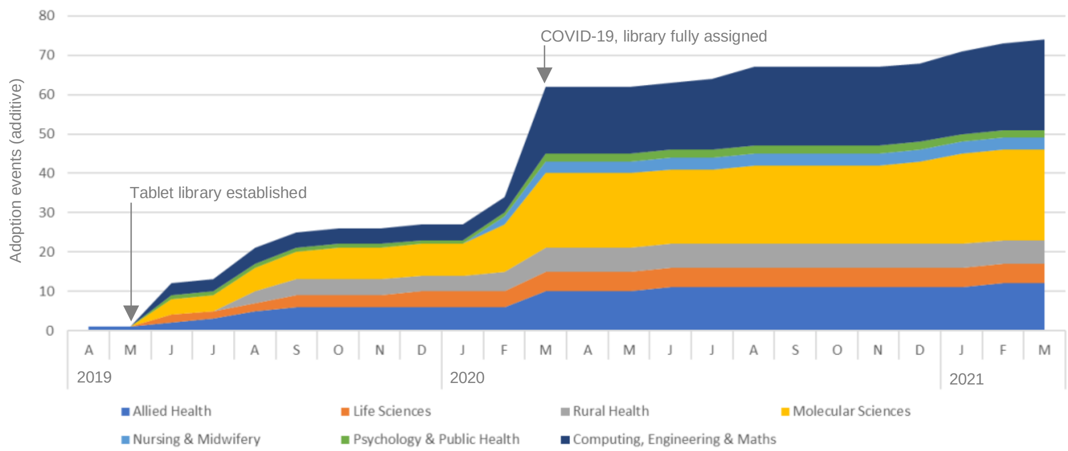

Figure 1: Cumulative uptake of tablet devices by school

Tablet teaching case studies

Six survey participants volunteered for follow-up interviews. Although the number of interviewees is small, their testimony provides valuable additional information concerning what motivated staff to begin teaching with the assistance of the tablet, as well as how they learnt to use their devices.

The 6 interviewees represented 4 disciplines, 3 of them lab-based sciences, and one a clinical discipline with professional accreditation. Interviewees were categorized based on when their tablet use started, employing a variation of the Rogers (2003) taxonomy, described above. Two of the interviewees, in the same discipline, had started teaching with tablets before the establishment of the device library. We will refer to them as Innovators 1 and 2. Two others took the opportunity provided by the availability of a library device to begin tablet teaching before the COVID-19 outbreak, identified as Early Adopters 1 & 2, and two others only commenced once the COVID-19 restrictions had been imposed, referred to as COVID Adopters 1 & 2. The distribution of uptake over time gives us confidence in the usefulness of the interviewee data, despite the somewhat restricted representation of disciplines.

Innovators 1 and 2 began using tablets to overcome certain challenges in cross-campus teaching. The student cohort in this discipline is spread over two campuses, and for several years face-to-face classes at one location have been successfully shared to the other location via a combination of a tablet computer and Zoom. This had involved a certain amount of experimentation, and for this reason this discipline already possessed a high level of know-how relating to tablet and remote teaching before the pandemic:

> The tablet's great as … a whiteboard because at one stage we were taking the laptop up to the whiteboard in the room and it was horrible … Being able to show the students in real time how to solve something instead of just saying here's the solution … and it's all typed up [is a benefit] … There's a permanent record of it [too] so that's another key advantage (Innovator 1).

The two other pre-COVID-19 adopters, Early Adopters 1 and 2, also turned to tablets to address particular teaching challenges. Early Adopter 1 used a tablet to annotate explanatory presentations during practical classes. These were projected on screens around the lab. She found the tablet made this far more effective than trying to use the whiteboard:

> It was way more effective than a whiteboard and having students gather around a whiteboard, and they may or may not see what you're actually drawing … and then there's a delay and then they come back later and they look at the whiteboard and they're trying to copy down what you've written … It just wasn't effective, not with 45 students (Early Adopter 1).

Early Adopter 2, from the clinical discipline, used the tablet as an aid in classroom teaching:

> Primarily the reason that I got it was to unhook me from the lectern … Being an early career academic I needed my presentation notes, so being able to carry them around with me was invaluable (Early Adopter 2).

Of the two who only began tablet teaching during the pandemic, COVID Adopter 1 had intended to use it pre-COVID-19, but had been discouraged by tech infrastructure issues. This is familiar from the literature on the Christchurch earthquake cited above, which identified structural blockers as hindering the diffusion of innovation. COVID Adopter 1's experience is also informative in understanding the role of the community of practice in the pre-COVID-19 dissemination of tablet teaching practice. She first saw the tablets being demonstrated at a CoP meeting mid-2019, and initially felt that using one would be too difficult. She recalled thinking, 'Oh my god, that's such a difficult technology I'll never get there' (COVID Adopter 1). At a subsequent workshop however, at which the CoP leader demonstrated how she was using a tablet in her teaching (also a lab-based discipline), COVID Adopter 1 felt confident enough to try one. She borrowed a Surface Pro early in 2020 and investigated the lecture theatres where she would be teaching, but was discouraged by the difficulty of connecting wirelessly. This became irrelevant shortly afterwards, however, when the university moved online mid-March due to the COVID-19 pandemic. COVID Adopter 1 reported that while she was mostly self-taught, she found the CoP useful in learning about tablet teaching. The COVID-19 pandemic transformed the tablet from something she was merely curious about into a game-changer:

> So it was just something that I was trying out and no, that didn't have any particular time-frame before COVID, and then when the whole thing happened it was like well now I have, you know, a

> saving device that's going to help me do everything that I do on the whiteboard or elsewhere in tutorials – usually the doc cam – that now I can do that (COVID Adopter 1).

COVID Adopter 2 indicated that she was self-taught, and had not participated in the CoP. Nevertheless, this academic was from a department which had the highest number of tablet borrowers, both before and after the start of online teaching, so it is likely her decision to commence tablet teaching was influenced by knowledge of her colleagues' behaviours.

In a similar way to COVID Adopter 1, Early Adopter 1 was influenced by the example set by the CoP leader, particularly in remaining calm in the face of technical breakdowns:

> Sometimes the connection wasn't great but you just have to say, well, if it doesn't work out you just have to keep smiling and keep going. You can't just go, oh my god, this is a disaster, because the students will focus on that (Early Adopter 1).

Early Adopter 2 was largely self-taught, but also benefited from the knowledge of a local (academic) colleague with a high level of technical literacy. Innovator 2 found the device easy to use, and put his to a wide range of teaching uses, but was nevertheless a regular attendee of the CoP meetings. He was also a major influence on Innovator 1, his discipline colleague. Innovator 1 claimed to be a 'technophobe', but one who was nonetheless happy to adopt a new technology if she could see colleagues using it effectively:

> I don't say I'm that game, but if someone else has fiddled and they say I've tried this and it works, I'm happy to adopt (Innovator 1).

These testimonials therefore provide concrete examples of how academics base their decision to try a new technology on the experience of the colleagues they work with, and rely on similar sources for learning how to use it.

Interviewees put their devices to a wide range of teaching uses during the period of emergency remote teaching, including paperless marking of assignments via annotation, as an additional Zoom participant to monitor what students see during synchronous sessions, creating screen-capture problem-solving resources, editing and rendering videos on a secondary device, and for hybrid online and in-person teaching, once partial return to campus was allowed. One academic even improvised practical experiments around the house during lockdown:

> doing sort of buoyancy experiments in the kitchen sink and setting up kitchen scales and pendulums and things like that and the tablet was good to just be able to pick up and carry around and keep speaking to the students (Innovator 2).

Those who began tablet use pre-pandemic all found themselves using the device in more ways during lockdown. Significantly, it would appear that this gain in confidence was not restricted to the one technology, as 5 of the 6 interviewees reported that their experience of adopting a tablet made them more confident to try further technology innovations:

> It definitely has … I'm much more open to technologies whether it's equipment or applications, much more open to new things than I was before trying the tablet and probably before the COVID push, to embrace anything which would work really well online and engage students (Innovator 2).
>
> You feel more confident that you can learn it. So once you've gone through that once, it's not so hard, it's not so scary, any of this stuff (COVID Adopter 1).
>
> I think in the future it may inspire me to use different technologies and just to be confident, so that, like, at first you might not know how to use a technology, but with time you can learn how to do something. And it's okay if things don't work, because you can keep improving and trying, maybe getting advice from somebody who's got experience (Early Adopter 1).

Finally, we asked interviewees directly whether they felt staff reaction would have been different if it had been university policy not COVID-19 that had led to online teaching. Three replied that there were aspects of their (lab-based) disciplines that simply could not be replicated online, without answering the question directly. We interpret this response as indicating their reaction would have been much the same: an acceptance that some curriculum elements can be moved online, but an insistence that lab classes cannot be. One interviewee answered 'it would have been very similar' (Innovator 2) and another thought there might be more initial resistance, which could be overcome with the provision of professional development (Early Adopter 1). Only one felt there would be significantly more resistance:

> Like with anything you've got your early adopters and your luddites, and I think the breakdown of people that fit into each of those categories would have been very much skewed towards the late adopters rather than early adopters (Early Adopter 2).

These reactions surprised us, and encouraged us to hypothesize that the lessons we learnt concerning technology adoption during the pandemic might have broader application to more normal times.

Discussion

Our evaluation of a tablet teaching dissemination strategy based on voluntary adoption supported by a well-resourced, self-directed community of practice, has provided us with significant insight into the processes of innovation diffusion. Our study appears to confirm the diffusion of innovation literature (Rogers, 2003) in finding that a credible recommendation from a peer is a key factor in an academic's decision to adopt. We saw that as dissemination gathered pace, the locus of this type of information exchange moved from within the CoP to outside of it – into the corridors and departmental meetings of the institution. Bearing in mind that it is the early adopters, not the innovators, who are more likely to play the role of opinion leader for later adopters (Rogers, 2003), we argue that a key function of a community of practice is to bring innovators and early adopters together, and so cement this first and critical stage of technology transfer. We see this reflected in both the survey and the interview data: earlier adopters were much more likely to be involved in the CoP than those who took up tablet teaching in the pandemic year. Once COVID-19 restrictions were in force, and uptake grew rapidly, CoP membership was no longer an important factor in dissemination.

We now return to our three research questions. Firstly, by available measures the dissemination of tablet teaching in our faculty can be considered successful. Users employed their devices for a wide range of teaching applications, including those which can be considered transformative, that is more than mere replication of existing activities in a new medium (e.g., multi-campus teaching, hybrid face-to-face and Zoom classes, capturing lab demonstrations for an online class). All survey participants indicated they were at least moderately likely to continue tablet teaching, and two-thirds were confident that tablet use was linked to increased student satisfaction. While the size of the library placed a cap on further diffusion, 'full dissemination' is in any case difficult to define in this case. There is clearly no necessity that every academic in the institution should be teaching using a tablet, as the devices are more useful in some disciplines – those which rely significantly on symbolic representations – than in others.

Regarding our second research question, we found evidence that our community of practice model facilitated dissemination of innovative practice. The CoP played a direct role early in the life of the tablet library, when, in addition to peer learning and shared problem solving, we posit two factors that made the CoP 'tick'. The first was modelling of innovative behaviour by the CoP leader herself: this was mentioned by two of the interviewees as a factor in overcoming their hesitations. The other factor was a sense of 'common adventure' (Wenger, McDermott & Snyder, 2002), which arose from the ongoing (and ultimately successful) campaign to bring about an update of teaching space audio visual technology to support untethered tablet teaching. In the second phase of dissemination, after the onset of the COVID-19 pandemic, the locus of diffusion moved away from dissemination within the CoP group to diffusion across boundaries into, we surmise, mainly departmental groups. In this process the brokering of this boundary crossing was mainly carried out by CoP members, and the main boundary artefacts they used were their own testimony of their tablet teaching experiences, or 'stories' to use Wenger's terminology (2000). The how-to videos and other artefacts on the CoP website may also have played the role of boundary objects.

The functioning of the CoP can also be interpreted according to diffusion of innovation theory (Rogers, 2003). The CoP ensured that pre-COVID-19 adopters were confident in using their devices for teaching. We surmise that this meant that in departmental meetings across the faculty, especially those called in March 2020 in response to the emergency decision to shift all teaching online, there was someone who could provide credible evaluation of the technology, upon which others could base their decision to adopt. The available evidence is consistent with this scenario. Our finding that pre-COVID-19 adopters were much more likely than later tablet users to frequent CoP meetings can be attributed to the locus of credible information transfer moving beyond the boundaries of the formal community of practice and into other contexts, such as departmental meetings. Our mapping of borrowing against time on a school basis also appears to show that schools with a more established pre-COVID-19 investment in tablet teaching saw greater growth under COVID-19. And finally, our in-depth interviews highlighted the importance of the CoP, and the example of the CoP leader and other colleagues in influencing academics' decision to borrow a device and commence tablet teaching. Perhaps the most powerful message of the interviews is the frank enthusiasm of the testimony of the interviewees, which must have provided a highly credible and persuasive source of information for discipline colleagues.

In answer to our third research question, concerning evidence that full dissemination would have eventuated even if the COVID-19 pandemic had not taken place, we put forward the following. Of our six interviewees, only one felt that compliance would have been much slower if the shift to online teaching had been mandated by university policy rather than a global pandemic. Three responded in ways which indicated that their personal response would have been very similar: insistence that lab classes could not be transitioned effectively online. One interviewee even felt there would be no difference between the two situations. Furthermore, while COVID-19 was the source of very great disruption, learning and teaching challenges are with as every day. There is no reason to think that the presence of early adopters in departments across the university would have failed to play a similar role in recommending tablet teaching as a way of addressing everyday challenges, particularly in disciplines that rely on symbolic systems of representations, albeit in much calmer circumstances than the COVID-19 emergency. Finally, figure 1 shows that the 'second wave' of tablet borrowing began in February 2020, a month before the COVID-19 mandated shift to online. It is possible that the preceding plateau in uptake was a result of learning and teaching arrangements being largely fixed for semester 2, followed by the summer break. This February upturn may indicate that dissemination would have proceeded without COVID-19, though possibly at a slower rate. Of course it may also indicate that some were taking early action in anticipation of restrictions.

If our proposition is correct, and our tablet teaching dissemination strategy has general applicability, then the implication is that an institutional rollout of a teaching innovation should be preceded by a phase which focusses on voluntary uptake by innovators and early adopters, supported by a well-resourced, academic-led community of practice bringing them together.

This approach would provide a range of advantages. Firstly, by the time adoption of a teaching innovation was mandated there would be users in every departmental meeting and in corridors across the institution who could provide credible testimony regarding the usefulness of the technology. We know from the literature that credibility comes from 'social closeness' (i.e., departmental colleagues) and status as an opinion leader. Early adopters, rather than innovators, are much more likely to be opinion leaders (Rogers, 2003, pp. 26, 293, 301), hence the importance of incubating the transfer from innovators to early adopters in the community of practice.

Secondly, possible structural issues can be identified early and addressed. The tablet teaching community of practice quickly identified the lack of technical infrastructure in teaching spaces for wireless tablet teaching. This issue even meant that one potential early adopter was prevented from trialling tablet teaching. While this problem became irrelevant for the majority of staff members when teaching moved online in March 2020, it is worth noting that our institution's audio visual department did investigate this problem, and identified a workable solution just before lockdown.

And thirdly, in the extreme case, while institutional decisions to proceed with a new technology or innovation are typically based on solid evidence of usefulness in the higher education context, if the innovators and early adopters were to discover that the claims of usefulness were not justified in the specific context, the decision on institutional adoption could be re-assessed before coming into force.

These findings from our limited study are preliminary, rather than conclusive. Further, and larger-scale testing of our hypotheses under non-pandemic conditions needs to occur before these results can be treated with confidence. We also acknowledge that our tracking of diffusion ended prematurely, once the library of devices had been exhausted, and that dissemination via non-library devices, which was not considered, would also be important to measure. However, we believe these initial findings do provide sufficient justification for our dissemination approach to be taken seriously in future trials.

Conclusion

Preceding institutional rollout of a teaching technology with a period of voluntary uptake supported by a well-resourced community of practice may be a way of improving reach and the chances of success. No matter how well-documented the benefits of a particular teaching innovation may be, academics are more likely to base a decision to adopt on the subjective experience of someone who is socially close to them, such as a departmental colleague. Our community of practice model appears to bring together and nurture transfer amongst innovators and early adopters, and it is members of the latter group who are much more likely to act as ‘opinion leaders’ in their respective disciplines and departments.

We have argued that while the COVID-19 pandemic may be unique in the scale and rapidity of innovation amongst teaching academics, it can in a sense be considered a greenhouse in which the processes of teaching technology dissemination can be observed in an accelerated state.

Perhaps the most significant finding of our study is that those who have enjoyed success in adopting one teaching technology feel more confident to tackle other innovations. We therefore put forward our community of practice model of technology diffusion as being able to contribute towards establishing an institutional culture of innovation in learning and teaching.

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reconnect
Reconnecting relationships through technology

The Interaction Effect of Group Formation and Individual Preparation on Computer Support Collaborative Engineering Design: An Exploratory Study

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Collaboration, as one of the most essential skill sets for engineering students, remains challenging for both engineering educators and student engineers. This study explores the role of pedagogical support individual preparation before collaboration on engineering students' collaborative learning outcome as well as the process. A total of 36 dyads engineering students from a university engineering class participated in the study, divided into 2 group formations: homogeneous group (two similarly experienced student engineers) and heterogeneous group (one experienced student engineer and one less experienced student engineer). All dyads completed two engineering design tasks in two conditions: immediate collaboration (control condition) and individual preparation before collaboration (experimental condition) in a face-to-face (F2F) computer-supported collaborative learning (CSCL) context. The results indicated the interaction effect of individual preparation and group formation on students' collaborative knowledge co-construction. The homogeneous group formation produced higher quality knowledge co-construction and design solutions when there was an individual preparation before collaboration than immediate collaboration. Meanwile, the heterogeneous group formation produced lower quality knowledge co-construction and design solutions when there was an individual preparation before collaboration than immediate collaboration. These findings expand the current understanding of individual preparation before collaboration and provide insights for the design of computer-supported collaborative learning in classrooms.

Keywords: F2F CSCL, collaboration scripts, individual preparation before collaboration.

Introduction

Over the last three decades, global educational stakeholders put increasing emphasis on developing comprehensive competencies in pre-service engineers, including creativity, lifelong learning, communication skills, teamwork, and collaboration (Jamison et al., 2022). However, high-quality collaboration is not easy to be practiced in current engineering classrooms. Researchers have identified challenges in the knowledge co-construction process in university-level engineering classrooms: lack of idea diversity and innovation, make minimal contributions, superficial discussion and analysis, and hasty decision makings (Marra et al., 2016). To address these challenges, appropriate technological and pedagogical support for collaboration is needed to enhance students' collaborative learning in engineering classrooms (Jamison et al., 2022).

Since the 1980s, the field of Computer-Supported Collaborative Learning (CSCL) builds the relationship between the social interactions in learning and computational objects, exploring how to help groups of learners achieve higher level collaboration with digital technologies (Hmelo-Silver & Jeong, 2020; Koschmann, 1996). The technology environment itself does not guarantee successful collaborative learning, appropriate pedagogical support is needed to facilitate students' productive collaborative learning in engineering classrooms. One pedagogical approach is to individually prepare learners before their collaboration (e.g., Lam & Muldner, 2017; Tsovaltzi et al., 2015). Individual preparation before collaboration refers to "devoting a part of the learning time for learning individually prior to learning collaboratively" (Mende et al., 2021, p.30). Though being applied in various collaboration script practices (Loll & Pinkwart, 2013), the effect of individual preparation before collaboration remains underexplored in the engineering design context. In particular, it is still an open question about its effect on student engineers' design outcomes and processes, considering the fact that different group formations of student engineers have different levels of engineering experiences. This exploratory study examines the role of individual preparation before collaboration, when applied in different group formation situations, on students' design solution quality as final products as well as their engineering design strategies applied in the knowledge construction process.

Literature review

Individual preparation before collaboration

One valuable instructional approach widely applied in the CSCL context is collaboration scripts (Kollar et al., 2007; Rummel & Spada, 2007). Collaboration scripts are designed to "promote productive interactions by designing the environment such that suggestions of different degrees of coercion are made to the collaborating students, engaging them in specific activities that otherwise might not occur" (Weinberger, 2011, p. 190). The scripted collaboration usually guides students on what to do, what roles to play, and what sequences of activities to perform during collaboration (Carmien et al., 2007). One component or activity that has been involved in various collaboration scripts is the individual preparation phase before students started talking (Loll & Pinkwart, 2013), also known as *individual preparation before collaboration* (Mende et al., 2021).

The mechanism of individual preparation before collaboration can be explained by the preparation paradigm brought up by Lam and Kapur (2018). The main role of individual preparation before collaboration, compared with direct collaboration, lies in several aspects: activating prior knowledge, exposing knowledge gaps, facilitating engagement, and increasing sensitivity to noticing (Lam & Kapur, 2018). The individual preparation before collaboration, recognised in previous empirical studies (e.g., Beers et al., 2006; Farrokhnia et al., 2019), showed higher learning gains (Salomon, 1997; Stahl, 2006), higher motivation for group work (Van Boxtel et al., 2000), better collaboration products (Engelmann et al., 2014; Engelmann et al., 2009) as well as more in-depth knowledge co-construction discourse (Tan et al., 2021). Meanwhile, a series of studies by Tsovaltzi et al. (2015) identified knowledge solidification as a result of individual preparation before collaboration, and that students became less likely to accept alternative opinions during the following discussion, which directly interrupted the knowledge co-construction at the group level. In summary, the empirical studies of the effect of individual preparation before collaboration had mixed findings: both cognitive activation advantages and possible coordination challenges (Mende et al., 2021).

In addition, only a few collaborative learning contexts and subjects have been investigated in the existing literature: ecology concept mapping activities, physics problem solving, collaborative argumentation, and collaborative writing. Most individual preparation studies were conducted in K-12 school settings, making it difficult to transfer empirical implications to university-level learning contexts. It remains under-explored what is the effect of individual preparation before collaboration in the university-level engineering problem-solving context, which requires ongoing idea generation, problem analysis, negotiation, and decision-making practices between student engineers in a group.

Group formation

To optimise collaborative learning efficiency, the application of pedagogical supports requires systematic considerations such as the collaborating students' gender, ethnicity, motivational level, learning ability, and familiarity with each other, as identified by Lei et al. (2010) and Chen and Kuo (2019). One of the commonly discussed factors is group formation (heterogeneous or homogeneous) in terms of the learners' level of knowledge related to the learning task (Chen & Kuo, 2019). A series of studies by Webb (1984); Webb et al. (1995) found that students with a higher level of knowledge contributed more to the collaboration work and gave more explanations while the students with a lower level of knowledge tend to be off-task. A heterogeneous group had a better teacher-student relationship and more meaningful peer interactions than homogeneous groups.

The prior experiences and skillsets in engineering design play an important role in pre-service engineers' participation and contribution to the collaboration process (Song & Becker, 2014), as demonstrated in their engineering design strategies and their decision-making approaches (Atman et al., 2007; Dym et al., 2005). Novice engineers and expert engineers tend to adopt different collaboration strategies when solving complex problems (Song & Becker, 2014). For example, experienced engineers spent more time exploring and framing the design problem while less-experienced engineers would rush to easy solutions without deep research. Experienced engineers tend to make critical evaluations and analyses surrounding each solution and alternative solutions while less-experienced engineers overlook the potential risks and limitations. From the knowledge co-construction perspective (Weinberger & Fischer, 2006), the different decision-making ways represent the different consensus-building approaches: quick consensus building, integration-oriented consensus building, and conflict-oriented consensus building. The hasty decision-making of less experienced engineers was related to lower quality of knowledge co-construction when the members barely build on each other's contributions (Deken et al., 2012). The experienced engineers may go through higher level of knowledge co-construction interactions when they were engaged in critical and analytical discourses and integrate multiple perspectives before making common decisions (Atman et al., 2007; Weinberger & Fischer, 2006).

As indicated in the preparatory mechanism (Lam & Kapur, 2018), one essential role of an individual preparation activity is to activate learners' prior knowledge and get them ready for a more critical and analytical group discussion activity. From this perspective, the less-experienced students are given more chance to understand the design problem before joining the discussion, so that they may contribute to the collaboration with more in-depth discussions, resulting in a higher quality of knowledge co-construction. Experienced students, however, are likely to get either "more-prepared" or "over-prepared" when they are given more time to analyze the given problems, generate their own solutions, and probably get a fixed standpoint, as reported in Tsovaltzi et al. (2015)'s study. The preparation activity, therefore, may either benefit or hinder the subsequent knowledge co-construction process for experienced students. Therefore, individual preparation may affect the collaboration process and outcomes of different group formations with a different or similar levels of engineering experiences in different ways.

Research Questions

With an interest in supporting and optimizing engineering students' collaborative learning process, this study provided pedagogical support for collaborative learning in engineering classrooms by taking students' prior engineering experiences into consideration, as the individual preparation may have a differentiated effect on the groups with different level of engineering experiences when they understand, analyze, and make decisions on the given problems in the engineering design. The groups were composed in two ways: more experienced student engineers and less-experienced student engineers (heterogeneous dyad) and similarly experienced student engineers (homogeneous dyad). The study is to examine whether and how group formation factor could mediate the effect of the individual preparation before collaboration on engineering students' collaborative learning processes and outcomes in engineering problem-solving settings, in particular, the knowledge co-construction patterns demonstrated in different group formations. There are two research questions to be addressed:

1. Does individual preparation before collaboration influence the quality of engineering design solutions in different group formations in terms of students' prior experience?
2. Does individual preparation before collaboration influence the engineering design strategies in different group formations in the process of knowledge construction?

Research Design

This study employed an explanatory mixed method design approach, with both quantitative and qualitative data collected and analysed to examine students' collaborative learning under different individual preparation conditions. The quasi-experimental design was employed to compare the design solution quality in the two conditions across two group formations to address the first research question. To further explain the difference in collaboration product quality among the two group formations identified in RQ1, two dyads, one homogeneous dyad, and one heterogeneous dyad were randomly selected to examine the collaboration processes and outcomes in detail.

Participants and learning context

A total of 72 students in a 4th-year engineering mainstream class "Mechatronics Engineering Design" at a Singapore university participated in this study. These students were engaged with a series of conceptual engineering design projects on an autonomous robot. The overall design problem is to design an autonomous robot that is able to perform certain functions in the given arena. To solve these design problems, student engineers were expected to analyze the design problem, identify the required functions, and generate alternative design solutions.

The learning environment was face-to-face CSCL. During the task, each dyad sat face-to-face with every student having one laptop/tablet. Students' collaboration was supported by the online collaboration platform Miro (miro.com), shown in Figure 1. This platform was chosen in this class as it allows collaborating students to co-edit, sketch, and use multi-media tools to represent their idea in real-time, which are essential practices required in early-stage engineering design. Each dyad finished two design problems following two conditions in this study: immediate collaboration (control condition) and individual preparation before collaboration (experimental condition). In the control condition, students collaborated on the shared digital board from the very beginning for one hour. In the experimental condition, students did preparation on their individual digital board for 15 minutes, which contained the same content as their collaboration board, and they move to the shared digital board and discuss for the rest of 45 minutes. This 15-minutes individual preparation invited students to examine the design problem and generate at least one design solution.

Figure 1: An exemplar shared digital board

The participants were randomly assigned to 36 dyads. There were two group formations: homogeneous (similarly experienced student engineers, N=21) and heterogeneous (one experienced and one less-experienced student engineer, N=15). The "experience" here refers to the students' prior engineering design experiences that were self-reported in the pre-survey. The more experienced student engineers were those who graduated from robotics engineering in polytechnic college before joining the university, who participated in relatively more mechanical engineering design projects than less-experienced student engineers who began robotics engineering training at university. The experienced student engineers had studied robotics engineering for more than 6 years before registering for this class while the less-experienced student engineers had studied robotics engineering for less than 4 years.

Data collection and research instruments

The data collected included each group's engineering design solutions in their shared digital boards and their verbal discussions. Content analysis was conducted to evaluate each group's engineering design artifacts in the digital board based on the coding scheme. The unit of analysis is one group's design solutions presented in the online platform. The coding scheme for engineering design solutions was adapted from the evaluation of the design concepts model (Roozenburg & Eekels, 1995) according to the design problems in this study context. It has four dimensions: diversity, elaboration, novelty, and functionality. Each dimension was rated on a scale of 0 to 5. Two expert engineers (the class instructor and another expert engineer outside this class) coded the quality of all the dyads' design solutions in two conditions. The Cronbach's alpha for the four dimensions are: 0.97 for diversity, 0.97 for elaboration, 0.97 for novelty, and 0.96 for functionality. The inter-coder reliability was high for all dimensions. The quality of each group's design solution was calculated by averaging the scores of four dimensions.

This study randomly chooses dyad A and dyad B from the homogeneous and heterogeneous group formations respectively. Their verbal discussions were transcribed into transcripts and qualitative content analysis was conducted to identify the different collaboration behaviours based on the coding scheme. The unit of analysis for coding was one utterance of a distinctive idea conveyed by students in the same group. The coding scheme of students' verbal discussion was adapted from the CommonKADS conceptual modelling language framework which has been widely applied to analyze collaboration and communication in engineering design contexts (Santirojanakul, 2018). To investigate students' knowledge of co-construction in engineering design, this study adopted the argumentative knowledge co-construction framework (Weinberger & Fischer, 2006) from consensus-building perspectives, including quick consensus building, integration-oriented consensus building, and conflict-oriented consensus building. Two trained coders coded the data. The inter-coder reliability was good (Cohen's Kappa=0.702). The explanation and examples of each code are given in Table 1.

Table 1: Coding scheme of student's verbal discussion

Dimension	Explanation	Sub-dimension	Example
Design problem definition	The goals and sub-goals of the design problem	Design Goals	"We need to walk toward the ball and identify it."
	Definition, sharing, and adjustment of the design requirements	Task Requirement	"It requires us to walk within the borders. "
	Identification of components that requires special attention	Design Consideration	"Your opponent may attack when you deliver the ball, right?"
Solution generation	Propose a new design idea/solution	Solution Generation	"I think we can use the velcro to catch the ball and make it a roller."
	Considerations surrounding a solution in terms of its effectiveness	Considerations for a Solution	"Then you must make sure their contact is uh.... perfect on the left and right."
	The specific variables and design details of a solution	Design Specification	"Actually, we can use the reflective sensor, the 2.5cm one."
	The resources available and accessible in the task	Given Resource	"How many motors do we have though?"
	Provide alternative solutions in response to specificities	Alternative Solution Generation	"In that case, we can add a funnel in the front instead."
Solution Analysis	Make predictions on a certain design idea/solution	Simulation	"So let's say it goes like that and the object hits the corner, then the car has to adjust the angel over here...."
	Voice out the possible risks and concerns of a design idea	Predicted Risks and Problems	"t's quite a small contact angle for a big ball. I'm concerned that it doesn't stick."
	Voice out the strengths and positives of a design idea	Identifying Positives of a Solution	"This structure is more stable definitely."
	Weigh the pros and cons of a design solution	Weighing Pros and Cons	"If we aim for somewhat fight, we should be heavier. But we also cannot sacrifice too much of our speed."
Evaluation	Evaluation of a given solution/idea	Evaluating a Solution	"This is the strongest solution."
	Referring to theories or concepts	Referring to Theories	"We should consider the maneuverability. The car should be maneuverable enough."
	Referring to past similar examples of the design problem	Prior Example	"See this team's design, they have that weird coloured paint around it. We can use this as well."
	Referring to prior engineering design experience	Prior Experience	"I know it works because I used it before."
Consensus-building	Accept a peer contribution without any modification	Quick Consensus Building	"-What else? -Good cable management maybe? -Ah okay."
	Take over the perspective of their learning peers and/or integrate different perspectives	Integration-oriented Consensus Building	"-I think we can use the long-range sensor to like localise where it is...Wait we only have 1 sensor? -Yeah we only got 1 short range sensor.. the mid-range sensor -Then what about 1 on top for the height? -Okay then we have like 1 sensor for each corner.
	Reject and/or repair contributions of their learning peers with further replacement, modification, and/or supplementation	Conflict-oriented Consensus Building	"-I want the robot to be seen. -Err... I don't think it matters at this moment. -Well...I mean, it's not to be optimised for, it's more like just adding some colours to the styrofoam ball.. shape like the tennis and then we put at our strong point. -Then maybe we put it with an explanation. -Okay. "

Results

Effect of individual preparation before collaboration and group formation on engineering design solutions quality

To answer RQ1, 36 dyads' design solutions were coded and compared under the two conditions. A two-way ANOVA was conducted to understand if there was an interaction between the two factors: group formation and conditions. There was no significant main effect of condition, $F(1, 34)=0.315$, $p=0.578$. This indicates that the 36 dyads had no significant difference between the two conditions. There was no significant main effect of group formation, $F(1, 34)=0.118$, $p=0.734$. This indicates that the design quality of the homogeneous group had no significant difference from that of the heterogeneous group. However, there was a significant interaction between the group formation and the condition, $F(2, 36)=6.25$, $p=0.017$. This indicates the difference in design solution quality between the control condition and the experimental condition is not equivalent in the two group formations. The homogeneous group showed a significantly higher score in the experimental condition than the control condition, $F(1, 36)=5.623$, $p=0.024$, while the heterogeneous group showed a higher score in the control condition than the experimental condition. As shown in Figure 2, for homogeneous groups, their artefact quality mean score was higher in the experimental condition and lower in the control condition. While for the heterogeneous group, their artefact quality mean score was higher in the control condition and lower in the experimental condition.

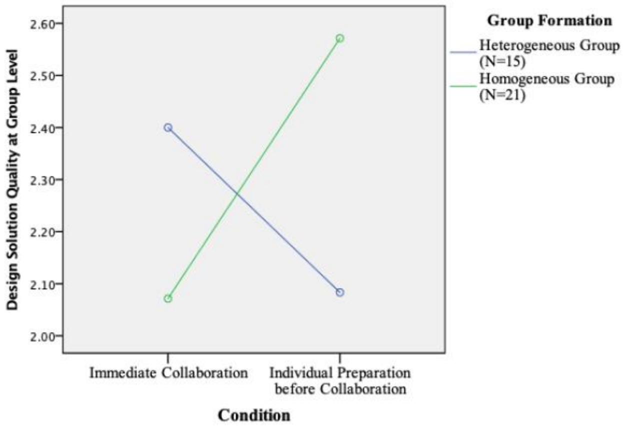

Figure 2: Design solution quality of homogeneous and heterogeneous group formations

Effect of individual preparation before collaboration on students' engineering design strategies in different group formations

To explain the different effects of individual preparation on different group formations, the verbal discussions of two dyads A and B chosen from each group formation were further analysed using Epistemic Network Analysis (ENA) to identify the connections among the different collaboration behaviours in different conditions for each group. ENA is a learning analytic method that can quantify the co-occurrence of different codes and identify the connections among elements of interest (Shaffer et al., 2016). The two groups' collaboration behaviours codes with their timestamps were imported into ENA web tool version 3.0 (http://www.epistemicnetwork.org/) to model their engineering design networks under different individual preparation conditions. The size of stanza was set to four, meaning that the ENA calculated the co-occurrence of the codes in every four collaboration behaviours. For each group, there were two network graphs created for the two conditions, indicating the connections among different engineering strategies and consensus-building approaches being applied by each group.

ENA produced a weighted comparison network result for groups A and B respectively, shown in Figures 3 and 4. In this network graph, each node represents one collaboration behaviour code. The connections among the different nodes indicate the co-occurrence of the two codes. The thicker lines represent stronger and more frequent connections between elements. The comparison plot was retrieved by subtracting the same group's networks under two conditions (one colour representing one condition), in which the connections in the experimental condition are subtracted from connections in the control condition. The colour represents a certain condition that has a stronger connection in their network.

Figure 3 is the comparison plot of homogeneous group A (similarly experienced student engineers) in two conditions. The purple lines indicate connections stronger in the control condition and the pink lines indicate connections that are stronger in the experimental condition. Several patterns can be identified based on the ENA result. First, the two experienced students tended to focus more on design problem definition, by talking about the design goals, given resources, and design considerations. They tended to work on the detailed design specifications by checking the resources available, such as the quantity and size of sensors and motors. When there was an individual preparation activity before the discussion, the two experienced students spent more time on solution generation and solution analysis, when they tended to generate alternative solutions and conduct a comprehensive evaluation of the solutions by discussing and weighing the pros and cons of the alternative solutions. More integration-oriented consensus building and conflict-oriented consensus building were applied instead of quick-consensus building.

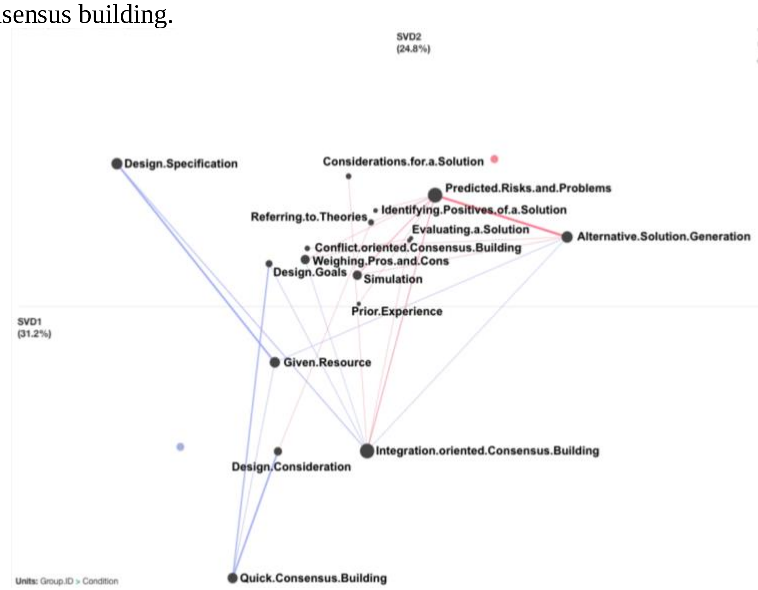

Figure 3: Epistemic networks of homogeneous group A

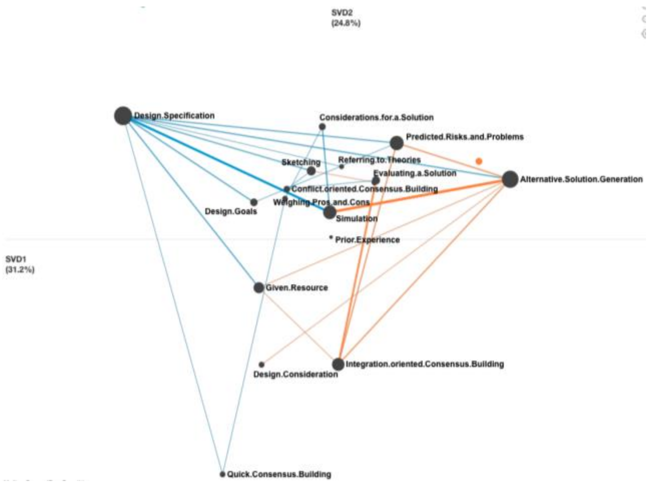

Figure 4: Epistemic networks of heterogeneous group B

Figure 4 is the comparison plot of heterogeneous group B (one experienced student engineer and one less experienced student engineer) in two conditions. The orange lines indicate connections stronger in the control condition and the blue lines indicate connections that are stronger in the experimental condition. The effect of individual preparation for group B can be recognised in the ENA result, whereas the two conditions weighed towards the left and right part of the space respectively. In the immediate collaboration condition (orange lines), the two students proposed multiple alternative solutions by simulating the task contexts together, such as how the ball goes and how to deal with the opponent's attack. These solutions were mostly produced in the integration-oriented consensus-building approach, as two student engineers tried to integrate each other's opinions. When there was individual preparation before collaboration, the two students altered the way of solution generating and made a great effort to determine the design specifications of one solution. Interestingly, the quick consensus building stood out in this process, indicating mostly rushed decision-making and few common contributions from both collaborators.

To summarise, the ENA results report different patterns of collaboration behaviour connections for the two group formations under different individual preparation before collaboration conditions. For both homogeneous and heterogeneous groups, student engineers applied different ways of defining the design problem, solution generation and analysis as well as decision-making under the two conditions. However, the individual preparation activity played different roles with different group formations. In homogeneous group A, the individual preparation activity encouraged students to move beyond one single solution, come up with alternative solutions, and engage in critical evaluation and analysis of each solution. These strategies represented more informed engineering design thinking activities and higher quality of knowledge co-construction. The individual preparation activity for the heterogeneous group B, however, played a different role in the way they worked on the design problem. With an individual preparation, group B was less likely to embrace multiple perspectives and integrate both sides' opinions, instead, there were overarching discussions surrounding the design specifications surrounding one solution via continuously quick consensus buildings. In comparison, the immediate collaboration condition for group B seemed to involve higher quality of knowledge co-construction and multiple perspectives.

Conclusions and Discussions

This study examined the effect of individual preparation before collaboration on engineering students' collaborative learning in different group formations. The groups with similar experience tend to produce higher quality design solutions in the individual preparation condition than the immediate collaboration condition. The group with different experience tend to produce lower quality design solutions in the individual preparation condition than the immediate collaboration condition. The content analysis of the two groups' verbal discussion revealed that the individual preparation played different roles with different group formations in terms of how student engineers define the design problem, generate solutions, analyze solutions, as well as make decisions. Heterogeneous groups tended to reach consensus and make decisions by integrating both sides' opinions when there was an individual preparation, compared to more quick-consensus building practices in the immediate collaboration condition. These behaviours all indicated the higher-order thinking process when students were more "prepared" for the teamwork (Mende et al., 2021), which also corresponds to the higher quality of their design solutions as the collaboration product (Farrokhnia et al., 2019; Tan et al., 2021).

The individual preparation before collaboration, however, played a different role in the heterogeneous group consisting of one experienced and one less experienced student engineer. The heterogeneous group were less likely to integrate each other's contributions after individual preparation but instead, rushed to decision-making surrounding the design specifications. In contrast, the immediate collaboration condition seemed to allow more transactive dialogues when multiple solutions were discussed and evaluated before the two collaborators made common decisions. This surprising finding can be explained by the possible disadvantage of individual preparation before collaboration, pointed out by previous scholars (Mende et al., 2021), that learners may experience knowledge solidification if they were given some time to develop their own ideas before joining the discussion. In this study, the more experienced student engineer ended up developing his own design solution in the 15 minutes and he was keen on detailing this solution in the following discussion, during which the less experienced student engineer may find it difficult to contribute his ideas to the conversation.

These findings contribute to the existing individual preparation before collaboration studies in the field of collaboration scripts with its application and examination in the real-world university-level engineering classroom context. The in-depth analysis of different group formations shed light on a strategised and adaptive use of this pedagogical support in CSCL practices. Besides, the process-oriented analysis approach illustrates the importance of evaluating both design outcomes and design processes to realise a comprehensive understanding of collaborative learning in engineering classrooms. There are limitations in this study. Firstly, the university engineering classroom context and the specific design tasks may pose challenges to transferring the findings to other learning contexts. Second, there was a relatively small sample size due to the real-world classroom limitation, making it difficult to explore the interaction impact between different group formations and different individual preparation designs on student design solution quality. Bigger scale experimental studies are needed to identify the possible interaction effect of group formation and individual preparation on students' collaborative learning.

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reconnect
Reconnecting relationships through technology

'It's not so scary anymore. It's actually exhilarating': A proof-of-concept study using virtual reality technology for music performance training under pressure.

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Extended lockdowns associated with the COVID-19 pandemic severely ruptured the capacity of performing artists to connect with peers and colleagues in professional and educational contexts. In this study we test a protocol for the use of immersive performance technologies in tertiary institutions to provide developing and early career musicians to connect with pedagogues and access safe, realistic spaces within which to practice performing under varying degrees of pressure. We investigated the affordances of a VR environment to trigger performance anxiety, and the effectiveness of a synchronous digitally mediated environment for tertiary educators to train a key performance psychology skill. Heart rate, self-reported anxiety and confidence measurements were taken over four levels of situational stress and performance demands. Results revealed that the technology enabled a pre-performance routine to be effectively taught online by an instructor to a musician wearing a VR headset. Notably, this was achieved by both participants being in separate locations without detriment to the teacher-student relationship. This study provides encouraging insight into the capacity for immersive technologies to help students effectively manage the stresses of live performance in both virtual and real worlds.

Keywords: Musicians, Immersive Environments, Performance Anxiety, Educational Technology

Introduction

Simulation training is used to develop performance skills in various disciplines, particularly where in-situ training is either impossible or unsafe to implement (Renganayagalu et al., 2021). Such training enables learners to acclimatise to real-life stressors and anxiety-inducing scenarios in physically and/or psychologically safe environments, to protect against performance decrements which reveal themselves in high pressure contexts rather than low-stress practice sessions. Recent work using virtual reality (VR) provides preliminary evidence of the capacity of this technology to evoke the intense anxiety which accompanies music performance (Fadeev et al., 2020; Fanger et al., 2020). In this proof-of-concept study, we explore the capacity of VR to assist music students to develop technical and psychological competence to perform at their best under pressure, implemented within tertiary music institution settings.

In early 2020 the COVID-19 global pandemic led to an almost overnight shift in the work and practices of the performing arts sector. The pandemic has had a profound and ongoing effect on performing arts professionals who have faced a substantial reduction in work and income, coinciding with increased anxiety, loneliness, and financial hardship (Spiro et al., 2021). This shift has equally been felt in the education sector, where the pivot to digital learning brought about by social distancing and lockdowns, has resulted in fractured relationships impacting students, staff, and the practices of research collaborations (Spreadborough et al., 2022). While the pandemic was not the catalyst for research and development in the use of immersive technologies for music performance (among other artistic practices), it did engender a deep sense of urgency to investigate how to reconnect with students and colleagues in meaningful ways. Indeed, our preparedness to embrace and harness immersive technologies will have enduring ramifications for performer wellbeing, accessibility, and readiness to perform.

Immersive technologies such as VR may play an important role for musicians to develop their performance techniques and performance skills under pressure. Performance stress and anxiety is a significant health and performance issue for musicians, with approximately 20% of professional musicians reporting that it adversely affects their career (Osborne & Kirsner, 2022). Pre-performance routines substantially reduce the likelihood of choking under pressure, particularly in tasks which combine psychological and behavioural components such as music performance (Hanton et al., 2004; Mesagno & Mullane-Grant, 2010). Such routines attempt to down-regulate the performer's autonomic nervous system fight-flight-freeze response which results in excessive muscle tension and negatively impacts the execution of highly refined fine motor skills. The centering[1] technique is one such strategy that has proven efficacy for reducing debilitating performance anxiety whilst simultaneously improving performance preparation, confidence, courage, focus, concentration, and performance resilience in conservatorium music students (Osborne et al., 2014). This self-regulating technique can be used pre- and mid-performance to control overactive autonomic activity and refocus attention towards performance cues which assist the execution of the musical piece in high pressure performance situations. In this technique the performer begins by quieting their eye gaze before verbalising a clear intention of what is to be accomplished in the task, e.g., "I'm going to play the opening phrase with confidence". A breathing technique is then employed which is initially focused on taking deep breaths in and out of the abdominal area, before changing to tension release in key muscle groups common in anxiety (e.g., jaw and shoulder tension), as well as those required to play their instrument. The performer then visualises an optimal execution of their stated intention - feeling, hearing and seeing themselves performing well. When this is clear in their minds, the performer starts to play. This process takes approximately 90 seconds to complete and can be shortened with practice (see Osborne et al., 2014, for more detail on the steps). Centering has been taught effectively in a tertiary education context to university students in face to face (Osborne et al., 2014) and dual-delivery simultaneous face-to-face and online delivery mode (Osborne, 2020), but not in a hybrid online-immersive VR environment.

Simulation training involving VR is used to develop performance skills in various disciplines such as surgery and sport where performance failures may have devastating consequences (Akbaş et al., 2019; Renganayagalu et al., 2021). Following the acclimatization principle, training under mild levels of anxiety can prevent choking when people are required to perform with higher levels of anxiety (Oudejans & Pijpers, 2010). To prepare to move from spending hours practicing alone in practice rooms and into dynamic and high stress live performance contexts such as an audition panel or concert hall, musicians can simulate the physical space of their upcoming performances. Interventions of this nature in tertiary education settings include the fit-out of physical rooms with adjoining backstage and stage area, ceiling mounted projectors to project life-sized audiences or audition panels onto walls, spotlights, and speakers (Bissonnette et al., 2016; Williamon et al., 2014). In these semi-immersive spaces musicians can practice walking from the green room and side of stage to the concert stage, before commencing their performance. The expressions and responses of the pre-recorded audience members can vary from responding very favourably to becoming more aggressive. These simulated performance environments provide a bridge between imaginal and in-vivo exposure, with equivalent state anxiety and physiological patterns of heart rate variability being recorded across simulated and actual auditions in front of live judges, and decreased anxiety across sessions accompanied by improved performance quality within sessions (Bissonnette et al., 2016; Williamon et al., 2014). These in-situ interventions raise questions of resource accessibility. Currently, and prior to COVID-19 restrictions, the opportunity for students to perform in concert halls, and to experience the associated pressure of a live audience, were - and remain - limited. The extensive lockdowns and restrictions in place during the COVID-19 pandemic has resulted in a reduction of opportunities to access physical spaces to practice and perform, including the on-site simulation facilities in place in certain tertiary institutions. Long-term questions also exist regarding access for students of diverse backgrounds, levels of competency, ableness, and career and/or life stage. VR may provide a unique platform to address these issues while providing realistic and ecologically valid performance situations for musicians.

One early adopter of the use of VR to assist musicians to alleviate music performance anxiety is the PIANX platform (Fanger et al., 2020). Designed specifically for pianists, the PIANX platform is a Mixed Reality platform consisting of a MIDI (Musical Instrument Digital Interface) stage piano and an HTC Vive Pro VR headset. The platform enabled a comparison of a virtual representation of hand tracking and a real representation using see-through VR, as well as three different performance settings in which to practice: home, audition, and concert hall. Unfortunately, despite the promise as a fully immersive VR performance experience in these three settings, due to COVID-19 constraints the researchers were unable to place musicians directly into the apparatus. Instead, 23 participants took part in an online study in which they watched a series of videos demonstrating features of the system and provided feedback ratings on what they *expected* they would feel. Ratings reflected real life comparisons of lower to higher stress contexts, with no significant differences in anxiety ratings between the audition and concert hall, and lower anxiety ratings between each of those conditions to the living room condition. These results are promising and lend support to the notion that VR can

[1] The American spelling is intentionally used when referencing the centering technique in this article for consistency with extant research and instructional literature.

stimulate performance anxiety. However, a major limitation is that participants did not participate in the actual VR simulation. The design of this study potentially underestimates the impact of VR on physiological responses and evocation of music performance anxiety. Further studies in controlled experimental conditions including physiological sensors to measure participant stress and anxiety levels more accurately in a fully immersive VR environment were recommended.

The current study
This proof-of-concept study was designed to address two elements. First, we extend the work of Fanger and colleagues (2020), by investigating the affordance of a VR environment to trigger the physiological fight-flight response that accompanies performance anxiety in a non-pianist. Second, we assess the affordance of a digitally mediated environment to enable tertiary educators to form productive teaching and learning relationships with students when training performance psychology skills online and virtually.

Method

Participants

The musician participant (second author, Glasser) in this study is a highly trained violinist (30+ years' experience) with early professional experience as a member of a state symphony orchestra. Professional performance in recent years is, however, minimal; Glasser’s professional involvement is currently in teaching and research activities with music performance students. Glasser therefore has an acute awareness of the needs and perceptions of this population. A registered psychologist and performance psychology lecturer (first author) guided the musician through the procedure. The technical setup, recording and video post-production was facilitated by a support technician (third author). All three members were located in their respective homes due to state-issued lockdown laws preventing onsite gatherings arising from the COVID-19 pandemic.

Materials

Richie’s Plank Experience (Toast VR, 2016) was used as the VR application to approximate the physiological symptoms of high-stress performance for the musician. This application has been used previously for VR studies such as exposure therapy (Hu et al., 2018; Ramdhani et al., 2019). An Oculus Quest 2 headset (rebranded as the Meta Quest 2 in November 2021) owned by the musician was used for running the plank experience. One-second intervallic heart rate data was captured using a Polar OH1 optical sensor secured to the musician’s forearm.

Communication between the psychologist, musician and technician was co-ordinated using the Zoom video conference platform. The psychologist guided the participant remotely through the routine via Zoom, whilst the participant was immersed in the VR environment. Audio and video recording of the participant and psychologist was captured by the technician on a MacBook Pro using the Zoom recording function. The first-person perspective view from the Oculus Quest 2 was captured using the in-built recording function of the headset. The heart rate information was generated by converting intervallic heart rate data from a .CSV file into a visual display ticker and saved as an mp4 file. The heart rate video, Zoom recording and captured plank experience was then edited together and exported as an mp4 file using DaVinci Resolve v17 editing software. The images depicted in the figures were taken from screenshots of the composited mp4 file.

Procedure

This study was designed as a researcher-as-participant paradigm (Probst, 2016). As per the Declaration of Helsinki (World Medical Association, 2013) and the National Statement on Ethical Conduct in Human Research (National Health and Medical Research Council, 2007), ethics committee review is not explicitly referenced as being required for self-experimenters, and therefore formal ethics approval was not sought. The lead author, as a registered psychologist with the Australian Health Practitioner Regulation Authority, was operating under the professional code of ethics. Verbal informed consent was obtained from the participating researcher (second author) prior to commencing the intervention. Two weeks prior to the exposure session, a performance psychologist (first author) taught the participant the centering pre-performance routine which has demonstrated efficacy to reduce performance anxiety in musicians (Osborne et al., 2014).

During the session the psychologist guided the participant remotely through the routine via Zoom, whilst the participant was immersed in the VR environment. Heart rate, subjective units of distress, and confidence measurements were taken across levels of exposure which varied the integration of instrument and intervention listed in Table 1. The session included baseline measurements and all four exposure levels and took 1 hour 22 minutes to complete.

Table 1: Description of tasks for each level of exposure

Condition	Task description
Baseline	Recording heart rate and self-reported anxiety rating when standing. No centering intervention, plank exposure or instrument play.
Level 1	Walk the plank, no intervention, no instrument.
Level 2	Center and walk the plank, no instrument. Centering intention “Now I’m going to walk confidently and safely to my previous position on the plank”.
Level 3	Walk the plank and play instrument, no intervention.
Level 4	Center, walk the plank and play instrument. Centering intention “Now I am going to perform confidently and safely”.

Results

Heart rate (HR), subjective units of distress and confidence measurements across the levels of exposure in Richie’s Plank Experience are summarised in Table 2. Figures demonstrating levels 1 to 4 can be accessed at https://doi.org/10.26188/20280321.v3.

Table 2: Heart rate, subjective units of distress and confidence measurements across exposure levels

	Baseline	Level 1	Level 2	Level 3	Level 4
Heart rate					
Mean	99.98	141.88	120.055	124.84	122.29
SD	2.63	7.01	6.26	9.61	7.33
Min	97	129	109	113	106
Max	105	158	133	135	135
Range	8	27	24	22	29
Anxiety /100	65	99	80	70	72
Confidence /100	--	70	80	60	90

Baseline measurements were taken at the start of session whilst the musician had the VR headset on but had not yet opened the Plank Experience application. The relatively high baseline self-reported anxiety of 65/100 was explained by the musician thus:

> At the moment I'm feeling pretty calm, it's peaceful, I'm in an open white space. Knowing I'm on a film in front of you two, and knowing what I'm about to do, the unknown, is making me feel a bit nervous. So I know my heart rate is higher than it should be.

The musician then opened the Plank application, entered the elevator and took it up to the plank floor before commencing the level 1 exposure task.

In level 1 we saw a dramatic elevation in HR from baseline to the first plank walk. The musician reported extreme distress during the task, which took 11 seconds from the edge of the plank in the lift to reach the end before racing back into the lift. Figure 1 shows their position within the lift looking out to the plank on the right-hand side, and their recovery position crouched on the floor in the lop left corner after they had completed the first level 1 task, as the psychologist watches and provides instructions.

Figure 1: Level 1 - Walk the plank, no intervention, no instrument
*N*ote. This figure demonstrates the musician recovering in the virtual elevator after their first time walking the plank. The HR bpm value shown corresponds to the moment the screenshot was taken.

In level 2 we saw a marked reduction in HR after the psychologist took the musician through the centering exercise in the lift prior to walking on the plank. The musician commented that they needed to reduce the sound of the city a little so they could hear and concentrate on the instructions, because the sound of the city was heightening their anxiety. Anxiety and confidence ratings were given after centering and prior to commencing the walk. Anxiety had reduced by 19 points and confidence increased by 10 from level 1. The increased confidence could be seen clearly in their body language through a more upright posture, and after shuffling along the plank and reaching the end of the plank they exclaimed with a smile, ‘Woo hoo! It’s not so scary anymore. It’s actually exhilarating’. They then looked down, lost their balance and fell to the ground at the front of the elevator on the street below. After this exposure, the musician reported that prior to the fall they felt an intense fight-flight reaction which reminded them of the anxiety prior to giving a talk or music performance, despite their improved confidence. Physiological responses were also evidenced in increased sweating and shaking which were uncharacteristic for the musician:

> My hands don't normally get sweaty but they were wet. And my whole body shaking, sweating on my face…I remember this type of feeling when you're about to perform or give a speech, such a quick physiological response….You know, when you're waiting to go on, especially a solo performance, and your whole body starts to shut down. I couldn't concentrate on what I was meant to do.

In level 3 we saw an increase in HR once again as the musician walked the plank for the first time with their instrument and played whilst on the plank. Surprisingly, despite not centering beforehand, mean HR increased only slightly, and minimum and maximum HR was comparable to level 2. The subjective difference in the difficulty of this task was evidenced by both anxiety and confidence ratings reducing by 10. The level of immersion the musician was experiencing in that moment was described by their concern for the instrument being damaged by the virtual environment:

> It's weird because I don't feel like…I've got one foot on the plank, and I don’t feel like I can put my arms out because I think I'm going to hit my violin against the wall of the elevator. I'm actually more concerned for the instrument than I am for myself at the moment.

Yet immersion was not absolute, as the musician also described that the ongoing communication to the psychologist over Zoom enabled them to feel tethered to the real world.

In level 4, we saw a minor drop in HR after centering in the lift before the musician walks the plank with their instrument and plays for a second time (see Figure 2). Interestingly, the inclusion of centering had the most impact on confidence levels which improved by 30 points from level 3. Anxiety remained steady.

After completing the final exposure task, the value of the Plank Experience application and guided practice to downregulate the physiological symptoms and subjective anxiety that can accompany music performance was encapsulated by the musician’s comments:

> Well it did (help me focus). And I think one of things that it did, is that it actually allowed a habituation of the sights and sounds as well. So in a really calm way, to just look around and feel safer…' (when in the elevator) '…made it feel less menacing or less dangerous'… 'I think after doing this, playing in a concert hall would be a piece of cake.

Figure 2: Level 4 - Center, walk the plank and play instrument.
Note. This figure demonstrates the musician playing the violin on the edge of the plank after a guided centering in the lift. The HR bpm value corresponds to moment the screenshot was taken.

Discussion

In this study we explored the affordance of a fully immersive VR environment to trigger the physiological and subjective fight-flight response that musicians can experience when they perform in high stress environments. We also assessed the effectiveness of a digitally mediated environment for tertiary educators to teach a pre-performance routine online to enable performers to practice the skills required to manage high levels of performance anxiety. Our findings confirm that Richie's Plank Experience VR application induces a notable stress response. We also show that a musician can be receptive to pre-performance routine instructions to downregulate their stress response when they are delivered online with the musician inhabiting an immersive virtual environment. The routine helped the musician feel poised and centred when walking the plank, and when playing their instrument. They were able to achieve a performance focus in the VR environment, demonstrated by decreased anxiety and increased confidence ratings across progressive performance tasks.

Examining the data we see evidence for the effectiveness of the centering technique, as well as habituation to stress over repeated walk-the-plank exposures. After centering, the musician demonstrated a dramatic reduction in HR from the first walk in level 1 to level 2, accompanied by their subjective experience changing from fear to exhilaration. Subsequent levels showed minor variation in HR. The increase in HR at level 3 was expected given it was the first time the musician had played their instrument on the plank. Interestingly, despite HR moving in expected directions given task requirements across the levels of exposure, the degree of HR variation was minimal. In level 3, the first play of the instrument on the plank *without* centering beforehand, the lower anxiety rating may be indicative of habituation to the task over repeated exposures in the same session. The lower confidence rating may also be a consequence of not having centered beforehand. By level 4, after four walks and centering with a clear performance intention, the musician's confidence rating had increased by a third, to almost 100% confidence in the task of playing their instrument confidently and safely on the plank. This is remarkable given that they had previously fallen off the plank and had experienced marked distress. It is also a testament to the capacity of the instructor and the musician to achieve an effective performance training outcome through a combination of video conferencing and VR technology.

One of the major affordances that VR can provide is the feeling of being in different place to the one that your body is physically located, referred to as *place illusion* (Slater, 2009; Slater et al., 2022). This phenomenon was seen in the actions of the musician on the plank based on two observed behaviours. Firstly, when carefully walking across the plank to avoid falling off and secondly, protecting the violin from hitting the virtual elevator doors when stepping back off the plank. The musician's sense of *self-embodiment*, i.e., having a body within a virtual environment (Jerald, 2015), was also observed during the session. In this case, the musician informing the psychologist of intermittent hand tracking (due to instrument occlusion) as well as not being able to see their own instrument.

This study addressed a major shortfall in Fanger et al's (2020) PIANX study by fully immersing a musician in a stress-inducing VR environment whilst performing their instrument. We utilised Richie's Plank Experience to trigger the physiological response which accompanies stressful music performance in the absence of accessibility to a virtual stage. Since conducing this study, work is emerging on bespoke applications for performance practice such as "VR Rehearse & Perform" (Lalioti et al., 2021). Their proof-of-concept platform combines visual and acoustic features of a virtual auditorium to simulate performing on stage. Similar to our own observations, they also reported performance challenges with performers not being able to see their own instrument in VR. Future studies of this nature could be further enhanced using more extensive biometric data such as eye tracking, heart-rate variability, pupillometry and facial expressions. These types of measures in a performance and educational context are worthy of further investigations in their own right.

The use of immersive technology in both educational and performance contexts also raises ethical considerations. The IEEE Global Initiative on Ethics of Extended Reality (XR) has produced a set of recommendations for consideration in the educational context including areas related to data privacy, user consent, accessibility and others (Mangina, 2021). Further work is required in this area to assist ethics committees appropriately balance the risks with the potential benefits of this technology in training and research.

Conclusion

Our study provides initial evidence that VR can induce the situational stress required to trigger physical and psychological responses. This provides musicians with access to a safe, realistic space within which to practice psychological skills to downregulate music performance anxiety and focus on performance. This project has also identified the urgent need to develop a discourse and performance practice framework regarding ethical performance in virtual and augmented reality. The employment of a virtual environment to consider ethical questions relating to music performance outputs and practices provides a rare opportunity to instigate a transdisciplinary conversation in this timely and urgent domain and deliver creative and performance art opportunities that capture the intersectionality and confluence of the arts.

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Reconnecting relationships through technology

Re/Connecting university teachers with digital teaching tools for "jobs to be done"

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Although constructive alignment is well understood within university teaching practices, technology does not always feature explicitly within this conceptual model. When educators seek digital technologies to assist them in their teaching, how do they find out both what is available to them within their higher education institution and, more importantly, which tools might make a good pedagogical "fit" within their unit of study? One university in Australia recently designed and developed a *Teaching and Learning Tools Guide* to assist their teachers to determine which educational technologies are available for their various educational purposes. This new resource offers guided navigation to assist teacher choice of tool to align to their intended pedagogical strategy. As an open-source resource, the guide is also offered widely to the higher education community. This paper recommends that this or a similar resource is used to support digital tool choice within the constructive alignment process.

Keywords: Constructive alignment; Digital technology; University teachers; Higher education

Introduction

> Any instructional strategy can be supported by a number of contrasting technologies—old and new—just as any given technology might support different instructional strategies. For any given instructional strategy, however, some technologies are better than others. (Caplan & Graham, 2008, p. 250)

Constructive alignment is understood within higher education curriculum design, development, and teaching to involve intentionally designing teaching and learning activities and assessment tasks to not only align to the intended learning outcomes but to provide a facilitated pathway for students to build or construct their way towards their new knowledge or other outcomes (Biggs & Tang, 2011). The role of constructive alignment continues to be considered core to instructional and teaching practices (e.g., Paskevicius, 2017), albeit should be viewed as a non-linear and complex process without denying other elements, such as unplanned creatively or unexpected directions taken by the students (Bellamy, 2018a; Fawns, 2022b). However, when constructive alignment is represented as an equation, the complexities that technological tools add do not always feature significantly or as particular entities that need considered attention. This might be implied in design discussions in higher education, such as when noting "experience with and awareness of alignment between technology, content and concepts being taught" as a factor within "mediat[ing] teaching and learning processes" (Green, 2022, p. 96). We anticipate that this—the explicit recognition of digital tools adding further complexity to the constructive alignment model—may soon be addressed given Biggs and Tang are joined by Kennedy to write a fifth edition of *Teaching for Quality Learning at University* (Biggs et al., in press), expected for release in November 2022. Nonetheless, when choosing technologies for use in teaching, educators should consider on a baseline level how these align or do not align with the intended learning outcomes, the teaching and learning activities, and the assessment tasks, and what other purposes might be enabled or inadvertently disabled by incorporating digital tools. Such consideration can take place at the planning stage when constructively aligning a subject or unit of study but also at the more granular level when designing activities and assessments, and then at a further level of granularity when actively practicing in the teaching and learning settings and responding to various needs as exposed during student engagement opportunities.

When teachers (or students) bring new digital technologies into educational settings, the planned alignment might be influenced in unexpected ways. Digital tools as a collective are unstable due to their rapidly evolving status, their opaque nature (i.e., their function may not be as immediately obvious as compared to physical, non-digital tools in a classroom), and their capacity to be applied in a variety of ways (Paskevicius, 2017). Barry et al. (2015, p. 209) noted that previous instances of "well-designed, constructively aligned curriculum may have remained constant" for some time, but with continually increasing access to and availability of both educational and social technologies, we now have more fluid educational environments, with "a continuous need to reflect on and consider students' learning and teaching needs with regard to their socio-technological world[s]". However, they added that this need not be seen as a burden but rather "an opportunity for teachers to refresh curriculum for new delivery modes, methods and techniques appropriate for the technology (and learners) of the times" (Barry et al., 2015, p. 209). Moreover, Fawns (2022a) elucidated the complex nature of an entangled pedagogy, which features interdependent elements (such as teaching methods; technology; and teacher and student purposes, values, and contexts) and iterative negotiations between these elements. Within this complexity of intertwined factors, the intended learning outcomes may be inadequate to represent emergent, unpredictable learning achievements (Fawns, 2022a).

At the start of the current COVID-19 pandemic, many higher education institutions around the globe rapidly moved their teaching and learning to online mode (e.g., IAU, 2020; Mascolo, 2020), meaning educators had to quickly adapt to teaching in online environments. Many institutions focused on "transitioning content to an online environment, and not necessarily on online pedagogy" and faced challenges resulting from this rapid change (Crawford, et al., 2020, p. 10). After the initial rapid response, concerted effort is being directed towards formulating a continuing response. Higher education institutes are reconsidering teaching and learning, with many mindful of the roles that digital technologies have in this new paradigm to support both increasing online and decreasing face-to-face learning in comparison to pre-pandemic contexts. Digital teaching skills factor in this. In a recent overview of systematic reviews, Peters et al. (2022) drew several factors from 13 reviews that influence university teachers' digital competency, including the increasing demands on faculty due to fast-paced changes in the digital teaching ecology, the institution meeting their responsibilities for training and provision of infrastructure, and a focus on teaching practice roles involving thinking critically about technology use including pedagogical aspects.

One University's particular response to support university teachers in these changing contexts included an action to reconnect teachers with digital technologies in a meaningful way. The University supported the development of a new guide for teachers to use as a resource for selecting digital tools for teaching; to help them to explicitly select tools to suit their various and specific teaching and learning aims. This paper shares this new resource developed for teachers at Deakin University, Australia, in the form of a *Teaching and Learning Tools Guide* (Deakin University, 2021). As an open-source resource, teachers from any university can access and use this new guide to help in their choice of digital tools; to select tools to incorporate into their teaching practices to meet various teaching purposes. On one level, tools can be searched by name to access tool resources (e.g., for *H5P* or *Mentimeter*). However, at a pedagogical level, teachers are offered the option of navigating through a few steps to consider the purpose(s) for which they intend to use any particular tool, and to consider the teaching methods they might employ.

The pedagogical navigation option is overtly influenced by Laurillard's (2012) framing of several "learning through …" activity types (e.g., "learning through practice"), and the layering within the guide is directly influenced by Goodyear's (2005) model of educational design. However, in practice, the guide is intended to support university teachers' achievement towards constructive alignment; teachers are encouraged to seek tools aligned to their teaching purpose(s). In straightforward (albeit hypothetical) terms, if the intended learning outcome is a practice focussed outcome to "Apply [X practical skills in Y contexts]," then teachers might go to the pedagogical tab titled "Practice" to view a range of digital tool options to support students in their on- or off-campus practice activities (e.g., on-campus experiment, off-campus internship). Further granular guidance is then offered in learning and assessment activity alignment, which is further detailed within this paper. By taking a multi-disciplinary team approach to design and create the new interactive web-based artefact, the digital tool guide reached beyond achieving the University brief to also address various "jobs to be done" that teachers and teaching support staff identified.

Analysing the requirements: Determining the jobs to be done

To create the Teaching and Learning Tools Guide, a needs analysis occurred iteratively during design ideation. Such a baseline "[n]eeds analysis is a core component" within a design-based approach for a learning technology or support tool (Phillips et al., 2012, p. 121). The central theme of the analysis was to determine what were the *Jobs to Be Done* by this new resource. This approach was inspired by Christensen et al. (2016), who highlighted that people effectively "hire" a product on offer (in this case, the anticipated tool guide) to do various jobs, and if it "does the job well, the next time we're confronted with the same job, we tend to hire that product again" (p. 56).

The project brief from the University was to replace a pre-existing *Digital Learning Environments* guide in the form of a PDF resource, to uplift it to a next generation interactive web resource of digital tool mapping and teacher choice guidance. Beyond this brief, consultations were conducted with teachers to ask them what they had effectively "hired" the previous guide to do for them. The teachers were then shown iterative draft design mock-ups (initially in *PowerPoint* then via *Miro*'s online whiteboard) of a new interactive tool to ask what they might like to use it for, and to better understand the user experience.

Despite the continuing challenges of teaching during the pandemic in late 2021, coupled with end of year marking loads, several teachers agreed to participate in individual consultation sessions (*n*=8), as well as a range of teaching support/development personnel (*n*=10) who worked directly with a wide range of teachers across the four faculties. Additionally, various experts on specific digital tools (e.g., *FeedbackFruits*) and people with other specific expertise (e.g., accessibility, digital literacy) were consulted across the university to help refine specific tool and contextual detail (*n*=11). The key jobs to be done that emerged from this range of consultations coalesced around having one reliable place to access detail on:

- the range of available enterprise-supported digital teaching and learning tools
- information and weblinks for each tool accessible from within the one resource
- a quick search option, for when a teacher seeks detail on a known tool
- a comparative choice option, to view alternative choices to achieve similar or related outcomes
- an easy-to-use, pedagogically focussed navigation choice, with guidance indicators comprising keywords and short phrases.

(*Note*: no direct data is given in this paper. This was a teaching and learning project rather than a research project, with no formal data collection and ethics clearance, and with a focus on project product outcomes.)

The resultant Teaching and Learning Tools Guide presents as an interactive web resource that allows teachers (and other users) to learn more about the suite of digital tools available at Deakin University for various teaching purposes. This is achieved through three key search functions (as indicated in Figure 1):

1. Routine site-wide search function: For those who know a specific tool for which they seek information (e.g., on a return visit to relocate tool detail), this navigation option allows keying in the name of the digital tool via a universally accepted method (upper-right search field denoted by a magnifying glass).
2. "Search by Tool": For those who have a good idea of what tool they need for their particular teaching activity, this navigation option allows a direct pathway to a list of enterprise-supported tools, select one, then navigate to the tool detail and further resources.
3. "Search by Activity": For those who are exploring digital tool options, this navigation option allows stepping through guided choices in relation to teaching and learning activities and other teaching functions, to reach specific tool detail and further resources. This option provides the most pedagogical guidance in terms of constructively aligning tools with teaching and learning purposes.

Specifying the design: Key theoretical influences

Beyond the key stakeholder influences noted above, two key theoretical influences stood out amongst multiple works that influenced the design of the new Teaching and Learning Tools Guide. One involved Goodyear's (2005) model of "conceptualising the problem space of educational design" (p. 85). While we recognise that Goodyear has made significant contributions to teaching and learning theory and practice since publication of the 2005 paper (e.g., see https://petergoodyear.net), this model was a key influencer for the layering within the guide. Embedded within Goodyear's model is the "pedagogical framework," which represents a hierarchical unpacking of teaching practices or "concrete educational activity in real world setting[s]" (p. 85). Beginning at the upper level and moving down, the framework comprises the Pedagogical Philosophy (or one's beliefs about teaching and learning, e.g., social constructivism); High-level Pedagogy (a pedagogical approach appropriate for the contexts, e.g., problem-based learning), Pedagogical Strategy (e.g., how we design, plan, action, and communicate teaching actions/activities/intentions), and Pedagogical Tactics (the granular detail enacted within the teaching methods that we employ in day-to-day educational settings) (Goodyear, 2005, pp. 86–88).

Figure 1: Home interface of Teaching and Learning Tool Guide (number annotations match above list)

A further influence within Goodyear's (2005) conceptual model is the explicit consideration of the educational environment, particularly the "digital environment within which learners work," and how this alongside the pedagogical framework, has a contributing role (together with tasks, physical environment, and people) to student activities leading to intended learning outcomes (p. 86). Goodyear acknowledged that while the environment (physical and/or digital) can constrain learning, tools are best used for active learning "activities" compared to less student-centred "tasks."

Beyond Goodyear's (2005) work influencing the layering within the guide, the Teaching and Learning Tools Guide is overtly influenced by various categories which Laurillard (2012) uses within the *Teaching as a Design Science* book. That is, the structured analysis of the conversational framework offers various highly useful categories of "learning through…" acquisition/inquiry/discussion/practice/collaboration activity types, plus production. This evidence-informed framing provides highly applicable descriptors for teachers to choose activity and/or assessment types that might best relate to their high-level pedagogical approach (e.g., tools for learning through "inquiry" for an inquiry-based learning approach) yet avoids being prescriptive to better allow for teacher judgement (e.g., the tools aligned to an inquiry strategy might suit the pedagogical strategy; however, "discussion" might better suit a strategy for a discussion-based inquiry approach). Further granularity within activity types (or subcategories as depicted in Table 1 below) provides additional guidance (e.g., seeking digital tools to help scaffold an inquiry process, or for students to present evidence of their inquiry).

Bellamy (2018a; see also Bellamy, 2018b) reminded readers not to be too restrictive when designing a constructively aligned subject, asking for consideration of two sides of the argument: Biggs' early advice around establishing a mechanism for consistency in a holistic curriculum design approach, versus Nelson's concern to avoid stifling curiosity or creativity through an overly rigid or industrious teaching design processing (Biggs, 2003, Nelson, 2018, as cited in Bellamy, 2018a). It is intended that the Teaching and Learning Tools Guide facilitates pedagogical decisions towards constructive alignment yet retains some flexibility to allow for educators to ultimately foster student-centred active learning and creativity.

Significantly, the works of both Laurillard (2012) and Goodyear (2005) directly influenced the theming and layering of the pedagogical choices in the "Search by activity" navigation option of the guide, as further discussed next.

Granular structure of the guide

The "Search by activity" navigation option in the Teaching and Learning Tools Guide provides more pedagogical guidance for teacher choice of digital tools than the alternative navigation options. This facilitates consideration of teaching purposes for the tool as constructively aligned to the pedagogical aspects of the intended learning outcome/s under focus and related learning and/or assessment task(s). Within this mode, teachers can navigate between two sections, "Learning and Assessment Activity" (represented in Table 1), or the more functional "Accessibility, Administration, and Support" area (see Table 2 to follow).

Table 1: Learning and Assessment Activity (Learning and/or assessment engagement strategy)

Navigation Tab*	Subcategories	Example digital tools
Pedagogical (learning and/or assessment engagement) strategy and activity types		*(Each tool leads to detail, resources, and example pedagogical tactics)*
Knowledge Acquisition Digital tools to build discipline content knowledge	• Create unit content • Curate third-party study materials • Interactivity with study materials • Schedule synchronous sessions • Support knowledge demonstration	• Microsoft Sway • Talis Aspire: library reading list • FeedbackFruits: Interactive Docs • Zoom • H5P
Inquiry Digital tools to investigate key ideas	• Guide dialogic inquiry • Interactivity with key ideas • Scaffold an inquiry process • Present evidence (of inquiry)	• LMS (CloudDeakin) Discussion • Padlet • Microsoft Forms • DeakinAir (Kaltura video)
Discussion Digital tools to discuss topics and ideas	• Any time asynchronous discussion • Scheduled synchronous discussion • Artefact-centred discussion	• Microsoft Teams • Zoom • FeedbackFruits: Peer Review
Collaboration Digital tools for collaboration between students	• Collaborative communication environment • Project processes (e.g., ideation, planning, management) • Design or create collaboratively	• FeedbackFruits: Interactive Study Material (Video, Audio, Docs) • Mural • WordPress
Production Digital tools for student-generated products	• Generate digital artefacts • Record product development processes • Evidence product outcomes	• Microsoft OneNote • Microsoft Planner • Pebblepad (Portfolio)
Practice Digital tools for on- or off-campus practice	• Demonstrate techniques, procedures, or skills • Support practice (communication and feedback) • Reflect in and on practice • Evidence learning from practice	• DeakinAir (Kaltura video) • Zoom • FeedbackFruit: Interactive Video • Pebblepad (Portfolio)

*Each tab represents a learning activity type inspired by Laurillard (2012) to promote consideration of an appropriate match to the educator's pedagogical strategy, *sensu* Goodyear (2005).

In the teaching function area ("Accessibility, Administration, and Support", see Table 2), teachers can find tools to help organise and run their subject/unit, including setting up their LMS site, improving accessibility of their learning materials, monitoring student progress, and managing assessment and grading administrative processes. For example, if a teacher chooses the "Prepare & Monitor" tab, they will see a range of digital tools under various subcategories, such as "Prepare an icebreaker" where *Padlet* is one of the suggested tools.

Once a tool has been chosen for consideration (clicked on), whether found by specific tool search or via navigating through the "Search by activity" option, users navigate to a page that provides a suite of tool detail. Represented in a generic schematic of a tool page below (Figure 2), this includes tool name and image identifier (to help orient the user as they navigate between pages), a summary of what the tool does, both Deakin-specific and vendor resources for the tool, further resources and practice notes where relevant, various example uses, and navigation points to facilitate returning to search options to make alternative tool investigations.

Table 2: Accessibility, Administration, and Support (teaching functions/learning support)

Navigation Tab**	Subcategories	Example digital tools
Prepare & Monitor Digital tools to prepare unit and monitor learning	• Organise unit site • Prepare an icebreaker • Setup unit-specific communications • Monitor participation (learning analytics) • Seek feedback from students	• LMS: Topics, Tools, Files, etc. • Padlet • LMS: Announcements • LMS: Class Progress • Microsoft Forms
Accessibility Digital tools to maximise student access to their learning	• Check accessibility of content in LMS • Improve accessibility of multimedia resources • Consider accessibility of various technology	• BB Ally • Kaltura Reach (for DeakinAir) • Most tools have some accessibility features built in/ready to activate, e.g., Microsoft OneNote
Assessment Digital tools to manage assessment and feedback	• Submissions and extensions • Feedback • Originality checking • Online examination (design and security)	• Extension Tool (bespoke) • Turnitin: GradeMark • Turnitin: Feedback Studio • Proctorio

**These tabs represent various teaching functions across a teaching cycle (e.g., semester or trimester cycle)

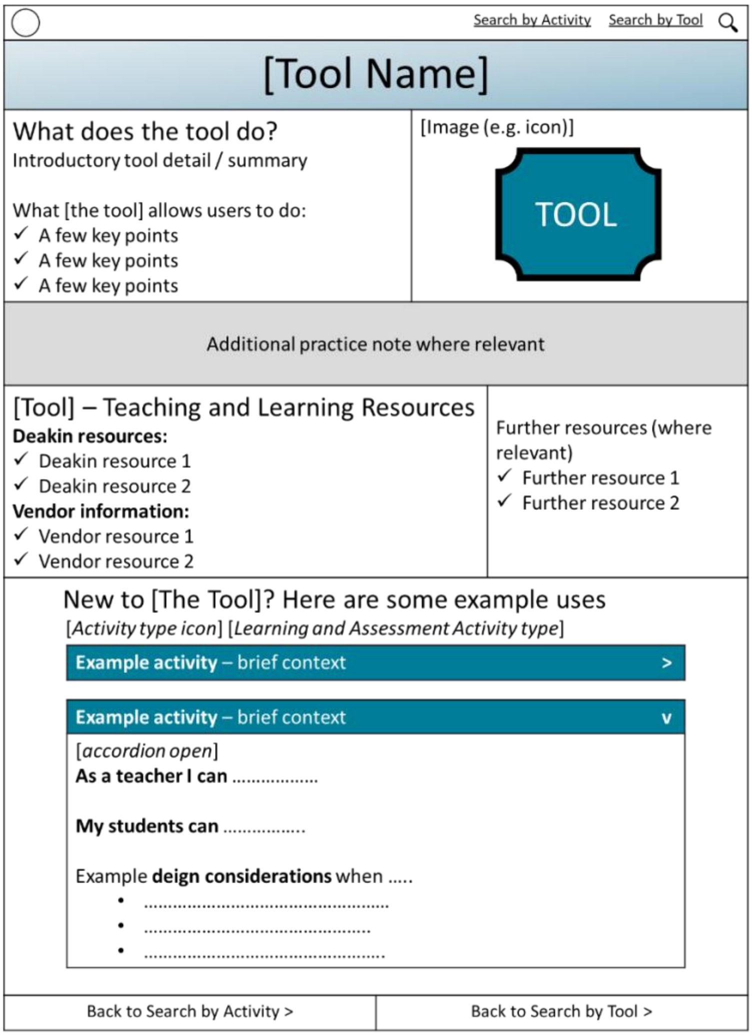

Figure 2: Schematic of the common structure of each tool page

Additional detail is provided via the various example uses for each tool, particularly for those who might be unsure whether they have selected the right tool (e.g., to match or foster teaching method) or for those who just want to read ideas on how the tool is used for various comparable teaching purposes. The example uses given on each tool page align to Goodyear's (2005) pedagogical tactics, providing finer detail of specific day-to-day uses in practice, from both a teacher and student perspective, and providing several practical design considerations.

While constructive alignment is discussed in more detail in the next section, we make an explicit link here with a brief illustration with the guide. For example, a teacher may have under focus an intended learning outcome aligned to a discipline knowledge graduate attribute, perhaps beginning with a verb such as "explain" or "summarise". They might orient to the "Knowledge Acquisition" tab in the "Search by activity" navigation option to seek digital tools for students to build discipline content knowledge. If their teaching method within this is related to offering synchronous sessions (e.g., to introduce, present, or discuss content related to what their students need to explain or summarise), the educator might select *Zoom* from the range of tools suggested, where they will be directed to the Zoom tool page, and where they can refer to the example uses aligned to knowledge acquisition to review various pedagogical tactics (see Figure 3).

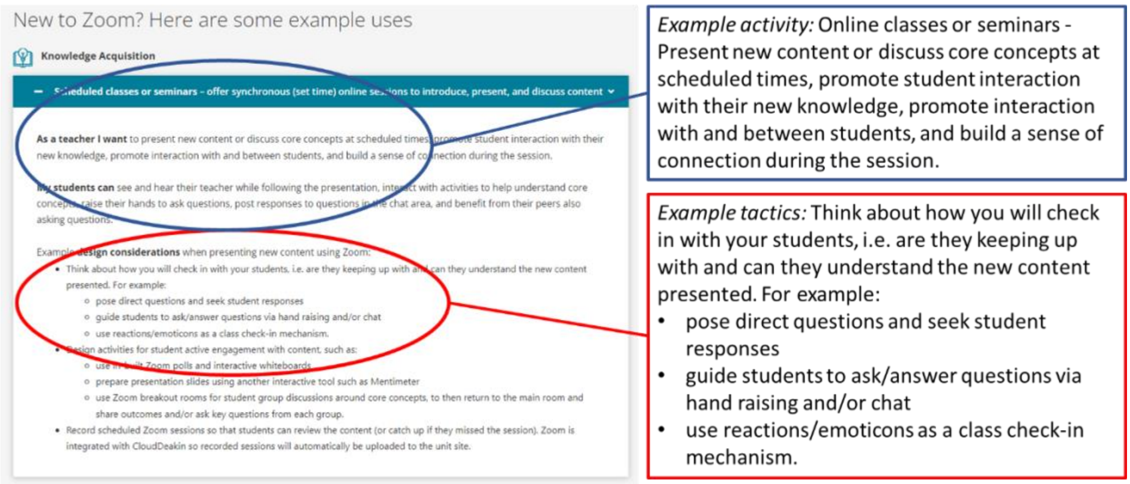

Figure 3: Example pedagogical tactics for using Zoom within a knowledge acquisition strategy

Using the *Teaching and Learning Tools Guide* in constructive alignment

Constructive alignment is an established conceptual model in contemporary higher education curriculum design and teaching practice, as noted in the introduction – coupled with a caution to not restrict the otherwise complex nature of teaching design and extended possibilities in learning. Drawn from constructivist learning theory, constructive alignment utilises the notion of students being actively engaged in the learning process to construct new knowledge and associated outcomes. The teacher, in a constructive alignment context, is positioned as facilitator or "'broker' between the student and a learning environment that supports the appropriate learning activities" (Biggs & Tang, 2011, p. 100), where we now understand this environment to include both physical and digital components. Drawn from curriculum theory, alignment means that the active verbs in the intended learning outcomes (written as demonstrable action statements) are activated by students in both the teaching and learning activities and the assessment tasks in relation to the context (Biggs & Tang, 2011).

A typical linear representative model of constructive alignment comprises the three components of intended learning outcomes, teaching/learning activities, and assessment tasks. For example, Hoidn (2017, p. 79, as adapted from Biggs, 1999) provided a diagrammatic representation employing these three components, while elsewhere noting the role of technology as "not essential" in a learning environment (p. 9), a point which might be increasingly debated in contemporary higher education settings. Hoidn went on to discuss cases where student feedback was more positive in teaching contexts where constructive alignment was well-established and complemented by, for example, "technology use to facilitate communication and deepen understanding, and helpful and timely feedback on course assignments" (2017, p. 252). Such case examples tend to imply the role of technology in constructive alignment, while not necessarily updating the representation/model of constructive alignment to render this further complexity explicit.

Figure 4 centrally embeds Biggs and Tang's (2011) core componentry of intended learning outcomes, teaching/learning activities, and assessment tasks, plus, to the left and right, explicitly incorporates the broader course/degree graduate outcomes and the rubric criteria. Both latter components are clearly included in Biggs and Tang's text, yet they are somehow not always directly reproduced into constructive alignment models and/or practice. The course-wide graduate learning outcomes are acknowledged for their importance during horizontal course-wide mapping and vertical subject/unit alignment, to ensure a mapped coherence that culminates in a qualification where students have achieved the graduate capabilities scaffolded progressively over their years of study. Graduate learning outcomes are distinct from other learning outcomes. They require a "programmatic framework" to map out their meaningful inclusion in the curriculum, to ensure alignment of these upper-level outcomes with subject level outcomes and assessments (Matthews & Mercer-Mapstone, 2018). Yet these graduate outcomes are also not finished with at the mapping stage and should continue to affect teacher planning and design choices such as digital tool selection (e.g., a communication focussed graduate learning outcome leading to considerations for incorporating a student-centred digital communication tool).

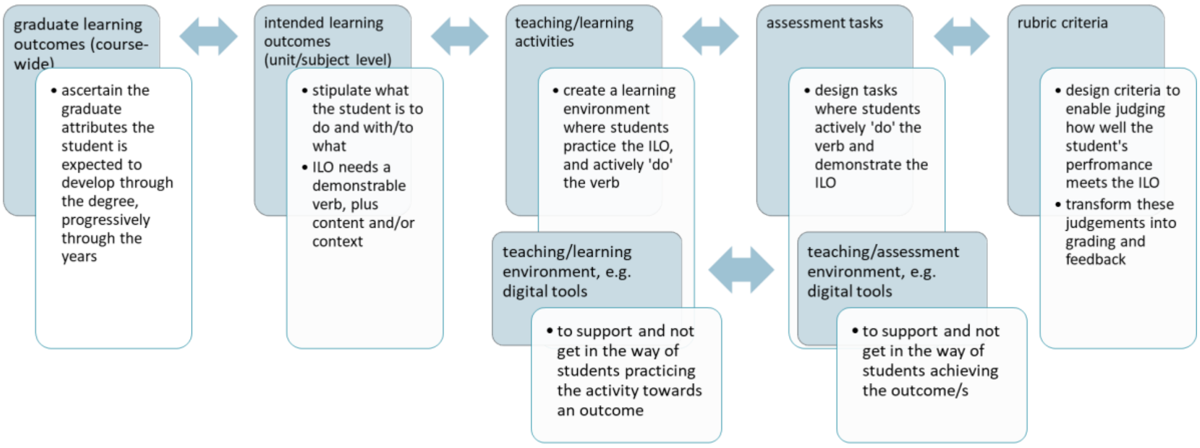

Figure 4: Constructive alignment with further complexity incorporated (e.g., digital tools)

Additionally, the educational environment (including digital tools, see lower boxes in Figure 4 schematic above) is explicitly included in this more complex model of constructive alignment. This builds upon both Biggs and Tang's (2011) recognition of a supportive learning environment and Goodyear's (2005) use of physical and digital learning environments in the conceptual model of educational design. With respect to Hoidn's (2017) note that technology is not always essential in an educational environment, the inclusion of digital tools is given by way of a conscious example. However, by explicitly adding "teaching/learning environment" including digital tools to the constructive alignment model, there is express recognition that digital tool selection can influence (e.g., interrupt or facilitate) the practice and achievement of outcomes through the activities and assessments. Additionally, Jones (2007) directly discussed incorporating ICT into the constructive alignment model. Jones stated that "web-based applications…may occur in either or both [components of] the TLAs [teaching and learning activities] and the form of student assessment…to ensure that their [tool] inclusion is purposeful and reflects an alignment between the intended outcomes and the teaching and assessment methods" (p. 461). Aligned to others in adding a caution not to include technology for mere reasons of enthusiasm (e.g., Selwyn, 2007), Jones (2007) advocated for using technology to contribute to an activity or assessment and aiding the students in their achievement of the intended learning outcomes. Nonetheless, digital tools should also be considered for the inverse, that is, whether they might inhibit students in their creativity or their potential for achievement beyond the intended learning outcomes (*sensu* Bellamy, 2018a; Fawns, 2022b).

The arrows in the more complex constructive alignment model (in Figure 4) are deliberately double headed to highlight the iterative nature of constructive alignment. The process is not typically a neat linear process; it may commence at any component and involves some messy movement between constitutive components during teaching design and planning activities. This signals a recognition of the complexity of the relationships between various elements, such as between purpose, pedagogy, and technology, and the need to repeatedly revisit these relationships during teaching design and practice (Fawns, 2022a).

Notably, there is also a double-headed arrow between the two "environment" components related to "teaching/learning" and "teaching/assessment". This symbolises the opportunity to scaffold student use of and familiarity with a digital (or other) tool within a subject/unit of study. Published cases help to illustrate such scaffolding of tool use between learning and assessment activities. In two postgraduate case examples offered by Colasante, et al. (2018), each subject uses "a collaborative online icebreaker activity" beyond socialisation and early engagement with introductory discipline concepts to also "encourage practice with subject relevant technology" (p. 326). In a Law subject (pp. 326–327), an icebreaker activity with online discussion encourages early engagement within the forum, which also aids students' technological preparation for a subsequent "issues-based discussion" assessment. In a Humanities subject (pp. 327–328), planning for the introduction of a video presentation assessment highlighted the need to provide a purposefully preparatory icebreaker activity that asks students to post a video, enabling technological preparation for the subsequent assessment task. Each case allows for student familiarity with a digital tool and digital competency building prior to their higher stakes use of the same tool to demonstrate achievement of intended outcomes in an assessment task.

Whether the Teaching and Learning Tools Guide has successfully met all the academic-inspired jobs to be done and wider expectations is yet to be formally determined. Iterative, formative evaluation examined whether the guide was consistent with the needs that surfaced in the baseline needs analysis, whether it worked as intended, and judgements were made for improvements (Phillips et al., 2012). Formal, summative evaluation of the guide is earmarked for a future date, where it will be necessary to re-examine these aspects. In a broader sense, the new guide does align to some factors that are understood to contribute to successful technology integration in higher education teaching contexts, such as a pedagogical "focus on teaching and learning" (Bates & Sangrà, 2011, p. 110) and providing one ongoing support mechanism for flexibility and adaptability for decisions on appropriate tools (Bates & Sangrà, 2011, p. 128). Other factors of success also need to be considered. This includes the successful management of ongoing maintenance of the guide, which is designed to expand and contract as new tools are added and others are removed from the enterprise suite of tools or otherwise decommissioned; to thus cater for the continually changing face of the higher education digital ecosystem (Bates & Sangrà, 2011; Peters, et al., 2022). Indeed, some editing of various tool detail has already occurred by the owning team (Digital Learning) since launch of the guide in early 2022. Another factor of success will involve using the new resource in university teacher training and academic development, to build teacher competence in integrating digital tools into their teaching practices (Bates & Sangrà, 2011; Caplan & Graham, 2008).

Conclusion

The "reconnect" theme of the 2022 ASCILITE conference speaks to "Reconnecting relationships through technology" during and post turbulent times. This paper shares an open-source tool created in late 2021 to reconnect university teachers with a range of digital teaching tools, to select from these for various pedagogical purposes, and to consider using technologies that are constructively aligned to various teaching purposes. This project arose out of the need for the University to respond to supporting their teachers who were pivoting to online teaching at scale, and associated capacity-building. It was a project driven by a central unit, resulting in a guide that catered for the whole of the University. The new guide illustrates a support resource initiated by one institution to help university teachers to navigate their way within this ever-changing ecosystem, yet it was made open source for others in the higher education sector to access. It is intended that other tertiary education stakeholders might use this new resource to help make meaningfully connections with technology. Evaluation of this guide is underway at Deakin University including planning for future improvements. The link to access the Deakin Teaching and Learning Tools Guide is provided in the reference list.

Finally, the reconnect theme has the power to not only reach forward but to also connect back. Inspired by the reconnect theme, discussions within this paper intentionally reconnect back to some prior and recent examples of ASCILITE events/publications (Bellamy, 2018a; Colasante et al., 2018; Fawns, 2022b; Jones, 2007) to illustrate various contributions from within the ASCILITE community as related to the paper's theme.

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Reconnecting relationships through technology

Contextualising Horizon: Connecting community to envision Australasia's future educational technologies and practices

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Over its 18-year history, the *Horizon Report*, originating in the United States, has become an important tool for administrators, academics and practitioners in envisioning future technologies likely to impact higher education and in determining institutional strategy. ASCILITE's Contextualising Horizon project aims to complement the *Horizon Report* and provide an Australasian regional lens to trends in educational technologies and practices. Beginning in 2021, Contextualising Horizon is a project aimed to connect members of the ASCILITE community and affiliates to engage in environmental scanning and evidencing the current state of play in higher education and the educational technologies and practices likely to be of importance in the 12-18 months following the process. This paper highlights the process of Contextualising Horizon, key findings, and plans for future iterations of the project.

Keywords: higher education, educational technology, Australasia, *Horizon Report*, trends, digital technologies, technology enhanced learning

Background

Since 2004, the *Horizon Report* has identified the "trends, challenges, and technology developments likely to impact teaching, learning and creative inquiry" (Peng, 2018). This report was first published by the New Media Consortium (NMC), and, in 2018, EDUCAUSE took over publication following NMC's bankruptcy. Since its inception, the report has aimed to provide analysis of the trends likely to be of importance to the higher education sector (Grussendorf, 2018). While scanning the horizon is thought to create thinking and debate on the future directions for various aspects of society (van Rij, 2010), it is acknowledged that it can be difficult to conduct in an ever-changing sector. While tools such as the STEEP categories can assist with this, using them takes time and conversation with experts in the field. This current project has aimed to do exactly that.

As EDUCAUSE is a North American organisation based in the United States, authorship and the nominated trends have been perceived as biased toward the North American context. In examining the list of contributors to the last two *EDUCAUSE Horizon Reports* (2021, 2022), 51% (n=40) and 57% (n=36) of the participants were from the United States. It was, therefore, the position of the research team that the annual *Horizon Report* may not accurately reflect the types of pressures and impacts felt by institutions in the Australasian region. Figure 1 below shows the world-wide distribution of contributors to the 2022 *Horizon Report*.

Further, whilst there are a number of participating international expert panelists from the Australasian region each year, this number is disproportionate compared to the number of North American representatives involved in trend nomination and the voting process. Therefore, given the size of the Australasian geographic region and the diversity of the higher ed sector, the current *Horizon Report* process does not sufficiently represent a balanced, representative regional voice.

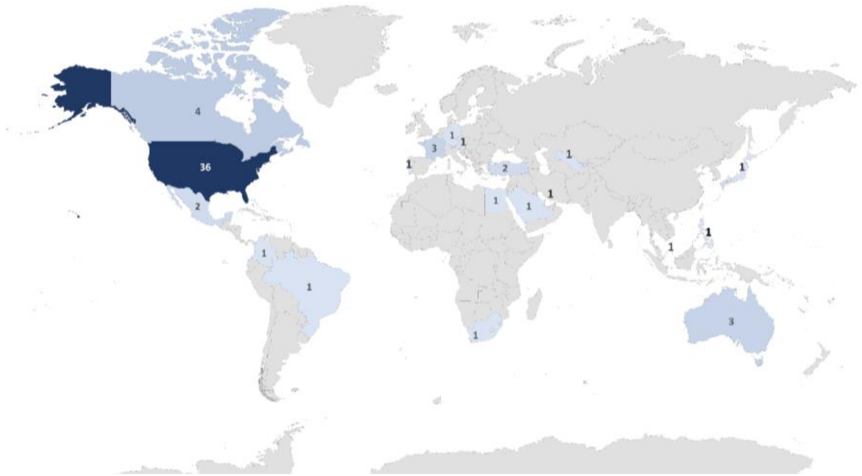

Figure 1: 2022 *EDUCAUSE Horizon Report* representation by country

The Contextualising Horizon project aims to complement the *Horizon Report* and to provide an Australasian lens by unearthing the issues and influences in the region and the educational technologies and practices likely to be important in the next 12 to 18 months. Furthermore, this project aims to create a consensus position that can be used to inform the regional input into the *EDUCAUSE Horizon Report*.

While scanning the horizon can prove somewhat difficult (Bishop, 2009), it is important that we try to do this. As such, the Contextualising Horizon project is an important addition to the field. Completing this project allows us to be prepared for change in the future (Bishop, 2009) and allows us to plan ahead. While Grussendorf (2018) questions the reports' importance and influence in the sector, she does conclude that the reports are of benefit to both students and teaching staff in that they prompt discussion and debate about the issues prevalent in higher education. Thus, Contextualising Horizon will continue to contribute to the field in the future.

Methodology

The Contextualising Horizon project employed a design-based research methodology as its basis. Design-based research uses the four-step process similar to that defined by Reeves (2006, p. 59) and depicted in Figure 2 below. Each phase in the process allows for modification, redefinition, and refinement. Ethics approval for the project was obtained. Where changes in the process impacted participants (e.g., changes to survey questions), the researchers filed and received approval for an ethics amendment. 2021-2022 was the first iteration of the project, but it has been anticipated that these phases will recur with each subsequent run of the initiative, which will be annually.

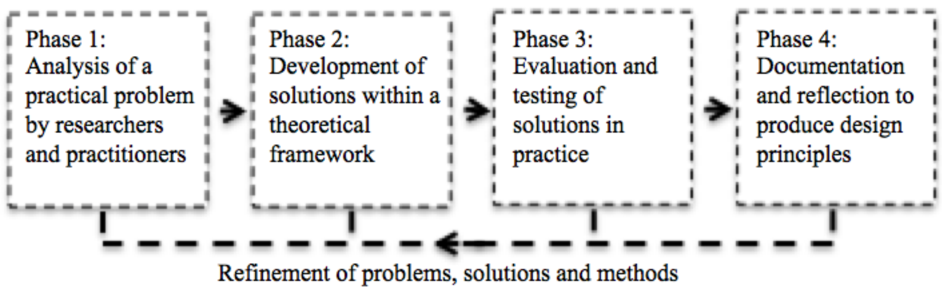

Figure 2: Design-based research model (Reeves, 2006, p. 59)

The research team started with a rough skeleton of the project that could be modified following observations and reflections at each phase. The phases were planned as follows:

- Phase 1/Session 1: Early in the 2021 ASCILITE Conference, a Special Interest Group (SIG) session occurred in which face-to-face and remote participants engaged in a collaborative activity to identify and discuss the current Social, Technological, Economic, Environmental, and Political (STEEP) influences on Australasian higher education.

- Phase 2/Session 2: A second synchronous session at the 2021 ASCILITE Conference was held in which participants used the STEEP trends identified in Phase 1 to forecast the learning and teaching trends likely to be of importance in the near, mid and longer term.
- Phase 3/Session 3: This session was conducted in February 2022 and allowed for broader discussion of the key technology and practice trends from Australasia.
- Phase 4: The creation of a website for dissemination of the project findings including a report of the trends and examples from the Australasian sector that will then be fed back to EDUCAUSE.

Contextualising Horizon used a combination of in-person workshops and survey research to arrive at the 2021-2022 educational technology and practice trends. We conducted two workshops as part of the ASCILITE Conference between 29 November and 1 December 2021. During these first two workshops, ASCILITE community members and affiliates identified and discussed the STEEP trends likely to impact tertiary education in the next 12-18 months. Analysis of participant verbal and written input, documents produced in the sessions, and session recordings helped us to produce a final framework in the form of a Padlet page, identifying three trends for each STEEP category. Then, in February 2022, we held a workshop to identify the technology trends for 2022. During the workshop, participants were asked to consider the STEEP trends and the educational technology trends and practices likely to be important in the next 12-18 months. In total, 15 educational technology and practice trends were initially identified. Following the workshop, we reviewed the trends to refine the list, resulting in 11 possible trends. We distributed a survey to participants in the workshops and asked them to rank the trends with the intent to identify the top six trends. The survey resulted in the selection of the seven trends discussed in the Results section.

Project Participants

Members of the ASCILITE community, particularly the ASCILITE SIGs, were invited to participate in each of the sessions. Given the impact of the community on educational technology in higher education institutions across the region, the research team identified members as having the expertise to identify the trends impacting higher education in their local areas/states/countries as well as the technologies and practices likely to be of importance locally into the future.

To encourage participation at the sessions, the research team worked with the SIG leaders to promote the sessions prior to the conference and the session in February. Invitations to all sessions were additionally communicated through social media. Participation in each of the sessions was voluntary, with some participants engaging in more than one session, while others came along to just one.

In addition to the workshops and survey described previously, participants were invited to respond to a series of demographic questions following each of the workshops and as part of the technology and practice trends survey. Participants were asked to identify institutional affiliation, number of years in current role, number of years in higher education, other sectors in which they may have been employed, and their primary discipline. Discipline areas were pre-defined using the Quality Indicators for Learning and Teaching (QILT) site (QILT, 2021). The results of these demographic questions were used to ascertain the level of expertise of the participants.

Results

The sections that follow summarise the outcomes of the workshop sessions, the results of the post-session demographic surveys, and the results of the 2021-2022 Technology and Practice Trends Survey, which also included demographic data.

Workshops 1 and 2: 29 November and 1 December 2021

Two workshop sessions were held at the 2021 ASCILITE Conference. Sessions were in a blended format, with participants attending either face-to-face or online. Attendance was not collected at these sessions. However, following each workshop session, participants were asked to complete a survey to identify the demographic makeup of the session participants.

Session 1 took place 29 November and was 90 minutes long. During the session, each ASCILITE SIG was assigned a STEEP category to discuss as a group and to identify possible trends. Groups were invited to share during the session what they had discussed. Each SIG provided notes, and the session was recorded for analysis following the conference. The majority of the participants in this session identified as academic staff (n=21).

Most participants had been in their current role for less than nine years (n=22), with a large proportion of those participants having been in their roles less than five years (n=15). However, more than half of the participants had been in the higher education sector for 16 years or more (n=16). Participants also identified having worked in other educational settings, including K-12 (n=10) and vocational education (n=10). In terms of disciplines represented, most of the participants were from Teacher Education (n=11) followed by Business & Management (n=4). Other disciplines represented included Computer & Information Sciences; Agriculture & Environmental Studies; Humanities, Cultural & Social Studies; and Communications.

Session 2 took place two days after the first session on 1 December. Following a debrief of Session 1, the research team modified the design of the second session to give more time for discussion of the STEEP trends and to provide participants the opportunity to discuss the influences and impacts identified in all five STEEP categories. To accomplish this, the research team distributed participants across three groups, with each group including at least one participant from each STEEP group from Session 1. Each group had about 30 minutes to discuss the trends. Following small-group discussions, the three groups came together as one larger group to share their insights, points for consideration, and recommendations regarding what the final STEEP Categories should be. Participant demographics for Session 2 were similar to Session 1, with the majority of participants in roles less than nine years but having been in the higher education sector for 16 years or more (n=11). Participants similarly also had work experience outside of higher education. K-12 (n=6), vocational education (n=7) and other areas (n=6), such as adult education and corporate educational services, were nearly equally distributed. However, Session 2 participants were more evenly split between academic (n=10) and professional staff (n=11). Teacher Education (n=6) and Business & Management (n=4) remained the largest proportion of disciplines represented. Computing & Information Systems; Agriculture & Environmental Studies; Humanities, Cultural & Social Studies; and Communications were also represented. However, the number of Teacher Education participants was not as greatly represented as it was in Session 1.

Large-group discussions for Sessions 1 and 2 were recorded and transcribed, and each of the small groups shared their notes. Following the conference, transcripts of the recordings and the submitted notes were used to code and classify trends and impact, resulting in the final STEEP categories. Each category included three major trends, as well as key indicators and references/sources for more information. The trends identified are included in Table 1.

Table 1: 2021-2022 STEEP trends

Social	Technological	Environmental	Economic	Political
1. Further diversification of student populations and digital divide 2. Microcredentials 3. Mental health & wellbeing	1. Student equity & digital equity 2. Online learning & faculty development 3. Widespread uptake of digital technologies	1. Sustainability 2. Climate change 3. Indigenous environmental recognition	1. Jobs: Insecurity, casualisation & staff retention 2. Financial insecurity 3. Resource-intensive priorities: Accreditation, work-integrated learning, and massification of higher education	1. Border restrictions & student mobility 2. Funding for higher education 3. Data privacy

Workshop 3: 15 February 2022

The research team hosted a 90-minute virtual event on 15 February to identify the 2021-2022 educational technology and practice trends. Prior to the session, participants were provided with the STEEP trends for review. During the first part of the session, participants discussed the trends and if any additional modifications were needed. Then, for the remainder of the session, groups were tasked with identifying the educational technology and practice trends that they thought might have significant impact in addressing the STEEP trends.

Seventeen participants took part in the session, however, only six participants completed the post session demographic survey. The majority of participants in the survey (n=5) had been in their positions for less than nine years, with most of the participants (n=4) working in higher education for 10 years or more. Most (n=5) of the participants had worked in other sectors as well. The disciplines represented were Computing & Information Systems, Teacher Education, and Business & Management.

The 17 participants in the session identified various trends for consideration. This list of trends was then circulated amongst participants over a two-week period for review and commentary. The aim of this extra step was to ensure Contextualising Horizon was presenting a consensus of the regional sector's horizon trends, technologies and practices.

Following the review period, the technology and practice trends were reviewed by theme. Where trends might be related or have significant overlap, they were collapsed into a single category. In total, 11 tech trends were identified. Given the low attendance at the event, the research team made the decision to survey participants to further validate the trends and to identify the final six trends.

Educational Technology and Practice Trends Survey

A survey was sent to all individuals who had participated in at least one of the previous workshops. The survey listed the 11 technology and practice trends and their descriptions identified in the February workshop. Participants were asked to select the six trends they felt would be important over the next 12-18 months and to provide demographic information. In total, 78 participants were surveyed, and 27 valid responses were received (a 35% return rate). Seven trends were identified due to a tie among the bottom three trends:

- Self-care and well-being for staff and students (13.58%)
- Redefinition of pedagogies (13.58%)
- Blended models of learning (12.35%)
- Educational technology infrastructure to enable learning (11.73%)
- Accessible content and digital equity (9.26%)
- Microcredentials (9.26%)
- Co-design of higher education (9.26%)

Participant demographics were similar to previous sessions. Most participants (n=21) have been in their role for less than nine years, but the majority of participants (n=17) had worked in higher education for 10 years or more. Participants also identified as having worked in sectors other than higher education. More academic staff (n=17) than professional staff (n=10) responded to the survey. Again, the greatest number of participants represented were from Teacher Education (n=11). Science & Mathematics, Computing & Information Systems, Nursing, Business & Management, and Humanities, Cultural & Social Studies were also represented.

Regional Representation

The Contextualising Horizon project aspires to capture the Australasian regional perspective. As such, as part of the demographics collected as part of the project, participants were asked to identify the entity they represented. Using this data, the research team tracked from where in the region participants came. These results are summarised in Figure 3.

For the 2021-2022 Contextualising Horizon, input has primarily come from Australia and New Zealand, with some representation from Japan. The majority of participants come from eastern Australia.

Discussion

For the first iteration of Contextualising Horizon, there were three key aspects worth noting. Firstly, the demographics and quality of the participants involved in the project were often well known and experts from the field. Secondly, observations on the process will inform improvements for future iterations of the initiative. Thirdly, the trends identified through the process have yielded and confirmed that there are regional deviations from the *EDUCAUSE Horizon Report*.

The Panelists

The participants in this initial iteration of Contextualising Horizon demonstrated both experience and knowledge in higher education, as well as a broad view of learning and teaching. While most participants had only been in their current roles for nine years or less, the majority of the participants have been in the higher education sector for 10 years or more, and a number of the participants had identified as working in other sectors, including vocational education, K-12 and corporate/industry contexts. This suggests that while participants may not be long in their current roles, they have shifted and experienced roles both in and out of the sector.

Figure 3: 2021-2022 Contextualising Horizon representation

From a disciplinary perspective, when mapped against the QILT (2021) disciplinary categories, participants only represented eight of the 21 discipline areas. Teacher Education, Business & Management, and Computing & Information Systems were well represented. Given ASCILITE's focus on the use of computer technology in tertiary education, representation from computing and education is not surprising. Further, the high involvement from Business and Management is largely due to the involvement of members of the Business Education SIG, ASCILITE's only discipline-specific SIG. Disciplines, such as Science and Mathematics, Agriculture and Environmental Studies, Nursing, and Communications were underrepresented, and other QILT disciplinary categories, such as Tourism, Hospitality, Personal Services, Sport and Recreations; Law and Paralegal Studies; and the medical and allied health disciplines were not represented at all. Increasing the breadth of disciplines may be worthwhile for expanding perspectives in future iterations of the initiative. However, this may be more aspirational than achievable, as engagement with ASCILITE and the increasingly trans-disciplinary use of technology-enhanced learning practices and tools has historically been uneven amongst disciplines (ASCILITE, 2021).

The Process

A design-based research methodology underpins Contextualising Horizon. This methodology adopts the position that learnings from each phase inform the next phase and that the overall review of the process allows for revision of subsequent iterations. Three key learnings emerged from the process. First, the environmental scanning processes requires socialisation with participants and time to implement. Second, "Australasia" as applied in the project required clarification, and some work was done on this to create the definition that ASCILITE now uses. Lastly, broadening regional involvement will be important in future iterations to reduce bias within the region, thus the team will need to encourage participants from outside Australia.

The environmental scanning processes used in the initial phases of the project to identify the STEEP trends challenged some participants and required more time than initially anticipated. As experts in education and educational technology, participants in the early phases of the project expressed their discomfort in discussing issues outside their professional comfort zones, particularly providing commentary on economic, political and environmental issues. In contrast, participants seemed much more comfortable when it came to addressing the technology and practice trends in Phase 3 of the process. The process of probing the STEEP categories and identifying trends required participants to think more broadly about the sector and to speculate about the potential impacts. There was very little time in advance of the first workshop session to introduce the environmental scanning process. To assist with accelerating the process, participants were provided with coaching and templates on which they could formulate their ideas, but it was clear that some additional supports were needed. The project and the workshop were conceived just weeks before the conference; this rapid turnaround did not afford participants the time ahead of the conference to consider the influences and impacts on the higher education sector prior to the session. Subsequent offerings will provide better guidance and lead time in preparing for the STEEP discussions.

Also, during the process of identifying trends, a question was raised about the scope of "Australasia". Australasia in the context of this iteration of Contextualising Horizon was initially restricted to Singapore, Australia and New Zealand. However, participants identified that the region represented countries across the Asia Pacific region more broadly. Therefore, the definition was then broadened within this iteration to be Australia, New Zealand, Malaysia, the Philippines, Melanesia (New Guinea and the island groups lying east and southeast as far as and including New Caledonia and Fiji, Micronesia (e.g., Solomon Islands) and Polynesia. Southeast Asian Countries including Brunei, Burma (Myanmar), Cambodia, Timor-Leste, Indonesia, Laos, Singapore, Thailand and Vietnam were also able to be included. This also included Hong Kong, Taiwan and Korea. Participants in this iteration of Contextualising Horizon mostly came from Australia, with the greatest proportion of those participants based in eastern Australia. Therefore, it is acknowledged that, while groups attempted to adopt a regional perspective, the environmental scanning and technology and practice trends may not be representative of the entire Australasian region. The broadening of representation from the region will be examined and built upon in future iterations of Contextualising Horizon.

Regional Trend Differences

Contextualising Horizon achieved its aim of identifying the influence, impacts and technology and practice trends for the region for 2021-2022. While there were similarities and overlap with the themes of the 2022 *EDUCAUSE Horizon Report*, the participants in Contextualising Horizon identified additional themes, signaling regional idiosyncrasies. This has significant impact for institutional leaders, researchers and practitioners who may use the *EDUCAUSE Horizon Report* to inform discussions and decisionmaking, particularly in instances where a regional view is more relevant.

In both Contextualising Horizon and the *EDUCAUSE Horizon Report*, STEEP trends, such as funding for higher education, sustainability and environmental concerns, financial deficits/insecurity, and exploration of different learning modalities were similar. In the Australasian context, however, social and technological issues had greater emphasis on capacity building, equity and digital divide issues, and mental health and wellbeing. By contrast, the *EDUCAUSE Horizon Report* placed greater emphasis on topics such as hybrid and online learning, skills-based learning, and learning analytics and big data. These differences have more than likely been influenced by the COVID-19 pandemic's regional impacts and the inequities in access to reliable connections and technologies and the lockdowns experienced across the region. Likewise, a heavy regional investment in Indigenous issues and reconciliation elevated that as a critical influence, which is not as prevalent in North America.

In terms of the practices and technologies selected in the two regions, there were also similarities and differences. An emphasis on blended/hybrid learning models and modes was common across the two reports. However, the 2022 *EDUCAUSE Horizon Report* placed greater emphasis on tools, such as AI and learning analytics. Meanwhile, the Australasian trends demonstrated more humanistic concerns, such as self-care and wellbeing and issues of access in learning materials, and co-design of higher education. Furthermore, the Australasian perspective looked at educational technology and university infrastructure more broadly, suggesting the adoption of technologies to support learning, whereas the Horizon Report placed greater emphasis for educational technology infrastructure in the development of hybrid learning spaces.

Next Steps and Conclusion

The identification of limitations and notes for further improvement are integrated into the Contextualising Horizon process. Contextualising Horizon assumes an iterative design process to enable adaptability and continuous improvement. As the first iteration of the process and in line with design-based research methodology, revisions were expected. The following are critical limitations and key areas for improvement:

- Continue to engage the community and affiliates with the environmental scanning process.
- Plan more time to conduct scanning activities and discussions.
- Expand the scope of participation to represent the Australasian region more broadly.
- Broaden the involvement of disciplines included in the scanning process.

This scan of the horizon is an important contribution to the field, and while environmental scanning can be difficult (Bishop, 2009), it allows us to brace for change in certain areas. Thus, this report will be used by the sector in the year to come and allow us to work towards the changes identified. It is also noted that scanning is most useful when repeated regularly (van Rij, 2010), and plans are underway to repeat this Australasian process annually.

The differentiation of Contextualising Horizon trends identified from the *Horizon Report* indicate that this is a worthy endeavour to continue to inform the educational technology and practice landscape in the Australasian region. The research team intends to continue Contextualising Horizon for 2022-2023 and has already begun planning for the next cycle, with consideration of the process issues identified through the first iteration. We hope that the community and affiliates will continue to connect with, engage in and value this worthwhile process.

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reconnect
Reconnecting relationships through technology

Fostering connections for professional identity formation: two case studies of Discord discipline-focused communities

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This research focusses on the links between online communication environments in university teaching contexts and supporting students in their professional identity formation. The online communication environments studied have been formed with Discord (https://discord.com) to complement the learning management system by providing informal chat-based environments. These environments can be easily maintained beyond semester limitations and membership is independent of enrolment status with the teaching institution. The first of two case studies is situated in the disciplines of computer science, information technology, mathematics, and statistics. A Discord community of current and past students and academics has been active for over three years. This community has developed organically and provides students with a variety of support – for specific courses and for their disciplines more generally, for making connections with others, and for gaining insights into their future professions. The second case study examines the introduction of Discord in support of a second-year veterinary sciences course. The learning design of the course aims at connecting knowledge to practice, and at helping students to understand the links between course content and professional work. Discord was introduced as a first step towards establishing an online community of students, academics and veterinary professionals. In interviews with students (first case study) and academics (second case study) the links between the Discord communities and professional identity formation are examined.

Keywords: chat-based online communication, student-professional communities, professional identity formation

Introduction

One of the core functions of universities and tertiary institutions is to prepare students for future professional roles. Students need to develop an ability to respond to the demands of work tasks and professional workplaces, and more so, they need to understand how to deal with real-world problems so that they can meaningfully contribute to society (Markauskaite & Goodyear, 2017). Professional identity formation is seen as an important step in helping students to prepare for work life and has replaced a narrow focus on employability skills (Tomlinson & Jackson, 2021). Professional identity formation is a complex process that draws on multiple components. Nyström (2008) describes the stages of professional identity formation individuals typically go through as non-differentiated, compartmentalised and integrated identities. On their way to becoming professionals, students negotiate the interplay of the personal and professional aspects of their lives. According to Tomlinson & Jackson (2021) this process involves building human capital (specialised and generic knowledge and skills), cultural capital (insights to enable understanding of socio-cultural practices), and social capital (ability to connect with significant others) as important aspects of professional identity formation.

Nyström (2008) emphasises the important role both university and work contexts play in professional identity formation. While professional identity formation can be aided by work placements or work-integrated-learning (Jackson, 2017), community of practice models (Lave & Wenger, 1991; Wenger, 1998) are another important approach and highlight the role of higher education, for example by connecting students with alumni and other professionals (Jackson, 2016). A yearly education forum, connecting employers and students across Australian universities to network, develop skills and discuss transition-related challenges (Gill, 2018), is an example for such an initiative.

Even though many approaches may contribute to professional identity formation, professional networking can arguably play a key role. With a general shift to online communication and networking and a reduction in opportunities for in-person meetings in times of the COVID-19 pandemic, attention has shifted to examining the affordances of online professional networking. Research in networked learning provides a solid body of evidence for professional learning as part of online, formal and informal networks, with many studies exploring collaborative learning in networks or communities (Carvalho & Goodyear, 2014; De Laat, 2012; Hodgson, McConnell & Dirckinck-Holmfeld, 2011; Jones 2015).

Studies, such as Heidari et al. (2020), establish links between online social networking and professional identity formation. Other studies foreground the use of specific platforms to foster connections amongst members of a network. For example, LinkedIn is seen as the premier online professional networking platform (Carmack & Heiss, 2018; Davis et al., 2020) and features in several studies.

Davis et al. (2020) examined engagement with LinkedIn for professional networking with a focus on finding out if online networking is comparable to in person networking. The authors found networking with LinkedIn brought a variety of career benefits. Important factors included the frequency of LinkedIn usage and learning about interests and activities based on postings of contacts to plan how to approach these contacts.

Carmack and Heiss' (2018) research was situated in a business communication studies context and aimed at helping students to successfully engage with LinkedIn for finding internships and jobs. The study showed that students mainly used passive features of LinkedIn, such as creating profiles, instead of using LinkedIn actively, such as approaching others, introducing themselves, seeking information or requesting feedback. The authors found that students are "not using the networking site for networking" and suggest that "It is unlikely that simply asking a student to launch a LinkedIn profile will teach them the communication skills needed to network effectively on the site" (Carmack & Heiss, 2018, p. 156).

A recent study by McGregor et al. (2022) introduces a project aimed at assisting students in the life sciences in the development of professional networking skills using closed LinkedIn groups. The authors refer to the importance of using online platforms for professional networking and to the need of separation between social and professional networking. Results of the study suggest that students are interested in developing their professional networking skills but lack confidence, e.g., in making their own postings. McGregor et al. (2022) found closed LinkedIn groups effective for connecting students and staff with alumni of their discipline areas.

Anders (2018) describes the redesign of an undergraduate business communications course by integrating networked learning principles and assignments targeting social networking skills. The aims included increasing students' self-efficacy to positively impact professional development, drawing on both educational and social capital. Besides LinkedIn, tools such as Google Docs and Google Communities were used to facilitate open and networked exchanges, reflecting workplace practices. Anders (2018) concluded that the opportunities for networking with professionals provided in the course was valuable for the students' professional development. Further, the networked learning with peers that occurred in the course contributed to lowering communication apprehension, preparing students for communication with professionals. Importantly, Anders (2018, p. 17) found that "students need support to overcome apprehension and to develop self-efficacy for social networking and communicating with professionals".

The Networked Learning Editorial Collective (2021) defines networked learning as involving "processes of collaborative, co-operative and collective inquiry, knowledge-creation and knowledgeable action, underpinned by trusting relationships, motivated by a sense of shared challenge and enabled by convivial technologies" (p. 320). This definition also highlights the importance of promoting connections "between people, between sites of learning and action, between ideas, resources and solutions, across time, space and media" (Networked Learning Editorial Collective, 2021, p. 320). The importance of networking for graduate students on their path towards joining academia as their professional field was raised by Kim and colleagues (2021). They emphasise the importance of relationship building, of claiming one's space as member of the academic community, of actively contributing and creating welcoming and inclusive spaces. Like the authors of other studies, Kim et al. (2021) point to the increasing importance of online engagement and describe an online community for early career job seekers. The authors used Slack as a platform, and established a Slack channel as a "supportive, inclusive, non-anonymous, and multi-way communication forum" (Kim et al., 2021, p. 310). With a focus on connecting, providing information and support, the Slack channel facilitated a supportive community of academics on a variety of experience levels.

The brief review of the literature presented sets important foundations for our research.

- Professional identity formation is a complex process that stretches over several years of study and early professional live; it requires subject knowledge but also understanding of workplace culture and finding one's place in relationships with others (Nyström, 2008; Tomlinson & Jackson, 2021).
- Higher education plays an important role in assisting students with professional identify formation (Jackson, 2016) and initiatives in variety of disciplines show how educators are trying to assist students in professional identity formation via the provision of online communication spaces; communication with peers forms a valuable step towards communication with professionals (Anders, 2018).
- Authors report that students need support to build the confidence required for active participation in online communication spaces (Anders, 2018; Carmack and Heiss, 2018; McGregor et al., 2022).

Our context and the argument for Discord

The context for our study reaches back to 2018 when a tutor in the computer science and information technology (CSIT) subject areas introduced Discord (https://discord.com) to complement the learning management system. Discord is a chat system that provides groups with dedicated online environments (servers) featuring a variety of communication channels. Anyone can setup their own servers. Users join by invitation. Discord is available at no cost, is ads-free and does not have social media features such as recommendation algorithms. Besides text-based chat, Discord also features audio and video support, file sharing and meeting support. An introduction to using Discord to assist groups is available at https://discord.com/college. In the CSIT context, the motivation for introducing Discord was to facilitate communication among students and staff by using a chat tool already popular with many of the students (personal communications). The use of Discord quickly grew, extending to all CSIT courses and, on student demand, stretching into mathematics and statistics courses. Informal observations showed that Discord was highly successful in connecting students and staff. Besides enhanced communication within courses, communities developed in which current and past students discussed a wide range of topics relating to study disciplines, course advice and professional issues. In 2022, academics in veterinary sciences started to use Discord in one of the core courses of the bachelor program. The initial aim was to increase online communication within the course setting, addressing the traditionally low levels of exchange in the learning management system forum environment. The longer-term goal was to explore how Discord could help to form an online community of veterinary students, alumni in veterinary practice and academics.

Veterinary sciences is an area with a with a strong sense of profession and a professional body that regulates study and professional learning as well as practicing requirements. Following the definitions provided in Johnson (2001), veterinary sciences is a strongly differentiated profession. The concept of professional identity, as described in Fitzgerald (2020) for health-related fields, is highly important and supporting students in the development of their professional identity should be part of their university education (Cruess et al., 2019). In contrast, CSIT can be considered a non-differentiated profession, again following the definition provided by Johnson (2001). While CSIT has some characteristics required for professions, such as an esoteric body of knowledge, professional organisations and a code of ethics, the roles within the area are highly varied and there is no professional oversight defining these roles or controlling access. Still, professionalism is an important topic, and a professional standard is highly desired, as can be seen, for example, by looking at information provided by ITP (https://itp.nz), an organisation representing information technology professionals in New Zealand. The CSIT example provides a well-established online community in a discipline area related to a loosely defined profession, whereas the veterinary studies example has an emerging online community in a discipline related to a tightly defined profession. We suggest that this context provides an interesting platform for the examination of opportunities for supporting students in professional identity formation.

In contrast to the studies reviewed in the introduction, the online communities we are looking at are based on Discord and not on LinkedIn or Slack. We are not aware of other research on professional identity formation in Discord communities. Based on prior research (Heinrich et al., in print; Kahu et al., in print) we suggest that Discord is well-suited to support online communities that facilitate students' development of professional identity. Discord provides an environment for informal communication, where connections among students and between students and staff can flourish and makes it easy to maintain active communities beyond semester durations and course enrolments. This allows connecting students of different year levels, current and past students, and all staff from a discipline area, and creates an environment for a learning community through opportunities for engagement in collaborative, co-operative and collective inquiry (Networked Learning Editorial Collective, 2021).

Methodology

The two discipline areas described in the context for this research form the two case studies for this article. The first case study focused on the analysis of the use of Discord in combination with Moodle in the context of CSIT, mathematics and statistics courses at a New Zealand university over several years of teaching. Nineteen students were interviewed, and the resulting data were analysed using both structured and thematic coding, initially guided by literature on student engagement (Kahu & Nelson, 2018) and communication spaces (Healey et al., 2008). The second case study focuses on the use of Discord in combination with Moodle and content provided via kuraCloud in a second-year course (130 students) in veterinary sciences at a New Zealand university. This study is in progress and for the first phase four teachers involved in the course were interviewed from a learning design perspective (Goodyear et al., 2021). Both studies were assessed following our university's ethics guidelines and conducted under the low-risk ethics notifications framework.

For the research presented in this article we analysed the data collected for the two studies under the angles of discipline communities and the development of professional identities. For the first study we were able to build on existing codes such as university-wide-connection, outside-university-connection, non-course-discussion and ongoing-connection. For the second study we focused on coding for the veterinary professional community and community hopes based on Discord, as well as statements relating the students' readiness to participate in the communities. Participants are referred to using pseudonyms.

Findings

Case Study 1: Computer Science, Information Technology, Mathematics and Statistics (CSIT)

Looking at the first case study, our focus in this article is on the exchanges that happened within the discipline communities beyond course boundaries. In CSIT, staff operating the Discord server had set up a variety of community channels open to anyone on the server beyond semester times. The community channels stay open and do not close when the teaching semester ends. This sense of connection is important, as Stevie said, 'people do still talk to each other in the other [non-course specific] channels which are available permanently'.

The students welcomed the ability to connect with others across courses on a social level and to gain insights about other people's experiences, as identified by Jennifer who mentioned, 'it is nice to chat with people who have done the same sort of thing'. Similarly, Dixie who described how the Discord channels facilitate connections across courses for off-campus students, said 'we can see each other, we can talk about how it's all going'. The special importance of the Discord community for off-campus student was also reported by CJ, 'as a distance student, it helps sort of give you that camaraderie of studying'.

Being able to connect with more advanced students was seeing as valuable. Both Rabbit ('I can talk to someone who's taking like a level up') and Stephan ('they've helped me along with it') talked about receiving help from more senior students in mastering the concepts. Others, like Kate, emphasised the usefulness of having help regarding course advice.

> Kate: It's good for gaining insight on courses and how people found them and recommendations for future study too.

Participants pointed out how the Discord community helped making industry connections. This can be as simple as listening in as described by Kate who follows conversations to check 'if there's anything in the industry that's interesting going on'. The Discord community includes part-time students who already have professional roles and alumni. Ben refers to this connection when saying 'they can also provide even more insight' as compared to undergraduate peers, who are not yet in professional roles. Ben benefitted from being pointed into the right direction when wanting to learn things 'related to [his] career'. Similarly, Stephan also made the connection to the professional space:

> Stephan: I've made a couple of friends from Discord, and that has been useful in my career. One of them, is I believe starting to do his masters now, he is a Senior Solutions Architect. I was asking how to progress, interview tips and things like that, hiring people, and he helped me with that, and I, myself have got a job with […] now

The students expressed the valuable role Discord plays in facilitating connections to others who share their passions for their subject areas. The computer science and information technology server has a programming channel and Ben has used this channel to talk to others ‘about programming specifically’ and found this highly useful as ‘programming is a large part of [his] major’. Likewise, Amy enjoyed how their statistics lecturer used Discord to share ‘live videos about R’ and how helpful this was even for ‘someone not doing those specific courses necessarily’. Jennifer and Stevie described how students have created a channel for ‘people who are interested in pursuing higher level maths’ (Jennifer).

> Stevie: We invite other [university] students who are taking any maths courses, and we post resources, and we have study sessions together. We also have a bunch of things that, you know, people can jump in on so just like fun maths videos that you might want to learn about so you can tell that these guys they, they really love math and they want to have fun and understand it. And that’s what, what, Discord has facilitated for us.

Case Study 2: Veterinary (VET)

The course at the centre of our second case study is an anatomy and physiology course taken by all students enrolled in a bachelor’s in veterinary science. Students work through lectures and quizzes online in their own time. Twice-weekly sessions on campus provide opportunities to explore, discuss and consolidate knowledge. A central aim of the course is to guide from recall of facts towards application in clinical situations to prepare students for when ‘they’re standing in a surgery with one of the surgeons in fifth year’ (Jude). The learning activities were designed to challenge students, to put them into situations of ‘productive struggle’ (Ash), while providing them with enough support to find solutions. The teaching team focuses on the importance of making students ask questions as formulating those questions is ‘really helpful for identifying the gaps in your knowledge’ (Mia). The course design allows lecturers to build ‘rapport with the students’ (Jude) instead of being the ‘anonymous person’ (Jude). The students work in groups, for example in analysing weekly problem scenarios. Besides targeting subject knowledge, this aims at building strong relationships among students to help them cope with the demanding degree program. Establishing connections is perceived as highly valued by the lecturers:

> Sam: What they don’t understand is that they need those connections with their classmates to be able to survive the degree, you know it’s a long, hard degree, you need your peers.

> Ash: It’s really important that they get good social relationships with each other, because it’s … a five-year degree, is a long haul, the workload is really intense, and they need to look after each other.

Part of the motivation for strengthening the online communication component of the course ‘is to include the people who weren’t able to make it to the lab in person’ (Jude), something that has been an issue over the last years, with international students being located offshore and others isolating at home, with COVID-19. The Discord online communication space has been used to provide updates, for example by posting about the weekly case studies, but also for strengthening relationship building, as ‘they had all of Semester one last year, and yet they don’t know who other people are in the class’ (Sam). Using Discord aimed at improving online interactions, as previous experience was that the forums in the learning management were hardly used. As Mia said, ‘it’s replaced what might have previously happened [on Moodle] in the forums, but never really worked that well’. The idea was to ‘get that same kind of feeling of interaction [as in the hands-on sessions on campus] and just keep it going throughout the week, rather than just on Friday or Tuesday classes’ (Ash). Besides strengthening the communication within the course, a longer-term goal is to connect students across year levels, and with past student, practicing vets and staff.

> Ash: I definitely want to eventually explore that whole kind of vertical possibility of Discord, across cohorts and new graduates even, or whoever the whole profession.

As a first step towards connections across year-levels, several third-year students were invited to join the Discord community. Staff were hoping for ‘students in the class to ask questions and have some senior students chime in and sort of help answer them’ (Jude), and for getting ‘peer teaching going’ (Ash). The thought was that the second-year students might relate more easily to their senior peers than to staff, and also that senior students can have an opportunity to experience being on a tutor role.

Compared to the very low levels of online communication on the learning management system forums in previous years, more exchanges happened in the Discord environment, even if that only ‘has happened to a small degree’ (Jude). There were postings around tutorial question, for example related to the completion of diagrams, where ‘another student might offer their own version that’s got the missing part’ (Ash) and ‘there’s quite a bit of discussion' (Sam). Some of the exchanges have created valuable learning opportunities for the whole class.

> Jude: [There] have been like really good questions, like really nice for someone to ask it and then for everyone to be able to see the answer.

While seeing 'huge potential', Ash says 'we haven't really realised it yet'. The students who asked questions online 'are probably the ones that would also tend to dominate discussions in any kind of like format' (Ash) and 'the vast majority of our students don't tend to use it to post questions' (Jude). While the questions posted by the strong students have been valuable, Mia would have liked to see 'some more conversation about some more basic concepts … more helpful for a bigger proportion of the class'. Jude observed that most interactions consist of students posting questions and staff providing answers and said, 'I don't know if we've quite developed that sort of peer-to-peer aspect so much yet'. A lack of confidence seems to be an important factor in the hesitancy to contribute to the Discord community. Mia reported on conversations with students who explained their hesitancy in contributing with their own postings.

> Mia: They are too shy to post anything on Discord because they think that the other students know more than them and what they've asked to be silly.

Being part of the veterinary profession and a tightly controlled degree structure offers opportunities for the establishment of a rich online community. All students take the same courses, 'we have essentially … a continuation of the same course next semester' (Jude) and introducing Discord 'the first time this group would be brought together would be quite different' (Mia). Veterinarians in New Zealand are tightly connected. As the only veterinary school in the country, the school educates new vets, provides professional development and plays an important role in the registration of overseas-trained vets. As Ash puts it, 'it's a very, very small veterinary world'. Due to these connections, practicing veterinarians feel close to the university and are willing to get involved. Ash stated, 'I'm always amazed … how many vets in practice actually really want to contribute to student training', and explained how this could be done, for example by posting photos of cases and challenging students to come up with diagnoses. Within the university, Discord provides opportunities to enrich students' learning by posting events from the associated teaching hospital, with 'putting up cool stuff … things that are relevant … have happened in the vet hospital' (Ash).

Discussion

The first case study shows evidence of well-established online community that connect students across year levels and are sustained year-round beyond semester times. Students discuss their discipline areas, ask for and receive course advice, ask for and receive insights relevant to their career development. This evidences that human and social capital building is happening in the Discord community. Students use the online space for networking, in contrast to what Carmack and Heiss (2018) reported in their study in which students did not engage in networking. Like in the closed LinkedIn group researched in McGregor et al. (2022), the Discord community serves to connect students with alumni. As the professionals who are part of the community are recent graduates (or part-time students working already in industry), the community forms a relatively low stakes environment that allows students to build confidence, something also valued in the study by Anders (2018). Students build relationships in the Discord community, similar to Kim et al.'s (2021) observations from their Slack community, and students also benefitted from contact with professionals from their professional area, like reported by Anders (2018).

The second case study describes the early efforts of a group of teachers aiming to build an online community for their discipline of veterinary sciences. While using Discord has increased the levels of online communication compared to prior reliance on the tools in the learning management system, the utility of the new Discord online community is still under negotiation. Though a good first step, challenges around student confidence were observed and seem to have limited a richer exchange. The hesitation to contribute actively compares to experiences reported by McGregor et al. (2022). Davis et al.'s (2020) thought, that those already good in networking face-to-face might be also good doing the same online, is reflected in the observations on the contributions of the veterinary students. Introducing Discord may require careful consideration for strategies that can help foster interactions.

The second case study is situated in veterinary sciences, an area linked to a strongly differentiated profession. This means that the program of study is highly regulated, with all students taking the same set of courses. It also means that a close professional community exists in which the university plays a central role. The study participants have expressed a strong desire to reach into this professional community via an online environment that brings the professional community and students together. They see valuable opportunities for their students to benefit from interactions with veterinarians outside the university and in the university's teaching hospital. Such interactions would align well with the aims of the course discussed which is designed to guide students on their path towards professional practice.

We suggest that professional identify formation is happening as part of the interactions in the Discord communities discussed in the first case study. This developed organically, facilitated by the informal nature of the Discord environment, and by the way the Discord channels were setup to provide communication spaces for discipline areas. Other publications (Heinrich et al., in print; Kahu et al., in print) explain why it is unlikely to achieve such online communities within learning management systems. The second case study shows the potential for supporting professional identity formation using Discord as part of a learning environment. While there is a long way to go, first steps in increasing online communication have been achieved, and, besides the efforts of the teaching team in encouraging interactions, students and teachers also need to get familiar with the affordances Discord provides. We assume Slack could be used in similar ways to Discord based on the experiences reported by Kim et al. (2021). We know that Ash considered the use of Slack but decided for Discord on hearing about the success in the CSIT area. We suggest that LinkedIn would be less suited than Discord. LinkedIn's focus is on creating profiles and networking to improve one's positioning for the job market. This is important, yet this seems to be more related to the later stages of professional identify formation. While it is possible to create closed groups and connect students and alumni in LinkedIn (see McGregor et al., 2022), students first need to grow in confidence, and need to develop their professional networking skills over time. Setup as in the CSIT context, with community channels and channels dedicated to individual courses, Discord provides multiple opportunities for students to engage and grow, from making course specific postings in a small group to engaging in a wider range of topics with the larger community. Discord is a chat tool that foregrounds transient conversations (past conversations are available to search without drawing too much attention on the individual). This adds to Discord lowering barriers to participation (publication under review) and is in stark contrast to LinkedIn which centres on attention to the individual and their professional identity.

Conclusion

Professional identity plays an important role in graduates' successful transition into professional roles. Professional identity formation is a complex, lifelong process that draws on personal, private and professional spheres of life. The years of university education play an important role in identity formation and institutions should integrate support for identity formation into their programs. While this can be in the shape of work placements or work integrated learning, initiatives within the university are also important and of particular importance in assisting students with a gradual development of skills and confidence levels.

We have looked at two case studies. The first study focused on student voices and showed evidence of professional identity formation in organically developed online communities in CSIT, mathematics and statistics contexts using Discord. The second study, situated in veterinary sciences, explained the rich opportunities for assisting students in their professional identity formation via an online community based on the characteristics of the strongly differentiated veterinary profession. The study described the learning design of a specific course that aims at preparing students for professional practice. The first attempt to establish a Discord community was reviewed and highlighted the need for assisting students in building confidence for active participation, a pre-requisite for successful professional networking. The study also reveals that strategies for encouraging participation are also needed, as the platform alone does not magically encourage students' co-operation or collective inquiry. We suggest looking at the Discord communities from two directions – as a welcoming space for the development of skills and confidence; and as a space that allows outside, professional influence into the teaching settings.

We see many opportunities for further research, some of which are related to the limitations of our work so far. Our first case study draws on interviews with students. What students reported shows clear links to professional identity formation. Due to the qualitative nature of the study, we cannot assess what proportion of the students in the discipline areas covered take an active role in Discord and experience professional identity formation. We did not have access to the Discord chat data for our research. Informally we know that the Discord communities continue to go strongly and feature many exchanges related to professional development. Gaining access to the chat data would open up valuable research directions, for example in attempting to link exchanges in the course and community channels to the stages of professional identity formation.

The data collection for our second case study continues and will include a survey with the students taking the course. The resulting data should provide further insights, for example on how students explain the apparent reluctance to engage actively and their awareness of opportunities for professional identity building. The teachers we interviewed see a strong potential in establishing a vibrant Discord community that links students across year levels and interfaces with veterinary professionals. They are committed to push further ahead and we hope to be able to research their progress.

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reconnect
Reconnecting relationships through technology

The Role of WeChat in Building Relationships amongst International Students

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In recent decades, there has been an increase in studies on international students' use of social media in their host countries. However, there has been limited investigation on how these students utilise social media to help them learn and adjust to their new surroundings. The purpose of this study is to find out how one group of Chinese international Students (CIS), utilised WeChat to support their living and study through building relationships amongst each other in New Zealand (NZ). Nine in-depth individual interviews were conducted focusing on critical incidents that these students experienced while studying in NZ. The analysis of these incidents yielded several themes. The findings identified that CIS used social media in many different ways but primarily to help them maintain and create social networks in their host country, construct and sustain community, and engage in peer interactions and collaborative learning. Overall, CIS frequently utilised WeChat for connecting with peers to cope with variety of issues, including emotional support, building a social network, an outlet to vent about stress, isolation and depression, amongst many others. This study highlights the importance of social media in creating a sustainable connection amongst peers that contributes to student wellbeing in the higher education sector.

Keywords: Social media, International students, Connecting peers, WeChat, New Zealand, Higher Education.

Introduction

An international student is defined as, individuals who "leave primary support networks to undertake an academic program, often in a new linguistic and cultural context" (Barker 2012, p. 201). International students are known to experience a number of transitional problems and difficulties when relocating to the host country Separated from their familiar support systems, such as families and friends, international students may suffer from isolation and loneliness whilst also coping with academic and living stressors (Neri & Cemalcilar et al., 2005; Ville, 2008).

With the advancement of Web 2.0 technologies, international students commonly use social media to settle themselves in host countries (Kaplan & Haenlein, 2010). Social media is virtual spaces that enable people to create and share interest, ideas, thoughts and practices and is participatory and collaborative in nature (Kaplan & Haenlein, 2010). The foundation of Web 2.0 in social media enables users to create profiles, connect with friends, generate content and interact with each other synchronously (Kaplan & Haenlein, 2010). Research consistently demonstrated that international students utilise social media to negotiate their challenges in the new country (Fruzzetti, 2011; Kaplan & Haenlein, 2010; Mikal & Grace, 2012).

Social media plays a significant role in effective communication among users, particularly in informal settings where conventional teaching and institutional activities rarely engage or reach students (Bull et al., 2008; Madge et al., 2009). It also fills the gap and builds a bridge in connection with formal teaching and institutional activities, particularly with courses which also have online components to their learning. This is because social media enables users to create their own spaces, which leads to increased conversations among students. It is vital to build relationships with peers for supporting student wellbeing. Consequently, using social media is likely to enrich student experience by building peer relationships and promoting student wellbeing (Kizgin et al., 2019).

Though some studies have found that there can be a detrimental effects to wellbeing when using social media (Alavi et al., 2011; Thomée et al., 2011; Zaremohzzabieh et al., 2015), social media could be exceptionally beneficial for students who are isolated or require more flexible and informal learning spaces (Orton-Johnson, 2014). In the context of international students, social media allows them to consolidate old networks and form new networks through regular communication online, which may positively affect their wellbeing (Zhu, 2011). As social media provides flexibility for students to engage with each other, it has been proven that social media enables students to build communities and retain connections with peer network (Ryan et al., 2011; Tosun, 2012; Valkenburg & Peter, 2009).

Despite the widespread use of social media among international students (Ryan et al., 2011; Tosun, 2012; Zhu, 2011), little is known about how international students use it to support themselves in the new environment of their host country (Veil et al., 2011). Hence the aim of this study is to explore how international students utilise social media (particularly WeChat) to assist in establishing themselves and engaging with western cultures in their new host country. This study chose Chinese international students (CIS) in New Zealand as research subjects for two reasons: Firstly, due to substantial cultural and societal differences with western culture, CIS are more likely to face additional problems and difficulties throughout the adjustment process in the host country (Yeh & Inose, 2003). Secondly, past studies conducted in New Zealand indicated that CIS have fewer opportunities to form friendships and receive little local support from domestic students during their time in New Zealand (Holmes, 2005; Spencer & Chen, 2004). Thus, CIS regularly seek support from online social networking sites such as WeChat to cope with issues encountered while studying in the host country (Ye, 2006). This paper also aims to explore the role of WeChat in building student-to-student relationships among CIS. In particular, how do CIS use WeChat to influence their experience of overseas studies and maintain peer relationships?

Methods

In order to explore the research question in-depth interviews were undertaken with nine CIS at the University of Canterbury (UC) in NZ. To recruit students posters inviting participation were distributed across campus and online. The study received approval for the university Human Research Ethics Committee (HEC 2021/158). Nine students from four faculties, of which seven were female, and five were postgraduate students were interviewed between late 2021 and early 2022.

Before the interview, each participant completed a pre-survey to gather demographic information and general WeChat usage data. This data was used to inform the interview and the resulting analysis. The interviews drew on the critical incident technique (CIT), which is a narrative inquiry approach aimed at recalling experiences of critical events with on a specific focus (Gremler, 2004). In this study we asked the participants to recall a situation when they used WeChat to assist them with their studies or life in New Zealand. The CIT approach was chosen as it can disclose the lived experience of CIS by describing significant events and outcomes of using WeChat that related to supporting their wellbeing. Each interview lasted from 30 to 45 minutes.

Drawing on Braun and Clarke (2006), thematic analysis was used as an inductive process involving recognising themes while comparing and contrasting data. Using NVivo the analysis was undertaken in four stages. First, the researcher familiarised themselves with the data by reviewing and reflecting on the narratives using memos; Second, the data was coded exploring similarities and differences; Third, broad themes and subthemes were identified. Finally, the themes were explored in more depth. In this article we will explore the outcome of this analysis, in particular, the themes about how WeChat was used to reconnect relationships through technology.

Results and discussion

The predominant findings from this study indicated that WeChat could support CIS to maintain and expand social networks, build and sustain a community, promote peer interactions and collaborative learning. Those findings contribute to understanding how the use of WeChat influences the relationships of peers among CIS through the three different areas.

Theme 1: Maintaining and expanding social networks

Maintaining contact with friends and family in their home country
This study found that CIS used WeChat to maintain regular communication with pre-existing networks in China. All participants demonstrated the importance of using WeChat to keep in touch with their families and friends. It was found that WeChat appeared to be the most efficient and useful communication tool for CIS to manage relationships. Similarly, Krause (2006) also highlighted the significance of international students' digital lives in terms of staying in touch with their families and peers in the home country. Furthermore, Sandel

(2014) discovered that social media might be used to mediate cultural ties, which is critical to retaining cultural continuity with one's home country in order to cope with acculturation (Li & Gasser, 2005; Sandel, 2014). According to Mikal and Grace (2012), "continuity provided by a sense of connectedness and the consistency of online communities could reduce acculturation stress" (p. 300). Zhu (2011) explained that this digital experience can help international students maintain their cultural identity. In other words, social media can help international students practise and convey their culture (Park, 2016). Participant B emphasised the importance of maintaining contact with people in the home country after transiting to a new environment,

> 'WeChat helped me make a smooth transfer that allowing me to keep contact with previous networks, as well as allowing me gradually to adjust to the new environment. If those networks were taken away from me right away, I would have to be enforced to accept another habit. If that happens, it will be quite difficult for me, and I will feel extremely lonely. If there are no platforms for people to contact with friends when they come to an unfamiliar place, he or she will have to deal with all the issues on their own. Therefore, WeChat plays a critical role in the transfer to the new environment.'

The quote above highlighted the importance of WeChat for CIS in coping with the feeling of loneliness and isolation after moving to a new country and adapting to a new culture. Participant B suggest that WeChat helped him to reduce the stress and overcome loneliness. Previous research also found that social media enables international students maintain connection with their home country (Gomes et al., 2014; Komito, 2011). Social media may have the potential to aid international students' social adjustment to the new surrounding through keeping in touch with home culture and relationships (Gomes & Alzougool, 2013). According to boyd (2014), the reason why social media could help users keep in touch with people in both their home and host countries is that "social media alters and amplifies social situations" (p. 13).

All participants universally considered WeChat as an indispensable tool for keeping in touch with their friends and families in China. For instance, Participant G described how WeChat helped her ameliorate the feeling of isolation and loneliness after transiting abroad:

> 'I was very unfamiliar with the environment when just arrived in New Zealand. Because my English is not good, I'm afraid to talk. At that time, I used WeChat to communicate with my previous classmates, which was a crucial way for me to mitigate the anxiety during that time. I almost didn't know anyone here at the time and was not brave enough to make friends here. WeChat was the spiritual pillar of the moment, and I used it frequently to communicate with my friends in China.'

Participant G strongly highlighted the connecting support from her peers in China through WeChat after she moved to New Zealand, which helped her to reduce the communication and mental barriers due to the new environment. As Martin and Rizvi (2014) noted, social media could assist in the creation of "a feeling of ongoing connection with (home country) places and networks" (p. 1018). WeChat plays a significant role whilst transitioning to the host country, in maintaining previous relationships focused on enhancing the sense of connectedness of CIS and their wellbeing. This is because social media can transcend time and space to keep people connected.

Enriching social life in the host country and keeping updated with the outside world

The results showed that CIS used WeChat to develop new friendships in New Zealand. Participant B stated that he mainly used WeChat for socialising in New Zealand. In his case, WeChat was primarily used by him for social planning and keeping up to date with news. This finding was similar to other studies where social media has the potential to broaden the spectrum of relationships in the host country (Hiller & Franz, 2004). Participant I clarified that WeChat is the greatest and easiest way to get into the local Chinese community because almost every Chinese in New Zealand uses it every day. As a result, CIS might make significant use of WeChat to expand their social lives and enhance their experience in New Zealand. Participant H noted,

> 'Joining more WeChat groups is the best way for Chinese international students to develop their social networks here. Many Chinese people will form multiple WeChat groups for a variety of reasons. You can always find what you need if you add a handful of WeChat groups. For example, on the UC Chinese students WeChat group, there is a great deal of information, including a variety of events for international. You can meet a lot of people If you can keep up with the news and participate in those activities.'

In contrast to Participant B who claimed socialisation as the primary motivation for using WeChat, Participant C noted, 'Sometimes I would switch off my WeChat on both my phone and computer, and put my phone in the drawer. I don't play games, but I will frequently open and check my WeChat updates, including WeChat public accounts and chatting with friends, which will distract me from my study'. A range of evidence suggest that social media could cause addiction that may inhibit learning (Junco, 2012; Lepp et al., 2015; Meier et al., 2016; Paul et al., 2012; Samaha & Hawi, 2016), especially for those with low self-efficacy and self-regulation skills (Meier et al., 2016). Nevertheless, the benefit of using social media as a supporting tool in terms of social connection is evidenced by many scholars (Ellison et al., 2011; Thai et al., 2019; Zhu et al., 2013), including most participants in this study.

Interestingly, Participant A used WeChat to develop virtual friendships. She reported using WeChat to communicate with a friend met online:

> 'I have a good friend I met through online. We both use WeChat to discuss events that have occurred in our lives. Communication with her gives me a lot of confidence, which is a great feeling. She is currently in Beijing. We met in a fitness-related WeChat group, and she added me privately through the WeChat group. Because I usually send some relaxing and happy things to the group, like some photos of my cooking. Then she wants to become friends with me and share each other's daily routine together. For example, we ask each other if one of us has been to the gym, or if the aerobic speed has increased, and even how long the training time is.'

Participant A indicated that the communication with her online friend via WeChat enhanced her self-esteem. She noted that WeChat provides her with a virtual space to express and share her feelings and experiences, which positively improves her confidence. Additionally, the interpersonal relationship was developed due to the shared interests and constant interactions with the online friend. Consequently, the enhanced self-esteem and confidence through using WeChat to communicate with online friends improves participant A's life satisfaction and wellbeing.The increased self-esteem and perceived social support on social media can ease the symptoms of stress and loneliness (Shaw & Gant, 2004), which could significantly influence individuals' life satisfaction and wellbeing (Valkenburg et al., 2006). While past research found that new culture and environment in the host country could negatively affect international students' self-esteem (Brown et al., 1992), social media allows international students to connect with friends from the same cultural background online, which may result in higher self-esteem (Buddington, 2002).

Furthermore, Participant A believed that making these virtual friend has a value. She believed these virtual friends allowed her to express herself without any concerns. She noted, 'In this kind of virtual world, with someone I have never met in person, or in the state of strangers, I may be more open to share my actual ideas, even if they are strangers'. In this case, WeChat facilitates new social communications by alleviating fears or rejection, especially showing a profit for lower self-esteem users.

However this feeling was not shared by all participants, Participant D, reported a negative experience navigating information problems on WeChat:

> 'I was furious at that time. I felt compelled to reveal my personal information. It was when I recently relocated to New Zealand and was unfamiliar with the leasing process. I had some difficulties with a landlord I had known via WeChat during the process of renting a house, which cause the privacy disclosure. I had known the landlord in WeChat before I moved to New Zealand. He listed his house with home address, pictures, and a price, which I believe is reasonable. At that time, I was in a hurry to find a house, and I thought the house was fine. And I believe New Zealanders are trustworthy, so I had paid over two hundred deposits. But after I paid the deposit, the landlord disappeared and nobody answered the phone when I tried to call him. Finally, I had no choice but found a new landlord in New Zealand. One of my friends helped me post news in some rental WeChat groups. But this led to a misunderstanding with my new landlord. As a result, she took screenshots of our chatting history, including my enrolment, family relationships, and even my bank account details, and posted them to the WeChat group, which caused a heated discussion in the group. I was enraged and apoplectic by her behaviour. This incident left an indelible mark shadow on my heart that lingered for a long time.'

Following the incident, Participant D became aware of the risk of security and privacy issues on social networking sites:

> ‘Firstly, WeChat can’t replace face-to-face communication. There may be traps and scams. Secondly, after all, WeChat is only a non-visible communication platform. Once the opposite party loses faith in people on WeChat, he or she may break the law by exposing other people’s privacy and security. I have learned the lesion. We can’t 100% trust people online, and we should communicate in person. Finally, we shouldn’t share our personal information with others online, because someone might screenshot it and then make you famous.’

However, Participant A had a different viewpoint by saying:

> ‘When it comes to the privacy concerns when conversing with stranger online, we must evaluate the risk for ourselves. I think everyone will need to make a judgement during online communication, and then we will get a sense of whether this person is trustworthy. I think that meeting up with anyone, even people in real life, carries a risk.’

To sum up, with the widespread utilisation of WeChat among Chinese people, a growing probability of misinformation and security issues may occur. Nevertheless, it is undeniable that WeChat is important for CIS to maintain and develop relationships. To intensively make use of the positive aspects of WeChat, it is advocated that users should develop 21st Century Skills (Griffin et al., 2012).

On the other hand, CIS viewed WeChat as a source of up-date information. Social media could meet international students’ needs for critical information to help them survive in a new country (Sin & Kim, 2013). It allows individuals access to others who can share and contribute helpful knowledge and resources (Fisher & Julien, 2009). In this study, it was discovered that CIS used WeChat frequently to look for information and resources to help them acclimatise to the uncertain environment.

For example, Participant D reported that WeChat played a critical role in keeping her up to date on what was going on outside of the lockdown bubbles in New Zealand. She considered WeChat as a more effective tool to discover local news and information. As she explained: ‘WeChat gave me a big favour during the outbreak because I could get the most up-to-date information from messages posted on a variety of WeChat groups. Like, my Hometown WeChat Group, Classmates WeChat Group, and Neighbourhood WeChat Group, provided me with the timely consultation and suggestions regarding the COVID situation, and helped me grasp the epidemic’s progression and dangerous aspects to avoid, which made me feel good’. What she said reflected a similar finding by Palen (2008), the fact that social media could play a significant role in delivering essential information and support, as well as serving as an effective communication platform during a crisis.

In addition, she identified WeChat groups as the most useful function for extracting the latest news and information due to the collaborative and synchronous nature of WeChat group chatting. For example, Participant D reported: ‘There is an embassy in the UC PhD WeChat group. He will regularly present the most up-to-date information for Chinese international students in New Zealand, such as New Zealand’s new border policy, which will be beneficial to our studies and living here’. Furthermore, joining WeChat groups with shared interests allows CIS to contact with a larger number of individuals, assisting in the development of their social networks, which is critical for their adjustment. Meanwhile, the participants indicated a need for emotional interchange and assistance from friends and families via social media, to support them in adjusting to New Zealand. However, the results also informed social media users to carefully navigate information issues, including privacy concerns. It requires online users to develop their cognitive, sociological, and emotional skills in the online environment to have a better online experience and then enhance their wellbeing (Martin & Madigan, 2006).

Theme 2: Building and sustaining a community

Some participants used WeChat to create a community by bonding in a virtual space to communicate and support each other. For example, CIS frequently build a variety of WeChat groups to form discussions, exchange opinions, share feelings, and ask questions, which all contribute to building a sustainable community. WeChat enables Chinese people abroad to maintain a sense of community, even though it is mediated by technology. The exchange of knowledge and resources among members of social media groups, particularly when it is a mutual communication, contributes to the building and developing of a community (Komito, 2011). Some participants indicated that their WeChat group members would respond to their inquiries posted on the group, and mutually they would contribute useful information and resources in the group. As a result, WeChat could support the formation and development of communities through a shared commitment among CIS.

For example, Participant F explained, 'When we had difficulties in China, we normally asked for help and received support from our families and friends there. But in New Zealand, we are scared to communicate reveal our problems and troubles with our family for fear of them becoming worried about us. Hence, in the WeChat group, everyone actually acts as a family member to support each other in New Zealand'. Furthermore, she used WeChat to maintain ongoing communication among community members, which contributes to a healthy and sustainable community:

> 'We made some friends in person, and then kept in touch with through WeChat by sharing content. For example, he made a kimchi today, and asked if anyone in the WeChat group wanted to try it. Or someone complained the weather since the morning, like it was insanely hot yesterday and why it is so cold today? Simply start conversation with these interesting daily topics and then work together to solve some problems. I remember last time I was so angry and upset after teaching a child and talked about this in the WeChat group. Then others in the group discussed how they dealt with it, shared a couple of resources, and consoled one another. Sometimes we end up with gathering for a delicious meal.'

This respondent commented that she used WeChat to preserve connection and community through exchanging feelings and information via WeChat. The WeChat group members continued to engage in a rapport-building community by sending messages, images, and comments in the group. According to Rheingold (2000), a virtual community may occur "when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace"(p. 3-5).

Theme 3: Engaging peer interactions and collaborative learning

Some interviewees are aware of WeChat's potential as a medium for setting up collaborative learning opportunities as well as an informal learning network to share ideas and clarify issues. For example, Participant G utilised WeChat to ask questions about the course and discuss group assignments. She reported,

> 'We have several WeChat groups for different courses, which are used to address and discuss questions related to the course. It is very efficient to do group assignments through WeChat groups. We will allocate each person's job after we join the WeChat group. We can search for chatting history on WeChat even if we have forgotten the work or are unsure. Then someone will send their completed part to the group, where others may view it at any time. There is also a benefit that we don't have to meet at a specific time and place. It is extremely efficient for our studies when everyone is occupied with their lives. arrange a fixed time somewhere to meet up.'

This finding is in line with research by Mason (2006), who found the potential of social media to engage peer interactions and collaborative learning in an informal way. However, only one participant did not use WeChat for learning purposes. Participant A explained,

> 'In terms of learning, WeChat is little use to me. Because I have no Chinese classmates here, there is no learning group for me to join. If I have problems in my study, I will use Reddit, a widely used software here that is similar to Douban in China, but it is a foreign version of English. Because I study here, I suppose some experience in China does not necessarily suit for me. Therefore, I don't want to use Douban or WeChat for study. Actually, there are also a lot of people sharing experiences on Reddit. For instance, recently I just added a Reddit section dedicated to helping engineering students improve their resumes. I can take a screenshot of my CV and upload to Reddit, then it will give me advice on how to enhance it.'

Nonetheless, most participants demonstrated that WeChat could facilitate collaborative learning and develop peer relationships by building virtual communities to share information and collaborate with each other in a collective way. As a result, WeChat could support CIS to engage in their studies and enhance student success, as it creates an effective online environment for collaborative learning. This reflected a similar finding by Han et al. (2016), who discovered that social media may assist students with course tasks and assignments due to its features of diversity and flexibility for discussions and clarifying questions with other peers without the time and location constraints.

Conclusions

This study aims to explore the role of WeChat in the development of student and student relationships among

Chinese international students. The findings revealed that WeChat, as a social networking site, plays a critical role in maintaining and expanding social networks, building and sustaining community, promoting peer interactions and collaborative learning among CIS in host countries. Although some negative aspects of using WeChat such as privacy risks and distraction, were also demonstrated by several participants, all respondents agreed that WeChat serves a useful purpose in connecting peers. The relationship between technology and connections was investigated, adding evidence to previous studies indicating that social media is important for preserving ties and fostering a sense of belonging and connectedness among university students (Ryan et al., 2011; Tosun, 2012; Valkenburg & Peter, 2009). Maintaining original contacts and making new social connections through technology is especially crucial for international students when studying abroad.

This paper adds to the body of knowledge about international students and the role of social media in their lives. Unlike the majority of past research on international students' experiences and the influences of social media use on users' wellbeing (boyd & Ellison, 2007; Caligiuri & Lazarova, 2002; Kaplan & Haenlein, 2010; Kim et al., 2015; Steinfield et al., 2008), this research looked at how a group of international students utilise social media to for peer relationships among peers while studying in the host country.

The findings revealed that WeChat, as a social networking site, plays a critical role in maintaining and expanding social networks, building and sustaining community, engaging peer interactions and collaborative learning among CIS in host countries. Although some negative aspects of using WeChat such as privacy risks and distraction, were also demonstrated by several participants, all respondents agreed that WeChat serves a useful purpose in connecting peers. Furthermore, this research demonstrates the need of facilitating international students' social networking through the appropriate use of technology in order to improve their experiences in the host country. Future research can use a larger sample size, such as a large-scale survey, to test our findings further.

The findings of this study have practical implications for student support units in host countries. The results highlight the importance of using technology to maintain and develop a long-term relationship or community among peers. Despite the fact that people's preferences for technology adoption vary, an increasing number of students are looking for ways to stay connected in order to enhance their learning and wellbeing (Duffy, 2010; Greenhow, 2011; Rosenfeld Halverson, 2011; Siemens & Weller, 2011; Smith, 2010). As a result, using technology to develop student and student interactions is likely to maximise an ongoing and thriving closeness among students without regard to time or location. Students will be able to deepen their relationships, cooperate with one another, and improve their wellbeing as they become more flexible in keeping in touch with peers and profit from the rise of opportunities provided by technology. It could especially beneficial for international students who are in desperate need of making new friends or expanding their social networking opportunities, all of which contribute to a successful adjustment and personal growth in the host country.

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reconnect
Reconnecting relationships through technology

Co-creating a digital learning innovation framework through design thinking approaches

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Although *innovation* is widely used as a marker of excellence by universities it remains a poorly conceptualised idea, particularly in the realm of teaching and learning. In this paper, we describe an institution-wide project to co-create a Digital Learning Innovation Framework at a large Australian university. Through design thinking approaches a central learning and teaching unit led a co-design process to investigate and define digital learning innovation within their institutional context. This initiative involved a total of 114 stakeholders who design and deliver digital learning innovations at the University. This paper reports on a tentative, working definition of digital learning innovation and six guiding principles that arose out of this Digital Learning Innovation Framework co-design process. In this way, this paper makes significant contributions in conceptualising and contextualising practice-based innovation for digital education. Future implications and limitations of this study are also noted.

Keywords: innovation, digital learning, design thinking, higher education

Introduction

The COVID-19 pandemic accelerated digitisation in every sector of education. The speed at which higher education had to adapt its strategy and practice highlighted the importance of agile innovation as a key characteristic of sustainable business models for contemporary universities. However, although the term is used extensively by universities, precisely what is meant by *innovation* in the higher education context remains unclear and under-investigated (Barger et al. 2021; Edwards-Schachter 2018; Hall & Lulich. 2021; Sanjay & Aggarwal 2021).

A survey of publicly-available digital learning or technology strategy documents from 71 top universities found that innovation was a core concept in most of these documents (Falvin & Quintero 2020). However, the authors concluded: "the innovation proposed is frequently modest, centring on more efficient operation and incremental improvement. Universities declare themselves to be innovative, but…analysis shows their conception of innovation to be, paradoxically, conservative" (Falvin & Quintero 2020, p. 482). This finding is echoed by a more recent study of 52 highly ranked American universities' strategic documents (Hall & Lulich 2021) which concluded that "though universities are recognizing the value of novel change, their plans, with few exceptions, do not express visions of bold initiatives, restructuring or 'disruptive innovation" (p.21). Further, Johnson (2018) has argued that innovation is often deployed by universities primarily as a symbolic, rhetorical strategy that results in little material change. He claims that in a sector driven by prestige and rankings, a public-facing innovation agenda builds an institution's symbolic capital often irrespective of the results of their publicly-promoted innovations.

In a review of literature on innovation and entrepreneurship in an academic context, Schmitz et al. (2017) note the fragmented nature of the literature and the lack of a systematic approach to understanding the nature and process of innovation in higher education despite the proliferation of the term's use and importance. They specifically note the need for closer analysis of "academic innovation" relating to the teaching mission of universities (Schmitz et al. 2017, p. 385). Ellis and Goodyear (2019) have also highlighted the importance of universities developing an innovation framework to guide teaching and learning development. Their interviews with 54 senior Australian university leaders (DVCE and equivalents) identified balancing innovation and quality assurance as a key tension. They conclude:

> In the current higher-education climate, focusing on both quality and innovation is essential…but considerable work needs to be undertaken to make it clear how quality and innovation can

> integrate strategically and effectively…there seems to be a better grasp of what a quality framework involves for course development and the student experience, but there is some uncertainty about how an accompanying innovation framework is best structured and integrated. The challenge for an integrated innovation framework lies somewhere in the space between encouraging creativity and risk-taking, while at the same time not undermining a systemic approach to standards. (Ellis & Goodyear 2019, p.68)

The current study reports on the development of a Digital Learning Innovation Framework (DLIF) at Deakin University a large Australian multi-campus university. It describes our practice-based methodology and offers a working definition of digital learning innovation with six guiding principles. This paper makes two significant contributions to the existing literature. First, we describe a bottom-up co-design process which captures cross-disciplinary insights into practice-based innovation within a higher education context. Second, this paper contributes to the conceptualisation of practical innovation processes which have been surprisingly under-theorised in the higher education literature. These insights will be relevant to both those teaching and learning leaders building symbolic capital through innovation projects (top-down processes), and those implementing pragmatic processes to enact digital learning change (bottom-up processes).

Innovation in (digital) learning and teaching

Kim and Maloney (2020) have recently argued in a book-length study that *learning innovation* is an emerging interdisciplinary academic field and should be recognised as such. They argue that despite a detailed understanding, from decades of learning science research, of how learning works, there is much less clarity on how to manage effective change that aligns teaching and learning practice within higher education institutions with this research. They suggest that a new field of learning innovation would match the "growing body of scholarly and popular literature on how people learn" with "a parallel scholarship on how universities advance learning" (p.5). They define learning innovation as:

> The interplay between the complex set of practices, methods, and designs that are part of the attempts by higher education to improve teaching and student learning. The practices not only bring together learning science, applied educational technologies, and learning analytics, but they do so within the framework of the institutional structures, policies, investments, and strategic leadership that enable this work… when we use the word "innovation," we mean an intentional and aspirational investment in change to improve practices. These practices occur along a continuum from individual faculty transformations to institutional reforms. (Kim and Maloney 2020, p.6)

Kim and Maloney lead teaching and learning centres at two large US universities (Georgetown & Dartmouth) and their analysis draws on case studies of similar learning innovation hubs across the US. They argue that the work of such centres and a range of institutionally-supported innovation programs marks a "turn to learning" and they speculate that these programs have "brought more change to teaching and learning in the last seven years than perhaps the previous seventy" (p.9). However, they fear that this momentum cannot be sustained without deeper more coordinated scholarship and the development of a "shared language of inquiry"(p.103).

In the Australian higher education context, a national teaching and learning grants program from the Office of Learning and Teaching (OLT) and its predecessors (2004-2016) encouraged an integrated scholarship around teaching and learning change projects. Gannaway et al. (2013) outline a range of studies commissioned by OLT and its predecessors which sought to consolidate a framework for embedding, sustaining and upscaling innovation practices that arose from funded projects. Crucial to this framework is a conceptualisation of dissemination as an engagement process at the heart of change/innovation projects rather than as a final stage of adoption or diffusion in a traditional linear model (cf. Rogers 1976).

The traditional diffusion model is ubiquitous in innovation studies and has been used extensively in the field of technology enhanced learning. Liu et al. (2020), in their systematic review of the adoption of learning technologies note that this focus on standard models of adoption and diffusion is underpinned by three problematic assumptions: "adoption is invariably positive; technologies are fixed, and; adoption is binary" (p.10). They suggest that these assumptions shape practice in several ways. Firstly, "conceiving non-adoption as failure… miss[es] insights into the positive motivators, decision making and behaviours of those who do not utilise learning technologies in the way that others think they should" (p.10). Secondly by focusing on technology as fixed there is a lack of understanding of the ways academic adopters might shape the technology to better fit their practice. They argue that, unlike other sectors, there is a lack of research around innovation and co-creation in the studies of technology enhanced learning adoption. Finally, by focusing on adoption as an end point many studies assume positive impact comes immediately with adoption rather than through iterations and adaptation over time.

These problematic assumptions often influence conceptions of academic innovation. As Barger et al. (2021) found, in a recent study on academic innovation through the examination of twenty US-based university websites, "academic innovation research and popular writing often present an overlap with educational technology, digital innovations, or eLearning in general" (p, 3). This results in what they term a "blurred line between academic innovation and educational technology" innovation.
Karen Smith (2012) who provides one of the only semi-systematic reviews of the literature to focus specifically on teaching and learning innovation, also emphasises the complexity of the diffusion/adoption processes. In a detailed review of 89 studies, which included a broad range of technology-adoption as well as policy, people and curriculum change projects, she identifies six key lessons from the literature which guide innovative practice:

- **"Senior staff need to support an innovation for it to spread effectively":** this includes creating an "institutional discourse" (Smith 2012, p.174) for projects that sets out a shared vision; ensuring that effective planning is in place for the continuity and sustainability of the project beyond launch or pilot; ensuring the policy framework delivers an integrated support mechanism for a given project and ensuring reward and recognition frameworks value participation and innovation.
- **"Innovation is time consuming and takes time to embed":** "Time was highlighted as the major barrier to adopting innovative work practices." (Smith 2012, p.175); therefore, effective workload allocation needs to be given to enable academic participation in innovation projects. Given both the complexity of change and the often-limited availability of resources, a carefully planned series of small iterative changes over time may work better than "big-bang" implementations.
- **"Staff and students must be adequately skilled to engage with the innovative practice":** this is often best achieved through building a community of active learners that provide "situated staff development, where projects and project teams provide authentic staff development opportunities." (Smith 2012, p.176). Capability development pays long-term dividends given that staff who have previously experienced innovation are more likely to respond positively to future projects.
- **"Innovations that sit well within a specific context spread better"**: successful innovations address a real perceived need in a particular academic or disciplinary context. Finding ways to "situate the innovation within the individual's own practice" (Smith 2012, p.176) can be achieved by involving academics in pilots or evaluation projects; this allows a "believable picture" (Smith 2012, p.177) of the innovation to be built up by academics in the context of their own teaching and learning practice.
- **"Supportive networks can facilitate the diffusion of innovative practices":** communities of practice and partnership approaches which gather interdisciplinary teams to work on innovation foster "ownership of the materials and subsequent changes in practice" (Smith 2012, p.177); collaborative partnerships between central learning and teaching units and disciplinary experts can work well especially where they are developed over time; peer pressure from colleagues and other institutions can be leveraged especially in the early stages of an innovation project.
- **"Institutional infrastructure needs to be in place to support the innovation"**: this includes technology infrastructure, but also other types of infrastructure such as project planning and communication strategy as "issues can arise if innovative solutions are not portable" (Smith 2012, p.178).

Smith's study highlights the complexity of innovation processes and confirms Kim and Maloney's (2020) contention that teaching and learning innovation is a process which requires multidisciplinary skills that marry an understanding of how people learn and of how institutions might adapt to change. We will return to Smith's work later, where a useful comparison can be made with our analysis. We have deliberately framed the work that follows as "digital learning innovation" rather than academic innovation or learning innovation. While we acknowledge the conceptual issues in the literature, and the "blurred line between academic innovation and educational technology" (Barger et al 2021), our previous research and practice, which we describe briefly below, has led us to conceptualise the relationship as a productive "entanglement" (Fawns 2022) rather than as a binary or melding.

Methods and Study Context

Study Context

The current case study of the development of a Digital Learning Innovation Framework (DLIF) comes from a university with a history of innovative practice, a reputation for innovation and one that consciously deploys that symbolic rhetoric to enhance its standing (Johnson et al 2022). Deakin university has been a pioneer in a number of significant projects such as the use of artificial intelligence to improve student services through a partnership with IBM Watson; the University's mobile app, which pioneered chatbot technology in the sector; the introduction of microcredential-based Masters degrees; and the production of a suite of postgraduate degrees on a MOOC platform (O'Donnell & Schulz 2020). The development of the DLIF was therefore born out of an existing commitment to innovation practice in a range of curriculum, student engagement, and technology projects rather than an abstract desire to initiate a culture of innovation. However, as teaching and learning leaders, we were acutely aware that signature projects alone do not necessarily result in a sustained culture of innovation or cultivate a practice of innovation. We therefore set out to create an infrastructure that could support the translation of innovation rhetoric and strategy into practical application across a range of small, medium and large-scale digital learning innovation projects at the University.

The DLIF was also developed in an environment where we had used a range of iterative design processes and frameworks across our signature innovation projects. We have previously described our approach to these iterative design processes as "Degree Design Thinking" (Adachi & O'Donnell 2019). This approach to institution-wide curriculum innovation and renewal projects takes a broad view of design thinking, as adopted by large-scale infrastructure programs to address "wicked problems" such as the redesign of national mental health systems (Dorst 2019). In reviewing this extended approach to design thinking methodology, Dorst suggests it is a move from a focus on a discrete design project to conceptualising a "design-driven program of activities" that entails "a multi-year approach, comprised of sub-projects in which multiple stakeholders have roles that vary over time" (Dorst 2019, p. 124). Design thinking like other practice-oriented approaches to research such as educational design research is one where "research and practice can become intertwined" (Amiel & Reeves 2008 p. 37).

Our Degree Design Thinking model had two important elements which influenced our approach to the development of the Digital Learning Innovation Framework. First, whereas curriculum renewal has traditionally focused almost exclusively on learning design, our Degree Design Thinking approach integrates design activity across four interrelated dimensions: *portfolio design* (the mix of courses, pathways and macro and micro-credentials); *team design* (effective work practices and collaboration); *learning design* (task-based social learning and authentic assessment) and *service design* (student-journey driven approach to a seamless user experience). Second, each design layer uses different designerly ways of working that include: *design thinking* – an overarching approach focusing on iterative user-centered processes; *design patterns* – which identifies and maps replicable interactions; and *design tools* – a broad set of techniques that enable and model work practices.

Our approach to the development of the Digital Learning Innovation Framework needed to similarly allow for innovation across a broad *portfolio* of digital learning products, enable collaboration across diverse *teams* and focus on creating a tight interaction between *service design* and *learning design*. Its outputs need to include a mix of *design approaches*, mapping *high level patterns* as well as developing a set of *tools for implementation.*

Design Sprints as co-creation

The DLIF project, coordinated by the University's central teaching and learning unit, brought together diverse stakeholders from across the institution to share their experience and expertise of designing and delivering innovation in digital learning. The project drew on design thinking and design sprint methodologies (Knapp et al., 2016; Mendonça de Sá Araújo et al., 2019). A design sprint is an intensive process which allows for the application of design thinking in a condensed, pre-determined amount of time, often one week (Mendonça de Sá Araújo et al., 2019). While less intensive than the standard one-week design sprint, our project imposed a design of three three-hour workshops with each workshop scheduled three months apart. The workshop series was designed to lead participants through a process of generating insights into the current innovation journey at the university and ideas for how that might be improved; refining and testing those ideas; and planning for the implementation of successful solutions. A design challenge was posed to position all participants as active contributors and co-creators, and workshops were facilitated by an external Strategy Consultant with expertise in User Experience design to ensure impartial arbitration of decisions throughout the co-design workshops.

The workshops centred on the design challenge: 'How might we help our people deliver student-centred digital learning innovation?' The first workshop ('The blueprint'), held in December 2019, focused on mapping the innovation journey in its current state to build a common understanding of current processes, and identify characteristics of innovators, and the barriers ('pain points') and enablers ('gain points') in their journey. The second workshop ('Build'), held in February 2020, was designed to elicit underlying principles for enabling, and reducing barriers to, digital learning innovation, and to create prototypes for structures or resources to support innovation. A third workshop ('Beta'), scheduled in June 2020, was planned to demonstrate and test prototypes, finalise the DLIF components and develop a plan for implementation and iteration (Figure 1). This final workshop was cancelled due to COVID-19 restrictions. Workshops were scheduled at three-month intervals, with discussion and ideas-sharing between workshops enabled by Microsoft Teams.

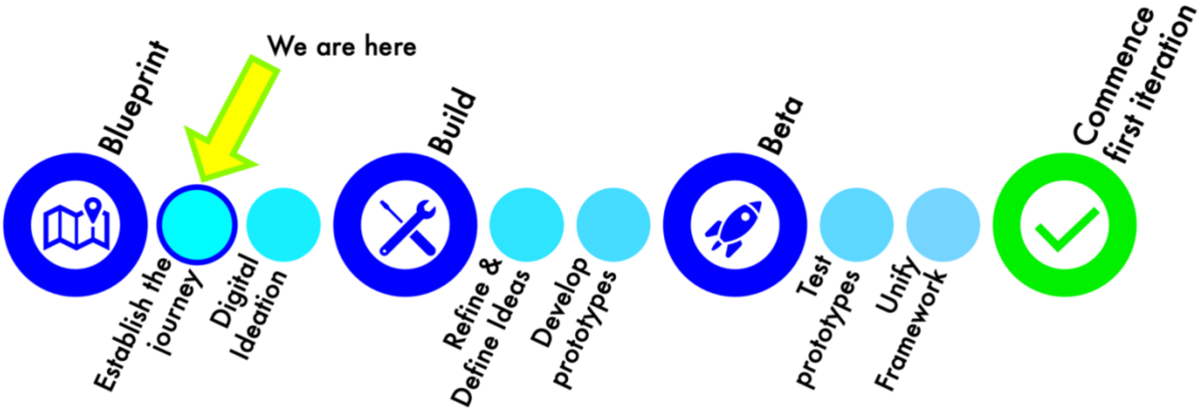

Figure 1: The series of three workshops (Blueprint; Build; Beta) modelled on Design Sprint methodology.

Workshop activities included small-group activities to provide all participants with an opportunity to share their experience of innovation at the University; individual reflections on what was 'seen, thought, felt, said and done' at five key stages of the innovation lifecycle (Inception, Initiation, Development, Implement, Sustain); group mapping of smaller steps and processes within those stages; brainstorming and refining principles; proposing ideas for enabling structures and resources; and working in teams to prototype new innovation processes. Due to the pandemic, and the consequent shifting priorities and requirement for staff and the University, the third workshop, scheduled for June, was postponed.

A total of 114 staff from across the University, including teaching academics, academic developers, learning designers, learning technologists, IT service technicians, solution architects, librarians, academic skills and language advisers and policy administrators, participated in the project over the first two workshops. This diversity of staff roles and experience meant that the full spectrum of academic innovation from those leading technology-focused changes through to those developing new styles of curriculum and assessment were represented. This also ensured capturing a wide range of experiences, perceptions and suggestions, and the identification of a range of potential solutions to the problem (Dorst, 2019; Mendonça de Sá Araújo et al., 2019). Further, the involvement of all participants in the DLIF creation process allowed for the testing and refinement of principles, ideas and prototypes by those who would use them and for whom they were designed.

Consolidating the Framework

Following the cancellation of the final workshop (due to pandemic restrictions), the project team, namely the three authors of this paper, undertook the tasks of finalising and refining the components of the Framework using the artefacts produced during the first two workshops. This paper reports on the first stage of this process which identified six principles of digital learning innovation and a working definition. These principles, together with other elements such as a detailed version of the Innovation Lifecycle Map and a set of templates for use by projects, will form the final Digital Learning Innovation Framework.

To arrive at the six principles and definition reported on here, the project team analysed material generated by participants throughout the two workshops. To conduct this analysis, an exemption from ethics review, based on the use of existing, non-identifiable data with negligible risk, was granted by the University Human Research Ethics Committee (2020-287). The first workshop artefact analysed was a list of characteristics of a successful innovator (characterised as 'Indy') generated through group brainstorming activities. The second was a list of 38 principles for successful innovation, again generated through a group brainstorming activity following discussion by participants in structured small group activities. The use of a collaborative, appreciative inquiry approach (Whitney & Cooperrider 2011) to generating these lists of characteristics and principles allowed for clarification of meaning and phrasing, and some preliminary grouping into common themes through the combination of similar or aligned suggestions. The principles were divided, by the workshop group, into 25 General Principles (GP) that applied broadly and 13 Contextual Principles (CP) that applied to more specific areas or circumstances; they are identified as such in the analysis below and when referred to in the discussion.

The third and final artefact generated from the workshops was a list of pain points and gain points associated with each stage of the innovation lifecycle. In small groups, participants identified smaller steps or sub-stages within each stage of the innovation lifecycle (i.e., Inception, Initiation, Development, Implement, Sustain). Individual participants then added experienced or presumed pain or gain points to the various steps or sub-stages across the entire innovation lifecycle.

The analysis of these artefacts was undertaken in two stages. First, the authors independently coded the 38 principles for successful innovation into emerging themes. This was followed by comparison of the emergent themes and groupings, and discussion to reach consensus across the authors. These thematic groupings were then compared with data from the other artifacts to confirm their salience as significant factors across the innovation process. This led to a vigorous discussion in proposing a definition of digital learning innovation, which coupled ideas from those design thinking workshops with our synthesis of existing literature.

In the following section, we discuss the six principles identified through our analysis and then compare these principles to those previously identified in the literature by Smith (2012), in order to propose a working definition of digital learning innovation.

Six principles of digital learning innovation

Principle 1: Create a safe place for new ideas
Our participants consistently identified that innovation demands radical intent, requiring actors to “be bold” and ‘be open-minded’ as they push boundaries and test out new and big ideas (General Principle/GP 1 & 2). In order to innovate, actors need to draw on courage and resilience to deal with, at times inevitable, failure and always-present uncertainty, as they reach into new territory. As Ellis & Goodyear (2019) identified, this is a challenging element as adherence to legislated standards often serves to make higher education institutions risk averse. Innovation therefore requires ‘different types of thinking (GP7)’ – both convergent and divergent thinking – to challenge the status quo: ‘just because we have always done it one way it doesn’t mean we shouldn’t change (GP22)’.

However, participants recognised the environmental tensions and discussed creating a safe space where those courageous and risky activities can be carefully tested – ‘Have a safe place for unsafe ideas: find places where you can take risks and push boundaries (Contextual Principle/CP 12)’. Workshop participants used the rhetoric of the ‘sandbox’ to draw out the nature of these “safe spaces”. In most Learning Management Systems (LMS)for instance, there are ‘sandbox sites’ where teaching teams mock up samples for new teaching practices and experiment with new tools and designs. These sandboxes provide a safe experimental space where new prototypes can be tested to evaluate and iterate on ideas, without real risks, using a variety of “designerly” processes (Dorst 2019).

Principle 2: Keep focused on your purpose
In bringing about innovation and change, the ability to paint a clear picture of value and impact - in short, purpose - is a must, particularly for those leading innovation projects (Gannaway et al. 2013) – ‘Be driven by value & impact (GP4)’. It is therefore critical both to set clear goals that build a narrative of the value added by the proposed change, and to assess the generated benefits at different stages of the project – ‘Continuously check your benefit (GP14)’. In doing so, participants discussed the importance of consulting multiple forms of data and evidence, so that innovation is evidence-based and feedback-informed – ‘Be data driven (GP21)’ and ‘Take on reflections and feedback (GP12)’. Participants saw innovation as a mindful and reflective practice of proactively seeking evidence for incremental improvements throughout a project, not a practice focused merely on evaluating a final impact. Using this feedback and evaluative evidence can also further build the purpose narrative articulating multiple levels of ‘why’ for a particular innovation – i.e., rationale for the institution (macro), for unit/course teams (meso) and for individual teachers and students (micro).

For instance, universities face criticism that some digital learning innovation projects can involve top-down imposition of a new technology across the institution. A classic example is the implementation of a new LMS, which constitutes the core digital learning environment for online learning and teaching at universities. Successful implementations are likely to be accompanied by a clear narrative of the pedagogical reasons for such big change, rather than a simple claim for automation and cost-saving through new technology. Similarly, implementation of such changes should include “a rollout plan, training plan, support needs and methods to obtain faculty buy-in” (Rucker & Frass, 2017 p.274). This highlights the need for a comprehensive framework underpinned by strong rationale and purpose.

Principle 3: Keep focused on your users

In design thinking approaches, co-creating solutions with users is common practice (Razzouk & Shute 2012). Our workshop participants also talked about the usefulness of this approach – 'Be customer (student) focused (GP3)'. Within the context of digital learning innovation projects in university settings, our users are students and/or academics who are the intended beneficiaries of improved practices and new applications. These co-creation processes driven by user/student/staff- centred approaches can then evoke meaningful communication and engagement throughout the innovation project lifecycle.

Any innovation project involves change in practice, process or product; thus communication and change management are key ingredients in successful innovation (Kotter 2008). In his classic work on innovation dissemination, Rogers (2010) argues that communication channels, which ensure that critical information is passed from one organisational unit to another, are one of five key elements affecting the diffusion of innovation People experiencing change need to obtain the right information in a timely manner to make sense of what is going to happen to them and to successfully adopt, and adapt to, the change. Our participants talked about the importance of embedding communication and engagement throughout innovation projects, at multiple stages and for multiple purposes: 'constructing the right story for the audience and claiming the story for implementation (CP5)' with a clear statement of what the success of this innovation looks like – namely, 'giving visibility to your innovation (CP11)'.

Sustained co-creation with users is difficult and this returns to the need to 'be open-minded' (GP2) and to 'draw on multiple points of view and multiple ways of thinking' (GP19). Our participants also noted that innovation requires 'nurture' in teams (GP8). Universities are beginning to draw on change models such as Engstrom's Change Laboratory (Bligh & Flood 2015) where a wide range of actors, expertise and perspectives come together to bring about grass-roots transformation over time. A key insight of the Change Laboratory process is its embrace of contradictions which are then used as a fertile ground for transformative learning. While tensions and contradictions are inevitable in diverse knowledge systems, user-focused change processes like Change Laboratory allow the participant-change-agents to confront tensions and eventually bring about focused transformations.

Principle 4: Be ethical

Ethical approaches to innovation are increasingly recognised as critical to sustainable business models (Bryden & Gezelius 2017; Fontrodona 2013). Unsurprisingly, within the university culture in which all research activities include ethics review, our participants asserted that digital learning innovation projects must be 'underpinned by ethics (GP9)'. This ranged from a desire to promote open and transparent communication about project goals, decisions and processes – 'Be open and transparent (GP13)' – to the honest and inclusive ways in which actors give and receive feedback during the course of innovation projects – 'Always provide an honest opinion, show professional integrity regardless of consequence (GP18)'.

This builds on the lengthy discussion amongst participants about how large and small innovation projects need to involve various actors with diverse backgrounds and levels of authority and influence at the University – 'Integrate across the University (GP16)'. Engagement with such diverse stakeholders should encapsulate ethical and inclusive practices where all actors are aware of potential impacts or harm that projects might impose and actively address these as they arise. In effect, actors are then able to proactively project and manage risks related to projects. Some participants also touched on the importance of abiding by relevant University policies– 'Be mindful of policies that might apply (CP4)'. Universities have numerous codes of conduct, privacy requirements, and organisational consent processes that can be considered in setting up and delivering on innovation projects.

Principle 5: Start small and build up

Prototyping is an essential component in design thinking approaches (Razzouk & Shute 2012). In co-creating desired solutions quickly and iteratively, our participants reported that actors should start with small ideas and work towards realising bigger goals – 'Work small and fast (GP5)'. When operating within a risk- and failure-averse culture as discussed above, this is a fast and cheap way to validate ideas through low-fidelity prototyping and refine solutions through purposeful testing. In this process, project teams can not only get early agreement on priorities, scope of work and end goals but also use this as a check-in opportunity with wider stakeholders in progressing work inclusively and incrementally. This also highlighted the resilience required in innovation projects – 'Be resilient and fail fast (GP11)', 'Embrace your gut when it's cheap and fast (CP13)' and 'Keep going until someone says stop (CP1 and 2)'.

The importance of failure is discussed by Henriksen et al. (2017) in their empirical study of the application of design thinking to developing teachers' capacity in tackling educational problems. The study acknowledges that "the relative newness of design thinking in teaching and education means there is much that we do not know" (p.141), and the teachers participating in the 'Learning by Design' program, agreed that failure must be framed as an opportunity for learning and improvement, rather than a cause for punishment.

Our participants also discussed the opportunity that this approach provides to celebrate small and large project milestones. In complex projects, this is particularly vital in keeping contributors engaged with the progress over time and providing a sense of collective achievement along the way, rather than waiting to see 'big-bang' outcomes at the end, at which point it could be too late to alter approaches or address issues. This start-small-and-build-up approach – 'incremental and building on strength (GP8)' - is therefore also part of the engagement and risk management strategies for innovation projects.

Principle 6: Think holistically
The inevitable complexity of innovation projects was acknowledged by our participants. Generating new ideas and practices first requires a good understanding of existing social, cultural, political and economic contexts and issues as well as resources, for the identified problems to be resolved – 'Seek holistic & reusable solutions (GP15).' Innovation requires resources, both human capital (creative ways of using existing sets of knowledge and time) as well as financial resources. Our participants highlighted the many innovation projects already underway on different scales and timelines at the University. They noted that knowing about, and piggy-backing on or aligning with, related projects can help produce unique outcomes, while also avoiding duplication in processes and outcomes. Depending on the timing and scale of projects, there might be cascading impacts across the projects,– 'Be mindful of your downstream impact (sometimes better isn't better for everyone) (GP23)'. Holistic thinking also applies to the way we 'nurture' innovation. Our participants embraced a 'more powerful together' mindset (CP8) and urged managers to 'nurture innovation appropriately for the level in the organisation', including efforts to 'connect your people with others who can help realise innovation'.

Towards a definition of digital learning innovation

The six principles of the DLIF are largely congruent with those identified from the literature by Smith (2012). For example, Principle 5 ('Start small and build up') aligns with Smith's observation that "Innovation is time consuming and takes time to embed" with the DILF principle proposing a strategy for advancing innovation when navigating time and resourcing constraints. There is also clear alignment between Principle 2 ('Keep focused on your purpose') and 'Innovations that sit well within a specific context spread better'; both highlight the importance of clarity of purpose and context.

However, there are clear differences in language and emphasis, largely attributable to the different framing and focus of the two studies. Smith's (2012) principles were synthesised from multiple individual research projects and, as such, are institution-level observations of the conditions or characteristics required for successful innovation. The origin of the DLIF principles as practice-based advice from experienced innovators is reflected in their action-oriented, solution-focused framing, as guidelines for innovation. For example, Smith's first principle – "Senior staff need to support an innovation for it to spread effectively" – does not have a clear pair in the DLIF, although it relates strongly to Principle 1 ('Create a safe place for new ideas') and Principle 2 ('Keep focused on your purpose'). A culture of innovation, which supports the development and testing of new ways of doing things, requires the support of institutional leadership; similarly maintaining a strong sense of purpose and vision can ensure that the innovation is aligned with the University's strategic direction and vision. Smith's principle can be viewed as the condition required for successful dissemination of an innovation, whereas the related DLIF principles focus on actions staff can take to achieve that condition.

The DLIF principles are also influenced by a specific institutional context. For example, Deakin places strong emphasis on a whole-of-institution ('One Deakin') approach, reflected in Principle 6: Think holistically. This extends Smith's principle of "Institutional infrastructure needs to be in place to support the innovation" by reference to building synergies across different projects and awareness of upstream and downstream impacts. This principle is of particular importance during moments of crisis such as the pandemic, which acts both as a driver for innovation and a constraint on the resourcing required for sustainable innovation. Similarly, the use of Design Thinking and User Experience frameworks over a number of years is reflected in the emphasis on user focus (Principle 3) and ethical approaches (Principle 6). While ideas such as transparent communication are noted by Smith, the DLIF principles explicitly call out ethical approaches. This reflects both the prevalent ethical frameworks of universities but also the strong practice-based framework of Design Thinking and appreciative inquiry approaches grounded in empathic understanding of user needs.

The DLIF principles reflect a practice-based, holistic conception of innovation as a process where co-creation and iteration are seen as both pragmatically effective and ethically enriching. When read against a synthesis of the existing literature, this work has led to a working definition of digital learning innovation as:

> Digital learning innovation iterates proposals that matter to collaboratively produce change in learning cultures at the intersection of people, pedagogies and technologies.

While it is acknowledged as argued above that there are many variations of the definition of digital learning innovation in the literature, this working definition encapsulates the ideal and practice of what those involved with driving innovation in digital learning at one university perceive it to be.

Conclusions, limitations and recommendations for practice

The importance of nurturing innovation cultures and practices in higher education has been emphasised during the recent pandemic which saw widespread unexpected transition to digital learning and teaching. As pressures continue to mount for universities through financial, geopolitical and environmental constraints, creative innovation will be essential to digital education futures, particularly in reconnecting the University with students and teachers. This paper described a case study where a bottom-up co-design process was undertaken to directly involve the change agents of digital learning innovation in the conceptualisation of principles for, and a definition of, digital learning innovation. This paper therefore offers inspiration for those universities willing to move beyond symbolic innovation, in highlighting that the co-design process itself can be just as powerful as the outcome of innovation. While the DLIF offers six synthesised principles as a way forward that might be applicable to other contexts, it is acknowledged that its application needs to be carefully considered to bring about productive innovation unique to those contexts. Additionally, while the stakeholder cohort in this case study was limited to staff stakeholders, due to the focus on internal staff working processes and not the outcomes of innovation, the role of students, both as impacted stakeholders of, and potential partners in, innovation, must be considered. Our analysis of the literature demonstrates that although there are general principles for successful innovation that appear to hold true across a range of contexts, a reflective, co-creation process that draws on the perspectives of stakeholders across the university can be used to contextualise those principles to individual institutions.

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reconnect
Reconnecting relationships through technology

Life after COVID-19: same-same or different relationships?

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Relationships with our students and each other have changed over the past two years with the necessary changes to teaching and learning enforced by the COVID-19 pandemic. A group of academics from business schools in Australia and New Zealand have been reviewing the impact of the changes to teaching and learning implemented over the past two years and consider what has worked, what has not, what changes can be built on and what practices need to be reconsidered. This paper concludes with a set of recommendations on how business academics can reconnect with each other and their students and how business schools can support this reconnection.

Keywords: online teaching, online learning, online assessments, educational technology

Background

In May 2020 the authors of this paper commenced a collaborative autoethnography (Hernandez et al., 2017) to reflexively make sense of the impact that COVID-19 and the pivot to online learning was taking on their academic lives as well as the experiences of their students. The discussions identified numerous similarities being experienced across the different business schools as well as some very significant differences in the way that their schools were responding to the COVID-19 pandemic. What was key to the discussion was that business faculties around Australia and New Zealand were struggling, as were so many others, with how to effectively use technology to continue the relationships established with students as well as how to support new university students, particularly those moving from secondary schooling where considerable face to face (f2f) support had been the norm.

The resulting papers published (Barker et al., 2020, 2021) concentrated on the impact of COVID-19 and the rapid movement to emergency remote teaching on assessment practices. It focused on how business faculties were responding to the change from invigilated assessment (for example face to face exams) to fully online remote assessment.

This paper reviews the changes to our teaching practices over the past two years, what has been retained from the COVID-19 response, what has had to change and what the future holds for business academics and their relationships with their students and each other. We do this through the lens of our changing relationships with various stakeholders and through technology. Despite experiencing differing lockdown conditions, universities mostly remained online throughout the various waves of COVID-19 to provide continuity and certainty for staff and students.

Method

In 2020, seven academics and academic developers from five Australian and New Zealand business schools commenced a collaborative autoethnography to reflexively make sense of, and inform, the rapid adoption of technology enhanced learning and teaching in our respective schools. We shared assessment related insights from this study in 2020, 2021 (Barker et al., 2020, 2021). Since then, five of us continued this collaborative autoethnographic journey through the period of disruption, where two of our roles became the victims of COVID-related organisational restructuring and voluntary and forced redundancies.

Drawing upon the logic of purposeful sampling (Patton, 2012), we believe our insights are transferable to Australian and New Zealand business schools more broadly. Insights reported here are based on observations made at three large business schools, one from New Zealand and two located in different Australian states. Across the three schools, students were enrolled in programs that ranged from face to face (f2f) on campus, f2f online and solely online asynchronous modes of delivery. This paper is our co-constructed account of how technology is mediating relationships between students, with students, amongst staff and with the wider community within our respective schools from the partial and perspectival views (Ely et al., 1997) as business educators. By sharing on-the-ground realities based on our collective experiences, this paper will assist business educators in making informed decisions about leveraging the power of technology for reconnecting and strengthening relationships with students, staff, and the wider community.

Our collective and varied experiences

Relationships with educational technology

In Table 1 below, we build on our earlier discussion (Barker et al., 2020, 2021) by reviewing how our schools' relationships with these forms of technology have evolved in the new COVID normal.

Table 1: Relationships with varied technologies

	University of South Australia (UniSA)	**University of Auckland (UoA)**	**University of Technology Sydney (UTS)**
Proctoring	Being used extensively with UniSA Online programs but there has been a reticence to use it for on campus/external offerings. Used only where courses required proctoring for professional accreditation purposes.	Began using proctoring to meet the requirements of accounting and other professional accrediting bodies.	Proctoring through AI continues, especially to meet professional accreditation requirements. There has also been increased usage because of concerns about academic integrity in take home exams.
Learning management system	Increased focus on using more functionality of LMS and improving academic implementation of interactive tools.	Increased focus on using more functionality of LMS and integration with new services for video recording and streaming, interactive tool H5P and improving academic understanding of LMS features.	A transition between LMS of Blackboard and Canvas occurred during the pandemic (planned prior). H5P was introduced to increase interactive learning elements.
Oral/video communication and presentation tool	Increased use of student video presentations and oral exams. Both live and pre-recorded videos are used for individual and team presentations. External students are increasingly using software such as Zoom/Google Meet to undertake teamwork.	Video presentations, both pre-recorded and live, have been integrated across courses, they are also being used increasingly as they provide opportunities for domestic and offshore students to work together.	Video presentations, both pre-recorded and live, have continued to be popular. The requirement for students to be visible in the videos and to include transcripts was added for academic integrity purposes.
Collaboration platforms	Increased usage of OneDrive for student collaboration (Microsoft Teams is not available for student usage).	Increased usage of Google tools and some courses did trial Microsoft Teams for students.	Increased usage of Microsoft Teams for within-class collaboration activities. Decreased usage of Google Drive tools due to inaccessibility from China.
Video interview software	The use of video interview software (e.g., VidCruiter) has increased to assist with oral exams.	Not used at all.	Vieple was used prior to COVID19 for developing student employability skills, some increased usage as an oral exam.

Table 1 (continued): Relationships with varied technologies

	University of South Australia (UniSA)	**University of Auckland (UoA)**	**University of Technology Sydney (UTS)**
Simulations and industry partnered projects	Simulations used in very few courses, but where used, students engage to high degree. Increased use of online industry partnered projects.	Continued use of simulations. Increased use of online industry partnered projects.	Commercial simulations limited in use due to budget constraints. Increased use of online industry partnered projects.
Standard professional software tools	All institutions have in place Microsoft arrangements that allow students to access Word, Excel, PowerPoint etc. via a web browser and download the software onto their own personal computer, whereas in the past, students were often expected to purchase these tools because institutions provided on-campus access free of charge.		

One important shift in terms of the relationship with technology is in major assessments, especially exams. This is because of the rise of online proctoring within Australian institutions (Selwyn et al., 2021). A common issue is the need to educate all students about how to use new technologies such as online proctoring, and the difficulties of reaching all students. The availability of recorded classes leads to many students choosing not to attend (for a variety of reasons including work, caring and recreation) but then failing to catch up by going through the recordings carefully (Yeung et al., 2016). There is also increased student anxiety in relation to using such technologies (Woldeab & Brothen, 2019, 2021) – sometimes because they have failed to take up opportunities to learn about how to use the technology, other times because the technology has failed, or because the students' equipment is incompatible.

Staff have also developed a love-hate relationship with online proctoring technology. Online exams provide many affordances such as increased authenticity by allowing students to use workplace tools like Excel and Tableau along with faster marking, less manual administration, and fewer mistakes when it comes to preparing final grades. However, the increase in issues experienced by students when using such software has resulted in many academics acting as exam and IT help lines in the lead up and during the exam. With more technological issues such as internet dropouts or computer issues, there is increased, even though unrewarded and unrecognised, administrative workload related to special considerations and the need to grant students a replacement exam. As online proctoring systems use artificial intelligence to flag potential instances of misconduct, staff need to be trained for making informed decisions by reviewing proctoring recordings to determine what is and is not cheating. This becomes challenging in the absence of any fool-proof strategies as noted by several experts (Dawson, 2020). Whereas in pre-pandemic times, the rules were fairly clear – with online proctoring – academics are being asked to make judgement calls about whether behaviour in a recording does or does not constitute misconduct. This has created greater anxiety around staff workload and the potential consequences of these decisions on student mental health and academic progression.

Impact on student peer and educator relationships

In response to the COVID-19 pandemic, universities globally have had to make decisions on how to conduct their academic year in an unprecedented environment. Universities in Australia and New Zealand were no different and implemented a variety of approaches depending on government policies, local attitudes and specific COVID-19 responses as countries began opening their borders and campuses. With requirements to work-from-home to deliver online teaching reducing, students and staff are being urged or encouraged to return to university campus while introducing a range of mitigation strategies to protect them and reduce the spread of COVID-19. These strategies include mandated face-coverings, limiting the size of class numbers, COVID-19 Vaccine Pass, reduced dormitory occupancy, and accommodations for isolating and quarantining students. In the following section we will examine the impact of COVID-19 on two key relationships during the transition to the 'new normal' and the likely implications. Firstly, student to student relationships and secondly, student to educator relationships. At the nexus of these two relationships, we will examine the benefits and challenges technology has presented for both students and staff.

The creation of online study habits

Gardner et al., (2012) suggested that it takes on an average 66 days for a new habit to form and become automatic. As students and educators across the globe had their learning environment rapidly moved online, this had a substantial impact on their daily routines and habits. For both educators and students, merging the home and workspaces into one became the norm and saw the formation of new behaviours, where work and home became comingled and intertwined.

For students, learning is largely comprised of attending online classes and completing assignments in isolation. Across multiple media platforms, many students have commented on the challenges associated with cultivating and growing relationships and friendships in online learning mode. Students found it near impossible to engage with new people, talk before class with classmates or even get to know educators when they only saw them virtually for a couple of hours during the week. Benito et al., (2021) refer to a study undertaken in the US in 2015 with over 300,000 participants across 541 institutions. Even prior to COVID-19, when interactions outside the virtual classroom could occur more readily, students engaging in online courses were "less likely to engage in other essential aspects of the learning process, such as collaborative learning, student- faculty interactions and discussions" (Benito et al., 2021, p. 53). Studying online for some students created a sense of digital isolation and potentially impacted on their academic performance. Fleischmann (2020) noted from participants comments that "time management and distractions working from home diminished motivation to attend a virtual class and/or watch pre-recorded lectures online; while social isolation issues included students missing the give-and-take of working with their peers in face-to-face collaboration" (p. 7). Many students noted a lack of community and friendship in the online space, even when educators tried to provide structure and keep students in teams to encourage familiarity and interaction. Experience showed that some students did not want to turn on their cameras due to privacy or personal issues, while others could not readily interact online based on their personal situation (e.g., sharing study space in a dorm or hall of residence, or at home or not having the necessary technology or internet access to engage). While educators attempted to mitigate these issues. Through a variety of initiatives and technologies, it continued to hinder student engagement and learning.

Creating community in online learning

One such initiative was the introduction of a virtual study hall that was created to support a new cohort of students with their transition, belongingness, and the development of their academic literacies in the first semester of their first year at university. The initiative sought to improve outcomes in several areas from the transition to university, first-year experience, social inclusion, growing learner confidence and agency space. It focused on leveraging peer support techniques and supporting the co-construction of knowledge to overcome the isolation and distractions students faced when studying online. The virtual study space was staffed by nearly 40 senior student leaders affectionally known as 'Study Buddies', who were there to connect and motivate students to thrive. Students were encouraged to join this space, the study buddies welcomed them and helped answer any study questions they had. The online study hall spaces can be used for individual, group, and general study space.

Other initiatives were set up to support students as they navigated higher education for the first time. Academics logged online earlier to check in with students, some played music to set a positive or fun mood and others remained online after class to answer any questions that had arisen. Some other academics opted to make available pre-recorded lectures and offer live Q&A sessions where students could ask questions and work through problems, in lieu of a conventional lecture format. Another strategy was to integrate into teaching other technology, such as Padlet to provide students with the opportunity to ask questions ahead of class anonymously. This allowed the educator to address student questions at the start of the session rather than waiting for student questions to be raised during class. Further technological initiatives saw the creation of digital modules that provided students an opportunity to virtually see their university campus or work through modules on resilience for wellbeing. Some staff made time in their virtual office hours to foster wellbeing by doing digital wellness checks on students and teams. One undergraduate University of Auckland course integrated Pastoral Care sessions with teams that were based internationally to concurrently adapt the course based on student feedback.

A greater emphasis on care

Care in higher education is not a new concept. Scholars like Noddings have been writing about care for over two decades (1995, 2013). Nevertheless, the pandemic and isolation of students brought to light the importance of care in higher education (Bali, 2020). Care was easier to provide to students who attend classes synchronously through simple activities, such as celebrating good news or sharing grief and concern. However, reaching students who could not attend live classes was more difficult – a lack of community in large classes meant that discussion forums weren't particularly effective in providing support. Social media was used effectively in some instances to provide care by humanising the learning experience. By giving students greater insights into who their teachers are as human beings, teachers tried to build relationships with students, create community and foster a feeling of belonging. Other tools, such as personalised emails based on learning analytics data are also increasingly being used to demonstrate care and gently nudge students towards greater engagement

Return to campus: the benefits and challenges for both staff and students
Studying on campus is viewed as providing students with a clearer distinction between study and home life, rather than the nebulous blurred study/home life that students have lived for the past 2 years. For some students, attending campus enabled them to have a dedicated and supportive learning space to study, concentrate and complete assignments. Face-to-face environments also provide opportunities for organic discussions to emerge and evolve, where students can bounce ideas off their peers who share their scholarly interests and develop a deeper understanding of their studies. For many students who have entered tertiary study over the past two years, the return to campus is not actually a return – it is their first opportunity to be on campus and engage with their peers' face to face. A potential challenge for this cohort of students is a lack of social awareness and norming that they might encounter as a result of missed social cues from studying online and limited social interactions. This sometimes led to social anxiety and stress.

Further complicating the decision making around on-campus study, many students have had their work-life balances disrupted. While job losses or absences due to sickness as a result of the COVID-19 outbreak are the most obvious, other students were required to care for younger children (either their own or siblings) due to childcare and school closures, restricting their ability to work, or conversely required to increase their working hours, often in lowly paid jobs, to contribute more to the household finances). These students may find it difficult to return to study, if they cannot afford to reduce the working hours and support, they provide their families, or if they have had to erode their educational funds through times of hardship (Kernan, 2019). Compounding these financial challenges, many economies have been strained during the pandemic with consequent impacts on the economy as the world adapts to COVID-19. In New Zealand, inflation has increased to the highest level in 30 years (StatsNZ, 2022), increasing not only the general cost of living, but also driving up commuting costs for many considering on-campus education.

Just as students face challenges returning to campus, so do staff. Many universities offered voluntary redundancies or placed staff on furlough, to reduce operational costs, and many staff used these opportunities to re-evaluate their careers. Now, emerging from the worst of the COVID-19 pandemic, society is experiencing ‘the great resignation’ in conjunction with a strong labour market and increasing demands for more flexible work practices, compounding the reduction in staff continuing within universities and conflicting with the drive to return to campus. This has resulted in universities filling permanent positions with staff who had previously been on fixed term contracts and relying on increasingly junior staff to fill roles. While this rapid development can be seen to be beneficial to these staff, it is also accompanied by an increased demand on more senior staff to mentor and develop these staff while still maintaining continuity and delivering the educational standard expected by students.

Whilst the shift to online learning provided opportunities for greater flexibility and reduced travel costs for both staff and students, for many students the rapid transition to online learning due to COVID-19 raised several issues and disproportionately affected some students with “rich over poor, urban over rural, high-performing over low performing, student in highly educated families over students from less educated families” (Agormedah et al., 2020, p. 196). Like many other researchers, we also observed the negative impact of the digital divide on some students (Camara, 2020; Langenfield 2020; Wiley & Buckendahl, 2020). Even though all universities are trying to equitably support students from varied socio-economic and demographic backgrounds, by providing technology and other assistance, there is “no one size fits all approach to returning to campus” (Deliotte, 2021, p. 1).

Staff on campus vs work from home (WFH)
As a result of COVID-19, the experience of academics working from home (WFH) has varied (Parham & Rauf, 2020) The positives of the WFH are that it provides the flexibility of avoiding the daily commute, drastically reduced the possibility of infection and enabled staff to carry out work from their comfort zone. However, this was not the case for all academics, work arrangements impacted on academic staff’s work-life boundaries, work pressure and work life conflict. Added to this mix was the increased workload from both learning and adapting to online teaching.

The shift back to campus brought with it much trepidation and excitement. Some staff saw it as an opportunity to draw on the energy of students on campus. Others were concerned about how to reinforce mandatory mask wearing in large lecture theatres. A further fear for many staff with childcare and eldercare responsibilities was that they would bring the virus home (especially for staff with children too young to be vaccinated). Staff also had to navigate mandated back to university teaching whilst also having to create videos for students who were isolated at home. As can be seen in Table 2, our schools used a variety of strategies to encourage students and staff to return to campus. While two universities the third university refused to mandate a return and instead encouraged local leadership to work with staff to encourage some return to campus. However, some work from home is now available at all institutions, reflecting the global shift in perceptions around work and where work must be conducted.

Impact on staff relationships

For those with management responsibilities within schools or departments, the direct management and oversight required increased with the pandemic due to negotiations around teaching loads/allocations, adjustments to research output requirements and providing compassionate care and understanding to our colleagues. While we have closer relationships with some of our staff and know more about them and their lives than pre-pandemic, others have chosen to stay more isolated – creating an increase in misunderstandings over email communications and unrealistic expectations. Many institutions have corporate-facilitated Employee Assistance Programs (EAP) to support mental health, however many staff have expressed concerns in using these as accessing an EAP is included on that staff member’s record.

University management are keen to return students to campus, however school and department heads manage concerns around risk, anxiety, and the demand by students for continued online classes. Contingency plans for teaching teams, designated backup teachers and the emergency phone tree are tools that are now part of the everyday norm in academic management.

Lessons learned and moving forward

Our shared experiences have led to the identification of a series of initiatives that are being used to rebuild our relationships in this ‘new’ normal.

Reconnecting people with educational technology

A deeper understanding of affordances of educational technology has become imperative for every academic in higher education, not just those focused on innovation; technology facilitates more learning experiences for students than in the past and is becoming an integral aspect of any higher education learning environment. We recommend creating more accessible spaces for sharing learnings about educational technology amongst peers, while also incentivising staff participation. Institutional funding for attendance at online conferences around teaching and learning would increase the exposure of the everyday academic to educational technology and good teaching and learning pedagogy. We strongly recommend institutions consider institutional memberships to professional associations focused on the uplift of teaching and learning with technology, including ASCILITE. Institutional licences for educational collaborative tools for polling (e.g., Mentimeter) and sharing (e.g., Padlet) have the potential to drive increased the adoption by staff.

Reconnecting students with each other and educators

Students are often experienced at interacting in digital communities in their social lives through a multitude of social media platforms. A challenge faced by higher education is what space(s) to use to create a digital learning community of students, educators and even alumni. Institutional digital community spaces like LMS discussion forums, virtual study halls, Microsoft Teams sites do not seem to have large scale and saturated interactions – with only a few keen students interacting. However, moving to non-institutional spaces like Facebook and WeChat can create inequities (for example, students in China are unable to access Facebook and many students studying in Australia are distrustful of using WeChat due to privacy concerns) and privacy concerns when it comes to private businesses selling data from social media usage. This may be one area where student-driven approaches to creating community are best – and that academics may choose to go to those student-led spaces to engage. One example is the student-run Facebook page UTS Confessions – a place where students can submit anonymous questions and receive advice from the broader community. It has become a place where students, alumni, full time staff (both professional and academic) and casual staff work informally to support the student experience by answering questions – personal, administrative and academic.

Table 2: Summary of Return to Campus Strategies

University	What our university did with the move back to campus: Rationale and steps taken
UTS	Clear messaging to staff and students that UTS undergraduate programs are designed to be on-campus experiences. However, there is more flexibility in Masters programs with an increase in programs designed for online-only delivery, mixed delivery (mostly online and then blocks of on campus) and some programs designated on-campus only. Have shifted to guidelines around timetabling of on-campus vs online classes for undergraduate with a desired 75-85% of classes on campus in undergraduate programs. Online classes are often kept only for students who are offshore or show medical evidence for studying remotely. Created pathways in Masters programs for students who want to study part time – with an on-campus path and online path. For students wanting to study full time – they must accept a blended approach.
UniSA	UniSA has on-campus (face to face) and external (online) offerings for most courses. Timetabled "face to face" lectures continue to be offered **online only** and academic staff are being encouraged to pre-record short concept videos and use the "lecture" time for more interactive and engaging learning activities with the students. All small class teaching (tutorials, seminars, and workshops) has returned to campus. With the return to campus additional professional development workshops and teaching and learning symposia are being held on campus as a method of reconnecting staff and building relationships through shared experiences.
UoA	UoA had very clear messaging sent to all staff and students around the University wanting to all teaching and learning activities, with the exception of most tests and exams, will be in-person and on-campus as timetabled, subject to any changes in Government requirements that might affect our operations, and with limited exceptions. Students were expected to attend on-campus unless aspects of their course are delivered in an online, blended mode. These settings will be subject to ongoing review. This decision reflects UoA's preference to provide high value in-person teaching and learning to our students, including the provision of course delivery where a blended mode is more suitable, while balancing this against the health, safety and well-being of our students and staff. Already implemented health precautions used in the past, such as expectations for mask wearing and enhanced ventilation in our buildings, will remain in place. Leaders were encouraged to implement flexible working arrangements with their teams as appropriate. Pathways in Masters programs for students who want to study had a hybrid approach. Some degrees were offered as purely an online delivery, and this was communicated to students from the outset of enrolment.

Reconnecting staff with each other

As staff return to campus amidst this period of disruption and staff mobility, many staff find themselves in a situation where some have not even met in a f2f situation due to new staff commencing at the university after lockdown was enforced. The connections with these staff have been fully online and as such the process of connecting (and reconnecting with other colleagues) has been slow whilst we adjust to being back on campus. The implementation of knowledge sharing opportunities with staff on campus, such as teaching and learning symposia or showcases, will allow time for staff to reconnect and learn from each other, thus building a stronger academic workforce. In addition to on campus events, the relationships between academic staff can be supported with technology through online training – at our institutions, we observed a greater number of staff attending workshops online (compared to on campus) because of increased flexibility. Staff are also more likely to reach out for teaching and learning support with peers by using video calls in systems such as Teams and the easy ability to see whether a colleague is available from their status notification. People are also proactively managing their time by using status notifications and blocking time in their diary to minimise work distractions.

Conclusion

The changes that have taken place in the last two years have highlighted the inequities alongside the opportunities that exist in higher education, particularly around how technology can be used to enhance the student and educator experience. When designing learning environments, degrees, programs, and courses – we must continue to focus on social aspects of learning while also considering accessibility and equity as well as the impact on learning outcomes and the student experience. Otherwise, a tertiary education may regress to an experience only for those who can easily afford the technology required to study.

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reconnect
Reconnecting relationships through technology

Same graph, different data: A usability study of a student-facing dashboard based on self-regulated learning theory

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Student-facing learning analytics dashboards have the potential to reconnect students with their purpose for learning, reminding them of their goals and promoting reflection about their learning journey. However, far less is known about the specifics of the relationship between different types of visualisations and data presented in dashboards and their impact on students' motivation. In this study, we used a Human-Centred Design method across three iterations to (1) understand how students prioritise similar visualisations when presenting different data (2) examine how they interact with these, and (3) propose a dashboard design that would accommodate students' different motivational needs. In the first iteration, 26 participants ranked their preferred visualisations using paper prototypes; in the second iteration, a digital wireframe was created based on the results from the first iteration to conduct user tests with two participants; and in the third iteration, a high-fidelity prototype was created to reflect findings from the previous iterations. Overall, findings showed that students mostly valued setting goals and monitoring their progress from a multiple goals approach, and were reluctant about comparing their performance with peers due to concerns related to promoting unproductive competition amongst peers and data privacy. Implications for educators and learning designers are discussed.

Keywords: dashboard, motivation, visualisation, self-regulated learning.

Introduction

Student-facing learning analytics dashboards have become popular in educational technology over the last decade. Dashboards have the potential to reconnect students with their purpose for learning, reminding them of their goals and promoting reflection about their learning journey. That is, assisting them to become active agents of their learning journey, or self-regulated learners. However, there are still many unknowns on the use of such dashboards to promote learning, particularly when referring to their impact on student motivation. Previous research had mixed findings; while some aspects of dashboards were found to motivate students, others were detrimental to their motivation (e.g., Corrin & de Barba, 2015). In this study, we iteratively examined students' perceptions of varied dashboard visualisations and widgets in relation to their motivation to learn, based on self-regulated learning theory.

Related work

Self-regulated learners are strategic about their approach to learning, planning, monitoring and adapting the chosen learning strategies (Zimmerman, 2008). The COPES model (Winne, 2018; Winne & Hadwin, 1998) provides a useful framework to understand how students regulate their learning. This model proposes four phases: (1) task understanding, (2) goal setting and planning actions, (3) execution of their plans to achieve their goals, and (4) adaption of their strategies when progress to achieve their goals is hindered. Students' success to regulate their learning lies on their ability to continuously control and monitor these phases during learning. Evaluations comparing their work against standards help students to check their progress towards their goals. Goals, therefore, guide students' actions and serve as a reference point for progress evaluation.

When setting goals, students set the standards they are hoping to achieve during their learning journey. These standards can be based in different reference points (Valle et al., 2003). Researchers refers to as mastery or learning goal orientation when the reference point used is a self-reference standard (i.e., increasing their own competence). For example, students aiming to learn all they can about a certain topic. On the other hand, performance goal orientation is when students' reference point for standards are other people, as they focus on demonstrating their competence to others. For example, students aiming to be the top student of their class. Goal orientation impact how students monitor and regulate their cognition, affect and behaviour during learning. Current research supports that students pursuing multiple goals are most successful (Valle et al., 2003). However, continuously controlling and monitoring their learning is an effortful enterprise. Students often lack the motivation and skills to adequately activate these regulatory skills (Zimmerman, 2008; Winne & Hadwin, 2013).

Dashboards have the potential to help students to regulate their learning, as they provide objective data related to their achievement and progress in relation to their chosen standards (Molenaar et al., 2019). Dashboards apply data science methods to process and analyse their data and present these back to them in a meaningful way (Matcha et al., 2019). Doing so, student-facing learning analytics dashboards can be considered intervention tools aiming to either instruct, support or motivate students (Pokhrel & Awasthi, 2021). Instructional interventions provide students guidance on what to do next, supportive interventions encourage them to continue their current actions, and motivational interventions have the purpose to bring their attention back to their learning experience. In this study, we aimed to examine how commonly used features in dashboards could be tailored to motivate students. This means that the focus of our dashboard was not so much to use the dashboard to guide students on what to do next, but bring their attention back to the course and provide insights into their current efforts.

Effort regulation in self-regulated learning theory is referred to students' ability to commit to achieving their goals. This could be translated to the amount of time a student dedicated to their studies, for example (de Barba et al., 2020). A useful dashboard would then present the 'right' data combined with the 'right' visualisation technique that best supports the users to evaluate their progress towards their goals. Deciding which data and visualisations to include in a dashboard is a big challenge for educators and designers. Defining the 'right' data includes dealing with data limitations related to what data is currently being recorded and can be retrieved, while defining the 'right' visualisation requires knowledge about how users will interpret the data. In the case of learning analytics dashboards, this involves knowledge about how the information being displayed will impact their learning journey. For example, previous research has found that visualisations displaying the class average as a reference point could be detrimental to students' motivation (Corrin & de Barba, 2015).

Commonly used visualisations and widgets (i.e., a simple stand-alone component) in dashboards allow students to set goals and monitor their progress, receive rewards and compare themselves to peers using leaderboards (e.g., Sahin & Ifenthaler, 2021). Goal setting and progress monitoring allow students to input their goals and monitor their progress throughout the course, either updating them themselves, or having a system updating them automatically. Virtual rewards and incentives are widely used in online learning platforms such as ClassDojo, where provides virtual points and badges to gamify the learning experience and engage online learners (Williamson, 2017). Leaderboards, on the other hand, are seen as a gamification strategy that when used in education can enhance learners' motivation through peer learning (e.g., Park & Kim, 2021). Platforms like Kahoot and Kaggle are widely adopted by online instructors, as such tools can help recreate a classroom atmosphere that allows isolated learners to visualise the participation and performance of other students to motivate their learning, improve the online study experience, and engagement (Gillett-Swan, 2017). In this paper, we investigated how students perceived these commonly used visualisations and widgets in dashboards when adapted to display data related to different goal orientations (learning and performance) and their commitment to their study so far (effort regulation).

The current study

In this study, our aim was to better understand students' perceptions and preferences of commonly used dashboard visualisations and widgets populated with different data, each representing a motivational construct. The following research questions were investigated:

RQ1. How do students prioritise similar visualisations and widgets when presented with different motivational data (i.e., performance goal orientation, learning goal orientation and effort regulation)?

RQ2. What are students' perceptions when interacting with similar visualisations and widgets presented with different motivational data (i.e., performance goal orientation, learning goal orientation and effort regulation)?

RQ3. How can a student-facing learning analytics dashboard design accommodate students' different motivational needs?

Method

This study followed a Human-Centred Design approach, which includes the design thinking process of empathize, define, ideate, prototype, and test in iterative cycles (Giacomin, 2014). This approach allows rapid prototyping and immediate evaluation to understand users' decision-making process and expectations under different goal-oriented visualisation scenarios. As design thinking is a non-linear iterative process, we organised this study in three different iterations detailed below. All iterations were conducted online due to COVID-19 restrictions at the time of data collection.

First Iteration: Paper prototype and survey

In the first iteration, 26 participants answered a survey on Qualtrics to evaluate a series of widgets created based on paper prototypes. Participants were students from the University of Melbourne recruited via emails and announcements on the Canvas learning management system (LMS) and provided informed consent (Ethics application number 20833). The online survey, using Qualtrics, displayed and prompted participants with a combination of card sorting activities, multiple choice questions, and an open-end question, all focused on setting, visualising and managing learning goals. The card sorting activity was based on the MoSCoW method (Hudaib et al., 2018) to help us understanding widgets prioritisation. Students were prompted with different widgets for Canvas and required to categorise them as 'Must Have', 'Nice to Have', and 'No need', with multiple choice questions following up on concerns related to widgets' features. Additionally, we asked them about their willingness to share their own data with peers on the leaderboard.

Quantitative research data from the first iteration was analysed through Majority Voting Goal-Based (MVGB) technique for Requirement Prioritisation (Hudaib et al., 2018). In this analysis method, a weighted value is given to each category: 'Must have' has a weight of 3, 'Nice to have' has a weight of 1, 'No need' has a weight of -3: $W= \{3, 1, -3\}$, and the evaluation value is the partial sum of the count for each category $C= \{C1,C2,C3\} * W= \{3, 1, -3\}$ and divided by total count. This method helped us create an ordered list based on the most important features students identified to guide their learning in the Canvas dashboards' paper prototypes.

The design of the paper prototype focused on the following widgets for students: goal setting and progress monitoring, receiving rewards on achievement milestone, and comparing themselves to peers using leaderboards. Each widget was created using data to promote a learning goal orientation, a performance goal orientation or effort regulation (for simplicity, referred to as effort goal in the visualisations), as presented in Figure 1 and described below:

- **Goal setting and progress monitoring (pie charts):** The performance goal is set to be the result students want to attain in a subject, the learning goals are the overall learning tasks and modules to be accomplished in a subject, and the effort goal is the time they aim to spend on studying the subject every day (Figure 1A).
- **Goal setting and progress monitoring (vertical bar charts):** Our performance bar chart was represented in a one hundred-point system, following strategies and scales adopted by the university. The learning progress and daily effort widgets in Figure 1B show students accomplished tasks and time spent on them every day.
- **Goal setting and progress monitoring (calendars):** Performance goals in our calendar widget (Figure 1C) would be automatically prefilled from events added to Canvas. The calendar widget was designed to also allow students to add personal goals to it. Moreover, students would be able to set the number of hours or effort estimation they want to spend on the goals they add to the calendar.
- **Reward (badges):** Our proposed 'performance' reward widget (Figure 1D) appears when students' performance surpasses their goals or when they reach the top 10% of the class. The 'learning goals' reward pops up when students finish all the learning tasks in a module or achieve a certain learning milestone. The 'effort-reward' appears when students achieved the number of hours they targeted to spend on their studies.
- **Leaderboard (horizontal bar charts):** This widget (Figure 1E) enables students to compare their goals and learning progresses with peers. The issue of privacy was considered during this initial design, and gamification of the leader board is proposed to help solve these concerns, such as showing data anonymously or using virtual points (Park & Kim, 2021) instead of actual performance data, and showing the top performer's data only.

Figure 1. Paper prototype of the widgets used in the first iteration survey

Second iteration: Digital wireframing and user testing

Building from analyses performed during first iteration, iteration two involved the design and creation of a wireframe based on widgets prioritisation ranking results. The created wireframe for the second round of iteration aimed at allowing students to set personalised learning goals and to track achievement progress on dashboards (i.e., user flows). Qualitative research methods such as think aloud protocol and interviews were adopted in this iteration to validate and test the wireframe prototype.

We had two participants involved in this second iteration. Participant A was doing bachelor's degree full time and could dedicate more than 30 hours per week to studying. This participant was familiar with Canvas LMS and has been consistently maintaining good grades and high Weighted Average Mark (WAM). Participant B was doing master's degree while having a full-time job. This participant was doing the degree based on personal interest in the area. Opposite to Participant A, this participant doesn't have much time to finish all the learning tasks on time due to work, but believes it's been studying enough to pass or obtain reasonably good grades in the subjects. Both participants were pursuing degrees in Information Technology-related fields; however, they are at different life stages and have different learning and performance goals.

Each participant spent over 90 minutes performing pre-established tasks using the wireframe prototype. Participants were asked to perform three user flows (or tasks) in this iteration: (i) set a goal in the pie chart view and monitor achievement progress, (ii) set a goal in the calendar widget and monitor achievement progress and, (iii) share achievement on leader board. During the user test, participants were encouraged to articulate their thinking as they completed these tasks.

Third iteration: High-fidelity prototype

After our analyses and investigations performed in iterations one and two, we designed a high-fidelity prototype for Canvas LMS that can accommodate students with diversified backgrounds, supporting them setting and monitoring learning journeys. This iteration had no student participation, rather we present and justify the design of a dashboard built based on our findings to support and motivate students.

Results

Students' prioritisation of visualisations and data (RQ1)

Results from the survey in the first iteration helped us identifying and ordering learning features students reported to be more motivating to them in the Canvas dashboards' prototypes (Table 1). The priority ranks for the dashboards corresponded to evaluation values given by participants (1 = most important). Overall, an average considering the priority of each type of data showed that, overall, performance goal orientation data had the highest priority (M=7.3), followed by learning goal orientation (M=8.33) and effort regulation (M=12.83) data. However, a closer inspection when considering the type of widget and visualization showed a more nuanced scenario, where participants mixed and matched the types of data: performance, learning and effort orientations.

Table 1: Survey results of the paper prototype evaluation (n = 26)

Widget	Visualisation	Type of Data	Evaluation	Priority
Goal Setting and Progress Monitoring	Pie chart	Performance goal for quizzes, assignments and exams	1.539	4
		Learning goals to complete the learning tasks and modules	1.923	3
		Efforts to spend a certain amount of time on learning	0.462	11
	Bar chart	Show performance/score for quizzes and assignments	1.385	6
		Show study tasks completed each day	0.923	8
		Show number of hours spend on study each day	1.385	7
	Calendar	View the deadline of quizzes, assignments and exams on the calendar.	2.692	1
		View the learning tasks and module to be completed on the calendar	2.000	2
		View the number of hours spent on study on the calendar	-0.308	17
Rewards	Badge	Performance goal for quizzes, assignments and exams	1.462	5
		Learning goals to complete the learning tasks and modules	0.539	10
		Effort/time spend on learning	0.770	9
	Share	Performance goal for quizzes, assignments and exams	0.077	12
		Learning goals to complete the learning tasks and modules	0.077	13
		Effort/time spend on learning	-0.770	18
Leaderboard	Bar chart	Performance for quizzes, assignments and exams	-0.231	16
		Learning progress to complete the learning tasks and modules	0.000	14
		Effort/time spend on learning	-0.154	15

Using a calendar for setting and viewing performance and learning goals received the highest priority from students, followed by using a pie chart widget for the same purposes. Bar charts were the preferred way for students to visualise daily learning effort and achievement progress. Overall, visualisations using pie charts and calendar to present effort data were considered less important. The reward feature analysis for performance goals, as presented on Table 1, was highly ranked by students, while being rewarded by achieving learning tasks and effort goals was regarded as less important. Survey result also revealed that students were not likely to feel motivated by sharing their achievement with their peers, especially, sharing achievement about 'time spent on learning', which was regarded as 'No need' by 50% of the participants.

The leaderboard widget survey results showed that it was a debatable feature as it received negative evaluation value for both performance and effort goal (Table 1). Privacy and negative feelings related to a sense of competition were some of the main identified concerns students raised in the open-end questions when comparing performance and learning data with peers. When asked about their willingness to share their own data to populate the leaderboard, only 15.38% of all students wouldn't be willing to share any data with peers at no circumstance. Therefore, considering other responses (42.30% willing to share their data only if anonymously, 23% willing to share data if converted to virtual points) we decided to include a leaderboard identifying users using virtual points instead of their real data. Moreover, three students replied to the final open-ended question about further suggestions for the dashboard. Two of the students mentioned that peer pressure is a major concern for the goal-oriented dashboard, especially on the leaderboard feature.

Students' perceptions when interacting with the dashboard (RQ2)

In the second iteration, responding to the evaluation result, widgets with an evaluation score of > = 0 were included in the dashboard design. A calendar widget for learning and performance goals which was ranked at the top in the priority list was placed on the right side of the dashboard (Figure 2, visualization 1, 2). The pie chart widgets for learning and performance goals were considered the second priority, so were presented on the top left of the dashboard (Figure 2, visualization 3, 4). The widget to show the users' achievement was put on the top right of the dashboard (Figure 2, visualization 5), the achievement score was converted to gamified virtual points (performance score + learning progress*100) to reward students for achieving multiple goals. The bar chart widget for monitoring users' daily achievements with an average evaluation value of 1.385 was put below the pie chart with a filter dropdown to switch between the metrics (Figure 2, visualization 6, 7, 8). Finally, the pie chart for the effort goal (Figure 2, visualization 9) and the leaderboard widget (Figure 2, visualization 10) were placed at the bottom of the widget. The wireframes for the goal setting and rewarding were shown as pop-ups (Figure 2, visualization 1B, 4B, 5B).

The two participants were able to successfully complete the user tasks within the available time. The main usability issue encountered was related to the ambiguity of how the learning progress and daily learning effort were tracked in the LMS. Participant A, who has a better academic performance, was initially drawn to the leaderboard widget and mentioned: "Wow, competition?! (I) wasn't expect that" in a negative tone. On the other hand, Participant B perceived the leaderboard as a motivating feature. Regarding monitoring their performance, Participant A would prefer to use their own WAM rather than the class average showed in the dashboard, while participant B thought the average in the dashboard was a good performance measure. Both participants mentioned that although they used the LMS to access resources and submit assignments, most of their learning activities were not completed there.

Accommodating students' different motivational needs in a dashboard (RQ3)

The evaluation results from iterations one and two gave us an understanding of students' goal-setting behavior on the dashboard for the Canvas LMS, especially on how different types of goals are prioritized under different scenarios.

Across the study, students preferred data related to goal setting and progress monitoring using pie chart widgets and calendar widgets. Performance goals were more relevant when showing expected grades for the subject such as in a pie chart view. Learning goals were considered as part of a continuous process and students found more relevant to visualize that on bar charts or calendars. Setting personalised deadlines for learning tasks and assignments were also preferred by students to manage study time, instead of setting target study hours for each day. Meanwhile, achievement-oriented virtual rewards have been found to be an effective feature that can motivate students during online learning.

Based on these findings, we designed a high-fidelity prototype for Canvas LMS that can accommodate students' diversified goal orientations (Figure 3). Our new leaderboard widget was designed to use virtual points calculated from performance and learning progress data to minimize the negative influence of seeing peer's data and aimed at satisfying students' needs in wide demography. We also added a feature to let students share their achievement with customised profile images and nicknames. Students were also given the option to hide the leaderboard widget. Symbolic colour connotations were used to represent different types of goals in the final prototype, with the aim to help students classifying information on the dashboard. Learning goals were represented in purple, performance goals were represented in green and effort goals were represented in blue.

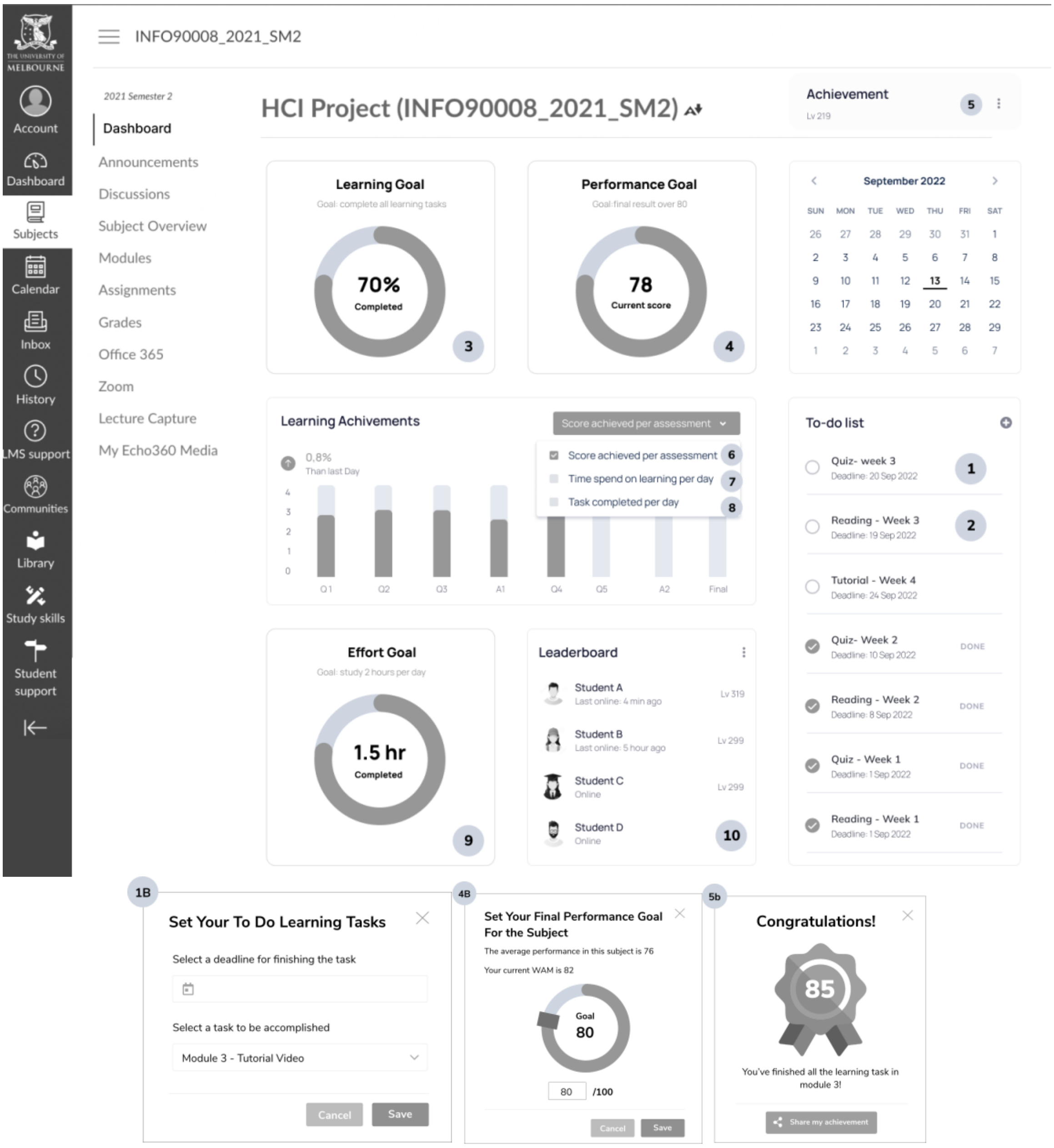

Figure 2. Wireframe created for user tests in the second iteration

Discussion and conclusion

The investigations conducted in this study clarified some of students' preferences for data and visualisation in relation to their motivation to learn. This is particularly important when examining the use of dashboards from a self-regulated learning theory perspective, which states that students' goals guide their actions during their learning journey. Although there are limitations in the current study related to small sample size, this paper provides important contribution related to students' perceptions and preferences related to how data visualisation in learning analytics dashboards may impact their motivation and reconnect them with their purpose for learning.

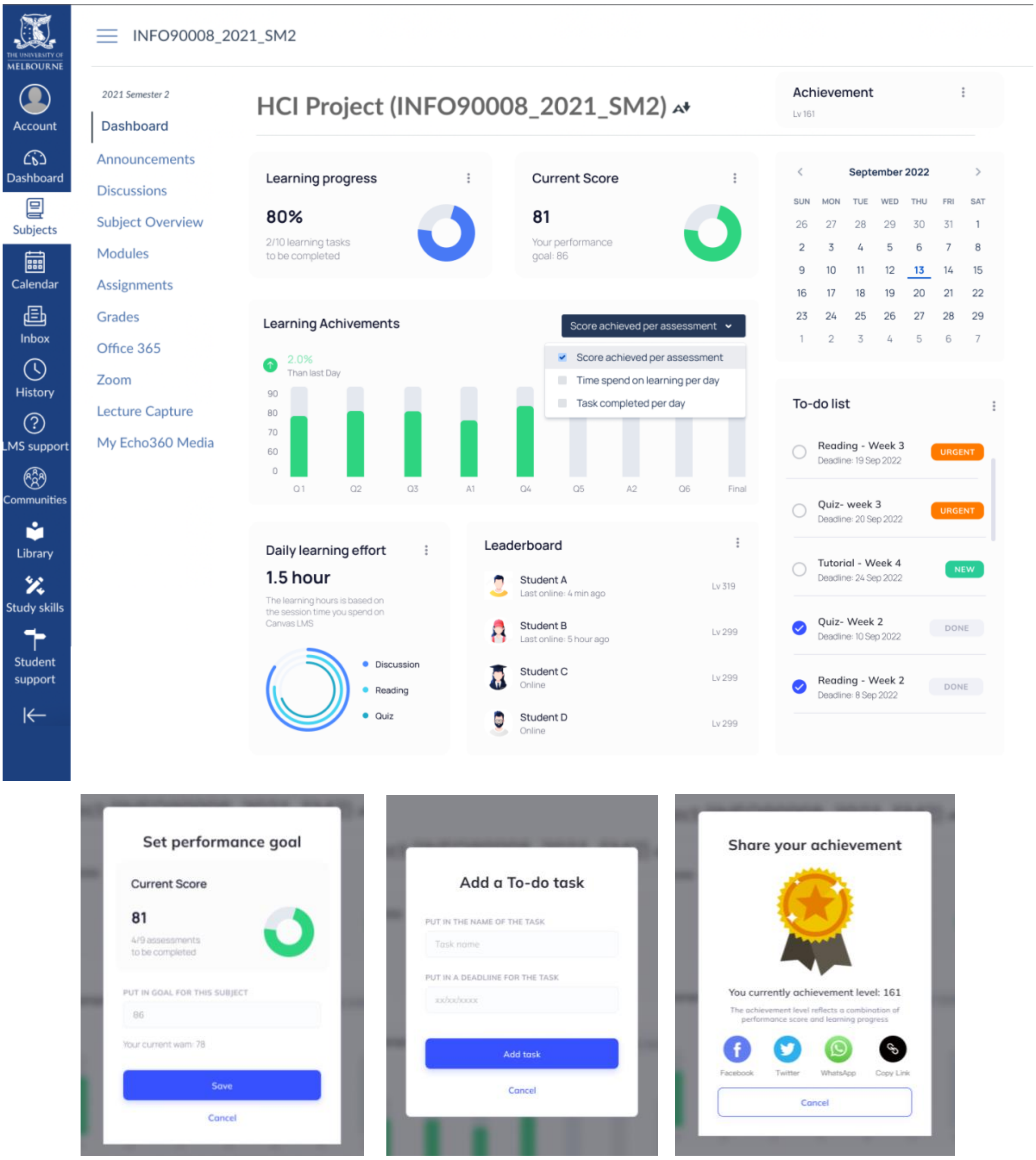

Figure 3. High fidelity prototype produced in the third iteration

Overall, performance goal orientation data had the highest priority, followed by learning goal orientation and effort regulation data (RQ1). A closer inspection, however, showed that participants preferred to mix and match the type of goals across different types of visualisations. This finding is aligned with educational research in goal orientation which has found that a multiple goals approach is the most beneficial for students (Valle et al., 2003). It is interesting to note that the visualisations with highest priorities – calendar and pie charts with performance and learning goals – helped students to identify what was coming next in their learning journey (calendar) and where they were at the moment (pie chart), in reference to both external deadlines and their own progress. Referring back to the COPES model (Winne, 2018; Winne & Hadwin, 1998), this suggests that students prioritise looking for information that will help them evaluate how they are progressing towards their goals. Only if they notice a problem in attaining their goals, data related to how they are exerting their effort becomes relevant. That is, if they are progressing well towards their goals, evaluating how they are applying learning strategies is secondary.

The cautionary tale of displaying performance data was replicated in our study when students interacted with the dashboard during user tests (RQ2). Participants reported concern in relation to the leaderboard inciting unproductive competition amongst peers. Potential negative outcomes from this could be, based on previous studies, distracting students from their own goals (Corrin & de Barba, 2015) or demotivate students if they see their performance far behind others (Sakulwichitsintu et al., 2015). This finding highlights the tension that designers face whenever displaying performance goal data comparing peers. Although these can be very useful to help students evaluate their progress, as mentioned in the previous paragraph, comparing themselves with their peers can be detrimental depending on their personal and contextual factors. Further research is necessary to investigate the specific of these personal and contextual factors so dashboards can provide personalised and adaptive data according to students' current situation.

Moreover, participants mentioned during user tests that even though they used the LMS to access resources and submit assignments, most of their learning activities were not completed there. This suggests that participants were aware of the incomplete nature of the data presented in this dashboard and took this information into consideration when interpreting the data presented. This finding complements current studies on the need to bring other data sources into the LMS (Kitto et al., 2015), or distribute student data out of the LMS (Oliveira et al., 2021), to provide more effective and comprehensive support to students.

Our suggested dashboard attempted to deal with three tensions found in the previous iterations of our study (RQ3). First, we prioritised learning and performance data related to goal setting and progress monitoring, using pie charts and calendar widgets, by placing them on a prime position in the dashboard (i.e., easy to find). Second, we decided to include the leaderboard, but with some modifications to lessen the negative impact on competition and peer pressure that this may bring to students. These included the creation of virtual points and of customised profiles to allow anonymity. Such modifications have been found to minimise the sense of inadequacy and maximise the student's experience of success and engagement (Park & Kim, 2021). Additionally, another modification to deal with the potential detrimental effect of a leaderboard, was the option for students to hide the leaderboard all together. Third, we included options for students to switch the type of data populating different graphs or widgets. The aim with this solution was to allow students to switch the data if needed. For example, after evaluating that they were failing to progress towards their goal, students could load effort data to examine their approach to learning (e.g., how frequently they were having study sessions). Ideally, an open learner model (i.e., a cumulative student model which students can access and make contributions; Bull & Kay, 2007) would inform dashboard design to promote personalisation and adaptation in real time. That is, depending on students' personal and contextual factors, certain graphs would appear, others would be hidden, and different types of data would populate them at different times.

For educators and designers involved in the development of dashboards, our findings can serve as initial guidelines to balance the type of goals represented in a dashboard. Our findings suggest that it may be useful to give emphasis to both learning and performance data to allow students to evaluate their progress towards their goal, followed by effort data, which may only be useful to them if there is a need to make adaptations to their approach to learning. In the case of presenting performance goal orientation data, additional care must be taken in regards to promoting unproductive competition amongst peers and to overstepping privacy concerns; perhaps involving students in the decisions involved in this process is a prudent first step. Future studies would benefit from applying elements of this dashboard to higher education learning settings with the aim to understand their impact on students' learning experience.

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reconnect
Reconnecting relationships through technology

The Impact of Cognitive Load on Students' Academic Writing: An Authorship Verification Investigation

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Automatic authorship verification is known to be a challenging machine learning task. In this paper, we examine the efficacy of an enhanced common n-gram profile-based approach to assist educational institutions to validate students' essays and assignments through their writing styles. We investigated the impact that essays with different cognitive load requirements have in students' writing styles, which may or may not impact authorship verification methods. A total of 46 undergraduate students completed six essays in a laboratory study. Although results showed small and mixed effects of the tasks differing in cognitive load on the different writing product metrics, students' essays and assignments texts contained features that remained stable across essays requiring different levels of cognitive load. These results suggest that our approach could be successfully used in authorship verification, potentially helping to address issues related to academic integrity in higher education settings.

Keywords: academic integrity, authorship verification, writing analytics, learning analytics, stylometry, cognitive load.

Introduction

Academic integrity is a growing issue facing higher education institutions, with increasing numbers of reported academic fraud worldwide. This issue is related, at least to some extent, to the quick growth of universities and higher education systems (Macfarlane et al., 2014). Although it is unclear what is the best course of action on how to deal with academic integrity, universities have high stakes on guaranteeing that their graduates will uphold their institutions' reputation once in the workforce (Awdry et al., 2021). Automated authorship verification is a technology that universities could use to monitor students' academic integrity at scale.

Authorship verification (AV) in higher education has potential to be applied to essays, a widely used form of assessment. This technology relies on applying algorithms to detect whether students are the author of submitted essays, based on their writing styles (i.e., stylometry). This is a useful technology for contract cheating, which is when students outsource essay writing to either companies ("essay mills") or friends and family. However, there are some challenges in the implementation of stylometry in higher education. Even though previous research has found students' writing style varied across essay tasks with different levels of difficulty (i.e., cognitive load) (Oliveira et al., 2020), it is unknown whether these variations would impact authorship verification. Cognitive load reflects the notion that a student's ability to perform a task depends on the cognitive demands of the task, and the student's working memory capacity available for task processing (Sweller, 1988). If the cognitive demands required for a given task exceed students' available working memory capacity, students' ability to perform the task will be affected. Students may take longer to process information, use strategies that require less cognitive load, or make more errors (Beilock & DeCaro, 2007; Parkman & Groen, 1971). Writing is a complex cognitive task, requiring coordination of long-term knowledge, language skills, motor skills, and working memory. This means that an authorship verification method could be unable to identify the same author across essays with different levels of difficulty.

In this context, this project aims to evaluate potential automated authorship identification or attribution technology to assist educational institutions to validate students' essays and assignments through their writing styles. As such, this paper extends research initiated by Potha and Stamatatos (2014) and Oliveira and colleagues (2020), evaluating and discussing the effectiveness and accuracy of an enhanced Common-N-Gram (CNG) profile-based approach combined with an investigation on the impact of essays with different cognitive load requirements.

Background literature

Essay writing and cognitive load in higher education

Essay writing is a widely used form of assessment in higher education and it can be used to assess different learning objectives (Brizan et al., 2015). The Bloom taxonomy proposes six educational objectives: (1) remember, e.g., retrieval, (2) understand, e.g., interpret and explain, (3) apply, e.g., execute and implement, (4) analyse, e.g., organise and attribute, (5) evaluate, e.g., critique and make judgements, (6) create, e.g., generate and plan (Anderson & Krathwohl, 2001). These categories are thought to increasingly demand higher cognitive load from students (Brizan et al., 2015). That is, essay requiring students to remember or explain something are thought to demand students' working memory to hold less information at one time than essays requiring them to analyse or create something. If the cognitive demands required for a given task exceed students' available working memory capacity, students' ability to perform the task will be affected. Students may take longer to process information, use strategies that require less cognitive load, or make more errors.

Previous research has found that such differences in cognitive load demands can be detected in essay writing using writing analytics (Oliveira et al., 2020). In the current study, we focus on the writing product or final essays and assignment texts submitted by students. Stylometry is used to analyse static completed texts (i.e., product). Stylometry is based on the linguistic style of the text produced by the author (Calix et al., 2008). The style of a completed text can be characterised by measuring a vast array of stylistic features, that includes lexical (e.g., word, sentence or character-based statistic variation such as vocabulary richness and word-length distributions), syntactic (e.g., function words, punctuation and part-of-speech), structural (e.g., text organisation and layout, fonts, sizes and colours), content-specific (e.g., word n-grams), and idiosyncratic style markers (e.g., misspellings, grammatical mistakes and other us age anomalies) (Abbasi & Chen, 2008; Holmes & Kardos, 2003). Stylometry is often used for authorship identification.

Authorship identification

Automated authorship identification or attribution is the problem concerned in identifying the true author of an anonymous document given samples of undisputed documents from a set of candidate authors (Keselj et al., 2003). The identification of authors is inferred from modeling of writing styles (Mosteller & Wallace, 1963; Potthast et al., 2016; Potha & Stamatatos, 2014) and its attribution is often examined in the relevant literature in three main forms: (i) open-set attribution, when the candidate authors may not contain the true author of some of the questioned documents (Potha & Stamatatos, 2014), (ii) authorship verification, when given examples of the writing of a single author, the aim is to determine if new texts were or were not written by the same author (Koppel & Schler, 2004; Potha & Stamatatos, 2014) and, (iii) closed-set attribution, when the candidate authors include the true authors of questioned documents (Potha & Stamatatos, 2014; Koppel & Winter, 2014). According to Potha and Stamatatos (2014), all authorship attribution cases can be transformed to different sets of authorship verification problems. As a categorisation problem, authorship verification is more complex than the other authorship attribution forms because a single author may intentionally vary his or her style from text to text for many reasons or may unconsciously drift stylistically over time (Koppel & Schler, 2004).

The use of stylometry for authorship identification assumes that an author's writing style is consistent and recognisable (Laramee, 2018). Stylistic features are the attributes or writing-style markers that are the most effective discriminators of authorship. Over 1000 different style markers have been used in previous research on stylistic analysis, with no consensus on the best set (Rudman, 1997).

Authorship verification and essays writing with different cognitive loads

Attempts to solve authorship attribution problems follow either the instance-based or the profile-based paradigm. The instance-based paradigm treats all available samples by one author separately; in this paradigm each text sample has its own representation. On the other hand, the profile-based paradigm treats all available text samples by one candidate author cumulatively. Text samples are concatenated into a single, often large representative document and then the profile of the author is extracted from that document (Potha & Stamatatos, 2014). Another profile is produced from the questioned document and the two profiles are compared using a dissimilarity function. Due to constant changes and improvements on students' vocabularies among higher education courses, the profile-based paradigm will be combined and investigated together with the CNG method in this study. We believe this paradigm can help us to establish and maintain students' profiles across several years while providing more flexibility and higher accuracy in authorship verification.

In a previous study, Oliveira and colleagues (2020) focused on writing analytics, they asked students to complete four activities distributed over a period of 90 minutes. To account for possible effects of question ordering, two setups were used: one setup with increasing cognitive load, from low (1) to high (6) and one setup with decreasing cognitive load, from high (6) to low (1). The first 29 participants completed Setup 1, while the following 17 participants completed Setup 2. In this study, the authors used seven metrics (percentage of sentence linking connectives, semantic similarity, mean length of T-unit, clause density, mean word frequency, percentage of long words and percentage of misspelled words) across four dimensions to analyse the writing outcome. The results showed only small and mixed effects of the tasks differing in cognitive load on the different writing product metrics. Students writing products remained stable and consistent across different cognitive loads.

Current study

In the current study we examine whether an AV algorithm would be able to identify the same author across essays with different cognitive load requirements in educational settings. That is, we evaluate and discuss the CNG profile-based paradigm efficiency and accuracy in supporting authorship verification of essays and assignments with different cognitive loads in higher education.

Method

Following the proposed approach by Castro and colleagues (Castro et al., 2015) related to method verification in text analyses (PAN dataset), our method included data collection, data pre-processing, authorship verification method analysis (Study 1) and main data analyses (Studies 2 and 3). These steps are presented in Figure 1.

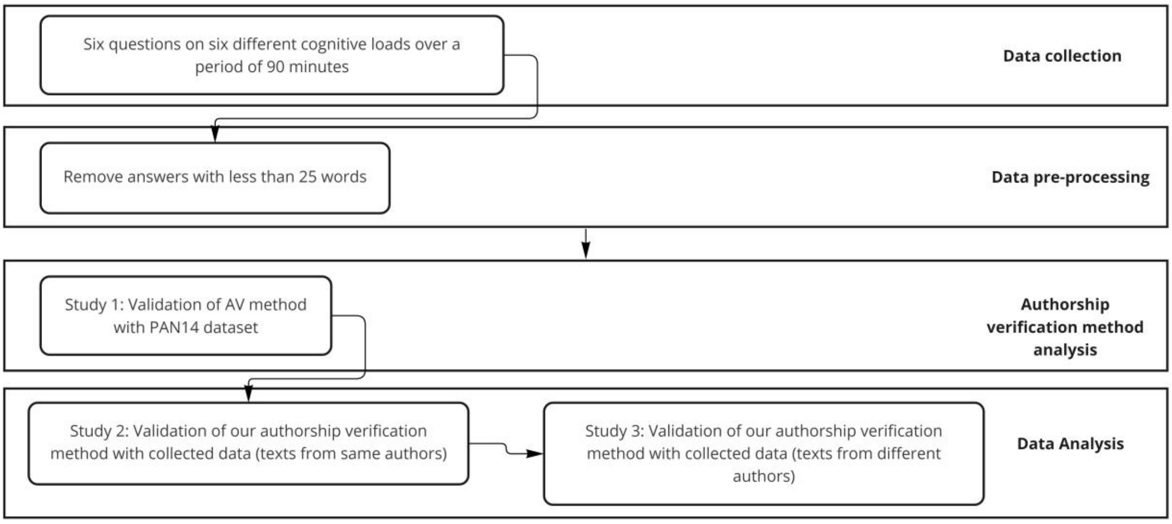

Figure 1: Research procedure

Participants

The study was conducted at The University of Melbourne from 2017 to 2019. Participants were recruited via posters across the campus and provided informed consent (Ethics approval #1748727.1). The sample included a total of 46 students from four main disciplines: Engineering (24%, n=11), Commerce (24%, n=11), Arts (19.5%, n=9), Science (13%, n=6) and other (19.5%, n=9). Most participants were undergraduate students (70%, n=32), with 24 males (52%) and 22 females (48%). More than half of the participants were from a non-English speaking background (76%, n=35), and most participants were right-handed (96%, n=44).

Data collection

In a computer laboratory, participants were asked to complete four activities using an Apple desktop computer and a QWERTY keyboard. The four activities were distributed over a period of 90 minutes (Figure 1). To account for possible effects of question ordering, two setups were used: one setup with increasing cognitive load, from low (1) to high (6) and one setup with decreasing cognitive load, from high (6) to low (1), as shown in Figure 1 The first 29 participants completed Setup 1, while the following 17 participants completed Setup 2. In the Creative Work 1 activity participants had 20 minutes to answer four open-ended questions requiring low to medium cognitive load (Q1, Q2, Q3, Q4; see Table 1). In the Creative Work 2 activity participants had 30 minutes to answer two open-ended questions requiring medium to high cognitive load (Q5, Q6; see Table 1). For the questions that required medium to high cognitive load, participants could consult two hardcopy supporting texts on the topic of university life. Participants then had a 10-minute break, where some snacks were provided. In the Review activity, participants had 10 minutes to review, edit and improve their answers from the Creative Work 2 activity (Q5a, Q6a; see Table 1). In Transcription activity participants were asked to transcribe one of the texts that was used as a support material during ‘Creative Work 2’ for 10 minutes (Q7).

Table 1: List of questions and respective level of cognitive load.

ID	CL	Question
Q1	1	What made you decide to join this university?
Q2	2	What would you say has been the best class you have taken at this university and what did you enjoy about that class?
Q3	3	You are asked to complete a group assignment. It is important all students in the group contribute equally to the project. Come up with a plan for completing the group assignment, from research to class presentation.
Q4	4	Describe the similarities and differences between preparing a written assignment and preparing for a final exam.
Q5	5	A fellow university student spends a significant amount of their time worrying about their ability to complete their academic work, and becomes very concerned when they do not meet their grade expectations. In addition, they are concerned about financial pressures such as rent and textbook costs. Considering the texts you have received and the situation presented above, please answer the following question: Do you think the university should support this student improve their wellbeing? Why or why not?
Q6	6	[Using the scenario from Q5] Describe what advice you would provide to the student to help improve their wellbeing. What steps could they take?

Note. CL = Cognitive Load: expected demand based on Bloom’s Taxonomy (Anderson et al., 2001), ranging from 1 = 'Low cognitive load demand' to 6 = 'High cognitive load demand'.

Data pre-processing

After obtaining the answers from participants, the dataset was examined and cleaned. Some participants did not answer all six questions. Furthermore, among all received answers, 21 responses had less than 25 words or 140 characters. Previous research has shown that significantly small text samples can impact the performance of AV (Stein et al., 2007). However, there also have been effective AV practices with Twitter texts containing no more than 140 characters (Escalante et al., 2011), whose scheme for AV could be referred to. Therefore, as part of this study investigation, the dataset was tailored so that each text would need to have at least the length of a Twitter text. Twitter doubled the character limit from 140 characters to 280 characters in 2017, but in this study we followed the same approach presented in Escalante et al., (2011). As part of this process, we excluded all texts with less than 25 words (which is approximately 140 characters). Remaining texts were included in our analysis.

Study 1: Validation of AV method with PAN14 dataset

After pre-processing our collected data, we developed the common character n-gram profile-based AV method proposed by Potha and Stamatatos (2014), which proved to be more effective under the circumstances where only short and limited numbers of sample texts are available. We then validated our implementation of the AV algorithm on a dataset retrieved from the PAN International Competition on Plagiarism Detection (Webis group, 2019a) so results could be compared with the ones published on Juola and Stamatatos (2013). PAN (Plagiarism Analysis, Authorship Identification, and Near-Duplicate Detection) is a series of scientific events and shared tasks on digital text forensics and stylometry (Meuschke and Gipp, 2013). They provide a series of openly shared text corpora for the scientific community to perform stylometric analysis and test AV methods for plagiarism detection. In this study, the “English Essays” test dataset from the 2014 PAN Competition (Webis group, 2019b) (referred to as “PAN14”) will be used for validating our developed AV method. As shown in Table 2, PAN14 offered us a great dataset to validate our implementation as it provides several essays in

English. To perform this analysis, Study 1 was designed in a similar way to AV method presented in (Castro et al., 2015).

Moreover, previous studies based on common character n-gram profile-based AV method achieved fair results when tested on PAN14 corpus using 3-grams (Castro et al., 2015, Satyam et al., 2014). In this approach, n-grams are extracted without word boundaries, which means punctuation and blank spaces in the text are also included. They are good representation of writing styles of participants (Escalante et al., 2011). We followed the same approach as previous studies and used 3-grams in our investigation.

Table 2: Statistics of the PAN14 authorship verification corpus

Corpus	Language	# Training documents	# Problems training	# Characters training (thousands)	# Test documents	# Problems test	# Characters test (thousands)
PAN14	English	729 (essays) 200 (novels)	200 (essays) 100 (novels)	3,450 (essays) 3,554 (novels)	718 (essays) 400 (novels)	200 (essays) 200 (novels)	3,342 (essays) 13,772 (novels)

Similarity Functions
Cosine similarity (referred to as "unknown similarity") between two count vectors (one from identified authors, another from an anonymous text) will be calculated and used as the classifier for verifying authorship, as shown in Figure 2. This approach is proposed by (Castro et al., 2015) and presented good results with character 3-gram features on PAN14 dataset. For comparison purposes, the metric for measuring the performance of our AV method is C@1 score (Penas and Rodrigo, 2011), which is also used in Stamatatos and colleagues (2014) for evaluating the participants' AV performances in PAN14. Once the performance of this AV method is evaluated and compared to other PAN14 participants using equivalent methods, we aim to apply the same method to our current collected data.

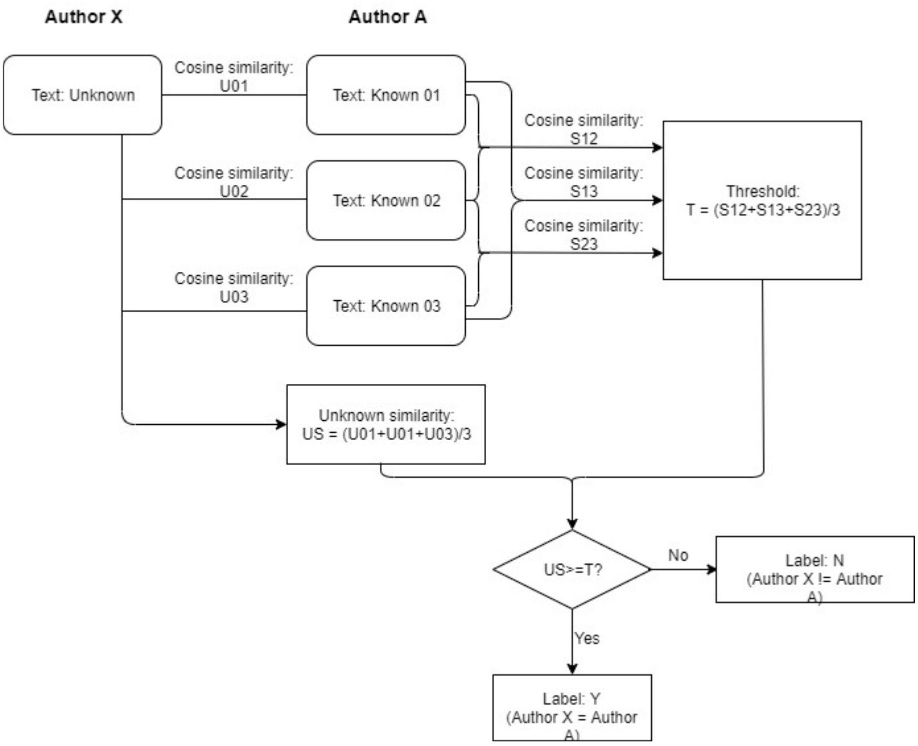

Figure 2: Workflow of the authorship verification method applied to PAN14 dataset.

Study 2: AV with texts from same author

After validating the efficiency of our AV method with PAN14 dataset, we tested the efficiency of our AV method on our collected data. Only texts from the same participant were used in a single case for testing this AV method. This means that for a certain participant, two different pieces of texts by the same author were compared. In study 2, we did not compare texts from different participants. The structure of the current dataset in study 2 was designed in a slightly different way than the PAN14 dataset. We structured collected data in multiple folders. Each folder with an author ID contains six (or less) text files numbered 01-06 in accordance with the cognitive loads of their answered questions. To adapt to the current dataset and examine the impact of cognitive load on the writings produced by a same author, this investigation was conducted as shown in Figure 3. As illustrated in Figure 3, to obtain a threshold for an author at a certain cognitive load (CL) level (n), this text was always compared against the text from the same author with CL 1, and a cosine similarity between these two were calculated and used as the threshold. Then, when compared with an anonymous text with a different cognitive load (m), the cosine similarity of these two (texts with CL m and n) were calculated and compared to the threshold to determine whether they were written by the same author.

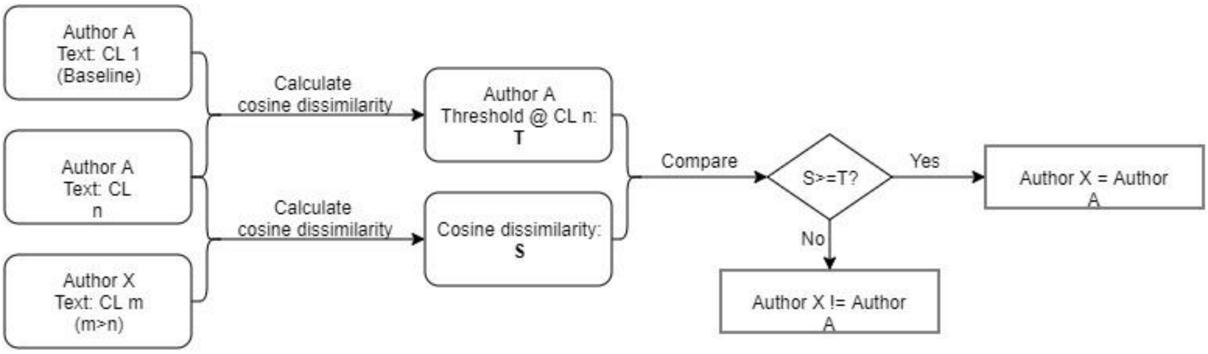

Figure 3: Workflow of the authorship verification method applied to the current dataset; CL refers to the Cognitive Load of the question

For each author, the process in Figure 3 was followed in each single AV case. To examine the impact of cognitive load on the participants' writings, comparisons were drawn between texts from different CL levels, as listed in Table 3. For example, in order to compare the texts of CL 2 and 3 from an author A, the threshold T was calculated as the cosine similarity between author A's answer to Q1 and author A's answer to Q2. Then, author A's answer to Q3 was regarded as an anonymous text and the cosine similarity S between this text and author A's answer to Q2 was then calculated. If the value of S was greater than or equal to T, this "anonymous text" was identified as written by author A; otherwise, it was regarded as written by a different author (i.e., fail to be correctly verified in this scenario). This process is referred to as "cross-CL level AV". For other cross-CL level AV listed in Table 3, the similar pattern was followed, with the author's answer to Q1 always used as a baseline for calculating the threshold T.

Table 3: List of all categories of cross-CL level comparisons

Comparisons
CL 2 - 3
CL 2 - 4
CL 2 - 5
CL 2 - 6
CL 3 - 4
CL 3 - 5
CL 3 - 6
CL 4 - 5
CL 4 - 6
CL 5 - 6

Study 3: AV with texts from different authors

In Study 3, we tested the efficiency of our algorithm against texts produced by different authors. This is not a common practice for AV in academic context, but more of an exploratory attempt in our investigations. In this study, each author's writing was compared to all other authors' writings with a different cognitive load, with the AV process following the scheme of Figure 3 and comparisons categorised in the same cross-CL level AV process as before.

Results and discussion

Study 1: Validation of AV method with PAN14 dataset

Our AV method was first performed on the "English Essays" subset from the test dataset of PAN14 authorship

verification. The accuracy of our algorithm performance was calculated as C@1 = 0.580.
With reference to Stamatatos and colleagues (2014), the evaluated performances of the participants in the English Essays subset are presented in Table 4. Comparing our results with the ones from previous studies (Jankowska et al., 2013; Layton, 2014) who also employed common n-gram features and applied similarity distance as classifiers for AV of the same dataset, the C@1 score of our AV method was close to theirs (0.610 and 0.548), and also above the baseline score (0.530) presented for that dataset considering other submissions (i.e.: including other AV methods). The evaluation showed that this AV method achieved similar results as its equivalents and could be applied to our collected data.

Table 4: Performance evaluation of PAN14 participants in English Essays

PAN14 Participants	C@1 Score
Layton, 2014	0.61
Proposed AV method in this study	0.58
Jankowska et al., 2013	0.548
BASELINE	0.53

Study 2: AV with texts from same author

After validating our AV method, we applied the AV algorithm to our collected data. In this part of the test, the process illustrated in Figure 3 was followed. The AV results were collected and the C@1 scores in each category of the comparison were calculated accordingly and presented in Table 5. AV performances in comparison CL 4-5 achieved the highest C@1 score of 0.941, while AV in CL 2-4 obtained the lowest C@1 score of 0.5. Considering the limited text sizes in the current dataset and the performance this AV method achieved in Study 1, it could be stated that regardless of the cognitive load changes in the texts, the AV method developed in this study could effectively identify writings from a same author. Furthermore, the results show that this AV method yielded higher C@1 score when at least one of the texts in the comparison correspond to a "Creative Work 2" (i.e. CL 5 or 6) question. This effect can be correlated with CL 5 and CL 6 responses having larger word counts average. 86% of answers for CL5 and CL6 questions in our study had between 100 and 300 words. However, the correlation between common character n-gram profile-based AV method accuracy and larger texts (over 500 words) might not be as straightforward and wasn't investigated in this study.

Table 5: Evaluation results of cross-CL (Cognitive Load) level AV of texts from same author

Comparisons	C@1 score
CL 2 - 3	0.618
CL 2 - 4	0.5
CL 2 - 5	0.824
CL 2 - 6	0.794
CL 3 - 4	0.765
CL 3 - 5	0.912
CL 3 - 6	0.912
CL 4 - 5	0.941
CL 4 - 6	0.911
CL 5 - 6	0.882

Study 3: AV with texts from different authors

After examining the AV method on texts from a same author, we conducted comparisons between texts written by different authors. In this study, the AV process followed the scheme of Figure 3 and comparisons are presented in Table 6. Our findings show that C@1 scores obtained from these comparisons were lower than those from same-author comparisons, which means a great number of negative cases (i.e., two texts written by different authors) were incorrectly identified as positive (i.e., two texts written by the same author). This indicates the threshold set for the AV process was generally too low (i.e., lower than the similarity between two texts from different authors) to successfully identify a negative case.

To better understand obtained results and try to improve this performance, some statistical figures were obtained in terms of thresholds (T) and similarities (S) in this AV process. The difference (T − S) in each AV case was calculated and the mean value as well as standard deviation of them were derived from each category of the comparisons, as listed in Table 6. It is noted that the standard deviation of T − S remained very stable around 0.1, regardless of the varied categories of cross-CL level comparisons.

We then experimented with increasing adopted threshold for determining authorship verifications in those scenarios. The original threshold obtained was increased by 0.104, which is a mean value of the standard deviations of all categories of the AV practice, as shown in Table 6. The verification processes remained the same. After making all the verifications, the C@1 scores were calculated again and listed in the rightmost column of Table 6. Compared to original C@1 scores, our new threshold significantly increased the accuracy of our comparisons.

Table 6: Evaluation results of cross-CL (Cognitive Load) level AV of texts from different authors, before and after scaling up threshold values

Comparisons	C@1 Score	Difference = threshold (T) -cosine similarity (S)		C@1 Score with scaled-up threshold (T+0.104)
		Mean	Standard Deviation	
CL 2-3	0.448	-0.01714	0.09357	0.798
CL 2-4	0.534	0.01198	0.11070	0.853
CL 2-5	0.288	-0.0535	0.09383	0.721
CL 2-6	0.396	-0.02798	0.10111	0.764
CL 3-4	0.314	-0.04721	0.11529	0.673
CL 3-5	0.117	-0.10934	0.09519	0.466
CL 3-6	0.177	-0.09575	0.10744	0.511
CL 4-5	0.135	-0.09887	0.08742	0.511
CL 4-6	0.182	-0.08955	0.09866	0.546
CL 5-6	0.272	-0.08953	0.14134	0.54
			Mean: 0.10446	

These results indicate that our AV method was not as accurate in identifying an author when comparing work of different authors. As an implication, the current paper supports use of stylometry for AV in higher education, particularly when comparing text written by the same student. This yields the need of creating leaner profiles database so individual learners' data can be stored and easily mined when required.

Limitations and future improvements

Three limitations and possible directions for future work could be identified in this study. First, due to the limited text sizes, the AV methods that have proved to be effective in previous research, such as Unmasking (Koppel et al., 2007), could not be tested on the current dataset. Also, as there is only one piece of text available in each CL for each author, the cosine similarity calculated and adopted as threshold might be biased and not generalised enough for the verification process. If several texts in the same CL from one author could be collected, this threshold could be calculated as an average group similarity as illustrated in (Castro et al., 2015). Thus, it will be less biased and might achieve higher accuracy in the AV studies. Second, considering the limited number of participants in the data collection process, it remains an open question whether the AV method proposed in this study could be generalised and applied to a larger sample of academic writings. If data could be collected from a larger number of participants and tested with the current AV method, the results will be of stronger statistical significance. Lastly, cognitive load for each question was not measured, but rather, assumed based on previous research. To test this, future work could measure the actual cognitive load, for example through participants' self-reported cognitive effort.

Conclusions

This study shows that authorship verification methods can provide good results to academic writings with varied cognitive loads. The results showed that with a valid AV method, the academic writings produced by students could be effectively verified. Findings also indicated that texts written by a same student could be successfully verified across different cognitive loads; moreover, when performing AV on texts of higher cognitive loads, the authorship is more likely to be successfully verified. This effect was found in responses with CL 5 and CL 6 as they had larger word counts average and richness of vocabulary. Larger responses supported better feature extraction and modelling students' (stylometric) profile.

These findings have important implications for the evaluation of academic integrity in higher education. Combined with anti-plagiarism tools such as Turnitin, AV methods can support educators identifying contract cheating. In this context, the use of AV in educational settings offer potential to enhance awareness around academic integrity issues beyond plagiarism, which can lead to better education around integrity issues. Moreover, in future, correlations between assessments' questions in different CL and frequency of AV issues in those can assist educators with assessment redesign.

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reconnect
Reconnecting relationships through technology

Online Assessment in Australian University Business Schools: A Snapshot of Usage and Challenges

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Whilst most institutions have been using online assessment submission for many decades, the move to fully online delivery during the COVID-19 pandemic meant more traditional forms of assessment also had to move online. In this national study we captured a snapshot of online assessment usage across business disciplines from 97 survey participants from universities in Australia and identified the challenges reported by participants. We found the three most predominant forms of online assessments are written reports and essays, online exams/quizzes and live or recorded presentations. We categorised the reported challenges into 13 groups, and they include academic integrity; additional time and effort for teachers; technology access and service consistency; student preferences and expectations; and changes to feedback. We conclude with a discussion on these challenges. This study contributes not only a better understanding of the usage of online assessment in Australian business education, but also provides a benchmark with which to track and evaluate future shifts in assessment practice.

Keywords: Online assessment; Academic integrity; Feedback; Authentic assessment

Introduction

At the beginning of the COVID-19 pandemic, most institutions within the Australian higher education sector switched to emergency remote teaching (Seraj et al., 2022) in order to continue operating. Prior to 2020 fully online delivery comprised a minority of the higher education deliveries in Australia for reasons including visa conditions for onshore international students that restricted online delivery to one-third of teaching in a course (National Code of Practice for Providers of Education and Training to Overseas Students, 2018).

The COVID-19 situation has been transformative for Australian university business programs catering to international students, given these students were unable to travel and enter Australia during 2020-2021. The impact of the pandemic on international student numbers and the flow-on effects to institutional funding has been far reaching particularly in business disciplines since they have some of the highest international student enrolments across the sector (Zhang et al., 2016). As a result, business disciplines had to considerably change their delivery models while progressing from remote emergency teaching to online delivery.

There has been considerable attention directed at pedagogical perspectives of online assessment such as the ability to provide immediate and meaningful feedback (Mate & Weidenhofer, 2021) and the implications of online assessment for academic integrity (e.g., Reedy et al., 2021). In addition to its advantages, the use of online assessment brings practical challenges, for example automated marking can provide immediate feedback but may also be less specific and personalised to the individual student and thus less useful for formative assessment, and remote invigilation creates challenges for student authentication and academic integrity (Mate & Weidenhofer, 2021). In response, a range of strategies may be applied to mitigate these challenges, for example, the provision of authentic assessment to inhibit plagiarism or contracting out, use of a wider variety of performance-based assessments where the identity of the student can be directly verified, adoption of technology-driven remote invigilation of online examinations, as well as feedback and feedforward. At the same time, it is acknowledged that further work is needed and a report on the future of assessment by Pauli and Ferrell (2020) identifies five key five-year targets for online assessment to support student learning and staff confidence: improved authenticity, accessibility, automation, continuous improvement and security.

Business educators in Australia have recently been responding to the unfolding COVID-19 related learning circumstances, and many have been required to design, implement and refine new online assessment practices.

However, there is little information available concerning what types of online assessment have been adopted in Australian university business programs, the level of innovation in these assessments or the practical challenges faced when designing and using online assessment. This research study seeks to provide evidence concerning these issues in relation to the forms of online assessment in use within Australian business school programs.

Research questions:
1. What forms of online assessment are currently being used in Australian university business programs?
2. What challenges do academics and other educators face when designing and implementing online assessment in Australian university business programs?

This snapshot of online assessment practices contributes two-fold. First, it helps us understand the educational practices in use during and after the COVID-19 pivot to online assessment delivery and the challenges educators face in delivering and designing online assessments. Second, the snapshot of current practice can assist with the evaluation of the future sector-wide efforts to improve and innovate online assessment practices.

Method

The study was approved by the University of Sydney Human Research Ethics Committee. An online survey developed from a comprehensive literature review (Brodzeli, 2022) was used to collect data from academics involved in educational delivery and/or design within Australian university business programs. The survey asked participants to share their online assessment practices and to provide additional detail about one specific assessment including a description of the challenges they had experienced with that assessment.

The survey was distributed via the Australian Business Deans Council (ABDC). An email including an invitation to complete the survey was sent from the ABDC to member institutions with a request to cascade the survey to their staff. A follow-up reminder was sent approximately six weeks later. The survey invitation and link were also shared through social media channels Twitter and LinkedIn, with appropriate professional associations tagged to these posts.

To document the forms of online assessment currently being used by respondents, descriptive statistical analysis was conducted on the survey responses concerning assessment type, individual/group modality and invigilation method. The Chi-square test of independence was used to examine the relationships between assessment type, professional accreditation status, weighting, program level and cohort size. The free-text responses were initially coded by one research team member to identify challenges for online assessment and the coding system was independently applied by a second researcher with any differences resolved through consensus.

Results and discussion

A total of 97 people completed the survey. Respondents identified multiple roles and affiliations within Australian business schools. Discipline affiliations were business (n=31), accounting (n=29), management (n=17), finance (n=15), human resources (n=12), marketing (n=11), economics (n=10), business law (n=8), innovation and entrepreneurship (n=8), information systems (n=7), business analytics (n=6), actuarial studies (n=2), property (n=2), and one respondent each for financial planning, IT/engineering, law, leadership, risk management, tax, and tourism and event management. A majority of the respondents held a role as a unit coordinator (n=85) and/or lecturer (n= 69), with other roles including program coordinators (n=36), tutors (n=32) and education developers/learning designers (n=15). There was one associate dean and one head of school, both of whom also coordinated units. For more detail about the survey sample see Huber et al. (2022).

Respondents were asked whether their courses were accredited by a professional membership body. Around two-thirds (n=64) reported that the courses they worked on were professionally accredited, 18 respondents reported that they worked on courses that were not professionally accredited, and a further 15 respondents were unsure of the accreditation status.

Online assessment usage in Australian university business programs

Forms of online assessment in use

Participants were asked to report all forms of online assessment that they had used. Table 1 shows the extent each type of online assessment was reported in the sample. Almost all respondents reported using written assessments and/or online exams/quizzes. Around two-thirds of respondents were using some form of presentation, either performed live or as pre-recorded/digitally-created multi-media. Within this group, 53 respondents were using live presentations and 50 respondents were using recorded/multi-media presentations. Close to a third were using participation as an assessment, with most of these respondents using in-class participation and a smaller proportion assessing students' participation outside class times. Online discussions, reflective journals and self/peer-assessment had similar levels of use at just under a third of respondents. Portfolios and interactive simulations/cases/games were each used by around one-sixth of respondents. Design or creative works, laboratory/practical assessments and online self-guided internships were used less frequently (see Table 1). Notably, the categories presented in the survey appear to be comprehensive, with only one participant selecting 'other' to record an online self-guided internship.

Table 1: Reported use of each form of online assessment (n=97)

Form of online assessment	Respondents reporting use of assessment n (%)
Written assessment (e.g. essay, report, research paper, bibliography, literature review, case study)	91 (94)
Online exam/quiz	86 (89)
Live or recorded presentation (e.g. debate, interview, presentation, demonstration, animation)	68 (70)
Live presentations	53 (55)
Recorded/multi-media	50 (52)
Participation (in-class and out-of-class)	32 (33)
In-class participation	31 (32)
Out-of-class participation	9 (9)
Online discussion	29 (30)
Reflective journal	28 (29)
Self/peer assessment	28 (29)
Portfolio	16 (16)
Simulation, interactive case or serious game	16 (16)
Design product or creative work	8 (8)
Laboratory/practical assessment	4 (4)
Other (Online Self-Guided Internship)	1 (1)

Note: Respondents were asked to report all forms of online assessment they had used

Use of individual and group assessments

Respondents indicated whether they used each form of online assessment as a group or an individual assessment, or in both modes (see Figure 1). Some forms of online assessment were substantially more likely to be used as individual rather than group assessments. These included online exams/quizzes, reflective journals, portfolios, and both in-class and out-of-class participation. Online discussions and written assessments were also more commonly used as individual assessments rather than group, although this preference was less pronounced and group modes were often used. The other forms of assessment were more balanced between individual and group approaches. These included recorded/multi-media assessment, live oral presentations, self/peer assessment and simulation/interactive cases/games.

These results raise the question of why some types of online assessment are much more likely to be set as individual assessments compared with other types of assessment. Considering the many permutations of group assessment available (e.g., Davies, 2009) and the recognized importance of improving student preparation and motivation for working in groups (e.g., Peklaj & Levpušček, 2006), this may indicate opportunities for expanding innovation with these assessments into group modes. On the face of it there are obvious reasons why reflective journals and portfolios are used to assess individual learning activity, however there may also be further learning opportunities for more collaborative reflection-based assessments and portfolios that could enhance skills in giving and receiving peer feedback while managing staff workload (e.g., Uijl & Filius, 2022). In relation to exams, Villarroel et al. (2020) argue that active learning is promoted when small groups are asked to respond to exam-based problems designed to be authentic and to assess higher-order learning, as students must engage with each other to present and evaluate arguments. Notably, such assessments develop a range of skills in collaboration, communication and negotiation valued in most workplaces. Further analysis into the selection of group or individual assessment modes for online assessment could also highlight the distinction between assessments that are completed and assessed in groups, and assessments that are completed in groups but individually graded (Davies, 2009; Rico-Juan, 2021).

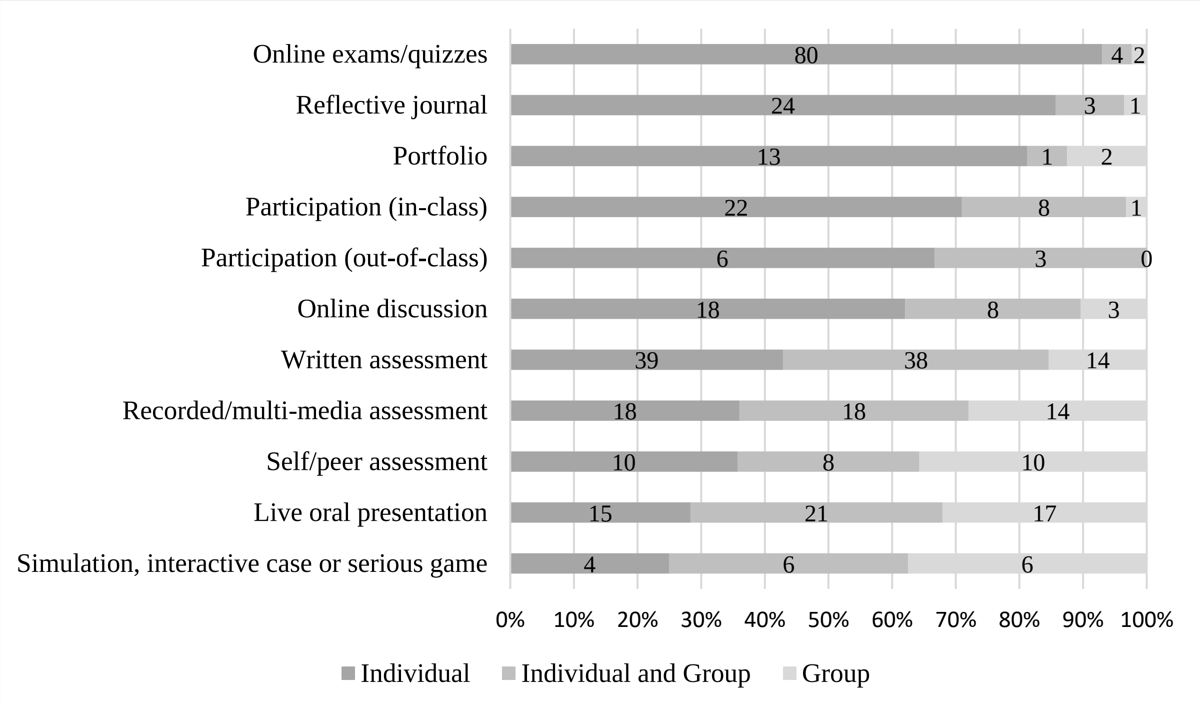

Figure 1: Use of Assessment types as Individual or Group Assessments

Note. Forms of assessment with fewer than 10 respondents are not displayed in Figure 1.

Invigilation methods for online exams and quizzes

The survey asked respondents who had used online exams/quizzes (n=85) for further details about the question types and invigilation methods. Respondents were able to select multiple answers. Table 2 presents these results, alongside an analysis of invigilation types according to whether the program was professionally accredited.

Table 2: Exam/quiz invigilation method, question type, and accreditation

	Human invigilated (%)	Computer invigilated (%)	Non-invigilated (scheduled timed session) (%)	Non-invigilated (take home) (%)
Question type				
Numerical calculations/quantitative	31	23	27	19
Multiple choice questions	27	28	30	16
Short answer questions	25	22	35	18
Extended written answers/essays	27	12	27	34
Professional accreditation status				
Accredited	26	21	32	21
Non-accredited	25	22	22	31

Regarding the relationship of invigilation method and question type, the data indicates that human invigilation was used with similar prevalence across all types of online exam/quiz. Also, there were similar patterns in invigilation method for numerical calculations and multiple-choice questions. On the other hand, extended written answers/essays had relatively higher prevalence of take-home (non-invigilated) approaches and less frequently used computer invigilated approaches. This may point to a lack of access to fit-for-purpose computer invigilation tools for extended written assessments. Emerging tools such as Cadmus (https://www.cadmus.io/) may fill this requirement.

The analysis of invigilation method and professional accreditation status indicates a similar pattern of people and computer based approaches across professionally-accredited and non-accredited programs. However there is a contrast in the prevalence of non-invigilated approaches, with accredited programs more often using scheduled timed sessions and non-accredited programs relatively favouring take-home exams.

Relationship of assessment type to accreditation, assessment weighting, course level and size of cohort
Respondents were asked to nominate one specific online assessment and provide additional detail about the design and implementation of that assessment. This allowed for more granular data as participants were considering the design of a particular assessment rather than their assessment practice in general.

Statistical tests were used to identify whether there was a relationship between the assessment type and (a) whether it was required for accreditation, (b) the assessment weighting, (c) the course level (undergraduate vs postgraduate) and (d) the size of the cohort. As some forms of assessment were rarely nominated by respondents, three categories were used: online exams/quizzes, written assessments, and ‘other’ (which included all other forms of assessment such as participation, live/recorded performances and portfolios). The only significant relationships found were between the type of assessment and assessment weighting and cohort size (see Table 3). Exams/quizzes and written assignments were more likely to be used for high-stakes (over 30% weighted) assessment compared with other forms of assessment such as presentations and participation. Regarding cohort size, most of the ‘other’ assessments were being used with cohorts of fewer than 100 students, while exams/quizzes and written assessments were used more consistently regardless of cohort size. Significant relationships were not found between assessment type and either accreditation requirement or course level.

These findings may both be explained in relation to resource requirements. The 'other' assessments category defined here includes a range of assessments that do not lend themselves to ease of standardisation or to automated marking and feedback, such as live or multimedia presentation, participation and reflective journals that must be marked by educators and are thus relatively resource-intensive, particularly as markers must be trained to achieve reliable marking. Thus, these resource-intensive assessments may be selected for smaller cohorts, and for lower-weighted assessments where concerns about marking consistency may be lower.

Table 3: Breakdown of accreditation requirement, assessment weighting, course level and size of cohort by assessment type (exam, written assignment, and other)

	Exam/Quiz (n=36)	Written (n=30)	Other (n=29)	p-value	Effect size
Weighting				<0.001	0.322
Assessment is weighted ≥ 31% (major)	24 (66.7%)	20 (66.7%)	5 (17.2%)		
Assessment is weighted ≤ 30% (minor)	12 (33.3%)	10 (33.3%)	24 (82.8%)		
	Exam/Quiz (n=36)	**Written (n=31)**	**Other (n=30)**	**p-value**	**Effect size**
Cohort size				0.004	0.181
Small (1-29)	4 (11.1%)	7 (22.6%)	4 (13.3%)		
Medium (30-99)	13 (36.1%)	5 (16.1%)	19 (63.3%)		
Large (100-249)	7 (19.4%)	12 (38.7%)	3 (10%)		
Very large (250+)	12 (33.3%)	7 (22.6%)	4 (13.3%)		

Challenges to implementing innovative online assessments

One of the key findings from the survey was that the most commonly used online assessments are traditional quizzes, exams and written assessments (see Table 1) where much has been written about translating these assessments to the online environment (Apps et al., 2020; Butler-Henderson & Crawford, 2020; Cramp et al., 2019). To explore the challenges of online assessments for educators we asked participants to reflect on a specific assessment that they had translated or designed for online delivery and 50 respondents described one or more challenges they had faced with their selected online assessment. Analysis of these responses identified 13 challenges, listed in Table 4, with some responses coded to multiple categories. The categories are described below with illustrative quotes. As many of the challenges were contextual to the type of online assessment being implemented, information about the type of assessment is also included.

Table 4: Challenges identified for implementing online assessments

Academic integrity	Logistics and timing	Getting students to take low-stakes assessments seriously
Additional teacher time and effort	Changes to how feedback is provided	Institutional/departmental support
Technology access and service consistency	Differentiating students against the criteria when grading	Institutional policy
Technology functionality and usability	Students do not demonstrate all assessment criteria	
Student preferences and expectations	Preparing students for the format	

Academic integrity
The challenges of academic integrity within online assessment are well documented (e.g. Holdenet et al., 2021). Respondents described identity verification 'It is difficult to guarantee (100%) that the student is the one who completes the assessment.' – written assessment, and collusion 'Student collusion is very difficult to manage.' – online exam/quiz, as specific challenges, as well as highlighting the difficulty of conducting remote invigilation 'Given the online environment validating business [organisations] used for the group assignment outside of Australia has been a challenge.' - written assessment. The challenge of academic integrity was well-represented in this survey with 16 respondents commenting on it, however it was only raised in relation to online exams/quizzes and written assessments.

Additional teacher time and effort
The respondents described a multitude of ways in which online assessment could result in increased workload or resourcing for teachers. This included additional time for question development, marking, technical set-up of the assessment 'Technologies not working appropriately for large classes… Increased workload not accounted for in workload considerations.' – written assessment, and responding to students' reported technical issues and appeals 'Student claims of technical difficulties that do not require any proof leading to further assessments that extend the semester and increase academic workload.' – online exam/quiz. Some respondents commented that their workload had increased in some areas, but decreased in others 'Requires a lot of work by assessment writer (coordinator) but substantially reduces end of semester stress and burden across the teaching team.' – online exam/quiz. Twelve respondents described this as a challenge which goes against the belief that moving assessment online is more efficient (Arney et al., 2012).

Technology access and service consistency
Challenges relating to the availability and stability of technology were frequently mentioned (11 respondents). Unreliable internet for students and limited access to appropriate hardware were the most common explanations identified for these issues. Some respondents noted ways of responding to this challenge, including rescheduling live presentations and functionality that allows auto-submit of answers. This challenge was mostly raised in relation to synchronous assessments 'Highly dependent on technology' – live oral; 'Not all students have access to appropriate hardware or reliable internet coverage.' – online exam/quiz, however was also reported for asynchronous assessments 'Upload times to the LMS for submission sometimes cause issues as well.' – recorded/multi-media assessment.

Technology functionality and usability
Seven respondents described challenges relating to the use of the technology (Mate & Weidenhofer, 2022), including whether the functionality provided was appropriate 'Technologies not working appropriately for large classes.' – written assessment, and challenges around teachers and students learning how to use the systems 'Some students struggled with the technical ability required to record a video.' – recorded/multi-media assessment. In some cases this resulted in downstream challenges for academics including issues around academic integrity 'IT issues where the student has completed some of the assessment and then is locked out of the assessment - not a good student experience but good for academic integrity' – online exam/quiz, and the need to allocate additional teacher time/effort to the assessment

> Host software platform (Mahara) does not integrate properly with marking platform (Moodle) so

> when students 'submit' a portfolio in Mahara, it's locked off from being able to be graded in Moodle. Constant source of pain in the submission window of having to unlock/reject submissions in Mahara, email students new instructions, students panicking and repeating the same path that didn't submit. – reflective journal.

Student preferences and expectations
Five respondents noted that the shift to more innovative assessments can require students to perform in ways they find uncomfortable compared with more traditional forms of assessment (Sokhanvar et al., 2021). For example, some students reportedly preferred assessment methods with pen and paper ‘Some students would rather do exams with pen and paper than on a computer. Pen and paper is not authentic as they wouldn't do this in the workplace. With a computer-based exam they can use the tools they would use in the profession such as Excel and searching Accounting Standards online.’ – online exam/quiz, or that align with rote learning ‘Students generally like the Discussion Board activity but some would prefer assessment where they regurgitate the text book.’ – online discussion. Online assessment modes may increase stress for students who are less comfortable with an assessment, particularly when it relates to culturally or otherwise socially sensitive topics ‘Requiring students to debate issues that might include culture or social-economic sensitivity will inevitably place stress on students. However, this is appropriate for a capstone subject.’ – recorded/multi-media assessment.

Logistics and timing
Five respondents who were describing live oral assessments noted challenges related to timing ‘We can’t have a long simulated meeting due to time pressures.’, - scheduling/rescheduling. ‘The larger the cohort the more stimulus pieces are needed and the logistics of arranging the presentations timing.’ and other logistical issues including challenges for students to manage their own logistics ‘Hard for students who share accommodation.’ This challenge was only raised in relation to live oral assessments.

Changes to how feedback is provided
Four respondents described challenges relating to the provision of feedback in online assessment (Arney et al., 2012). These were driven by changes to teaching processes that occurred as a result of adopting online feedback rather than by difficulties in providing effective feedback per se ‘Having this assessment task online has meant that the feedback can be provided to students more rapidly than offline assessment. However, that does mean that marking and feedback time for academic staff is spread across multiple submissions.’ – reflective journal.

Differentiating students against the criteria when grading
Three respondents reported challenges with distinguishing students at different levels of performance when grading online assessments ‘Finding ways to distinguish high-achieving students due to the open book nature of online assessment.’ – online exam/quiz. This challenge can also impact students, who likewise need to be able understand the characteristics of good performance with reference to the criteria (Boud et al., 2018) ‘Oral presentations are not always black & white in terms of right & wrong, so its a bit harder for students to digest why they are wrong (despite the volume of feedback provided)’ – Recorded/multi-media assessment.

Students do not demonstrate all assessment criteria
Another challenge was that educators considered that students were often not demonstrating all of the assessment criteria in their assessment submissions. The reasons for this were varied, including time constraints making demonstration of complex skills difficult ‘The challenge is that we can’t have a long simulated meeting due to time pressures. This means students struggle to display all their interdisciplinary skills in the time frame.’ – live oral assessment; and engaging the teaching team with the deeper pedagogical aspects of the assessment (noted by three respondents).

Preparing students for the format
Innovative assessments can require a shift in mindset or further capability development for students (Cramp et al., 2019), and three respondents described the preparation of students for the online assessment as a challenge ‘Online presentations are relatively new to students’ – live oral. One respondent noted that this can also have unintended benefits for students ‘Students with limited English sometimes struggle a bit to start with, but the ongoing practice actually works in their favour by providing regular practice in written English over the semester.’ – online discussion.

Getting students to take low-stakes assessments seriously
A few respondents commented that it was challenging to engage students in low-stakes assessments, such as low-grade discussion contributions and optional peer-feedback.

> Some students don't take it seriously-until they receive their first round of feedback in Week 4 of the 12 Week semester, and then they sit up and pay attention. In fairness, the first 4 weeks are accordingly down-weighted compared with the following 8 weeks. – online discussion.

Designing assessments that align with all criteria
A few respondents reported that moving exams/quizzes online meant that they needed to write questions differently and that it was a challenge to align the questions with the learning outcomes they wanted students to demonstrate 'It took some time to develop high quality questions and ensure fairness to the students in terms of whether they had truly encountered the material being tested' – online exam/quiz.

> Some teaching staff don't recognise the integration of functions that is integral to the relevance of this assessment task. They see it as a weekly summative requirement to "spit out what you have learned this week" of dubious relevance, rather than as formative assessment that operated on multiple levels. – online discussion.

Institutional/departmental support
A few respondents described a lack of support from the department or central university services, which compounded challenges they were having with the online assessments 'Little support from department with designing and implementing anything.' – recorded/multi-media assessment; 'Lack of support from Uni central support sections.' – written assessment. This aligns with the findings of Cramp et al. (2019).

Institutional policy
One respondent reported that an institutional policy around the use of online exam proctoring restricted their options for designing mid-term assessments and generated challenges in aligning the assessment to what they wanted to assess.

> My institution uses proctoring for final exams but not for the mid-term assessment described herein. Thus the assessment is effectively open book […] the inability to effectively restrict access to other materials limits the range of suitable questions. It means I need to use more application and am less able to allocate some marks to demonstration of knowledge. – online exam/quiz.

Limitations

The survey was distributed to Australian university business faculty staff involved in the delivery and/or design of online assessment and attracted 97 respondents who were primarily working in universities. While this included people from across the range of business disciplines, there was a higher proportional representation of some disciplines. The sample therefore had some underrepresentation of non-university business education and of some business disciplines, which leaves open the possibility that some areas within the business education community have a substantially different profile of online assessment usage and challenges.

The analysis and identification of challenges was based on each respondent selecting only one online assessment for more in-depth description. This approach will have identified many of the challenges that respondents had at top of mind, but we do not claim that this list of challenges has reached saturation and includes all challenges that business academics may experience. More targeted data collection on the challenges of implementing innovative online assessments may reveal other challenges. Also, the identified challenges relate to online assessments that have already been implemented, and there may be other perceived challenges that inhibit business academics from implementing innovative online assessment in the first place. Finally, the survey included staff only, and although the explanations for challenges often referred to aspects of the student experience, the student perspective would be better addressed directly with a student sample.

Conclusions

This study has identified the range of online assessment practices in use in Australian business education through the pandemic years and the challenges faced by academics in implementing them. These challenges are unlikely to be limited to business disciplines but rather to be common across other disciplines.

Our survey indicates that traditional forms of assessment continue to dominate the assessment regime, with exams, quizzes, written assessments and to a lesser extent live and recorded presentations comprising the majority of assessments reported in this study. Despite this, it is also clear that innovation has been occurring as evidenced by the widespread use of forms of assessment such as online reflective journals, online discussions, self/peer assessment, portfolios, and simulations or games. The results also indicate that this innovation is predominantly taking place in smaller cohorts and with a focus on lower-weighted assessments. Further work may be needed across the sector to address the additional complexities of innovating online assessments within large scale cohorts.

Based on our findings on invigilation of exams and other assessments, we note the importance of shifting from pure invigilation to identity verification. 'At home' invigilation methods through use of cameras can create privacy issues and reduce the student experience (Milone et al., 2017; Huber et al., 2022). Invigilation concerns can be addressed if further support is provided to staff to rethink assessment and the need for invigilation by considering alternative forms of assessment such as performance-type approaches, whereby the student's identity can be verified. If we must stay with online exams then work is needed on reducing the student and staff cognitive load by offering practice opportunities before the exam is run (Cramp et al., 2019).

This study contributes not only a better understanding of the usage of online assessment after the temporary adoption of emergency remote teaching in Australian business education, but also provides a benchmark with which to track and evaluate future shifts in assessment practice. The links between student employability and authentic assessment are becoming more evident (e.g. Sokhanvar et al., 2021) and a further shift away from traditional exams, quizzes and written assessments towards more performative and reflective forms of assessment can be expected in the future.

The findings also suggest there may be further scope for innovation in the use of group and collaborative modalities for some forms of assessment, particularly exams, quizzes, reflective journals and portfolios. Few respondents using these forms of assessment reported using group modes, and while there are obvious reasons why individual assessment might be prioritised with these assessments, the findings also prompt the question of whether additional student learning and assessment opportunities could be realised with deeper exploration of collaboration. We concur with Villerroel et al. (2020) that the use of group assessments for non-invigilated, low-stakes assessments such as quizzes may improve learning outcomes while reducing the risk of normalising academic misconduct.

The analysis of challenges to implementing online assessment provides insight into some of the areas that need ongoing focused attention in order to better facilitate assessment innovation. These challenges highlight the integrated nature of assessment design for online delivery, with overlapping relationships between challenges of alignment of assessment and learning, change management, online technologies, institutional policy and support, and the distributed nature of contemporary teaching practice. Some challenges were notably more common for some assessment types, with timing and logistics particularly impacting live oral presentations and academic integrity concerns being emphasized for exams, quizzes and written assessment and less for other forms of assessment.

Participants in our study submitted their innovative assessment practices via the survey and these have been transposed onto the project website https://bizonlineassessment.com/. Many of these examples can be used as solutions to overcome the challenges identified in this study.

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reconnect
Reconnecting relationships through technology

The impact of an anatomy and physiology open textbook on student satisfaction and engagement in a regional Australian university

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The rising cost of tertiary study-related expenses, including textbooks, has been shown to influence enrolment rates, course choices and quality of learning experiences and outcomes for students. To address issues related to affordability and accessibility, the University of Southern Queensland (UniSQ) has recently implemented alternative learning materials through open educational resources (OERs). Published by UniSQ in 2021, the 'Fundamentals of Anatomy and Physiology' is an opensource, online textbook provided as a supplementary resource for students undertaking first-year anatomy and physiology courses. To investigate student satisfaction and the overall usefulness of implementing this textbook into undergraduate courses, responses to a student feedback survey were analysed. The main themes that emerged from the qualitative feedback included 1. increased student accessibility to course information, 2. improved tertiary education affordability, 3. enhanced course content comprehension, 4. provisioned student agency and choice to interact with formats that best suited the student learning context and 5. overall was rated as a beneficial and useful resource. Although the majority of students who responded to the survey (56%) did not have any negative perceptions about the online textbook per se, there were two negative response themes that emerged regarding the user interface and internet connectivity. Further evaluation regarding retention rates and overall achievement remains to be addressed.

Keywords: OER, Accessibility, Student Satisfaction, Online textbook, Anatomy and Physiology

Introduction

Over the past 20 years textbook costs have almost doubled (Durbin, 2015). Open textbooks are a viable lower cost alternative that can be freely adapted, contextualised, edited, and revised to suit courses and are provided under an open licence making them free for students to access. Aside from a financial benefit, positive pedagogical and andragogical impacts have been reported. An international review of 16 higher education settings utilising Open Education Resource (OER) textbooks found that students achieved the same learning outcomes as students using traditional textbooks (Hilton, 2016). Similarly, a multilevel modelling approach to control for student, instructor, and course effects, found no difference between learning outcomes and grades achieved by courses using OER and traditional textbooks for continuing students (Winitzky-Stephens & Pickavance, 2017). A more recent study found that students who used open textbooks performed equally well as students using traditional textbooks in the same course with the same instructor (Beile et al., 2020). Engaging with OER has shown equivalent learning outcomes when compared to traditional commercial resource use (Annand & Jensen, 2017); showing positive outcomes beyond affordability including reduced failure rates and time-to-graduate (Colvard & Watson, 2018). For academic staff, the use of open texts can influence practice more broadly at the institution (Jung et al., 2017) by changing perceptions and providing authentic use cases and provide opportunities to explore different pedagogical models (Tualaulelei, 2020).

Usage of OER translates into cost savings for students (Weller, 2014) with an estimated $3 million savings for students in the US through the OpenStax textbooks initiative (Green, 2013). More locally, the 2017 Universities Australia report on student finances ascertained that three in five domestic Australian students are significantly affected by financial stress, with one in seven regularly skipping meals due to lack of money, and half of working students stated their working hours adversely impact on their studies however they need to work to meet their financial obligations (Universities Australia, 2018). This risk of financial stress increases even more for students who are Aboriginal or Torres Strait Islander, international full fee-paying, from low socioeconomic status (SES) backgrounds, and those in regional and rural centres. Furthermore, negative mental health effects caused by educational affordability issues were reported as a major concern in the Australian Council of Social Service (ACOSS) 'Starved for Opportunity' report (ACOSS, 2019), with Australian students in designated equity groups more likely to discontinue studies, with lower achievement scores; financial issues and negative health effects (Li & Carroll, 2020). Access to learning resources can be enhanced through OER, and reduce financial stress for all students – not just equity groups – although research indicates these groups benefit more significantly in terms of increased academic achievement, retention, and progression (Bali et al., 2020). Australian students in designated equity groups are more likely to discontinue studies and experience lower achievement scores; financial issues are the most likely reason cited, second to negative health effects (Li & Carroll, 2020). Addressing issues related to affordability and accessibility of tertiary education will play an increasingly important role in improving student enrolment and education attainment. To address these issues many educational bodies are now relying on the use of OERs as either their primary or supplementary study tools (Annand & Jensen, 2017; Colvard & Watson, 2018; Sandanayake, 2019)

'Fundamentals of Anatomy and Physiology' (FAnP) is an OER published by the University of Southern Queensland (UniSQ), as an adaptation of the open textbook 'Anatomy and Physiology' by Betts et al., an OpenStax resource from Rice University in Texas, US (OpenStax, n.d.). The adapted OER delivers an Australian perspective including Australian terminology, information regarding Australian disease statistics, and contemporary career pathways in Australia. Additionally, the amended textbook includes interactive learning tools such as quizzes, appendices, and a glossary. The amended text was designed to reflect Australian standards and requirements, striving to enhance student retention rates and to improve student satisfaction and academic achievement. Although the OER provided an Australian perspective, as of July 2022 it has over 58,000 unique pageviews and 3,000 downloads, has been accessed by both non-UniSQ higher education referrals and high school students from 190 different countries.

The aim of the current research study was to investigate student satisfaction when using FAnP, a freely available online textbook in a blended learning course, and any features or improvements students would find useful to their studies. The study utilised a student feedback survey to assess the number of students utilising the textbook, the usefulness of the textbook and its elements, and the feedback they had regarding the OER.

Methods

Study participants

Participants (n = 93) were drawn from student cohorts enrolled in first-year courses at the University of Southern Queensland (UniSQ), a regional university in South-East Queensland, Australia. Participant cohorts were recruited from the following courses: 'Human Anatomy and Physiology 1' offered in semester 1, 2021 (Cohort A) and 2022 (Cohort B), 'Human Anatomy and Physiology 2' offered in semester 2, 2021 (Cohort C), and 'Bioscience for Health Professionals' offered in semester 1, 2022 (Cohort D). Students enrolled in these courses were from a range of undergraduate bachelor degrees, including nursing, paramedicine, sport and exercise science, biomedical sciences, medical laboratory science, and education. All courses were conducted within 13 calendar weeks and provided students with access to the OER textbook as a supplementary resource throughout the semester. No incentive for research study participation was offered.

Student feedback survey

The student feedback survey contained 16 questions designed to measure student satisfaction with 'Fundamentals of Anatomy and Physiology' and OERs in general. The questions included quantitative five-point Likert scale questions, yes/no questions, and broad qualitative questions based on similar questionnaire themes (Craft & Ainscough, 2015). An example of the questions included 'Have you used [FAnP] free online textbook throughout your studies?', How useful was [FAnP] to your study?', 'What did you enjoy about [FAnP]?', and 'What are the biggest issues with using a free online educational resource?'.

Survey responses were thematically analysed (Braun & Clarke, 2006) and NVivo Release 1.5.1 (940) (QRS International Pty Ltd, Burlington, MA.) was used for qualitative content analysis. This process outlined by Braun and Clarke (2006) allowed for a familiarisation with the data, generation of initial data codes, searching for emerging themes, reviewing emerged themes, defining, and naming feedback themes and producing a thematic report.

Ethics

Ethics approval for the study was gained from the University of Southern Queensland Human Research Ethics Committee, (UniSQ HREC) ID: H20REA157 (v2).

Study limitations

The study was limited to voluntary survey participation of four cohorts of first year university students.

Data analysis and results

Student demographics and survey participation

Of the students enrolled in the four cohorts (n=1668), 5.5% of students chose to participate in the research study. This included 8.3% of students enrolled in Cohort A (n=58), 2.94% of students enrolled in Cohort B (n=8), 6.61% of students enrolled in Cohort C (n=16), and 2.42% of students enrolled in Cohort D (n=11). The student demographics are outlined in Table 1.

Table 1. Student demographics across the four surveyed cohorts.

Demographics	Percentage (%) of enrolled students				
	Cohort A (n=699)	Cohort B (n=242)	Cohort C (n=272)	Cohort D (n=455)	Total (n=1668)
On Campus	76.97	72.79	79.75	71.21	75.12
Online/External	23.03	27.21	20.25	28.79	24.88
Part-time	13.73	18.01	12.81	9.67	13.19
Full-time	86.27	81.99	87.19	90.33	86.81
School leaver	39.77	39.71	38.84	39.78	39.63
Non-school leaver	60.23	60.29	61.16	60.22	60.37
Low Social Economic Status	31.47	30.51	31.4	28.13	30.40
Aboriginal or Torres Strait Islander	4.15	5.15	3.31	3.52	4.02
English Second Language	18.31	8.46	10.33	32.31	19.36
Disability	6.58	9.19	9.09	4.62	6.83

Cohort A: Human Anatomy and Physiology 1 S1 2021; Cohort B: Human Anatomy and Physiology 1 S1 2022; Cohort C: Human Anatomy and Physiology 2 S2 2021; Cohort D: Bioscience for Health Professionals S1 2022

Utilisation of the free online textbook

The freely available, online textbook FAnP was offered to students as a supplementary resource and advertised through lectures and online learning management platforms. Of the 93 study participants, 72.83% of students (n=67) used the OER throughout their studies. Among the 28.26% of students (n=26) who did not use the resource, 38% of students did not know it was available, 19% of students forgot it was available, and 4% of students could not access the textbook and/or website link. The remaining 38% of study participants chose 'Other' as their reason for not utilising the textbook.

To further analyse the trends regarding overall interaction with the online textbook, the study participants were asked how frequently they incorporated the OER into their studies and how useful they found the textbook to their studies. Of the students who accessed the OER, 65% reported using the textbook at least 'occasionally', 'sometimes' or 'often' with only 35% of students reporting 'seldom' or 'rarely' (Figure 1A). Moreover, these students indicated that the OER was very useful to the comprehension of their course content with 65% of students reporting the textbook to be either 'Very Helpful' or 'Helpful' (Figure 1B).

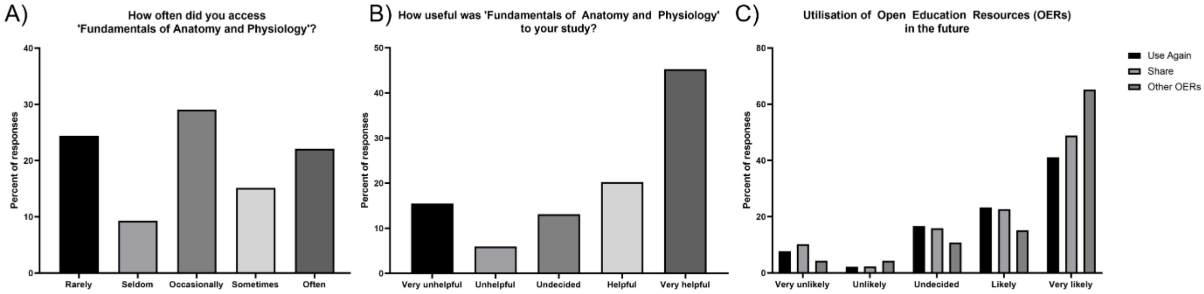

Figure 1. Student feedback survey results.

A) Frequency of utilisation; B) Usefulness of resource; C) Utilisation of OERs in the future. ‘Use again’: If you used "Fundamentals of Anatomy and Physiology" for your studies, how likely are you to use it in your further subjects?; ‘Share’: How likely are you to share/recommend "Fundamentals of Anatomy and Physiology" to friends and other students?; ‘Other OERs’: How likely are you to use free online resources (such as textbooks) for future courses/study?

The survey found that approximately half of the students (44%) preferred using online textbooks or both the (8%) physical printed text and digital text. An overwhelming majority of students (95%) stated they would like free online educational resources to be provided in their remaining courses. To further analyse the preferences of utilising OERs, participants were asked to indicate how likely they were to use the OER FAnP in their future courses, whether they would share the resource with other students, and the likelihood of using other OERs in their future courses. The results indicated that most students were ‘very likely’ to continue utilising the OER in their further courses (41%), would share the OER with their colleagues and others (49%), and were willing to use other offered OERs such as textbooks in future courses and study (65%) (Figure 1C).

The opportunity to engage with the free online textbook also allowed 62% of students to save money on tertiary education related expenses, as gathered from the question ‘Did you save money using the online resource?’. One student, although selected ‘no’ as their answer, stated that the OER was ‘*Excellent. I wish I had [of] known about it before buying the text book*’.

Themes from the qualitative feedback option

The open-ended feedback response questions were grouped into emerging themes which addressed positive and negative aspects of utilising a free open educational resource such as the FAnP online textbook (Table 2.). The positive feedback theme was further divided into five different sub-themes which included accessibility, affordability, course comprehension, favourite features, and resource usefulness. The negative feedback theme was divided into two sub-themes, including user interface and internet connection. It is important to note that an overwhelming amount of feedback regarding what students disliked about the online textbook was noted as ‘nothing’.

The positive feedback sub-themed ‘Favourite Features’ was also supported by other survey results which found that 63% of students used the readily available ‘review’ and ‘critical thinking’ practice questions embedded at the end of every chapter.

Discussion and Conclusion

The current study sought to understand students’ opinions on using the Fundamentals of Anatomy and Physiology (FAnP) online textbook throughout their studies, and to measure student engagement with the online textbook. The survey feedback, while limited to approximately 5% of the enrolled student cohort, showed that the students utilised the supplementary OER throughout their study semester. The main themes that emerged from the qualitative feedback included accessibility, affordability, course comprehension, favourite features, resource usefulness, user interface, and internet connection.

Table 2. Student (n=93) opinions regarding Fundamentals of Anatomy and Physiology free online textbook.

Theme	Sub-theme	Students	Example
Positive Feedback	Accessibility	12	*It can also be used 'out and about'* *Easy access* *It would save money buying a textbook and make it a lot easier to access anywhere and at any time.*
	Affordability	20	*Bridge the gap for students unable to afford textbooks* *Students and parents cannot afford the huge [expense] of textbooks* *I am thankful to have free textbooks available for use throughout my course as it can become very costly to purchase them.*
	Course comprehension	21	*If I was unable to gain a clear understanding from the [publisher] textbook I was able to go through the similar chapter online on the fundamentals textbook and most times gain clarity through a different way of explaining a concept.* *More specific to our course* *Directly related to course topic*
	Favourite features	21	*I like the flash cards that is available, they are quick and easy to use. Also like the check your understanding option, that gives a range of ways to further develop your understanding* *Short quizzes at the end of every chapter* *Practice questions / check understanding questions*
	Resource usefulness	42	*Extremely helpful and great resource* *Fantastic opportunity* *It was great! Very useful*
Negative Feedback	User interface	12	*Harder to do things like annotate or bookmark certain sections* *Always having to go through each and every tab* *Sometimes wanting to take notes on your computer and needing your screen to see the textbook*
	Internet connection	9	*Poor network connection and electricity* *Internet quality* *Internet issues in downloading huge files*

Accessibility

Students highlighted the key beneficial feature of online textbooks was the ability to access credible information from any device capable of being connected to the internet. The textbook publisher, Pressbooks, also provided the option to download the textbook in various formats including PDF files, ePub files, and HTML book, which allows readers to access the textbook without internet connection or provide the ability to print either all or selected parts of the book. Additional features provided by the Pressbooks publisher allows the online textbook to include a range of compatibility features with screen readers and other assisted technologies to ensure the text is inclusive and aid in bridging the gap (Navarrete & Luján-Mora, 2018). "Bridging the gap" refers to reducing inequality between groups of people, especially those from a disadvantaged background. While Australian educational policy is established around inclusivity of all people, Boyle and Anderson (2020) have recently highlighted the increasing inequality within the educational sector. This inclusivity primarily arises from challenges in the policies and governance of Australian education and educational reforms (Boyle & Anderson, 2020). While advertising inclusivity and equality within the educational sector, there is clear evidence showing that people from disadvantaged and minority backgrounds do not meet key developmental milestones in early schooling, or continue full time education in early adulthood (Smith Family (Charity), 2016). Across the four student cohorts explored within the current study, 60% of students identified as non-school leavers, which means that students did not proceed with tertiary education directly after high school graduation. Andragogy varies quite significantly from pedagogical teaching techniques, as highlighted within Knowles five assumptions of adult learning. Knowles highlighted that adults have different motivations, approaches, and styles of learning which need to be considered when making assumptions of how adults learn, which included: self-concept, adult learning experiences, readiness to learn, orientation to learning, and motivation to learn (Knowles, 1980). There are also two main barriers that adults face when approaching learning, the external/situational barriers, and internal/dispositional barriers (Falasca, 2011). It has been suggested that utilising OERs such as online textbooks reduces some of the obstacles faced by adult learners by providing an equitable platform (Sandanayake, 2019). Although themes of equity were not directly assessed by the student satisfaction survey, the feedback comments alluded that the accessibility to textbook information provided by the FAnP online textbook would allow financially disadvantaged students to have access to otherwise unobtainable resource.

Affordability

Financial affordability is especially important when taking into consideration the student demographic enrolled in these regional university courses. A quarter of the students in the current cohorts were enrolled as external or ‘online’ students, majority of the students identified as non-school leavers (60%), and 30% of the students identify as having a low socioeconomic status. Survey studies in recent years have shown that the increasing expenses associated with textbooks play a vital role on the choice of courses students are able to enrol into and influence the quality of their learning experiences (Senack & Donoghue, 2016). The education statistics for Aboriginal and Torres Strait Islander peoples (2018-2019) found that “financial reasons” and “high expenses” were the main reason (20.4% responses) for persons aged 20 years and over did not study or continue educational qualifications within the last 12 months (Australian Bureau of Statistics, 2020b).

Access to OERs can reduce financial stress for all students, however, indigenous, low socioeconomic background, regional/rural, and international students have a significantly higher academic achievement, retention, and progression when provided with resources to reduce financial stress (Bali et al., 2020). These equity groups are also more likely to experience lower academic achievement scores and discontinue their enrolment in educational institutes due primarily to financial issues (Li & Carroll, 2020). It is also important to note that these studies were collected prior to the COVID-19 pandemic, which has shown to further increase the unaffordability of tertiary education (Australian Bureau of Statistics, 2020a; Barnes & Noble College, 2020). The effect of COVID-19 pandemic has not only been felt by the students, but by the tertiary institutions as well. Forbes released an article in June 2020, several months prior to the major COVID-19 wave in the USA, which highlighted the financial burdens felt by tertiary institutions due to interruption of tuition and fee revenue, as well as revenue generated from student’s on-campus presence (DePietro, 2020). Some American institutions, such as the Pennsylvania State System of Higher Education and the University of Wisconsin had each projected a loss of approximately $100 million due to the COVID-19 impact (DePietro, 2020).

The estimated modelling of Australian university revenue projected a $16 billion loss by the year 2023 (Universities Australia, 2020). Actions implemented by tertiary institutions to reduce costs have included the review of expenditure costs and the “scaling-back” of infrastructure aspirations (Marshman & Larkins, 2020). Given the severity of the financial losses associated with COVID-19 to both individuals and institutions, and the inevitable shift to virtual teaching, the implementation of digital textbooks and OERs is crucial to maintain and increase enrolment rates and assist in student’s completing their chosen degrees.

Course comprehension

The consensus from this study was that the supplemental OER resource provided the same key information as the printed textbook, however, was overall presented in a simpler language which made it easier for first-year students to comprehend the course content. This was especially noted by students who highlighted they did not study science in high school or have not been exposed to scientific concepts in many years, which made comprehension of anatomical and physiological concepts more difficult.

Pedagogical studies have also found that there was no difference in student academic achievement when comparing the use of OER versus traditional textbooks. Hilton and colleagues observed 16 tertiary education intuitions which implemented OERs into their teaching, finding that students achieved the same learning outcomes as those who used traditional textbooks (Hilton, 2016). The same finding was observed in a multilevel modelling study which took into consideration course effects, instructors, and students (Winitzky-Stephens & Pickavance, 2017). Studies controlling for pedagogical differences by observing the same courses and instructors prior and post OER incorporation also recorded no differences in student academic achievement (Beile et al., 2020). The Covid-19 pandemic, while having forced educators to shift their teaching style out of necessity, has also provided educators with novel teaching strategies and opportunities (Lockee, 2021). The shift to virtual learning has accelerated the use of technology within the learning environment, offering more opportunities within the classroom.

The implementation of OERs such as the digital textbook FAnP aligns with this recent pedological shift to virtual learning. This is largely due to the ability to amend OERs to fit a tailored requirement of individual courses, disciplines, and settings. These resources are frequently used as supplementary materials as they tend to lack detail and clarity provided by standard resources, contain outdated information, and/or provide information that is not applicable in an Australian setting. One of the most important implications being discussed in the recent literature is the need to develop practical measures to ensure open textbook quality (Fischer et al., 2017; Jung et al., 2017), including the use of open peer review. This process is currently implemented by the Open Textbook Library and UniSQ texts.

Favourite features

When creating novel tools and resources designed to improve student satisfaction and course engagement, it is important to evaluate and note the physical features important to the students. This was highlighted in the sub-theme '*Favourite features*' which explored the key aspects of the provided OER that students utilised most frequently. An overwhelming majority of the respondents highlighted the benefit and need for tools which help to test student's comprehension of the learnt topics. This was done by providing a range of 'review' and 'critical thinking' questions embedded in every chapter. The style of questions included a range of multiple-choice questions and short response questions.

The survey also explored any new or additional features students would like to see implemented in OERs, and while many respondents (63 %) chose additional practice questions and quizzes, some of the other requested features included videos, labelling activities, more illustrations, and flash cards.

Resource usefulness

The most frequently stated positive feedback provided by the students was the overall usefulness of the resource. The provided feedback highlighted the utilisation of online textbooks and the high engagement with the offered alternative resources. The majority of feedback from this sub-theme (n=42) included comments as the resource being 'great' and 'helpful'. These comments were also often combined with other sub-themes such as accessibility and affordability. These results corroborate the findings of other similar international studies where students perceived the use of OERs as being very useful to their studies (Branson et al., 2021; Cheung, 2018; Venegas-Muggli & Westermann, 2019).

User interface

One of the negative themes that emerged was the user interface. This was not directed at FAnP specifically, but rather at the Pressbooks publisher user interface. Students highlighted issues regarding inability to annotate the webpages and needing to skip tabs to access the next chapters. These issues can be readily addressed by providing informational videos to expose students to a range of annotation tools such as hypothesis.is (open-source annotation software) or by providing additional links to the Pressbooks user guide to assist readers.

Internet connection

As an open educational resource, the FAnP textbook is a web-based digital text that requires access to a stable internet connection to access the information. The second negative feedback received regarding the use of digital textbooks and issues in utilising OERs centred around the reliability on internet connection to access the textbook. As a regional university, the majority of UniSQ students live in rural, regional, and remote areas, especially those who study externally. It has been noted that although digital inclusion in Australia is improving overall, areas of rural and regional Australia with low socioeconomic background and poor education rates do not have the same inclusiveness, with the gap appearing to widen across these disadvantaged groups (Wilson et al., 2019). For enrolled students residing in these areas, access to a reliable internet connection could become an issue, however this is one of the many reasons why Pressbooks offers the option to download the book in various formats. Additionally, while internet connection and access to appropriate technology could be limited for some students, the vast majority of course content is provided digitally on the University's online learning management system 'StudyDesk'. This includes lecture content, assessment information, additional resources, and an assessment submission portal. Students are required to connect online throughout their tertiary studies and as such internet connection is not an issue limited to OER access and usage, but a wider issue experienced by many students especially in the rural, regional and remote communities that enrol at UniSQ (Hay & Eagle, 2021). Recently, the Australian Government's Higher Education Participation and Partnership Program undertook a project which formulated a framework for both Australian universities and public libraries to support Regional, Rural, and Remote (RRR) students. The framework formulated an adaptable guide for the development of learning support required to assist RRR communities with low socio-economic higher education students (Partridge et al., 2021). Implementation of such frameworks in the future could aid in reducing the issues of connectivity, not just for students in RRR communities but also those from disadvantaged or low socioeconomic backgrounds.

OERs in Australia

The use of OERs is not a novel concept in Australian tertiary and secondary educational institutions. The Open Education Practices (OEP) was first established in Australia in 1998 by the Australian Government (Miao et al., 2016; Picasso & Phelan, 2014). The Open Education Resources Foundation, a New Zealand based organisation supported by UNESCO, established a "parallel learning universe, in order to widen access to more affordable education for learners" (Open Education Resource University, n.d.-a). This new collaborative project was named Open Education Resource University (OERu). Today, the OERu is associated with almost 40 international tertiary and secondary institutions across five continents, including Australia (Open Education Resource University, n.d.-b). Although the use of OERs in Australia has been increasing, there is a severe lack of their incorporation in tertiary education. There are, however, several key benefits of utilising and creating OERs in tertiary institutions, including student engagement and satisfaction, cost reduction, and ability to tailor information.

Conclusion

The main goal of the current study was to evaluate student satisfaction and engagement with the supplementary resource Fundamentals of Anatomy and Physiology, an opensource online textbook. The most marked finding to emerge from this study was the student eagerness to utilise OERs throughout their studies. Although further evaluation regarding retention rates and overall academic achievements needs to be explored with a larger student population, the current study has highlighted an evident benefit in the development and implementation of OER textbooks in tertiary institutions.

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reconnect
Reconnecting relationships through technology

Developing a micro-credential for Learning Designers: A Delphi Study

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Teaching and learning online have increased as a consequence of the pandemic. There is an increasing need for learning design proficiency both in terms of new roles and also new expertise. In recognition of this, the Tertiary Education Commission in Aotearoa | New Zealand is supporting the design of a micro-credential to develop introductory knowledge in this field. Given the complexity and breadth of competencies needed in this role determining the foundational components is challenging. Prior research focused on professional standards and employer requirements only capture one perspective of the role. In this Delphi study, we sought the views of thirty-four learning designers to determine the essential competencies required for learning design in the current (post)pandemic context. Findings demonstrate the importance of understanding the nuances of different modes of learning, pedagogy before technology and the value of relationships.

Keywords: Delphi study, learning design, competencies, online, micro-credential

Introduction

Over the last few years, there has been a dramatic uptake of digital learning. While the COVID-19 pandemic has exacerbated this rapid move to online learning, the adoption of learning facilitated by technology has steadily increased over the years. As a result, there has been growing interest in the role of the learning designer (LD) to facilitate and support educators to design effective online learning experiences (Slade, 2018). As a consequence of the pandemic, there has been a greater focus on online-only or high-end blended models of learning in all sectors of education (Heggart & Dickson-Deane, 2022). Support is therefore needed within all areas to support the effective development of learning, making learning design a critical component of many educational institutions.

The implications of the pandemic and the move to online or technology-facilitated learning, have been twofold. 1; An increased requirement for those in the learning design field, especially those with expertise in digital technologies and online spaces, to redesign and develop effective learning that can be undertaken online. 2; New roles and expertise are needed to support educators in designing and developing learning, especially when learning is undertaken online.

A search on Seek.co.nz for the term “online learning” in June 2022 resulted in 228 job vacancies. While this search uncovered a wide range of jobs, that include aspects of online learning, it does acknowledge the growing influence of online where aspects of learning happen online, either fully online or as a part of the learning process (e.g hybrid learning, hi-flex, technology-enhanced face-to-face learning).

The rapid adoption of technology in education, accelerated by the pandemic, has meant that educators have had to increasingly grapple with how technology can support learning. As the pedagogical approach of designing learning is fundamentally shaped by the mode (online, face-to-face, blended etc) in which learning happens, educators are requiring new competencies to adapt to different approaches. This has meant that while educators have needed to develop their own capabilities for teaching online there has also been an increased demand for new roles to provide additional support to these educators (often referred to as Subject Matter Experts (SME).

The outcome of this demand has meant a plethora of new roles and job titles that have arisen, over time, created to support the design and development of online learning. These titles have included, content developer, curriculum coordinator, curriculum developer, e-learning specialist, e-learning producer, instructional designer, and learning technologist (Sun, et al, 2018) but fall under the broad area of learning design (a term we will use in this study to represent the broad area). Anecdotal experience, from talking to various sectors in our region, has highlighted the struggle employers are facing in seeking to fill these growing vacancies in the range of roles that cover these areas of learning design. Many providers have to hire and provide on-the-job training to upskill people outside the LD field. A review of where LDs come from, in the Australian sector, has highlighted the diversity of backgrounds and lack of formal training in this field (Sage & Sankey, 2021).

As a result, there is a current need for training in this area, to up-skilling educators to engage in this area and to train LD to work with SMEs to support and create learning content. The upskilling, in both areas, has led to the proposed development of a set of micro-credentials that could serve as a mechanism for those wanting to upskill in this area. Micro-credentials are increasingly being used as a way to support people to retrain or upskill to address skills shortages in the workforce. They provide a mechanism for learners to rapidly gain recognition for smaller components of learning that focus on skills or knowledge of particular importance to the workplace (Miller & Jorre de St Jorre, 2022). Though the adoption of micro-credentials within the high education has received some criticism (see Wheelahan & Moodie, 2021), it has continued to be promoted as a way to address societal issues, particularly employability and life-long learning-related agendas, and equity and social inclusion (Desmarchelier & Cary, 2022).

As one way to meet this need, the University of Canterbury, supported by the Tertiary Education Commission (TEC), has started the development of a micro-credential to provide an overview of the core skills, knowledge and abilities that are needed for designing digital learning experiences. While there has been a wide range of different competencies and frameworks developed (e.g. Aragon & Johnson, 2002; Piskurich & Sander, 1998; Arinto, 2013) the field of learning design is rapidly evolving.

A micro-credential would clearly not be able to cover this expanse. There are already entire books (for example Clark, 2021 and Dalziel, 2015), and postgraduate qualifications devoted to becoming a LD. However, there clearly is a need for something in between being thrown in the deep end as a person new to designing digital learning and becoming an expert in the field.

To discover what current needs and gaps the micro-credential should focus on we adopted a Delphi technique to gather input from experts and colleagues in the field as our starting point. The purpose of adopting a Delphi technique was that it provided the opportunity to collaboratively involve a range of experts in the field (Okoli & Pawlowski, 2004). As the field of learning is broad, we wanted to gather a wide range of perceptions in a way that could also be consolidated. The adoption of this technique enabled us to gain expert opinions and build consensus to inform the development of curricula. This approach has been used extensively as a way to inform the development of curricula (Sitlington & Coetzer, 2015). The outcome of this process was to provide the first steps to the development of these courses. So, while the process would not provide the final design of these courses it would rather highlight the perceptions of the field as to what needs to be covered. This would be then used to support the design of the course, where this feedback would be used to design a cohesive set of courses that acknowledge the process of learning design.

In this article, we explore the outcomes of this Delphi study and propose the critical content, understandings and abilities that should be developed in a micro-credential to support those designing digital learning. As defined by MacLean and Scott (2011), these roles “require the application of theories of learning and instruction to the creation of learning material and the design of online learning experiences” (p557). We use the term LD to represent this broad field of learning design.

Methodology

The study adopted a web-based Delphi technique to address the focal question: What foundational skills and knowledge do LDs need in our current context? The study was undertaken in two iterations, the first was designed to gather opinions and the second version was focused on consolidating these opinions.

The surveys were designed to be undertaken anonymously utilizing the Qualtrics platform. The study was submitted and approved by the University of Canterbury Human Research Ethics Committee before the commencement of this study (2022/35/LR-PS).

Before the commencement of the study, invitations were circulated via email to experts that had already been involved in the initial consultation for these micro-credentials. These experts came from suitably qualified senior practitioners in the sector. We utilized our networks within the professional community from our own work experience. We also asked these experts to send the invitations to anyone they felt may be able to contribute to this process. While some researchers have advocated for rigorous guidelines for selecting experts (Okoli & Pawlowski, 2004), we decided to determine our expert panel more broadly whereby experts were determined by the individual’s involvement in the work of learning design. This approach has been adopted in other studies such as Brill et al. (2006). In this study, we had a wide variety of participants from a variety of different roles in the learning design space. The majority (n=12) had titles including the term LD, including four having a role including the term head, manager or senior. The next most common were those with the title of Instructional Designer (n=5), with two including the title of either senior or head, and those having Curriculum Development or Education Specialist or Advisor their titles (n=5). Three participants had the title of Learning Technologist with seven having a variety of titles including Education Innovation Designer, Head of Digital skills, Online and Digital Learning Coordinator and Lecturer. Two participants did not include a title.

Of these participants, most were employed by a Government Education Provider (n= 26), while five were employed as Private Training Providers with only two employed in business. Most respondents came from New Zealand (n=14), but responses also came from the UK (n=7), Canada (n=5), Australia (n=3), USA (n=2) and one person from Nigeria and Burundi respectively. One person declined to answer these two questions.

There is little agreement in the literature about the size of an expert panel (Keeney et al., 2001). While numbers can vary between 10 and 40 participants (Sitlington & Coetzer, 2015), there is always some attrition when running multiple phases required for a Delphi Study. 34 people participated in round one and whilst 23 agreed to participate in round 2 only 17 people completed round 2. The survey ran over two weeks with each survey running over one week.

The first round of the Delphi study was designed to elicit feedback and brainstorm ideas. While the structure can differ our first survey included structured questions seeking the participants' perception of importance along with open-ended questions. This approach was important as it provided a structure to the study but also allowed for flexibility and spontaneous contributions from participants (Critcher and Gladstone, 1998). The survey was sectioned into three parts. In the first two; 1) the knowledge areas required by LDs, and 2) the skills that they need to develop the participants were given items drawn from the literature and asked to indicate the importance of these items using a Likert-scale. They were then asked to add any additional items they felt were important but had not been included in our initial lists. In the last part, we asked the participants to rate the pedagogical approaches or learning theories that LDs need to be aware of and draw into their design. We also asked if anything was missing from our original list.

In Round 2 we fed back the results of the Round 1 survey. In this phase we grouped the information and skills into topic areas of 1) Learning Design Concepts, 2) Assessment Approaches, 3) Learning Approaches 4) Research Concepts 5) People and project management. We then asked the panellists to indicate if these “Needed to be covered for understanding only”, “Needed to be applied (demonstrated in the assessment for example)” or “were not relevant or would be covered later” (realizing that the three courses are only considered to be foundational). When categorizing these items into two groups (understanding/application) we asked them to rate these in order of importance. We did not ask participants to comment on the learning theories/pedagogies as we had already asked the participants to rate and we did not receive many additional areas.

The first and second round was undertaken anonymously, with the participant demographics captured in the invitation/recruitment survey not linked to their answers in the two rounds of the study. Therefore it was not possible to explore how their responses and perceptions may have varied across the different demographics, sectors and regions.

Findings of the Delphi study

Round One Findings

The first survey focused on gathering the panel's perception of the most critical competencies that would be required for a foundational course (Table 1). The panel were asked to rate the importance of a range of skills and knowledge areas, that would cover a range of competencies, on a Likert scale of 1-5, with five being the most important. These items were drawn from a wide variety of sources including exploring job vacancies as well as key literature (e.g. Kang, & Ritzhaupt, 2015). The aim was not to provide the panel with an exclusive list but rather to provide a starting point for them to add their own ideas (Table 2).

As identified by the panellists, the most important knowledge includes an understanding of the pedagogical application based on the context of learning, and how this differs between different modes e.g. online, face-to-face, mobile, and blended. This also included an understanding of different approaches to learning and learning theory to specific knowledge areas related to LD, such as the roles, constructive alignment and learning experience (LX). As for skills, the panel felt that assessment and constructive alignment was a critical skill along with general skills required by LD, including communication, presentation, evaluation and project management.

Table 1: The most essential competencies considered as most important ($\bar{x}$=>3.5)

	Item	Mean $\bar{x}$ (SD)
Knowledge Area	Different modes of learning (online, face-to-face, mobile, blended etc)	4.53 (0.56)
	Active learning approaches	4.3 (0.94)
	Learning theory	4.21 (0.92)
	The roles of LD and SME	4.13 (0.96)
	Constructive alignment	4.13 (0.96)
	Learner Experience (LX)	4.1 (0.83)
	UDL principles	4.03 (0.91)
	Culturally responsive design	3.97 (0.98)
	Knowledge of various development tools (Sharepoint, Captivate, Articulate, LMS etc)	3.5 (0.72)
Skills	Assessment design	4.33 (0.7)
	Assessment Development	4.03 (0.84)
	Constructive alignment	4 (0.91)
	Communication and presentation skills	3.83 (1)
	User evaluation methods	3.73 (1.06)
	Project management skills	3.66 (0.84)
	Storyboarding	3.53 (0.99)

Analysis of the open-ended responses from each section demonstrated that panellists found the distinction between knowledge and skills hard to make. This raised the question of whether knowledge and skills were too simple in their dichotomy as pointed out by one panel member "*I think knowledge is only one part of it, need a way to develop practical skills*"... '*beware over-emphasis on technology/ academic theory, instead ground in practical application*". It was clear that our definition of skills were not helpful as we didn't intend to emphasize one over the other.

Additional areas were grouped thematically into areas related to learning design concepts and approaches and included items like, Māori pedagogies, copywriting skills with audience focus, accessibility flipped learning and new models like Hyflex learning. It also included items related to assessment approaches and include items such as authentic assessment, feedback and approaches like collaborative assessment, and research concepts and include items such as data analytics, evaluation and research skills (for evidence-based design/approaches). The panel also included more general skills that a LD would need to carry out their role and related to engaging with stakeholders and managing projects, items included relationship-building skills, change management and dealing with stakeholders.

The last section included a list of learning theories and learning design models which the panel were asked to rank from 1 -13 with 1 being the most important. The most popular learning design models were ADDIE ($\bar{x}$=3.69, SD=3.14), Bloom's Taxonomy ($\bar{x}$=4.72. SD=3.26), and TPACK and SAMR ($\bar{x}$=5.97, SD=3.38) were rated the highest alongside learning theories, like constructivism and social constructivism ($\bar{x}$=6.34, SD=3.73) and Vygotsky's Zone of Proximal Development and Scaffolding ($\bar{x}$=6.44, SD=3.52). However additional, more contemporary theories and models, were mentioned by the panel and included Critical thinking/First principles thinking, humanizing online Learning, Community of inquiry, Networked learning, Relationship-based learning and Threshold concepts.

So, while many people were able to rank these it was clear that while some theories/models appeared lower in the ranked order that this did not mean they should be covered and also that these would not all be relevant in all contexts. As highlighted by one panel member, "*Although a sound knowledge of theory is important it is more important to be able to read a situation and apply appropriate approaches. Models date so if I was designing* *this course I wouldn't specify a list but suggest that contemporary models are investigated and that the learner identifies those that resonate with them and how they do their work (mahi).*"

Table 2: Top-ranked items under each category

	Understanding only - Students only need to have a basic understanding of these ideas or concepts	**Application - Students should demonstrate their understanding through creation and evaluation**
Learning Design Concepts	Learner Experience (LX) (14) Different modes of learning (online, face-to-face, mobile, blended etc) (10) Communication with diverse audiences (10) Continuous improvement (9) Culturally responsive design (9)	Designing learning outcomes (28) Learner Experience (LX) (16) Storyboarding/Instructional Mapping (11)
Assessment Approaches	Inclusive assessment (18) Assessment strategies (16) Authentic assessment (12) Assessment development approaches (10) Accessibility (10)	Constructive alignment (31) Assessment strategies (20) Assessment feedback design and strategies (10) Assessment development approaches (9)
Learning approaches	Learner engagement (18) Collaborative learning approaches (14) Practice/Problem/Project Based Learning and Inquiry-based learning (12) Inclusive and accessible design (12) Online class dynamics and management (10) Asynchronous learning approaches (9)	Active learning approaches (23) Learner engagement (13) Online class dynamics and management (12) Inclusive and accessible design (9) Asynchronous learning approaches (9)
Research Concepts	Audience identification (19) Data analytics (13) User evaluation methods (13) Research skills (for evidence-based design/approaches) (12)	Evaluation, analysis and design critique (21) Understanding learner context (17) Research skills (for evidence-based design/approaches) (13) Designing and gathering user data (i.e focus groups, interviews etc) (10)
People and project management.	Positive relationship and stakeholder management (22) The roles of LD and SME (and other stakeholders) (16) Change management (12) Collaboration and relationship building (10) Conflict management and negotiation (9)	Effective communication strategies (25) Writing and presentation skills (14) Collaboration and relationship building (14) Project management (11)

Note: Number in brackets indicate the weightings based on their ranked order of first, second or third place.

Round Two Findings

Based on the findings from round one we adopted the five categories identified from round one. For the collated list from Tables 1 and 2, the panel were asked to categorise if this needed to be covered for more understanding or application. The panel did not need to categorise all items and they needed to list them in order of importance (from most to least importance). Table 2 shows the outcome of this ranking and categorising. In order to identify the top items, we looked at the rating of each item as top 3 in each category and weighted them, a weighting of three for the first ranking, two for the second ranking and 1 for the third weighting these were then added together to get the top-rated items in each category.

Discussion

Pedagogy above technology

The most important aspect foregrounded by the panellists was an understanding of the nuances between different modes of learning. How does learning need to be designed differently for online/face-to-face, blended, and mobile? Whilst this has always been important (Kumar Basak, et al. 2018) this is even more critical in the (post) pandemic context as educators have to move rapidly and responsively between different modes. *“Focus on course design rather than technology. A course design should be able to be applied to any modality. Technology should be transparent and used only to achieve the learning goals and objectives.”*

Pedagogy was noted as more important than technology eg how to use various tools. As noted by a panellist *“The tools and platforms are the least important in the skill set of a quality curriculum and learning designer. The skills to use tools are transferable and can be picked up easily.”* Skills, needed to focus on learning and not technology *“practical skills relating to creating the better and aligned learning environment is important, more so than technical skills.” and “Focus on course design rather than technology. A course design should be able to be applied to any modality. Technology should be transparent and used only to achieve the learning goals and objectives.”*.

Almost all panellists ranked designing learning outcomes as necessary, and in terms of assessment approaches - constructive alignment. These are core pedagogical competencies of any educator so it is interesting to think about the similarities and differences of these in a digital context.

Overall, the mainstream global LD approach ADDIE was the one most people felt was essential to cover. This concurs with the employer views where competencies related to analysis and design, particularly the ability to use ADDIE was one of the most frequently cited skills (Klein & Kelly, 2018). This is interesting as this model was not initially created as a learning design tool. In our bi-cultural contexts in Aotearoa New Zealand, we have a responsibility to uphold the Treaty | Te Tiriti. One does wonder how a framework created in the seventies in the US for military training purposes to do that?.(Bouchrika, 2020). One panellist did note the importance of more culturally relevant approaches but also acknowledged the complexity of doing this within the scope of a micro-credential around learning design. “*while I think culturally responsive design and Māori pedagogies are extremely important, I'm not sure a micro-credential could cover enough to have people confident enough to be assessed on it (they could be micro-credentials on their own)*.”.

Designing for engagement

Active learning design and approaches were rated highly in both rounds along with learner engagement in round 2. Clearly this is an emerging area as the additional contemporary theories highlighted by panellists included a focus on participation and collaboration e.g. Humanizing online learning, Community of inquiry, Networked learning, and Relationship-based learning. Whilst designing instructional activities is sometimes listed by professional organizations who publish design standards (Martin & Ritzhaupt, 2021) it is not explicitly mentioned as a key competency in other research exploring this topic. This might be because the interrogation of key competencies for learning designers has mostly been through job postings (Kang & Ritzhaupt, 2015, Sun et.al. 2018, Wang et.al 2021). However, it could also be that in the current context where online learning has been the predominant form of education during the pandemic this has become an issue of increasing importance for learning designers, and educators. This also foregrounds the importance of peer-to-peer relationships and consciously creating opportunities for this to occur across multiple times and spaces. It also demonstrated the importance of newer learning theories that explicitly foreground social learning theory.

People relationships are above project management

Effective communication and positive relationships were rated more highly than skills in project management, Panellists confirmed that what was important was not just the what but the how of LD. “*The values-based approach and cultural competence is more essential to focus on, particularly in Aotearoa”.* This is an interesting observation because this is not something that is necessarily taught but is a critical part of the role.

This points toward the importance of collaborative / peer-based activities in learning and teaching about the LD. Something that is better enhanced through interpersonal communication as opposed. As one panellist suggested *"perhaps some small examples of role plays or scenarios … could be useful to apply. Being able to show an understanding of different roles, who takes on what, strategies and the project process and what happens regarding dependencies when projects stall or have scope creep could be good."* This concurred with the analysis of instructional design job announcements (Wang, et al., 2021) which found collaboration and communication among the top three skills and consulting with subject matter experts amongst the top three concerning abilities. In the current context, however, this is perhaps more challenging as work and learning oscillates between virtual and face-to-face depending on the circumstances of individuals. Hybrid working and learning are likely to be a reality of the future.

Research and evaluation

Evaluation, analysis and design critique was the most highly ranked of the research concepts. However, in open-ended comments it appeared that if something had to give this would be it. *While I think evaluation is really important I am conscious that there's only so much that can be done in a foundational course. At most maybe some kind of short proposal on how they intend to gather user data, and what qual vs quant methods could be used?.* It was also noted that "*Not entirely sure that research is a high priority for most learning designers or something that they are commonly allowed to do".*

The dichotomy of knowledge and skills

Previously frameworks for learning design competencies such as the Knowledge, Skills, Abilities (KSA) framework (Martin & Ritzhaupt, 2021, Kang and Ritzhaput, 2015) have sought to organize competencies within these spheres. However, the current context is making this more complex/ nuanced. One of the challenges highlighted in the first round was that almost every topic had an aspect of knowledge and skills. Panellists found it hard to separate these and the dichotomy between the two was seen as, to some extent, arbitrary.

In addition, the changing nature of tools across contexts suggested that the principles of LD were more important to learn than the tools *"LDs will be expected to be able to learn different platforms as they move between jobs, so I would provide more of a conceptual overview of what the purpose and key features of different tools (e.g. LMS) are and practical ways that students can develop skills with specific versions"*

Conclusion

The increasing need for learning designers in the workplace and educators to upskill in the design of online learning makes a case for a foundational introductory micro qualification in learning design. The views from the Delphi study confirm the breadth and complexity of the learning design role. They also offer concern that this process might be too simplistic. "T*hey are really only things picked from a pre-selected list. Learning design is a complex process and set of skills. see my Book Learning Experience design. Honestly I find this approach a little simplistic".* Clearly, it is necessary to be strategic about what a micro-credential can focus on given it clearly can't cover everything. So, what foundational skills and knowledge are absolutely essential for a learning designer?

Because technology changes both across contexts and time it is essential to have a solid foundation in pedagogy including relevant learning theories, designing learning outcomes, assessment strategies and constructive alignment. A clear understanding of the differences in pedagogy and practice across modes is critical. LDs need knowledge about the learning process and models to provide a structured approach to the design process.

However, relationships proved to be a key aspect of the LD role. Understanding strategies on how to engage learners, and scaffolding peer-to-peer relationships through collaboration, inclusion, and interaction are core aspects of the role. LDs need to know how to create positive relationships and communicate effectively with stakeholders. Building relationships is seen as more important than managing projects. Developing and maintaining relationships in the (post)digital context, where the lines between online and offline, virtual and face-to-face are blurring, is more challenging than ever. These skills are not something one learns "on paper" but rather through experience. A flexible cohort-based micro-learning opportunity would need to foreground these aspects alongside foundational content.

The next phase of this project will be to take the findings of the study to inform the next phases of the design and development of this micro-credential. The finding will help to inform our general design where we will then go back and work with key stakeholders to further develop and refine the ideas generated from the panel.

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reconnect
Reconnecting relationships through technology

A peer community approach to research education: A case study of a student-initiated online community

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This paper reports the trends and challenges of research education in Australia, and presents a case study of a student-initiated community for Higher Degree Research (HDR) students at a public university. The study aims to determine whether an online Community of Practice (CoP) has developed among HDR students without any design effort from the university, and whether the community helped HDR students achieve connectedness without face-to-face interactions. The results indicate that the community is a spontaneous, distributed, small but diverse HDR CoP within a faculty. Feedback from the members show that the technology employed in the community is appropriate for peer communication, knowledge sharing and collaboration in the CoP, but technical problems on the communication technology could discourage members' engagement and participation. The findings also reveal that length of the membership has a statistically significant impact on HDR student connectedness, but technology satisfaction and virtual mode do not.

Keywords: Communities of Practice, online communities, peer support, research education

The trend of pursuing postgraduate research study in Australia

The Australian Government Department of Education defines a 'Higher Degree Research' or 'Higher Degree by Research' (HDR) as "a Doctorate by Research or Masters by Research" (2020, p. 6). According to the Higher Education student data released by the Australian Government Department of Education (2014), Australia had a total of 45,659 HDR students in 2003 and the number grew by 36.8% to 62,471 in 2013. While the number of Masters by Research (MPhil) students between 2003 and 2013 decreased by 16.3% (from 9,784 to 8,190), the number of Doctorate by Research (PhD) students increased by 51.3% (from 35,875 to 54,281). In early 2022, the Australian Government Department of Education, Skills and Employment released the 2020 student data (2022) which shows a similar trend despite the negative impact of the COVID-19 pandemic: the number of Australian HDR students between 2010 and 2020 grew by 19% (from 55,740 to 66,337); the number of MPhil students decreased by 5.2% (from 8,674 to 8,227); and the number of PhD students increased by 23.5% (from 47,066 to 58,110).

Since Australia is a popular study abroad destination with a large number of international students (Hasnain & Hajek, 2022), statistics related to overseas students are extracted from the available Higher Education student data (2022) to understand the composition of the HDR students in Australia. Although there was a growing number of overseas HDR students and overseas commencing HDR students before 2019, the majority of HDR students and commencing HDR students in Australia from the years 2003 to 2020 have been domestic students. Domestic students, as defined by the Australian Government Department of Education, Skills and Employment (2021), mainly include Australian citizens, New Zealand citizens, and Australian permanent residents.

In sum, the student data provided by the Australian Education Department shows a trend of pursuing a HDR, particularly PhD, in Australia for both domestic and overseas students. The majority of HDR students and commencing HDR students in Australia are domestic students, despite the high number of international students. On average, the number of domestic HDR students is more than twice the number of overseas HDR students.

The disengagement and long completion time issues

However, the most recent HDR completions report published by the Australian Government Department of Education (2020) shows that domestic HDR students have a consistently higher drop-out rate than overseas

HDR students. Based on the data over the period 2007 to 2017, the average drop-out rate of domestic HDR students is 20.8%, which is significantly higher than the average drop-out rate of overseas HDR students (11.5%). In addition, part-time HDR students are significantly more likely to drop out than full-time HDR students. On average, 28.3% of part-time HDR students dropped out compared with 16.8% of full-time HDR students. While the HDR completion rate has been a concern as there is no consistent improvement (except the drop-out rates for overseas students have been decreasing steadily) over the period 2007 to 2017, another issue is completion timeframe. According to the same report, on average 67.4% of PhD students were still enrolled at the end of their 4-year cohort period. Although the doctoral education policies and funding schemes in Australia expect students to complete their doctoral studies within 3 to 4 years, Torka (2020) found that most PhD students complete their studies in the fifth year.

A peer community approach for supporting research students

To improve HDR completion rates and reduce completion time, institutional support is necessary but not sufficient. Back in 2005, Boud and Lee had discussed the performance problem in research education, and they criticised the over-emphasis on supervision and provision of 'hard' resources such as equipment and physical space. They pointed out that the academic research community is a peer community, and thus they proposed "learning with and from peers and learning to become a peer in a community of research practice" (2005, p. 515) as a pedagogical approach for research education. Their peer community approach frames research learning as a social practice and interaction, and this social perspective on learning has its theoretical basis. The concept of Community of Practice (CoP) was proposed by Wenger and colleagues (Lave & Wenger, 1991; Wenger, 1998; Wenger et al., 2002), and Wenger et al. (2002) advocate that "the community element is critical to an effective knowledge structure. A community of practice… is a group of people who interact, learn together, build relationships, and in the process develop a sense of belonging and mutual commitment" (p. 34). Since the sense of belonging is recognised as a critical factor for student retention in higher education (O'Keeffe, 2013), HDR CoPs could help to address the disengagement issue.

Although Wenger et al. (2002) mention that CoPs do not have to be purely spontaneous, they emphasise that "the success of the community will depend on the energy that the community itself generates, not on an external mandate" (p. 36). Many CoPs are designed by the institutions for students (e.g., the doctoral CoP reported in Brooks & Fyffe, 2004), but may not be appealing to students (e.g., see students' comments from Martin & Woods, 2008, p. 143 evaluating the institution-initiated doctoral CoP). By contrast, communities that emerged on the Internet (e.g., online discussion groups and gaming groups initiated by online users and players) do not have a centralised authority to lead their development but seem to be more sustainable and accommodating. It seems that a thriving CoP is more likely to be grown organically rather than made artificially. In addition, spontaneous CoPs have been shown to help keep postgraduate research students on track and maintain progress (deChambeau, 2017). Therefore, spontaneous HDR CoPs not only would improve HDR completion rates but also could help to address the long completion time issue.

Research questions and methods

The key questions are whether (and how) spontaneous CoPs can be grown in the Australian HDR context; and what (and how) technology can help HDR students communicate and connect with each other. Answering these questions is especially important and valuable, due to the impact of COVID-19 on HDR students in Australia and around the world. Therefore, a case study is conducted to examine a student-initiated HDR peer community formed online through communication technology available to students at a public university in Australia. The community was initiated by the author in early 2022 as a peer support group, not as a research study. The idea of conducting the present study came in a casual discussion with a peer in late June of the same year, then the idea was mentioned to and supported by other peers during a subsequent regular meeting of the members in July. Since the author is a complete member of the community under study, the case study is an autoethnographic 'insider research' (Greene, 2014).

The advantages of insider research include a better understanding of the community under study, having convenient access to participants and data, and a deeper level of interpretation; while the challenges include ethical issues, trustworthiness, and being subjective and biased (Fleming, 2018). To ensure that the present study is an ethical, reliable and impartial research, following is a guideline derived from the literature (e.g., Fleming, 2018; Greene, 2014; Mercer, 2007; Unluer, 2012) for conducting the study.

Conducting the autoethnographic insider research

1. No specific individual can be identified in the case study
The author, as the initiator and member of the community, has a deep understanding of how the community was developed and functioned. It is evident that the author's personal narratives could provide a rich source of data about the community, but it is important to respect and protect the members' privacy. Therefore, the author will not mention personal details of any other individual when describing any thought about the community.

2. Only non-identifiable data which was never collected with identifiers are used
The author has access to different kinds of information related to the community and its members, which include personal messages and emails from other members and community messages posted by other members. Although this kind of information could enrich the source of data and the author could seek informed consent from the members, the potential for implicit or perceived coercion is considered to be high because the author is in a role of informal power (the person who initiated and organised the community). Therefore, the author will not use any identifiable data even though consent can be obtained, but non-identifiable data which was never collected with identifiers will be utilised. In addition, ethics review exemption for using anonymous survey data has been obtained from the Human Ethics Office at the author's institution.

3. Only use data that existed before the start of the case study
Analysing the community may unconsciously affect the author's actions in the community, which could influence the quality and trustworthiness of the data. In addition, members' behaviours may also be influenced after they knew about the author's idea of the present study. Therefore, the author will not use any data generated from July 2022 onwards given that the study was started in July 2022.

4. Balance between personal experience and research analysis
Being an 'insider' would allow the author to analyse the data from a unique perspective, but since the focus is the community being studied rather than the author, it would be more appropriate to present the case as a 'realist tale', which is an ethnographic representational form that uses "third-person narration, and document field-work experiences from an omniscient, objective, and authoritative perspective" (Adams et al., 2015, p. 84). Therefore, third-person voice and point of view will be used to reflect the analytic process of the author and to analytically study the development of the community.

Collecting case study evidence

The empirical study aims to determine whether (and how) a CoP has developed among HDR students without any design effort from the university; and what (and how) technology employed in the community helped HDR students achieve connectedness without face-to-face interactions. As a good case study uses multiple sources of evidence to investigate the phenomenon within its real-world context (Yin, 2018), the data collected and used for this case study include:

- Narratives and reflective notes from the community initiator (description of the community and thoughts about running the community)
- Documents about the community (descriptive information about the community and its online hub written by the community initiator)
- Notes taken by the community initiator for the purpose of running the community (date/time of the meetings, the number of attendees, and topics discussed in the meetings)
- Analytics data about the online community hub (the number of users, the number of messages, and the number of files shared recorded by the system)
- Data from an anonymous survey conducted by the community initiator in mid-June 2022 with the aim of improving the community (members' feedback on the community arrangement, communication technology, and peer connectedness in the community)

The collected data are records between February 2022 and June 2022, which constitutes a data set of 4 months' qualitative and quantitative data of the community.

Case study: A Peer-to-Peer community run by HDR students for HDR students

Firstly, the background of the student-initiated community is described. Secondly, how the community was developed and its characteristics are analysed to determine if the community is a CoP or other structures (such as an informal network). The three key elements of CoP (Domain, Community, Practice) and CoP characteristics based on the structural model and concepts from Wenger et al. (2002) are used as the framework. Thirdly, activities and communication technology used in the community are analysed to understand how the community functioned. Finally, survey responses are analysed to understand community members' needs, perceptions of the technology employed and the connectedness in the community. In the survey, peer connectedness was measured based on evaluation questions adapting the student-to-student connectedness items from the Doctoral Student Connectedness Scale by Terrell et al. (2009), which will be examined in the final section of the case study.

Community background

The HDR Peer Community is a peer support community for postgraduate research students at a public university in Australia. Similar to most spontaneous communities, the HDR Peer Community did not intentionally start as a CoP and members were not explicitly aware of the CoP concept. This peer community was initiated by a final year HDR student (the community initiator) who felt that many research activities were suspended and HDR students were disconnected with each other due to COVID-19. The community was started in mid-February 2022 to connect and reconnect HDR students, as most states in Australia had passed the peak of COVID-19 Omicron variant in late-January 2022. After two years of COVID-19, international students are allowed to enter Australia again, schools are open and research can be resumed. It was a turning point for both domestic and overseas students. In the next section, how the community was developed is described and the community characteristics are analysed.

Community characteristics

1. Domain element
Before the HDR Peer Community was set up, the community initiator shared the idea of creating a peer support community specifically for research students with 10 other HDR students from the same academic school (which has approximately 160 HDR students). The students agreed that peers would be more responsive than university's units (such as the Student Centre) and there is a need for a collaborative space that enables them to remain in contact with their peers outside shared courses or seminars, share knowledge about doing research and support each other (even before the disruption caused by COVID-19). The students have a shared domain, as all of them are learning to do research, which "creates common ground and a sense of common identity" (Wenger et al., 2002, p. 27). In addition, this initial peer discussion shows that the community initiator took the role of 'coordinator' as described by Wenger et al. (2002) that "a community coordinator does not 'lead' the community in the traditional sense, but brings people together and enables the community to find its direction" (p. 43). Therefore, the Domain element is present, and the group structure is unlike non-CoP structures such as Project or Operational Teams in which the team leaders give directions rather than link people.

2. Practice element
After the initial peer discussion, the community initiator created the community hub on the university's enterprise edition of Microsoft Teams, which is an online workspace that provides 'channels' (for threaded conversations), file sharing and online meetings features. After creating a private team named 'HDR Peer Community' on Microsoft Teams, the community initiator added 11 channels based on the needs learned from the initial peer discussion and the initiator's own experience as a final year HDR student. Table 1 shows the description of the online community hub and its channels on Microsoft Teams. 'General' is the default channel in any team on Microsoft Teams, and its description is the description of the team. The channels show that the HDR Peer Community focuses on building a shared practice, as ideas, tools, information, etc. can be shared among members enabling them to be effective in their domain (Wenger et al., 2002, p. 29). Therefore, another key element of CoP: Practice is present. In addition, the channels show that the HDR Peer Community would go beyond a Community of Interest which simply puts people with similar interests in a group configuration and a Professional Association which do not "create practice-development relationships among members" (Wenger et al., 2002, p. 44). It is because the community aims to develop "a shared practice, which directly affects the behaviours and abilities of members" (Wenger et al., 2002, p. 44).

Table 1: 'HDR Peer Community' team channels and their description

Name	Description
General	For HDR students to share knowledge and resources, offer tips and advice, and stay connected.
Ethics Application	Seek advice from your peers and share tips about getting ethics approval.
Find and Be Participants	Advertise your research study, recruit participants, and participate in your peers' study.
Find and Be Research Buddies	Be each other's data coders, systematic reviewers, experiment confederates, etc. and learn research skills by doing.
Get Your Thesis Done	Ask questions and share thesis writing tips, writing review, thesis editing and submission.
Meetings and Events	A channel for online catch-up and scheduling face-to-face peer meetings.
Methodology and Methods	Research approach, methodology, methods, tools, techniques, etc. - Ask questions, share, and learn from each other.
Other Topics	Discuss anything not covered in other channels or suggest new channels.
Procedures and Requirements	Questions and answers about HDR policies, procedures and processes, administrative or anything in the RECS, etc.
Proposal Writing	Anything about the thesis proposal - share your experience and advice with your peers.
Self-Introduction	Introduce yourself and get to know your peers. Edit your self-intro post anytime to share your progress.
Writing and Publishing	Questions and tips about writing papers and submitting to (and presenting in) conferences and journals.

3. Community element and spontaneous

The community initiator introduced this new peer community on 10 February 2022 (the initial peer discussion mentioned above), 22 February 2022 and 20 April 2022 via student zoom sessions within the school, and information (see Figure 1 below) and instructions for joining and accessing the community hub are shared via online documents that can be circulated to interested students. Current members can share these online documents with fellow students or request to add new members to the community via Microsoft Teams. In addition, a HDR support staff member from the faculty was informed about the HDR Peer Community and had directed interested students to contact the community initiator. In sum, students either learned about the HDR Peer Community directly from the community initiator or the online documents or were referred by a current member. Superficially, it seems that the community was grown from a network of professional friends and tends to organise along friendship lines. But as shown in the community information in Figure 1, the community would be more than an Informal Network for friends because it invites any HDR student to "deepen their knowledge and expertise… by interacting on an ongoing basis" (Wenger et al., 2002, p. 4) and has "a cohesiveness and intentionality that goes beyond the interpersonal nature of informal networks" (Wenger et al., 2002, p. 43). Besides, only 5 members are acquainted with the community initiator before they joined the community, all the other members did not know the community initiator before joining the community, and any HDR student at the university can follow the instructions in the online documents to join the 'HDR Peer Community' team after logging into their university account. Since this community is self-organised and voluntarily participated in by HDR students rather than intentionally developed by the institution, it is a community where "members spontaneously come together because they need each other as peers and learning partners" (Wenger et al., 2002, p. 26). Members are self-selected, and given that it is a community of people who care about the domain, the Community element is present and it is a spontaneous community.

As the community combines all three key elements of CoP (Domain, Community, Practice), it is a young CoP even though it did not intentionally start as a CoP. Also, it is a spontaneous CoP. To further understand how it developed and functioned, more of its characteristics are analysed.

HDR Peer Community: A Peer-to-Peer community run by HDR students for HDR students

The HDR Peer Community is a new peer support community for HDR students to share knowledge and resources, offer tips and advice, and stay connected. This peer community would also offer HDR students a space to (i) advertise their research study, recruit participants, and participate in their peers' study; and (ii) be each other's data coders, systematic reviewers, experiment confederates, etc., have research collaboration, and learn research skills and knowledge (research methods, procedures, etc.) by doing.

The peer community would have both online and on-campus activities, depending on the members' schedule and needs. All HDR students are welcome no matter whether you are a full-time, part-time, or remote student, as everyone could be connected through asynchronous online interactions in the community's online space. Doing research is a challenging process and nobody knows everything, but we can share what we know to help everyone know more and get the most out of our research journey.

Figure 1: The HDR Peer Community information written by the community initiator

4. Small, diverse and within faculty
The peer community had 20 members by the end of its first month, and the number of members slowly grew to 32 at 4 months as shown in Figure 2. It shows that the community is a small and slowly growing CoP. Over 90% of members are from the same school as the community initiator, and the rest are from the faculty which the school belongs to. The majority of the members are Education HDR students, and almost all members are PhD students. Nevertheless, the community has a mix of full-time and part-time students, a mix of domestic and international students, and HDR students from all years of study with different research approaches. Besides, the community not only has campus-based students but also students studying remotely in Australia and overseas. It shows that the community is homogeneous in terms of faculty/school but heterogeneous in terms of study mode, geographic location, cultural background, research stage and methodology. Therefore, it is a small but diverse HDR CoP within a faculty/school. After understanding the size and make-up of the community, how the community functioned to accommodate its members is examined next.

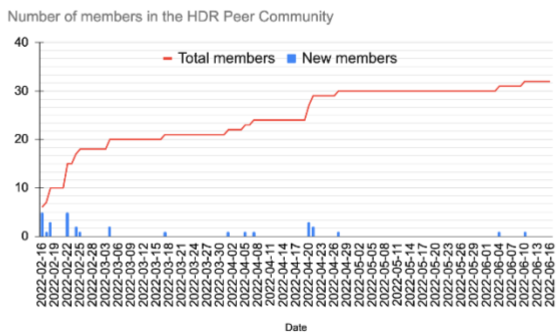

Figure 2: Number of members during the first four months of the HDR Peer Community

5. Distributed
Although not intended when the community started, the HDR Peer Community thus far is an online community which connects its members without face-to-face interactions. As mentioned above, some members are part-time students or remote students (including those living in other cities or states and outside Australia due to COVID-19 related reasons or non-COVID-19 related reasons), and therefore they could not meet in person. The members communicate through technology and all meetings in the community have been conducted virtually. It shows that the community is a distributed CoP that "cannot rely on face-to-face meetings and interactions as its primary vehicle for connecting members" (Wenger et al., 2002, p. 115). As a distributed CoP, the community requires additional community-development effort and employment of communication technology. In the next section, the community activities and how the members communicate through technology are described and analysed.

Activities and technology used in the community

1. Communication via threaded conversations and file sharing
Referring back to the online workspace created as the community hub, it is understood that the main communication technology employed in the community is Microsoft Teams. On average, the online community hub only had 5 to 6 daily active users which shows that most members did not use the online community on a daily basis. The most recent day that has the highest number of active users was 22 April 2022, and there were 15 members (out of 29) using the online community hub on that day. As shown in Table 1 above, the 'HDR Peer Community' team has different channels for members to discuss different topics, and these channels

constitute “a public space of the community” (Wenger et al., 2002, p. 85) for members to communicate with each other. During the first 4 months of the community, there were 231 messages and 23 files posted on the ‘HDR Peer Community’ team. As shown in the left panel of Figure 3, over 80% of messages were posted in the ‘Meetings and Events’ channel (50.2%), the ‘General’ channel (18.2%), the ‘Methodology and Methods’ channel (6.5%), and the ‘Ethics Application’ channel (6.1%). This indicates that there were more conversations regarding these topics, and reflects that active members in the online community participated more in meeting activities, general discussions, research methodology learning, and ethics application enquiries during the first 4 months of the community. Although there are first year HDR students in the community, the message distribution shows that these members did not express a need for thesis proposal support on the online community hub because ‘Proposal Writing’ was an inactive channel (0.4%).

In addition to text messages, community members can share files with their peers, but only 8 channels (out of 12) had file sharing activities as no file was shared in ‘Proposal Writing’, ‘Find and Be Research Buddies’, ‘Self-Introduction’, and ‘Other Topics’ during the first 4 months of the community. Among the 8 channels with file sharing activities, ‘General’ was again a popular channel (26.1%) but the ‘Methodology and Methods’ channel had the highest number of files shared (30.4%) as shown in the right panel of Figure 3 below. The distribution data show that the online community hub was mainly used for sharing general information and research methodology resources. Besides, 13% of files were shared in the ‘Get Your Thesis Done’ channel compared with none in the ‘Proposal Writing’ channel, which reflects that the materials available on the online community hub appeared to be more useful to members who are at the later stage of their HDR.

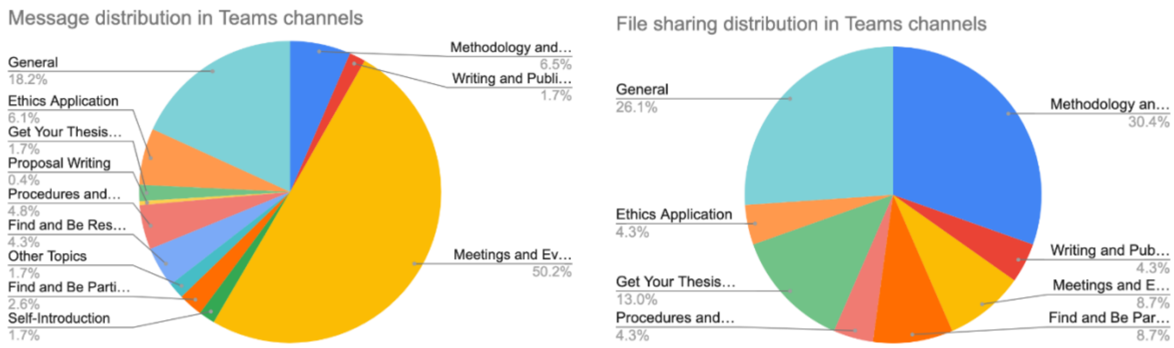

Figure 3: Distributions of messages posted and files shared between 2022-02-16 and 2022-06-16

2. Communication via online meetings

The members not only had asynchronous discussions via threaded conversations and file sharing, but also had synchronous discussions via online meetings which constitute another public space of the community. The community has regular meetings (1 hour each) in which members meet virtually, share progress and seek advice from other peers. During the first 4 months of the community, there were 8 meetings and the average number of attendees was 7. In these meetings, a wide range of research-related topics were discussed, which include literature review and management, writing and publication, research methodologies and methods, research collaboration and peer support, research events and opportunities, thesis proposal and ethics application, funding and resources, workshops and tools, research challenges and supervision issues, and proposal meeting and annual progress review. One of the meetings involved a peer presentation which was a thesis proposal meeting rehearsal by a member, as members were informed that they can share their research work to get feedback from other members and practice presentations in meetings. Furthermore, one of the meetings was a seminar on systematic literature review, which was presented by a member who has practical experience in conducting and publishing systematic literature review. It is because any member can volunteer to share their research methods and experiences by offering seminars and workshops to their peers. These reflect that the public space constituted by online meetings was a more thriving space than the asynchronous discussion space on the online community hub, not to mention that over half of the threaded messages were posted in the ‘Meetings and Events’ channel as shown in the left panel of Figure 3.

Communications described and analysed above are activities that occurred in the public spaces of the community, but certainly the members could send private messages to others using the Teams Chat function or communicate one-on-one using more conventional ways such as email. The community initiator had private conversations with most of the members, linked them with resources that might be helpful to them, and connected them with others who might share the same problem or might be able to solve the problem. The one-on-one networking of members constituted the private space of the community, which is very important as the community's aliveness is created through "a mix of public and private spaces that encourage diverse forms of participation" (Wenger et al., 2002, p. 193).

Previous sections of the case study described and analysed the community based on data directly derived from the community initiator and Teams statistics (analytics data about the online community hub). The next section looks at the community from another angle by presenting what the members thought about the community.

Member feedback

The final section of the case study analyses responses from an anonymous survey conducted in mid-June 2022 for improving the community. The survey asked for members' feedback on the community arrangement, communication technology, and peer connectedness in the community. The community was 4 months old when the survey was conducted, 22 survey responses were received from 32 members giving a response rate of 68.75%, and the majority of respondents had joined the community for more than 3 months (59.1%).

1. Community arrangement

The members had community meetings every 2 weeks, and 61.9% of the respondents are satisfied with such arrangement. The rest either expressed they want more meetings (23.8%) or prefer a less frequent meeting arrangement (14.3%). Regarding how long the meetings should last, over 90% of the respondents are satisfied with the 1-hour duration and the rest think that 1 hour is too long (9.5%). The feedback also shows that most respondents are satisfied with meeting others virtually (81.8%), with half of them prefer meeting online only while the other half want a mix of online meetings and on-campus face-to-face meetings. The rest either prefer on-campus face-to-face meetings only (9.1%) or want other types of physical meeting (9.1%). And unsurprisingly, respondents have different schedules and thus no single meeting day/time option could fit everyone's preference, which reflects the difficulty of arranging meetings for all members and the online meeting arrangement was appropriate in a HDR CoP.

2. Technology

Although the majority of the respondents (54.5%) are satisfied with Teams as the online meeting place, more than one third of the respondents (36.4%) want to move the meetings to Zoom and the rest (9.1%) are unsatisfied with both and prefer to meet in a more natural and interactive environment offered by another platform called Gather Town. Besides, some respondents expressed that sometimes they choose to be less active on the online community hub because Teams is not user-friendly (18.2%), they encounter access or technical issues on Teams (18.2%), or Teams does not support anonymous discussions (13.6%). However, most of the respondents (76.2%) are still satisfied with using Teams for peer communication and prefer Teams over other communication methods such as emails. Moreover, 81.8% of the respondents think that the 12 channels on Teams (see Table 1) are working well for their knowledge sharing and collaboration in the community. The results show that Teams is a proper technology for peer communication, knowledge sharing and collaboration in a HDR CoP, but technical issues encountered by the members or lack of some desirable features on the communication technology could discourage members' engagement and participation.

3. Student connectedness

Since the survey contained 9 questions adapted from the Doctoral Student Connectedness Scale created and validated by Terrell et al. (2009), the responses could be used to explore the student connectedness in the community. The original scale by Terrell et al. (2009) is a 5-Point Likert Scale (1-strongly disagree to 5-strongly agree) with 9 items measuring student-to-student connectedness and another 9 items measuring faculty-to-student connectedness. Their 9 student-to-student connectedness items were adapted to fit the context of the HDR peer community, and the adapted questions used in the survey and the results of each question are shown in Table 2. Cronbach's alpha for the adapted scale is 0.91 which indicates that the adapted scale is reliable.

The overall mean score is 4.05 which shows the student connectedness in the community is strong, although the community was only 4 months old when the survey was conducted. It is interesting that members reported that they feel a strong peer connection in the community (see Q1, Q2 and Q9 results in Table 2), but they gave a more neutral response on whether they communicate with their peers regularly (as reported by Q5 in Table 2). To understand the factors that may influence student connectedness in a HDR CoP, statistical tests are performed to investigate whether there is any significant difference in the mean value of the connectedness score between different groups that can be formed based on the survey responses. The null hypothesis is there is no statistical difference between the mean connectedness scores of members in the two groups, while the alternative hypothesis is the means are statistically different. To examine the effect of membership length, technology satisfaction and virtual mode on HDR student connectedness, the groups shown in Table 3 are formed and the results of each group's connectedness score are reported.

Table 2: Questions and results of the adapted student connectedness scale

Questions	$\bar{X}$	*SD*
1. I feel that students in this HDR Peer Community care about each other.	4.55	0.60
2. I feel connected to other students in this HDR Peer Community.	4.23	0.81
3. I feel like I can easily communicate with other students about the dissertation.	4.27	0.94
4. I feel like fellow students in this HDR Peer Community are like a family.	3.64	1.00
5. I communicate regularly with other students in this HDR Peer Community.	3.36	1.26
6. I feel I can trust other students in this HDR Peer Community.	4.10	0.70
7. I feel a spirit of community between other students and myself while working on the dissertation.	3.86	0.94
8. I feel like I can rely on other students in this HDR Peer Community for their support.	4.09	0.87
9. I feel like I can easily communicate with other students in this HDR Peer Community.	4.32	0.78

Table 3: Groups formed for hypothesis testing and results of the connectedness score

Hypotheses	Groups	*n*	$\bar{X}$	*SD*
Hypothesis 1 (H1)	Group 1 (G1): Joined the community for 2 to 4 months	17	4.25	0.52
	Group 2 (G2): Joined for less than 2 months	5	3.33	0.70
Hypothesis 2 (H2)	Group 1 (G1): Satisfied with using the 12 Teams channels for knowledge sharing and collaboration	18	4.20	0.56
	Group 2 (G2): Unsatisfied with the Teams channels	4	3.35	0.82
Hypothesis 3 (H3)	Group 1 (G1): Not concerned by technical issues or lack of desirable features on Teams	13	4.07	0.56
	Group 2 (G2): Discouraged by the Teams problems	9	4.01	0.86
Hypothesis 4 (H4)	Group 1 (G1): Satisfied with using Teams for meetings	12	4.08	0.57
	Group 2 (G2): Unsatisfied with Teams meetings	10	4.00	0.82
Hypothesis 5 (H5)	Group 1 (G1): Unsatisfied with online-only meeting arrangement	13	4.07	0.62
	Group 2 (G2): Satisfied with online-only mode	9	4.01	0.79

The alpha level of .05 was used and the results of Welch's *t*-tests revealed that there is a statistically significant difference in the mean connectedness scores between the two groups in H1 shown in Table 3, $t(5.37) = 2.75$, $p = .037$, $d = 1.51$. The statistical power (1-β) is 0.81. For the rest of the hypotheses (H2 to H5), the difference in means for G1 and G2 is not statistically significant ($p > .05$).

The results show that members who have been in the online community for 2 months or more, have significantly higher student connectedness than members who have only joined for less than 2 months, with a large effect size and a high statistical power. It follows that membership length can be identified as a positive factor that affects student connectedness in a HDR CoP, but technology satisfaction and virtual mode were not found to have a significant impact on HDR student connectedness. Although four months is a short time span for a community to fully develop, the findings suggest that a spontaneous CoP can be formed and help HDR students feel connected within months via technology.

Conclusion

This paper presents the trends and problems of HDR education in Australia, and explores a peer approach to support research students. The case study of the student-initiated community for HDR students shows how a CoP could be developed among HDR students without any design effort from the university and how communication technology could help HDR students achieve connectedness without face-to-face interactions. The results reported in this paper demonstrate and provide insights into how to connect and reconnect students with each other through technology. While this research aims to learn about cultivating a spontaneous HDR CoP within months via technology, future research should examine large HDR communities that have been fully developed online (e.g., on social media and Internet forums) to further understand and foster HDR students' self-initiated communities and collaboration in online environments.

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Concise papers

reconnect
Reconnecting relationships through technology

‘As long as you use the template’: fostering creativity in a pedagogic model

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As the higher education landscape enters a new era of digital-first education, education designers are tasked with supporting the pedagogic work of educators to design learning experiences which connect students with disciplinary content, with each other and with their educator in the digital learning environment. This paper uses a collaborative autoethnographic approach to reflect upon the challenges experienced by two education designers implementing a pedagogic model to support blended and hybrid learning at scale. A key tension of this work is the perception that design templates diminish educators’ academic freedom and creativity by exerting institutional control over disciplinary experts. We argue that bringing teaching teams together in dialogic and disciplinary learning communities around our pedagogic model fosters creativity by providing space for educators to scaffold their own development, and ultimately, reconceptualise their content for new ways of teaching and learning.

Keywords: education design, academic freedom, pedagogic models, creativity, learning communities

Introduction

After decades of debate on, experimentation with, and challenges to traditional notions of knowledge and teaching, in 1998 the Boyer Commission called for the ‘radical reconstruction’ of higher education (Boyer Commission, 1998). The scholarly literature at that time broadly recognised that a student-focused approach to teaching results in deeper learning within a cultural and disciplinary context, but for the next twenty years, much of the teaching and learning occurring in universities continued to be grounded in a teacher-led paradigm (Brew, 2012). In 2015, Monash University, a large research-intensive university, prepared a bold vision for whole-of-institution education transformation to meet the demand for more student-centred, flexible and blended offerings. The University employed education designers (EDs) in all faculties to support educators as they embraced the digital environment. Enter the COVID-19 pandemic stay-at-home orders and travel restrictions in 2020: the shift online accelerated to meet students wherever and whenever they were able to study.

In this paper, two EDs from the Science and Arts faculties at Monash University reflect upon their experience of implementing an innovative pedagogic model at scale. Our model draws on a complex mix of learning theory, blended learning methodology and instructional design principles, and is supported by ‘just-in-time’ support resources, workshops, and showcases of educators’ good practice to inspire colleagues to innovate Despite the policy mandates, the appetite for hybrid learning, and the available education support resources, uptake of our pedagogic model was uneven as educators’ reservations about the practice of digital-first education persisted (Henderson et al., 2022). This lack of faculty-wide adoption prompted us to reflect on our own practice. We realised that we were rushing the implementation of our pedagogic model. We recast our change management strategy as a learning design, recognising our educators as active participants in their own learning (Geertsema, 2016). We argue that bringing teaching teams together in dialogic and disciplinary learning communities around our pedagogic model fosters creativity by providing space for educators to scaffold their own development, and ultimately, reconceptualise their content for new ways of teaching and learning.

We use a collaborative autoethnographic approach to make sense of, and derive meaning from, our experience of influencing the practice of the educators. We began in 2015 as part of a small group of faculty-based EDs, gathering for an informal weekly catch up to share our stories of success and failure. Faculty-based education design was relatively new to Monash University and we were unsure of the best way to proceed. We examined our philosophies and processes for shifting the paradigm of teaching, and reflected on the institutional positioning and preconceptions of our roles. We devised a strategy to introduce a pedagogic practice that made explicit student-centred learning. These ‘living-in-common’ experiences (Bazzul & Siry, 2019) were critical in the development of our identity as EDs as we navigated our way through an opaque system of traditional academia towards a clear and effective process of learning transformation. We have examined our dialogue over seven years in our roles to develop a narrative of our experiences that bring to the fore issues of power, influence, pedagogy, and entanglement with organisational structures. Our ongoing dialogue opens our experiences as a site of enquiry where we can critically reflect on our roles as agents of change. For the purposes of this paper, we examine how the dynamic of our relationship with educators informs the uptake of an aspect of our pedagogic model: the LMS template. We invited a range of academics to respond to questions about the experience of working within the template, and we share two of these examples below.[1]

Our pedagogic model

Our pedagogic model is grounded in a programmatic approach to curriculum transformation. We work with educators to ‘map out’ their programs to demonstrate the contribution of each unit of study to the course learning outcomes, the University’s graduate attributes, and other relevant educational frameworks such as the Australian Qualifications Framework (AQF) (French et al., 2014; Lawson et al., 2014). We encourage educators to embed transition pedagogy in their program design to enable successful student transition into and through first year, into later years and ultimately out into the world of professional practice (Kift, 2009; Kift et al., 2010). At the unit level, we meet with educators to explain good learning design principles, examine learning outcomes and their relationship to assessment and feedback loops, and introduce LMS templates to guide educators to structure their learning materials into a cohesive and logical learning pathway (Laurillard, 2012; Boud & Molloy, 2013; Biggs, 2007; Boud, 2007). We don’t do the work ‘for’ educators; we do it ‘with’ our educators, in a broader effort to support staff to build their capabilities and transform their education practice.

Our self-reflexive practice led us to explore and document our early successes and failures in implementing program- and faculty-wide LMS templates. Our aim, and the mandate from our faculty leadership, was to lead educators away from the use of the LMS as a repository for files, and towards best practice for active learning in the digital environment. Our LMS templates comprise two main elements: firstly, a navigation banner which organises LMS sites into prescribed sections; and secondly, subheadings within each of these sections, which guide educators to provide students with all necessary information and learning resources in the unit. These elements together create a context for consistent, purposeful and signposted learning pathways for students. Our support resources and workshops focus on a ‘digital first’ approach: intentional design for the digital learning environment placing the student learning experience at the centre, with face-to-face teaching elements added to extend and deepen student learning. Following the success of numerous implementations, (as described in Gleadow, et al., 2015; and Hook et al., 2018), we felt confident that this good practice would continue unabated.

“The ironic surrender”

Our first story illustrates the tensions in the implementation of new LMS templates. It was at the end of a one-on-one session between an ED and a new educator in a high-profile master’s program, who had been referred to the ED by the program director. The ED had spent the meeting explaining and demonstrating the LMS template to ensure the educator would design their unit content in line with good practice, and to be consistent with the other units in the program. It was all going very well, with the ED fielding the educator’s questions: ‘Can I do X?’ or ‘How would I do Y?’, until the ED said, ‘You can do anything you like, as long as you use the template.’ With a shrug the educator indicated their compliance. The ironic surrender was palpable.

That shrug gave the ED pause. The LMS template was core to the design of a pedagogically-sound, customised learning pathway, developed over hours devoted to sessions where the academics and the ED explored appropriate design models suitable for their learning and assessment materials; and wide-ranging discussions covering best practice in blended learning, the relevance of style guides, usability and accessibility guidelines, and the use of banners and icons to create a distinct ‘look and feel’ for the program. This groundwork addressed feedback from students that their online learning space was messy and inconsistent, and promoted a delivery approach that would work across multiple units with a teaching team. How could the educator not see that the easy-to-use template would save them time thinking about how to lay out their learning materials, so they could instead spend their time ‘imagining’ what they could do with their content? We asked ourselves, does our pedagogic framework facilitate the creative freedom of educators to teach their disciplinary content, or are we “part of a machinery suppressing them”? (Roxa & Martensson, 2017, p. 95).

[1] This research has ethics approval from Monash University.

Are we doing the devil's work?

In *Creativity Crisis* (2018), Robert Nelson argues that "constructive alignment harms creativity" (p. 242). Nelson defines creativity as "a disposition toward the productive use of the imagination", filling the space between knowing and not knowing (p. 27). Creativity and imagination are collaborators in the learning journey; a journey that propels the learner from the known to the unknown and out the other side, untethered by a culture of compliance. Our challenge is to create opportunities for our educators, who are our learners in this process, to incorporate creativity and imagination into the development of their course materials. We want educators to use the LMS template to clear the way for their innovative practice, rather than trapping them in a "web of consistency" (Biggs, 2007, as quoted in Roxa & Martensson, 2017, p. 102).

Core to academic identity is intellectual freedom (Akerlind, 2005). Our educators are disciplinary experts, and some fear that 'working to a template' is a challenge to their control over their content. Others proclaim that using the LMS template 'dumbs down the curriculum'. Further, our positions as EDs afford us power across a number of domains: we are education experts; we realise the institutional education strategy through our work; and our faculties have mandated the use of our LMS templates. As Roxa and Martensson argue, we must recognise that we "do have power to do things to people" (2017, p. 102). We argue that our pedagogic model does not stifle creativity, instead we provide a framework where we encourage educators to harness their disciplinary expertise to create innovative learning experiences for their students.

Educators as learners

Our initial change management strategy was to build relationships, work with early adopters, and showcase exemplars of good practice, all within the university vision and strategy. We now reflect on what we know makes for good learning and apply this theory, knowledge and practical experience to build the capacity of our educators. We bring teaching teams together in collegial and dialogic 'learning communities' that reinforce their identity as educators and experts in their fields; and foster the creative and imaginative development of learning opportunities within a shared pedagogic model. These learning communities are meaningful connection points where educators have the opportunity to share their experiences and stories and "to explore [their] concerns collectively, drawing on [their] experiences as educators" (Fox, et al, 2021, p.2079). We acknowledge the passion, fear and pride in teaching (Gibbs, 2013). We encourage our educators to consider the ways in which they can use digital technologies to create 'expansive', 'expressive' and 'empowering' learning experiences where students actively produce knowledge (Henderson et al., 2017).

Our second story centres on an educator's reflection on their experience of working with EDs and using our LMS template. This educator is the program lead of a fast-growing, new specialist undergraduate degree program which welcomes over 300 new students into its first-year units each semester, from a range of cultural backgrounds, with 75% international enrolments from 22 countries, and with many students studying remotely. They say: 'As the course coordinator, it was really important for me to really invite all 300 students to feel welcomed and to feel that our unit is like home for them' (Hook & Macfarlan, 2022). At first, the educator was sceptical about how the EDs could help them to create a culture of communication in the digital learning environment: 'I had my serious doubts about how 'outsiders' from my own discipline could help me teach. How could the EDs really help me to make my classrooms more engaging via the LMS?' (Hook & Macfarlan, 2022).

Through a number of iterations, the educator and their teaching team talked through practical ideas with the EDs, thinking about different ways to create a culture of communication. Together they harnessed the LMS template to create a sense of intellectual and emotional belonging for the students. The onset of the pandemic accelerated the need for the educator to design cognitive, social and educator presences into the digital environment where students could engage with the content, with each other, and with their educator (Swan et al., 2009). The educator recognised that these 'presences' must be intentionally designed, and not merely assumed as they often are in the physical classroom. They employed the 'pre-in-post- class' sections of the LMS weekly page templates to offer layers of engagement to students. The pre-class, asynchronous lesson includes recorded 'mini-lectures' where the lead educator and guest lecturers introduce the key themes and readings for the week, integrated with curated content and interactive 'check your learning' questions, finishing with an ice-breaker activity. Student engagement data shows that 90% of students complete these lessons before attending tutorials. This preparation lays the ground for a series of creative in-class activities, such as small group work to collate a photo-collage sharing initial thoughts on the topic. The small group work then extends to focussed discussions on the readings and lecture material drawing on the intercultural differences across the cohort, and finally, doing the hard work and thinking for assessment preparation. In the post-class space, the lead educator uploads a 'video-letter' at the end of each week, reflecting on the learning that has occurred during the week, connecting the learning to the unit learning outcomes, sharing some student work and offering feedback, and preparing students for learning in the following week. The educator was ‘completely shocked to find how much students were accessing the material in the LMS, especially the video-letter’ (Hook & Macfarlan, 2022). In their feedback on the use of the LMS template, the lead educator reported that:

> The template provides me with the pedagogical framework to create a welcoming and intellectual space for my students. I could build this using the different layers of the template and it helped us to create activities in a very open and creative manner. We used the activities to share how we are, what we have been doing and thinking. And some students really open up, and open the doors for the learning. In that way it gave the students a solid academic reach. The video-letter was also a really important layer. It created a culture of identity, emotional belonging, safety and intellectual curiosity. The students stepped off from there to do incredible, intellectual, hard work. Their final assignments were absolutely incredible. It worked beautifully…It was my first time working with my group of tutors, and we came together in this communicative space, it was a privilege to be together. My tutors are young, vibrant, exciting and passionate teachers. I invited them into a conversation to think about activities before and during tutorials. We were able to create levels of trust; we became friends who really cared for each other and for our students. And to the end, we just couldn’t say goodbye to each other, we basically had a couple of end-of-semester events with the students and with each other. (Hook & Macfarlan, 2022)

This logical and coherent unit design did not occur in isolation, but in the context of the entire program. Each unit in the program exemplifies a blended learning design where “the digital is not a special or separate domain from embodied, co-present spaces that we inhabit day to day – instead, the two kinds of spaces are inextricably linked with each other” (Bayne & Jandrić, 2017, pp. 14-15). The lead educator has gradually built towards using the full functionality of the LMS as an active learning space. Although they find teaching in the digital space ‘difficult’, they are now more thoughtful about it, integrating educational technologies to implement their teaching philosophy, regardless of the mode of instruction. They remain committed to a Socratic method of teaching, incorporating multiple learning modalities for students to work together toward answers: ‘I celebrate students when they build on each other’s ideas rather than look to me for answers’ (Hook & Macfarlan, 2022). The program now serves as an exemplar in the faculty, and the educator is recognised for their education practice across the university and beyond.

Conclusion

As Nelson argues, “contemporary syllabus design does not favour creativity or imagination—and…it is worth contemplating how creativity and imagination can be cultivated within constructivist parameters” (2018, p. xiii). In our ED informal weekly catch ups, we have excruciated over this question, wondering aloud and sharing our stories of success and failure in implementing institutionalised frameworks for teaching and learning. Is it possible that we are doing the devil’s work and shoe-horning the educators into borders within which they must design and develop?

The authors of this paper have found that our pedagogic model provides a framework where educators, as discipline experts, can come together as learning communities to reconceptualise their content for new modes of teaching and learning. Educators use our LMS templates not just for quality assurance, but to create dynamic, individual and bespoke online learning spaces for their students. Further, those educators who embraced the learning process were cognitively prepared for the challenges of the sudden shift to online learning in 2020. Some educators, such as the one from our second story, reported an emotional teaching experience that they will always remember. They shared their anxieties about their changing identity as educators in the online learning environment, they made space for creative and imaginative risk-taking with online learning technologies and approaches, and have been propelled as learners from the known to the unknown and out the other side.

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Reconnecting relationships through technology

Social Anxiety in Digital Learning Environments: Empirical Evidence and Call to Action

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It is internationally accepted that digitally-supported learning increases the accessibility of higher education due to its capacity to overcome traditional university's spatial and temporal limitations. At the same time, increased student-teacher ratios and reduced student-targeted support may lower the quality of learning and instruction in higher education. Research focussed on digital learning environments in higher education identified social anxiety as an increased challenge for learners and teaching staff. This international case study investigates students' social anxiety at two higher education institutions. Findings show that social anxiety exists in higher education digital learning environments and differs across cultural contexts and gender. The data suggests that it is worth tertiary educators pausing to consider the role that social anxiety may be playing in reducing interactions within online units. Additional research is required to establish the causes of social anxiety in digital learning environments and develop strategies to minimise its effect.

Keywords: Social anxiety; digital learning environment; higher education

Introduction

Digital learning environments are widely used especially in higher education and in this way, learners are provided with learning opportunities that are independent of time and space. Digitally-supported learning is defined as any set of technology-based methods that can be applied to support student learning and instruction (Wheeler, 2012). Research has shown that digitally-supported learning increases the accessibility of tertiary education due to its capacity to overcome the spatial and temporal limitations of traditional teaching settings (Bates, 2005; Braun, 2008). Open access to higher education (Greenland & Moore, 2014) and different modes of distance learning (Bailey et al., 2018; Bailey et al., 2015; Cohen, 2003) have thus become critical long-term strategies for international universities to encourage higher education participation (Allen & Seaman, 2006; Ziguras & McBurnie, 2011).

However, a recent report from OECD (2021) emphasised that increased student-teacher ratios and reduced student-targeted support may lower the quality of learning and instruction in higher education, leading to greater dropout rates, especially among disadvantaged students. Further, research focused on digital learning environments identified various challenges for learners, such as technical problems, lack of community, motivation, self-regulation, self-efficacy, or social anxiety (Armellini et al., 2021). Such barriers may limit the opportunities of digital learning environments for supporting learning and teaching (Hill et al., 2009; Muilenburg & Berge, 2005). Hence, social anxiety, an emotional disorder that is often unnoticed or masked by the casual observer, is one psychosocial aspect that may impede achievement in higher education (Brook & Willoughby, 2015). Research findings support the assumption that there are differences among learners with different levels of social anxiety, both in face-to-face and digital learning environments (Grieve et al., 2017).

This paper reports on an international case study comparing students' social anxiety at two higher education institutions located in Australia and Germany. Particularly, the research team utilised a standardised instrument at both higher education institutions which provides insights into perceptions of students' social anxiety among peers as well as concerning teaching staff.

Background

Social anxiety

Through digital learning environments, learners interact with learning materials and related assessments as well as with peers or tutors and instructors. The various interaction types are central to enhancing the learning experience and learning processes as well as performance (Garrison & Cleveland-Innes, 2005). From a social constructivist perspective (Cole et al., 1978; Woo & Reeves, 2007), the interaction with peers and tutors or instructors facilitates the critical reflection of processed information and helps to elaborate the conceptual understanding of the phenomenon in question. In addition, Tinto (2005) suggested that engagement and integration in the social environment of the higher education community are critical predictors of student persistence, retention, and study success (Tinto, 2017). However, thinking about engaging or interacting with peers and teaching staff may exacerbate the social worries that are at the heart of social anxiety, making it difficult to participate in class, join in conversations, or seek help to navigate the higher education environment successfully (Brook & Willoughby, 2015).

Social anxiety is defined as a persistent fear of embarrassment or negative evaluation while engaged in social interaction or public performance (Heimberg et al., 1999). Anxiety, depression, and uncomfortable feelings are symptoms of social anxiety (Pierce, 2009). Social anxiety is triggered by some situations such as early experience, social fear, fear of negative evaluation, social avoidance, social stress, self-depreciation, and positive anticipation (Hofmann et al., 2010; Shepherd & Edelmann, 2005; Weidman et al., 2012). In the context of digital learning environments, social anxiety is regarded as an individual disposition that affects the interaction with the digital system (Agarwal & Karahanna, 2000). Individuals feel more comfortable in online communication (Lee & Stapinski, 2012; Shepherd & Edelmann, 2005) through anonymity and deindividuation potential of the environment (Weidman et al., 2012). Grieve et al. (2017) have found that individuals who demonstrate a high level of social anxiety tend to interact more through online systems rather than via face-to-face interaction. However, interaction in digital education is not generally anonymous so this may not be the case with most digital learning environments. In addition, social norms, embarrassment, self-construal, gender role and gender role identification have been identified as variables that affect individuals' social anxiety states (Hofmann et al., 2010; Jefferies & Ungar, 2020). Further findings indicate that the individual's level of social anxiety is differing according to their country of origin, i.e., cultural background and contexts (Zhong et al., 2007). Further, Weinstein et al. (2015) show that gender differences in social anxiety are related to cultural expectations. However, research seems limited concerning social anxiety in digital learning environments from an international perspective. Closing this research gap is regarded as highly relevant concerning heterogeneous student groups and digital learning environments being available for students from different countries (Loizzo & Ertmer, 2016).

Current study

The aim of this international case study is a comparative investigation of students' self-reported social anxiety focussed on higher education digital learning environments. Given previous research findings (Zhong et al., 2007), it is hypothesised that students' social anxiety in higher education digital learning environments differs based on their country of origin, i.e., Australia or Germany for learner-learner interactions (Hypothesis 1a) and learner-instructor interactions (Hypothesis 1b). Following previous related findings focussing on gender differences related to social anxiety (Weinstein et al., 2015), we assume that students' social anxiety in higher education digital learning environments differs among gender for learner-learner interactions (Hypothesis 2a) and learner-instructor interactions (Hypothesis 2b).

Method

Participants, context and design

The study utilised a non-representative convenience sample with participants enrolled in higher education institutions from Australia and Germany. The study was conducted by two of the co-authors of this paper as self-report online survey research at their respective higher education institutions. Participants included N = 295 (75% female and 25% male) undergraduate and graduate students from Australia (N_{Aus}= 155) and Germany (N_{Ger}=140). Both student cohorts were studying in the broader context of education, while Australian participants were enrolled in child development and creative technologies and German participants in the area of economic and business education. The average age of participants was 24.56 years (*SD*=7.32). Ethics approval was obtained for this research and the relevant protocols were followed.

Instrument and analysis

The Social Anxiety Scale (SASE) for digital learning environments (Keskin et al., 2020) consists of two sub-scales and 46 items. The first sub-scale focuses on Learner-Learner interactions (23 items) and the second sub-scale focuses on Learner-Instructor interactions (23 items). Each sub-scale consists of three dimensions such as negative evaluation (9 items), somatic symptoms (4 items), and avoidance of interaction (10 items). The SASE uses a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). Cronbach's Alpha reliability coefficient for the two sub-scales was calculated as 0.96 for Learner-Learner and 0.97 for Learner Instructor. Further data collected included students' demographic information such as age, gender, and study course. After combining the data sets from the two countries and a standard data pre-processing, the hypotheses were tested with adequate descriptive and inferential tests. All effects were tested at the .05 significance level.

Results

Independent-samples t-tests were conducted for testing hypotheses 1a and 1b. Regarding hypothesis 1a, there was a significant difference of social anxiety for learner-learner interactions between Australian students (M_{AUS} = 77.96; SD_{AUS} = 19.30) and German students (M_{GER} = 69.88.64; SD_{GER} = 22.56), $t(293) = 2.941$, $p = .004$, d = .029. Regarding hypothesis 1b, no statistically significant difference was found for social anxiety for learner-instructor interactions between Australian students (M_{AUS} = 71.48; SD_{AUS} = 23.25) and German students (M_{GER} = 67.42; SD_{GER} = 24.38). Accordingly, the findings suggest that Australian students have higher social anxiety when interacting with peers in higher education digital learning environments.

Concerning hypotheses 2a and 2b, independent-samples t-tests were conducted. Regarding hypothesis 2a, there was a significant difference of social anxiety for learner-learner interaction between female students (M_F = 76.39; SD_F = 21.36) and male students (M_M = 67.49; SD_M = 19.65), $t(293) = 3.271$, $p = .001$, d = .036. Regarding hypothesis 2b, there was a significant difference of social anxiety for learner-instructor interaction between female students (M_F = 71.53; SD_F = 23.77) and male students (M_M = 63.77; SD_M = 23.24), $t(293)$ = 2.551, $p = .011$, d = .022. Accordingly, the findings suggest that female students have higher social anxiety when interacting with peers and teaching staff in higher education digital learning environments.

For post-hoc analyses, a new variable was created by combining gender and country. The new groups include Australian-Female (AF), Australian-Male (AM), German-Female (GF), and German-Male (GM). One-way ANOVA was conducted to determine the differences between the groups ($F(3, 291) = 6.164$, $p = .000$, Eta2 = .059). There was a significant difference in social anxiety for learner-learner interaction between the groups. Tukey-HSD test was conducted to determine the source of the differences. Significant differences of social anxiety were found between AF (M = 79.66; SD = 19.10) group and GM (M = 66.13; SD = 20.32) for the learner-learner interaction. No further statistically significant differences in social anxiety for learner-instructor interaction were found.

Discussion and conclusion

Mass higher education has become a reality across continents and led to substantial growth in the number of countries with universal access to higher education, and great diversification of an international student body (Teixeira & Shin, 2020). While higher education digital learning environments offer more freedom for individual learning, they also require increased personal responsibility, both from the learner and from the teaching staff.

Our findings support the assumption that social anxiety exists in higher education digital learning environments (Muilenburg & Berge, 2005). More specifically, the cultural context appears to be a significant driver of social anxiety within the peer interaction (Zhong et al., 2007). Interestingly, our findings did not identify cultural differences in social anxiety for learning-instructor interactions. As higher education institutions move toward more online delivery our findings suggest that a pause to consider the impact that social anxiety may be having on students is appropriate. Students participating in digital education are not anonymous to staff or to other students in the unit being studied (Giacumo & Savenye, 2020). This means that interactions within common elements of online courses such as discussion boards, or other online tools through which students contribute responses visible to staff and/or peers, may be producing social anxiety at a level that impedes participation and hence lowers the educational effectiveness of these tools. Higher education teaching staff often lament the lack of interaction in online units and an often overlooked factor in this may well be social anxiety levels (Beuchota & Bullen, 2005). The question of how to better design online learning to encourage maximum participation while minimising anxiety requires further investigation if higher education institutions are to optimise the digital learning experience for students. If nothing else, as individual educators, it is important to reflect on the online courses being taught, the characteristics (e.g., culture, gender, age) of students within them, and the potential for our pedagogical strategies to cause social anxiety unintentionally. This may be especially the case within a social-constructivist paradigm where activities that encourage communication and cooperation are being embedded within online units.

Despite the findings reported, this international case study is not without limitations. These findings may not apply to the general population as they were based on two convenience samples. Expanding the data from both institutions through purposive sampling could further enhance the representativeness of obtained findings for the local contexts. Further, the self-report data may be biased as individuals tend to have different answers when they report their own experiences. Through a mixed-methods design, qualitative data might produce more detailed descriptive insights into individual dispositions linked to social anxiety in digital learning environments. Therefore, our current research expands to samples from additional countries and adds a qualitative investigation focussing on students and teaching staff concerning their perceptions of social anxiety and what pedagogical practices they are familiar with. Looking ahead, higher education institutions may further embrace and utilise the well-documented advances of learning analytics, such as personalisation of learning and interaction opportunities as well as adaptation toward individual dispositions of students (Bennett & Folley, 2021; Feng et al., 2021; Gašević et al., 2019), to overcome the challenges related to social anxiety in digital learning environments.

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reconnect
Reconnecting relationships through technology

Developing feedback literacy capabilities through an AI automated feedback tool

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The use of Artificial Intelligence (AI) in teaching has mainly focused on providing students with immediate, and more, feedback while reducing teachers' workload. In this paper, we propose a shift in thinking about the role AI can play in developing students' feedback literacy. Through the reflection of a University wide T&L pilot project ran with an AI tool for automated feedback, we frame a discourse on the use of AI for teaching and learning to promote and further develop students' feedback literacy capabilities, including the dispositions required for a meaningful partnership with their teachers in relation to feedback. This paper reports the interactions of higher education students with an AI automated feedback tool and discusses its affordances in relation to the development of students' feedback literacy capabilities. Implications for further refinement of this tool are also presented.

Keywords: artificial intelligence, feedback literacy, automated feedback

Introduction

Feedback has the potential to have a great impact on student achievements of learning outcomes, however, in reality its impact is highly variable (Hattie, 2008). Furthermore, feedback is not just related to studies and lifelong learning, but it is also a core capability within the workplace (Carless and Boud, 2018). To realise the potential of students becoming future ready for the world of work, students' feedback literacy needs to be developed. Students' feedback literacy is underpinned by the understanding of feedback, the appreciation of feedback, and the ability to take action on feedback (Carless and Boud, 2018). In fact, effective feedback relies more on students actions and outputs in response to the feedback that on the quality and timing of the feedback. Carless (2020) argues that developing students' feedback literacy should become a core element of the curriculum, with it being embedded systematically in the curriculum through enabling activities and meta-dialogues about feedback processes between teachers and students. This would in fact be ideal, however, it would add to the already overcrowded curriculum and teacher workload and depend heavily on teachers' feedback literacy.

To counterbalance this, in the recent years, there has been an increasing interest in the use of Artificial Intelligence (AI) for teaching and learning within the higher education sector (Khosravi et al., 2022, Markauskaite et al., 2022, Popenici & Kerr, 2017). In particular, the discourse on applying an AI for providing automated feedback on written assignments has been on the rise, suggesting benefits for improving student writing skills (Conijn et al., 2020). AI-powered, automated feedback tools that address academic writing could support the development of students' feedback literacy. This appropriate use of AI for automated feedback aligns with Molloy et al. (2020) suggestion that, the development of students' feedback literacy can't displace other activities but should be embedded as part of existing learning activities. It also addresses the matters of teachers' workload by augmenting the low-level outcome feedback so that teachers can focus on providing more high order thinking skills. In addition, something an AI feedback tool can easily do, is position feedback as a student-centered activity rather than an attribute of teaching. It also removes the judgement value and the power structure from the feedback interaction, potentially promoting students to be less emotional and more critical, thus better placed to enhance evaluative judgement (Tai et al., 2018) of the feedback in relation to their own work.

This paper describes the current AI powered automated feedback tool and presents Molloy et al. (2020) learning centred framework for feedback literacy, as the framework that will be used to inform the tool's iterative design. Observations form the pilots undertaken at a large Australian University, which have elucidated the affordances of the current tool in relation to improving students' feedback literacy capabilities, are presented and the implications for the next iteration of the tool are also discussed.

Background

As part of the University wide strategic teaching and learning project, a large Australian university partnered with FeedbackFruits through a 'DoTank' innovation project. Feedback Fruits is an edutech company based in the Netherlands that develops educational tools that integrate to any LMS. This DoTank project involves "co-designing" processes to further design and develop innovative educational technologies for teaching and learning. An AI powered automated feedback tool has been developed by FeedbackFruits through collaboration and piloting of the tool with other international universities. The aim of this tool is to assist students with timely and actionable feedback on academic writing and assist teachers' workload to focus on feedback related to higher order thinking skills. Our University embarked on piloting this tool in 2021.

Feedback Literacy

Feedback literacy refers to the understandings, capacities and dispositions required to benefit from feedback opportunities (Carless and Boud, 2018). In other words, for students to be feedback literate they need to have an understanding of feedback and how it works, they need to have the ability to plan and act in response to feedback received, and they need to value and be accepting of feedback processes. Furthermore, Molloy et al. (2020) elaborate on the specific understandings, capacities, and dispositions of feedback literate student, through the validation of a learning-centred framework for feedback literacy. This framework groups student feedback literacy characteristics into seven feedback literacy dimensions.

1. Commits to feedback as improvement.
2. Appreciates feedback as an active process.
3. Elicits information to improve learning.
4. Processes feedback information.
5. Acknowledges and works with emotions.
6. Acknowledges feedback as a reciprocal process.
7. Enacts outcomes of processing of feedback information: incorporates feedback into learning goals.

These seven dimensions of feedback are critical in preparing graduates for the future of world of work and can be addressed and developed through various learning activities designed by teachers.

AI tools for automated feedback

The term artificial intelligence (AI) is sometimes equated with artificial consciousness or sentient robots. However, these are still theoretical forms of AI. The AI in existence today, also called narrow AI, is focused on performing specific tasks. Amazon's Alexa and autonomous vehicles are some examples of narrow AI. Narrow AI (or just AI) process data to identify it and classify it based on their programming or training. The AI field encompasses multiple subfields such as machine learning, natural language processing, deep learning, and intelligent agents (Tang et al., 2020). Common to all these is an outcome that is predictive, or in the form of a probability, as opposed to being deterministic. In other words, AI algorithms result in systems which make predictions or classifications based on input data. This is different from conventional programming, where programs are provided with input data and generate an output based on programming logic that relies upon calculations within some information boundaries.

Among the AI tools that support writing, are the automated writing evaluation (AWE) tools. The AWEs identify specific characteristics of a text, supporting editing and drafting stages. AWEs can focus on micro text level only (words, phrases, or sentences), macro level only (paragraphs, whole text) or both (Strobl et al., 2019). Grammarly is a well-known example of AWE (Khoshnevisan, 2019). AWEs that focus on micro text level only are used at the editing stage of writing while those that focus on macro level can be used at the drafting stages.

In some of these AWEs the parameters are pre-set, such as in Grammarly, in others the parameters can be set by either teachers or students. The responses to the information collected also results in different responses or forms of feedback depending on the purpose of the tool and the features being detected. Grammarly, for example, being focused on copy-editing support, suggests to the user changes that can be accepted individually or globally.

FeedbackFruits automated feedback on academic writing AI powered tool
FeedbackFruits have developed an AI tool that enables automatic feedback on academic writing. The automated feedback tool developed by FeedbackFruits is a form of AWE. As mentioned, AWEs can focus on micro text level only (words, phrases, or sentences), macro level only (paragraphs, whole text) or both. The automated feedback tool developed by FeedbackFruits currently focuses on micro level features of texts only, supporting the copy-editing stage of writing. Micro level AWEs detect specific parameters in the text such as sentence length, punctuation rules, grammar, or text structure. In the current version of the FeedbackFruits automated feedback tool, the teacher sets the parameters, but the student uses the tool independently. The tool highlights errors and either describes mistake or directs the student towards additional information or learning resources and the student receives and actions the feedback without teacher involvement. The current aim of this tool is to provide timely and actionable feedback on specific aspects of writing skills for students and to reduce academic workload by automating low level feedback, allowing teaching staff to focus on providing feedback on more complex, or higher order thinking aspects of the tasks. The provision of immediate feedback is also expected to increase the use of specific feedback by students, stimulating active learning and resulting in higher quality of written submissions.

Methodology

Design-based research (Reeves, 2006; Akker, 1999) approaches are commonly used for the research on educational technology. These approaches involve a successive approximation through iterative integration of design principles with technological affordances, and testing and refining the prototype or tool (Akker, 1999). In fact, Akker (1999) remarks that direct application of theory is not sufficient to solve these complicated problems. These approaches ideally include the collaboration with practitioners in real contexts. In the pilot project described in this paper, the University’s academics, and students, across all Faculties, are involved in piloting and evaluating the prototypes.

This pilot project ran across three teaching periods on a total of 29 units, reaching almost 4,000 students. These units span across the undergraduate and postgraduate levels, in the Faculties of Science Engineering and Building Environments (SEBE), Arts and Education, and Business and Law. The number of undergraduate units in the pilot was 8, while there were 17 postgraduate units involved. However, undergraduate units had more students, with 70% of the total number of students with access to the tool being undergraduates. The writing tasks the tool has been piloted on are diverse and include thesis, research reports, project reports, autoethnographies, essays and reflective tasks.

Findings

In undergraduate units, the tool was used on average by 13% of the students. In postgraduate units, the tool was used on average by 12% of the students. However, in postgraduate units, there was a big variation in the use of this tool across different units, ranging from no use to 34% of students using it. In both, undergraduate and postgraduate units, the nature of the task did not appear to have an impact on the use of the tool, for example, long academic writing tasks did not result in more use of the tool than small reflective pieces.

The evaluation of the pilots with the 29 units in consultations with the university teachers and the usage data of the AI tool suggest the following 6 key observations:

- proactive, high achieving students use the tool more
- most common numbers of submissions are one, two or three submissions (in that order)
- multiple submissions are commonly done in a single day
- students commented on usefulness of feedback received
- students highlighted errors/inaccurate feedback
- students rated the feedback, with the average rating being very positive

In what follows, we will discuss our reflections and inferences in more detail.

Discussion

The pilot of the AI powered automated feedback tool, provided students the option of using the tool to seek immediate feedback on their academic writing. It was observed that a relatively small number of students

(13%) used the tool given the formative nature of the task. Those students who decided to use the tool were identified by their teachers as mostly proactive, high achieving students. This aligns with the fact that engaging with this optional tool requires student agency and evaluative judgement skills. Students need to be willing to elicit information to improve their own learning and be committed to feedback as improvement. A single submission was most observed, followed by two or three submissions. Multiple submissions can be a proxy of students taking on the feedback provided, and they usually occurred in a space of 2 minutes to 5 hours. This indicates that some students not only commit to feedback as improvement but also appreciate feedback as an active and ongoing process. These observations evidence how this tool positions feedback as a student-centered activity rather than a teacher's task and highlights the importance of student agency in this process. In fact, this indicates that the use of the tool, or lack thereof, is not influenced by students' capability of processing feedback information as much as on their appreciation of feedback for improving their writing skills.

Students' interactions with the tool were possible and encouraged for each feedback instance through options for rating the feedback, commenting on its usefulness, and highlighting any errors or inaccurate feedback. All these options were used by students whereby students had the opportunity to provide their feedback on how useful the AI powered feedback was. This indicates that some students acknowledge feedback as a reciprocal process and that some of them feel capable of processing the feedback information and judging its quality or correctness through the application and calibration of their evaluative judgement. Importantly, this tool aims to remove the power structure from the feedback interaction, potentially promoting students to be less emotional and more critical, thus better placed to make evaluative judgements of the feedback in relation to their own work. These, combined with the affordances of this tool, make it ideal for using it to develop students' feedback literacy capabilities such as acknowledging feedback as a reciprocal process, processing the feedback information, and acknowledging and regulating their emotions.

Conclusions, implications for future work

The pilots indicated that the AI tool affords students to develop and demonstrate the different dimensions of the learning-centred framework for feedback literacy (Molloy et al., 2020). However, not all students were able to act on these affordances. To scaffold students' feedback literacy, the use of the current tool needs to be incorporated in the learning design work by teachers in actualising these affordances. In other words, teachers need to make students aware of the different feedback literacy dimensions and include some guidance or strategies on how to enact them.

Distinct framings shape how learning and assessment activities are designed, what roles learners play, and what is valued in terms of improving learning outcomes (Kafai et al., 2020). By reframing the automated feedback tool to developing feedback literacy through addressing academic writing, this tool will not only have a greater impact on student academic writing but also on their academic writing skills and on their learning strategies in general. Into the future with the next iteration of the tool as improvements, the first step proposed is to make the tool student-facing. Currently, the teacher decides whether they will add the tool into their units and which assessment tasks it will be associated to. The parameters against which a task is analysed by the tool are also set by the teacher. The use of the tool for feedback is optional for students. We propose that the next iteration of the tool be made available in all units so that each student can decide what task they will use it for and the aspects of writing skills for which, they would like to seek feedback. Making it widely available across all units, with no teacher involvement, will further cultivate a space for developing student agency and feedback literacy in self-regulating their learning. Furthermore, this solution does not add workload or rely on teachers' expertise to embed feedback literacy systematically. It would only require some strategic points across the degree where more sophisticated teaching and practice of feedback literacy would need to be integrated. For example, by including assessment tasks that scaffold feedback as an active process by asking students to use the tool at a specific draft stage and demonstrate the incorporation of feedback into their final submission. The other feature recommended for inclusion in the next prototype is the inclusion of templates for three different drafting stages, guiding students through understanding the process of writing at each stage. This will raise awareness of the reciprocal nature of feedback and the role students need to play in it. It is expected that this will build an understanding of what an AI tool can and can't do, creating a partnership between student and AI in relation to feedback, a disposition that can be related to and extended to their teachers.

This pilot study has therefore provided preliminary insights on how the AI powered tool for automated feedback can be incorporated in the way that students engage with and develop feedback literacy and evaluative judgements although further detailed evaluation of the pilot is required to improve the tool and learning design that surround the incorporation of AI for teaching and learning.

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reconnect
Reconnecting relationships through technology

Reconnecting teachers and students: Exploring educator experiences in large online cohorts

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Increasing class sizes in higher education make it difficult to maintain quality. Teaching large cohorts within the context of restrained resources and the limitations of Learning Management Systems impacts the experiences of educators. Research is now examining how educators make sense of this experience to guide stakeholders toward practical directions for future pedagogical and social practices. A review of previous research noted three groups of challenges faced by online teaching: (1) technological, (2) pedagogical, and (3) social. Our study explores the experiences of educators teaching large cohort (500 to 2300 students) undergraduate courses online. This concise paper presents the findings from the social aspects of the challenge. Our qualitative approach explores the experiences of educators at our school who teach large cohorts online. We suggest recommendations to address the social needs of students and educators involved with large cohorts online.

Keywords: Large cohorts, Learning Management System, social needs, educator experience, strategies

Introduction

The massification of higher education to allow tertiary learning to be available to everyone has resulted in escalating numbers of students entering universities and increased opportunities for establishing large cohort classes with high teacher-student ratios (Hornsby & Osman, 2014). In addition, the recent COVID-19 pandemic has encouraged reflection on online teaching strategies across the globe (Ferri et al., 2020). Most modern institutions use a Learning Management System (LMS), for example, Moodle, Blackboard or Canvas, to assist efficient management of materials and larger numbers of students.

Increasing class sizes make it difficult to maintain quality; however, since current practices continue expanding class and cohort sizes (Ryan, 2020), especially online, it is critical to explore how educators face the challenges of teaching large student numbers. Research has shown positive and negative aspects of e-technology, such as the LMS. Kanuka & Rourke (2008, p. 5) argued that "e-learning and its constituent technologies and techniques amplify certain aspects of the teaching and learning environment while reducing others." It is important, therefore, to monitor the experience of teaching and learning in online spaces to take advantage of the technological affordances without losing the social connections mediated communication potentially disrupts. Exploring how educators make sense of this experience will guide educators, institutions, administrators and other stakeholders toward practical and effective directions for future pedagogical and social practices (Al-Freih, 2021; Cutri & Mena, 2020; Kearns, 2016; Kerres, 2020).

Previous research has explored the lived experience of academics teaching large classes specifically, looking at the problematic nature of teaching and learning in large classes. For example, Chikoko (2015, p. 2) stated, "realising and maintaining quality education will only be possible when, among others, there is knowledge about how academics experience their large class teaching." Research is now examining educator experiences, especially considering the recent pandemic, which accelerated a move to totally online learning. Concern has been raised about the impact on educators of the rapid shift online. Ferri et al. (2020) reviewed previous research and noted three groups of challenges faced by online teaching (1) technological, (2) pedagogical, and (3) social. They noted previous literature identified lack of suitable study space at home, and they found social challenges of lack of interaction between educators and students. Mantai & Huber (2021) reported on the experiences of academics teaching large cohort classes in Australia. They found the locus of control for learning with large cohort classes shifts from the educator to the student. This shift, they suggest, may lead to the educator experiencing feelings of disorientation and disempowerment. Considering these study findings, we feel it is important to explore the experiences of educators in our school to identify challenges and strategies in our context. This paper focuses on the social aspects of the online challenges, although technological and pedagogical aspects also influence the social experience of educators and their interactions with students.

Rationale & Context

This study explores educator experiences teaching large cohort undergraduate courses online. We examine how they meet the technological, pedagogical and social challenges of online delivery. This paper focuses on the social challenges, and the other two are examined in later papers. We take a qualitative approach through focus groups comprised of academics at our school who have experience working on large cohort courses. Many countries commonly maintain quality teaching on a larger scale (Ryan, 2020). We hope to develop recommendations and guidelines for meeting student social needs to better support lecturers teaching large cohort undergraduate courses online locally and internationally.
The location for this study is the [Institution Name, Department Name]. This department within the [Name] provides students with a foundation of knowledge applicable to all other health science majors. Enrolled students complete four courses to introduce them to core topics such as anatomy and physiology, developmental psychology, social and environmental influences on health, and academic enquiry processes. Knowledge of *Te Tiriti* (the Treaty between the indigenous Māori people of Aotearoa/New Zealand and British settlers signed in 1840) and *Mātauranga Māori* (Māori concept of enlightenment), as well as academic skills, are woven throughout these first-year undergraduate courses. Subsequently, students begin their major(s) and minor(s)/electives and continue those through their second and third years of study. Each course cohort's enrolment ranges from 350 to 2300 students and educators (lecturer and above) range from one to four. These courses have traditionally occurred in a blended format with materials and some online assessments combined with face-to-face lectures and tutorials. In addition, the COVID-19 pandemic required these large courses to move entirely online. Furthermore, the university changed the LMS from Blackboard to Canvas in semester 1, 2022. We are also educators on these large courses but were not participants in the study. Our institution granted ethical approval (ref. 21/392).

Methodology

To foreground the participants voices as we explore educator experiences of teaching large cohorts online, we used a qualitative descriptive approach. The qualitative descriptive approach allows the academic educators members to express their experiences in their own words (Sandelowski, 2000). We stay close to the transcribed data in reporting the findings, include many quotes and describe the academic experiences in language similar to their own. The qualitative descriptive approach allows the focus group member's words to speak for themselves and assists us in focusing on their experiences and views. There were 18 potential participants who taught on large cohort papers (excluding the authors).

Data collection

We planned to gather data via online focus groups using Teams, which records the sessions and generates a transcription. Focus groups enable both individual perspectives and reflection on peers' views of their experiences (King, 2004). The first focus group was held in the second week of May 2022 with five participants, and the second in the following week. However, only one participant appeared for that group, so we conducted it as an interview. The focus group and interview included the three researchers. The semi-structured focus group and interview included the following questions:

1. Please tell us about your experiences using technology while teaching large cohort undergraduate classes online? If you experienced challenges, what were they? How did you resolve these challenges?
2. Please tell us about your experiences in applying sound pedagogy while teaching large cohort undergraduate classes online? If you experienced challenges, what were they? How did you resolve these challenges?
3. Please tell us about your experiences in addressing student's social needs while teaching large cohort undergraduate classes online? If you experienced challenges, what were they? How did you resolve these challenges?
4. Is there anything else you would like us to talk about regarding teaching large cohort undergraduate classes online?

Participants were encouraged to voice their thoughts freely and openly. The focus group and interview lasted approximately 60 minutes each.

Data analysis

Following the check of the Teams-generated transcription for accuracy, we printed out the written transcripts to read for gaining familiarity with the content. We used a template analysis process (Brooks et al., 2015; King,

2004) in which we created our initial template based on previous literature and our own experiences. This helped us clarify the definitions among ourselves. In line with our subtle realist stance, the template analysis enabled us to focus on some key reported areas of the experience while also allowing for subjective interpretations to appear. The template also assisted us with a limited interview time and to compare perspectives of educators working across substantially different courses. The highest-order codes were technological, pedagogical, and social issues. The interview guide questions reflected these categories. Table 1 shows the coding template for the social issues dimension.

Table 1: The initial coding template for social issues

Social subthemes	Suitable study space at home Connection between students Connection between students and educators Connection between educators (esp. team teaching)

Our first round of coding began with the three general categories of technology, pedagogy, and social needs. Within these three categories we also coded text as either positive or negative. We individually coded the text and then came together to compare initial codes. We discussed our coding to reach consensus as we noted some overlap between the three general categories. We reached agreement on where each comment was coded into the three general categories and their overlap. The second round involved coding the subthemes within these categories and overlaps.

Findings & Discussion

Strategies for connections between students and educators

Connections between students and educators occur through synchronous online tutorials, asynchronous discussion boards, email, and announcements. Interactions through these spaces create both positive and negative implications for teaching and learning that require some consideration. Most mentioned was the online tutorial experience. Educators used a range of strategies to engage students. Table 2 shows the positive strategies educators (E1-E6) used and illustrative quotes.

Table 2: Positive strategies used to connect with students online

Strategy	Quote
Lower the power imbalance / share personal life	'Raise your hand. We will talk directly to you. […]. We're not above them in any way. […]. You know, bow and scrape to us. We've totally devolved that so that we're not.' 'Sometimes I'll tell them stories about things that have happened to me that were humorous.'(E6)
Humour	'I'm using humour to pull them in. And sometimes I'll banter off with [co-teacher]'. (E6) 'You're trying to be entertaining for keeping them captivated.' (E5)
Authenticity	'One thing that I had to learn very quickly going online was to remain genuine and say to people you know things might change a bit here. We're doing the best we can, so that students feel that it's not um. It's not going to be a beautiful presentation, but I myself try and give of myself in the session as well.' (E4)
Giving hope	'So I basically make them think there's hope and that's back to this whole thing of if you give them hope and a goal, you'll enhance their wellbeing and you when you use compassion in that message, it oils the wheels.' (E6)
Safe & relaxed space	'it's not just imparting the knowledge as a creating a safe space [...for] students to be comfortable with each other to, to share the ideas and to share their chat in an online environment. So [...] asking how you're doing? or an icebreaker at the start of a online session is quite good for that.' (E1)
Affirmative environment	'Right from the beginning, I always put poster welcome into the sessions day as people come in, I say welcome and you know, I don't say turn on your cameras because I know they would if they wanted to so they don't do that. But I say please use the chat session if there is chat feature, please if you feel you want to contribute using your microphone please do so. I actually affirmatively say engage in the ways that work well for you. […]. At the end I will say I will be remaining in this online room until you will leave. […] I try and be as expressive as I can with the bits of me that people can see.' (E4)
Include lurkers	'I started calling them lurkers. I said there's 120 of you in this tutorial. (E6)

	That means that 110 of you are lurkers. And I make my face go funny. Are the lurkers learning anything, or are you just here for the entertainment? I mean, is anything happening, and they get on the chat, and they say, yeah, yeah, it's happening.'
Sign off connection	'Oh, they always say goodbye and thank you so much. We learned so much. And I'm the chat. The chat box explodes again after I do my little lurker joke thing, you know, are the lurkers learning anything? I give them a little funny face, you know. Are you, are you there? (E6)
Sharing own social need	'Put your camera on so that I'm not talking to a blank space because I have emotions too and I'm feeling very alone.' (E6)
Using images	'You know, that kind of thing. And I just showed my dog and what I started getting feedback from the students. We so loved these announcements. You're the only people we've ever had where the announcements help us to feel OK about life and what's happening around us. I've sometimes tried to pick different cultural pictures that I know mean something to' [students]. (E6)
Asynchronous connection	'I have agreed with my students whenever they have any question or any concern, they can contact me by email and particularly I'm looking after the [...] Canvas, discussion board. So, I'm just getting quite a lot of questions, something that they don't ask me in the class online class.' (E3)

Ferri et al. (2020) recommended blended learning to mitigate the social challenges in online learning. However, when this is not possible, educators need to make the best of the online environment even in small, but meaningful ways. Our comments show some of the micro moments of online practice. In some comments the social engagement was through comments staff made to students, such as telling personal stories or staying until the last student left. In many other cases, the social interaction was influenced by technology, such as asking for cameras to be turned on, use of a netiquette slide and engaging images. Pedagogical aspects also influenced the social as regarding students a community of practice with peripheral lurkers impacted how one teacher engaged with students. This can also help mitigate the sense of staff powerlessness and loss of control noted by Mantai and Huber (2021). Another teacher was influenced by both technology and pedagogy to connect with students via expanded time with students on the discussion board, though this was only considered "some sort of connection" rather than a deeper one.

We have presented positive strategies teachers used as this offers some practical actions for other educators; however, we also found negative comments about the social affordance of online teaching. One teacher said,

> I do most of my undergraduate teaching at South Campus and I must say the students seem excited about being back. There's so much more that goes on down at South Campus than sitting in the classroom. There are people milling around, chatting to each other outside the classrooms, they're eating together. They're doing things together, and I don't think we would ever be able to create that environment online. So, there is something around the social environment actually entering and going there and being there.

Social needs often intertwined with technology and pedagogical issues. Furthermore, there was a balance between positive and negative aspects of these dimensions. For example, although technology enables communication, that communication can seem impersonal (See Figure 1).

In the technological-social balance, online learning offers another way for students to learn; however, the online environment may feel more disconnected. One educator noted online learning was "Quite good for large cohort because it means that we not limited by how many people can come online at the same time um it is a little bit less interactive in terms of not being able to go around and checking what people are, how students are doing, what stage they're up to and so on" (E1). The balance required for social and pedagogy, for example, showed staff are "creating a safe space and also getting students to be comfortable with each other to share the ideas and to share their chat in an online environment" (E6); however, another educator noted "The facilitator still tried to keep it, you know, busy and active, but it was just one dimensional" (E4).

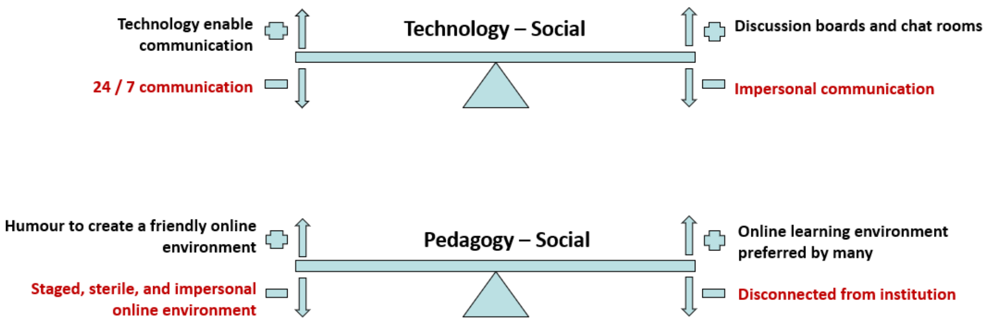

Figure 1: Balances between social and technology and pedagogy domains

Conclusion and Implications for practice

In response to COVID, the university adopted online teaching, Teams meetings and other LMS online collaboration methods to replace traditional classroom-based interactions. The initial reaction for some was to try and put old wine into a new bottle – they tried to recreate the classroom situation online. However, these educators quickly realised that this might not be the best approach. Most educators found that online teaching produced an opportunity to reimagine the learning environment to provide learning opportunities that enabled more flexibility and a more engaging platform to meet their students' social needs. Table 2 showed ten strategies that help educators better meet the social needs of their students: 1) lowering the power imbalance by sharing aspects of their personal life, 2) using humour, 3) ensuring authenticity, 4) giving hope, 5) providing a safe and relaxed space and an affirmative environment, 6) include lurkers, 7) creating a sign-off connection, 8) sharing own social need 9) using images and 10) adding an asynchronous connection. Staff have noticed some engagement with students through these strategies, and future research could explore how students perceive these strategies.

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reconnect
Reconnecting relationships through technology

Considering modes of delivery in blended PBL: a literature-based approach

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The COVID-19 pandemic had accelerated Blended Learning in many institutions worldwide, catapulting it into a now permanent spot in the school curriculum in many higher learning institutions. However, given the infinite permutations in blended learning, it is not surprising that it has led to contradictory student outcomes and learning experiences. Research has suggested the combination of Problem-based learning and blended learning can lead to constructivist learning environments that promote 21st century skills such as innovative uses of technology, problem-solving and collaborative skills. However, there is little to guide educators in the design of blended PBL. One design consideration is the choice of delivery modes. In this presentation, the literature is explored for the essential instructional components in PBL, and the modes of delivery that best support them. This could be offered as a starting point to support lesson designers approaching blended PBL.

Keywords: Problem-based learning, Blended learning, Blended PBL, instructional design

Introduction

The COVID-19 pandemic has been said to have accelerated blended learning. In many countries, including in Singapore, blended learning has now been said to become a new constant in the school curriculum (Lim & Graham, 2021; Ng, 2021). However, clear and concise design principles for creating instructional activities for blended learning seem to be lacking in the literature (Boelens et al., 2017). The literature suggests a promising approach in the use of blended problem-based learning (PBL), where learning is initiated and anchored by an authentic problem (Boud & Feletti, 2013), and delivered through blended learning. Firstly, blended PBL has been said to offer a constructivist learning environment (An, 2013). Secondly, it enables the benefits of learning through both online and face-to-face modes where they are best used (Donnelly, 2017). Thirdly, it encourages innovative uses of online tools and new technologies that can enhance the PBL process (Donnelly, 2017; Ryberg 2019). However, there have been few studies on blended PBL, that have paid close attention to its design process (An 2013; Donnelly, 2017). The purpose of this paper is to review existing literature on various blended learning delivery modes and, through the investigation, suggest suitable modes of delivery in blended PBL for higher learning institutions, such as polytechnics, colleges and universities. It is guided by the research question: Based on a literature review of PBL and blended learning research from 1996 to 2021, which modes of delivery best support each key component in the blended PBL process?

Literature Review

The Key Components in Problem-based Learning

PBL has been adapted to suit various disciplines, levels and contexts since its early roots in medical education. In designing PBL, there are no fixed and universal set of practices which must be followed (Barrows, 1996; Boud & Feletti, 2013). However, there are core components that seem key to the PBL process. These are six components gleaned from the literature:

Component One: A 'Problem'

The PBL process typically begins with students being presented with a problem scenario to initiate the learning process (Barrows, 1996). An effective PBL problem is (i) stimulating, so that students are invested to explore and investigate concepts and ideas to solve them (Boud & Feletti, 2013), (ii) authentic, mirroring real-world problems (Boud and Feletti, 2013), (iii) transdisciplinary, to enable students to learn in relevant and connected ways (Duch et al., 2001), and (iv) ill-structured, to encourage students to explore, discuss and adapt their knowledge (Loyens et al., 2011).

Component Two: Teacher as Facilitator
In PBL, the teacher's role is to guide learners to sharpen their cognitive skills, to collaborate and solve problems, in so doing reaching deeper levels of understanding in their subject areas (Hmelo-Silver, 2004). She may toggle flexibly between scaffolding strategies such as giving feedback, question prompts, hints, and expert modelling (Hmelo-Silver, 2005) or even direct instruction such as mini lectures, when the need arises without necessarily fixating on the right or wrong answers (Hmelo-Silver et al., 2007). It is a role centred on mutual respect and independence (Barrows, 1996).

Component Three: Collaborative Learning
Peer collaboration is a significant component of the PBL process. Collaborative learning in small groups introduces a social dimension into the learning process (Hmelo-Silver, 2004). When learners engage, coordinate and work purposefully towards a common goal, they naturally interact, verbalise and dialogue through their learning process together (McCaughan, 2015). Group work helps to distribute the cognitive load in a team making learning more manageable (Kirschner et al.,2011).

Component Four: Self-directed Learning
Self-directed learning is encouraged in PBL as opposed to being fed information or by being instructed by a teacher (Barrows, 1996). Self-directed learning is triggered, for example, when students identify gaps, hypothesise, and devise solutions to the given problem (Hmelo-Silver, 2004). These arm them with problem-solving skills for the real world.

Component Five: Assessment
Hmelo-Silver (2004) and Loyens et al. (2011) summarised the goals of PBL into five main objectives – for students to (i) construct an extensive and flexible knowledge base (ii) become good collaborators (iii) become motivated to learn (iv) become self-directed learners and (v) develop problem-solving skills. These objectives cover both the process and product of learning. The assessment of students' achievement in PBL should thus be done using both formative and summative methods that covers both learning and performance (Boud & Feletti, 2013; Duch et al., 2001).

Component Six: Synthesis and Assimilation
In PBL, reflection is a key metacognitive skill that helps in the process of synthesis and assimilation (Hmelo-Silver, 2004). Barrows (1986) described it as getting learners to re-examine all facets of the process to better understand what they know, what they learned and how they performed. The conscious act of synthesising and reapplying new knowledge to the original problem and evaluating their learning processes consolidates understanding (Boud & Feletti, 2013).

Determining Delivery Modes in Blended Learning

Modes of delivery in Blended Learning
Blended learning is defined as the combination of face-to-face with computer-mediated instruction (Bonk and Graham, 2006). The literature often discusses three broad modes of instruction used to deliver blended learning. These are face-to-face instruction, synchronous online instruction and asynchronous online instruction (Bonk & Graham, 2006).

Determining the modes of delivery in blended learning
Blended learning works when the modes of delivery complement each other (Alberts et al., 2010; Yukawa, 2010). These combinations need to be constantly evaluated to suit the environment as well as teaching and learning needs (Fuller, 2021). Two theories are suggested here that may aid in the selection of delivery modes in blended learning. They are (i) the Media Richness theory, a concept developed by Daft & Lengel (1986), which continue to be employed in communication and education research such as Sun and Cheng (2007), Balaji and Chakrabarti (2010) and Ku et al. (2021); and (ii) the Media Synchronicity theory (Dennis et al., 2008), a theory that has been employed in e-learning literature such as Samardzic et al. (2014) and Tang and Hew (2022).

The media richness theory recommends the delivery media based on its degree of 'richness' (Daft & Lengel, 1986). On one end of the spectrum, a 'rich' media can accomplish four goals. It can (i) send multiple signals such as nonverbal cues (ii) support language variety such as slang (iii) provide immediate feedback from the receiver and (iv) allow for the tailoring of messages in a real-time situation. Some examples of rich media are face-to-face sessions or online video conferences. They are best for activities where there are multiple interpretations or conflicting solutions. On the other end of the spectrum, less rich media are best for activities that can do with delayed feedback such as asynchronous discussion forums.

The media synchronicity theory considers all communication tasks as composed of two fundamental processes: conveyance and convergence (Dennis et al., 2008). Conveyance processes, such as giving instructions to students, are better done asynchronously. Convergence processes such as discussion or debates where there are divergent ideas, are better done synchronously.

A summary of these two theories and how they can guide the decision-making process in determining activities in blended learning, is offered in in Figure 1.

Media richness theory (Daft and Lengel. 1984)

	Less Rich Media	Rich Media
What it means	Media with less rich sensory input, delayed feedback or shared focus	Media with richer sensory input, immediate feedback or personal focus
What it supports	Unequivocal Learning Tasks: Learning tasks with low haziness such as learning factual knowledge	Equivocal Learning Tasks: learning tasks with multiple or conflicting interpretations or solutions
Examples	Online discussion boards	Face to face meetings

Media synchronicity theory (Dennis et al., 2008)

	Conveyance	Convergence
What it means	Low dependency of time and location and different modes of communication	High dependency of time and location and different modes of communication
What it supports	Learners work and share information regardless the constraints of time and place. Learning is more reasonably designed for conveyance, that is, the exchange of information.	Learners work together with a shared focus at the same time and place. Learning should be designed to facilitate a convergence process that reaches a common understanding
Examples	Relaying information. Sharing resources.	Face to face project work

Figure 1. Two theories for determining delivery mode and media in blended learning

Suggestions on Delivery Modes in Blended PBL

In this section, the media richness and the media synchronicity theories are mapped out to the six key components in PBL to produce a set of suggestions for the delivery models that can support blended PBL.

Component One: A 'Problem'

The problem scenario is often given to the students before or at the start of the PBL process. This seems to fit the description of a conveyance activity (Dennis et al., 2008). It does not require "rich" media where immediate feedback or personal attention is crucial (Daft & Lengel, 1986). Thus, for a blended PBL approach, it is proposed that the release of the problem scenario can be done online and asynchronously. The lecturer can put up the problem statement online for learners to access at their own time. This gives the flexibility of time and space for students to access and process it, which is one the advantages of blended learning (Boelens et al., 2017; Staker & Horn, 2012).

Component Two: Teacher as Facilitator

In PBL, the role of the teacher is to guide and coach the learner through the learning process (Barrows, 1986). In "rich" face-to-face classes, lecturers are able to observe and react to non-verbal cues, address concerns and provide immediate feedback in real time (Daft & Lengel, 1986). This could be especially helpful for convergent activities where students may need to work through a divergence of ideas (Dennis et al., 2008). Online learning on the other hand, presents a large range of communication tools which allow for flexibility without being bound by geography (Ryberg, 2019). For a blended PBL approach, this study suggests that facilitation is done throughout the PBL process on face-to-face and online synchronous and asynchronous platforms. This gives the lecturer presence and the flexibility to customise the timing and degree of scaffolding for students where they see fit. For example, teachers can meet students face-to-face or online synchronously on video call to work through any perturbations they may have about the problem scenario, for which there are conflicting interpretations that need to be guided through (Daft & Lengel, 1986). They can also facilitate asynchronously via online platforms like discussion forums or chat groups where they can observe ongoing discussions without necessarily participating in all of them (Savin-Baden, 2007). This is aligned with Andersen et al. (2021)'s study which found that in online PBL during the COVID-19 pandemic, students enjoyed the flexibility of one-way activities like online lectures, but sought more facilitator interaction when learning became active and social.

Component Three: Collaborative Learning

The wide range of opportunities for interaction in blended learning is valuable to learners (Yukawa, 2010). Face-to-face sessions are useful for intensive and challenging tasks where convergence of thoughts and ideas are the focus (Daft & Lengel, 1986). On the other end, asynchronous mediums are useful for conveyance processes (Dennis et al., 2008). Blended learning allows for learners to reap the benefits from both types of interaction (Bonk & Graham, 2006). For these reasons, this paper suggests that collaborative learning activities in blended PBL are done on face-to-face and online synchronous and asynchronous platforms. For example, in between "rich" face-to-face meetings, students can learn collaboratively by sharing their thoughts and ideas asynchronously via discussion boards and chat groups.

Component Four: Self-directed Learning
Technology has made it easy for learners to find resources on their own (Ge & Chua, 2019). With this access, they can be encouraged to explore concepts, thoughts and ideas and decide on their own pathways, space and time (Staker & Horn, 2012). In the blended PBL approach, this paper recommends that self-directed learning activities be done online asynchronously. For example, they could be encouraged to research ideas related to the problem scenario through a series of activities that they could do on their own. Learner independence and autonomy are core to successful blended learning courses (Alberts et al., 2010).

Component Five: Assessment.
Assessment in PBL is holistic and concerns both the process and product of learning (Boud & Feletti, 2013; Duch et al., 2001). For the blended PBL approach, this study proposes that assessment activities are done on face-to-face and synchronously and asynchronously on online platforms. For example, formative activities that involve feedback, adjustment, refocusing and coaching can be done face-to-face or through online consultations with the facilitator, as well as asynchronously through pre-set self-paced quizzes and games. Assessments that are more time-sensitive could be done during the face-to-face components on the blended PBL approach. This is especially if the assessment involves multiple solutions or requires immediate feedback such presenting problem solutions.

Component Six: Synthesis and Assimilation.
The reflection process consolidates the learning process (Savery, 2015). In this way, it is an introspective activity where students can potentially value flexibility in time and place. In the blended PBL instructional approach, this study recommends that synthesis and assimilation activities such as reflection activities are done online asynchronously. For example, this can be done through online platforms like email, text chat or discussion forum. These asynchronous online tools provide the benefit of flexibility as students can participate in these activities at periods that are convenient to them.

Conclusion
This research set out to suggest the suitable modes of delivery that can support blended PBL based on the literature. First, the six essential components of PBL were drawn out from the literature. Next, two theories were discussed that may aid in the selection of delivery media in blended learning. The two were mapped out to produce a set of suggestions for how the different components in PBL can be delivered in blended learning. This study's limitations include the lack of literature that examines the outcomes of these suggestions in the context of blended PBL. Future directions include the implementation of these suggestions to test and explore the outcomes and experiences from both the teacher and learner perspectives. Nevertheless, it is hoped that this offers a starting point to support lesson designers approaching blended PBL. Figure 2 presents a summary of the suggested modes of delivery that supports blended PBL.

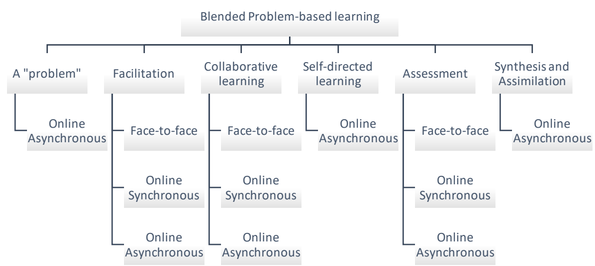

Figure 2: Suggestions for modes of delivery in blended PBL

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reconnect
Reconnecting relationships through technology

Educational Designer social influence: changing teaching and learning practice

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In the current neoliberal agenda, universities require Educational Designers (EDs) to establish influence and ensure the improvements in education for the benefit of graduates. The preservation of high-quality teaching is fundamental in connecting educators with students, which was crucial during the COVID-19 pandemic. Yet, the influence of EDs on affecting a change in teaching practice has not been adequately explored. This case study collected qualitative survey responses from seventeen EDs in one Australian university, and used inductive thematic analysis to explore how they attempted to influence academics to change teaching practices. Results indicated a definitive need to collaborate *with* academics to implement the desired changes. Moreover, strong professional relationships with academics, effective communication, and creating a favourable environment were important to the EDs' influence attempts. Cultural challenges within the university was an interesting discovery regarding influence capability. These findings provide key insights into how EDs support a change in educational practice within the university environment.

Keywords: educational designer, social influence, influencing change, university teaching practice

Introduction

In Australia, Educational Designers (EDs) have been an integral part of influencing effective quality teaching (and learning) practices in universities for over a hundred years (Seeto & Herrington, 2006). Yet, their role and positioning are often invisible or even camouflaged (Akerman, 2020). While empirical research into this occupational group has increased, the perspectives of EDs and how they affect change in academics' educational practices has not been adequately established. This research investigates "*How do Australian EDs who practise in a university setting influence academics to implement changes to their teaching practices?*".

Who are EDs and what are their roles in universities?

Within the Australian higher education context, EDs operate under a variety of titles, including educational designer, instructional designer, learning designer, and academic developer (Bisset, 2018). In the university under study, 'educational designer' has been exclusively used to describe the role responsible for the "effective uptake of new educational approaches, educational technologies, and the use of learning spaces" (University Position description, n.d.). Hence, the acronym 'EDs' will be used to describe the participants' role and practice.

There is an ever-growing body of literature that describes the practices of EDs in Australian higher education. Bisset (2018) proposed that EDs "operat[e] at the intersection of research, theories and practice in instructional design and academic development, yet these professional orientations are themselves fluid and evolving" (p. 73). Altena et al. (2019) stated that EDs are influencers who inspire positive changes in practice. Furthermore, they distinguish that EDs demonstrate leadership by "modelling the way", and "enabling others to act" (p. 362). Similarly, Slade et al. (2017) found that influencing academics was amongst the highest ranked work that learning designers do on a daily basis. However, there is a call for "urgent research…to validate the findings and inform professional identity" of this emerging group (Altena et al., 2019 p. 362).

To optimise the students' learning experience, there is a conspicuous desire by universities to ensure the quality of teaching practices. However, resistance to teaching and learning enhancement due to time pressure, resource constraints and student numbers (Knapper, 2016), continue to impact the implementation of change and quality improvements. Quinn (2012) contends that teaching is being under-valued, teaching development is unnecessary or driven by compliance. Changes in educational-technology affordances and diverse ways of learning have also created great disruptions to the university landscape (Pelletier et al., 2022). Consequently, these various changes and challenges have highlighted the need for EDs to lead and facilitate while simultaneously serving as change champions in the transformation of teaching practices (Altena et al., 2019).

Methodology

Social influence is defined by Pratkanis's (2007) as being linked to processes such as “conformity (creating or changing behaviour or belief to match the response of others), persuasion or attitude change (change in response to a message, discourse, or communication), compliance (change in response to an explicit request), yielding to social forces (change in response to the structure of the social situation), or helping (change in response to someone’s need)” (p. 17). Pratkanis proposed four broad categories of non-coercive social influence tactics, (1) landscaping, (2) credible and social relationships, (3) effective message tactics, and (4) emotional tactics. Further to this, Cialdini (2009) argues that reciprocity, commitment and consistency, social proof, authority, liking, and scarcity can increase one’s influence on another's decision making. Pratkanis’s (2007) work was chosen over Cialdini’s (2009) on social influence as this study’s theoretical foundation, as Pratkanis’s specific influence tactics and detailed explanations enabled the researchers to appreciate the distinct parallels between the literature and the collected data. Furthermore, the social influence lens supports a contemporary visibility into EDs’ practice, hence addressing some gaps in the literature.

The philosophical positioning of social constructivism played an integral part in this study. It enabled the insider researchers to obtain a deeper understanding of how other EDs understand their own reality (Cohen et al. 2011), in a research-intensive university. Considering the potential ED’s diverse locations, time constraints and limitation of resources, it was determined that data was best collected via a qualitative survey rather than via individual interviews. Furthermore, given that EDs were in the midst of supporting the rapid move to online teaching due to COVID-19, conducting individual interviews might have decreased the anonymity required and further increased what is now colloquially known as Zoom (video conferencing) fatigue.

As EDs themselves, the research team had access to the internal community of practice (CoP) member list, and other communication channels including emails and the Google Hangouts chat platform. Once ethics approval was granted, an email was sent to thirty-nine listed colleagues in April 2020 via the generic ED CoP email address to ensure anonymity and confidentiality. The email contained the mandatory information about the study, and the first survey question required consent before proceeding with the remaining questions. Participants had approximately two weeks to complete the survey and during this time there was one reminder sent out via the aforementioned email address.

The survey questions focused on eliciting relevant professional information about the participants, including position title, position classification, education qualifications and career backgrounds. Informed by Pratkanis's (2007) social influence framework, two open-ended questions were also included for participants to elaborate on their understanding about influencing practice and make comments about their influence attempts on changing educational practice within the university environment. Eighteen responses were yielded (46.2% response rate). One response was excluded, due to the participant’s work being described as ‘developing’ educational technology rather than supporting teaching and learning practice. Among the seventeen respondents, most are professional staff (Professional: 16, Academic: 1). The majority hold or were working towards postgraduate degrees (PhD or PhD in progress: 5, Master or Master in progress: 9, Graduate certificate/Diploma: 1, Bachelor: 2). Nine participants had their highest education qualification in Education, with respondents having worked on the current ED job for an average of 3.29 years (SD=2.57).

Braun and Clarke’s (2012) inductive approach to thematic analysis was employed to analyse the data. As insider-researchers, the research team could "draw upon the shared understandings and trust of their immediate and more removed colleagues with whom normal social interactions of working communities have been developed" (Costley et al., 2010, p. 20). In particular they could "study a particular issue in depth and with special knowledge about that issue, ... hav(ing) easy access to people and information that can further enhance that knowledge" (Costley et al., 2010, p. 22). However, ensuring participants’ anonymity and researchers’ impartiality are among the greatest challenges in insider research (Costley et al., 2010). This study was no exception. By coding the colleagues’ responses individually and re-theming the codes collaboratively, the researchers believe that they minimised the impact of reflexivity in the research.

Findings

The following sections highlight the thematic findings from the survey data: (1) relationships - trust and credibility; (2) effective communication; (3) creating a favourable environment and; (4) navigating cultural challenges. The first three themes highlight how EDs influence change in academics' teaching practice and thus have an impact on connections with students. The fourth theme showed the impact of cultural challenges on the EDs' ability to influence academic staff's teaching practices. All aspects are fundamentally intertwined. Survey responses did not demonstrate a connection to Pratkanis' fourth category - that of "...emotions to persuade." (Pratkanis, 2007, p. 19). The reason for this is unknown, and one possible reason is that the survey questions did not allude to any of Pratkanis' (2007) influence categories.

Relationships - trust and credibility

To influence and, in turn, change teaching practice, the EDs in this study disclosed that trust and credibility must first be established with their academic colleagues. They alluded that the most important aspect was to first be recognised - by others - as having expertise and being able to practice, within the educational field. This study highlighted that participants have the expertise and knowledge in the discipline of education. Existing research indicates that EDs enter the position from "...diverse professional, theoretical and educational backgrounds" (Bird, 2004, p. 123). Knowledge and experience in the field of education was necessary to establish credibility and a trusting connection between EDs and academic staff. Additionally, several participants noted that while academic staff are content/discipline experts, they may not necessarily have a formalised teaching qualification.

> Most academics are not professional teachers so they need a lot of guidance in how to do that part of their job and we are the best to help through research, peer work, and what others do. We are professional, qualified, experienced and understand their issues, we build trust and work one on one to improve the academic and the student experience. (P-13)

Yet, expertise and knowledge appeared to be insufficient in influencing a change in practice. Pratkanis (2007) proposes that to establish influence, there needs to be "a social relationship that facilitates influence between the source and target of influence" (p.30). EDs encounter many opportunities to build social relationships with academics, and indirectly with students. These encounters include one-on-one consultations, facilitation of professional learning, and building resources, where examples of evidence-based practices can be shared and facilitated with academics. Several participants indicated that they undertake these activities to establish a relationship with academics. As P-5 indicates, they build this through an "audit tool...for the purpose of providing comprehensive, constructive feedback to academics regarding how they can improve their students' engagement and learning". Others discussed resources which they themselves have built and/or found "to assist academics in developing their educational practice" (P-8). While previous studies have described the role of EDs as being responsible for supporting academic staff, designing and delivering professional learning, and managing projects (Mitchell et al., 2017; Morgan et al., 2007), very few have evaluated these activities' effectiveness on influencing teaching practice and/or engagement with students.

Effective Communication

In any relationship, effective communication and the use of a common discourse is important; and the studied participants echoed the same sentiment. Not only did participants engage in local (school/department) communication strategies, they were also instrumental at a central level (faculty/university) for affecting change in teaching practices. Pratkanis (2007) posits that an "effective persuasive message is one that focuses the targets' attention and cognitive activity on exactly what the communicator wants them to think about" (p. 41).

The participants indicated that effective messaging (through effective communication) supported their roles and when environmental needs changed, they increased their publications as indicated by P-5 below:

> Communication - a conduit for clear, regular, relevant communication is required to help build a sense of community and shared knowledge. We send a monthly teaching and learning newsletter for this purpose. This was increased to weekly during 2020 to cater for the increased need for communication and community. (P-5)

Other participants discussed how they supported communication through documentation and evidence.

> When I started in my current role in 2015, I developed a holistic and strategic approach to facilitating faculty-wide curriculum transformation. I saw the need to document the curriculum at the program and major level, and share that back to teaching teams to start a conversation about change, as there was clear evidence of poor practice that was not being addressed. (P-14)

Creating a favourable environment

The neoliberal agenda facing universities has resulted in changes to traditional practices and a blurring of practice boundaries (Whitchurch, 2015). In this study, EDs were well aware of the impacts that such an agenda has on influencing and ensuring that quality teaching practices are upheld within the university. Pratkanis (2007) advocates for ‘landscaping or pre-persuasion’, creating favourable situations in which “the target is likely to be receptive to a given course of action and respond in a desired manner” (p. 20). Participants discussed many opportunities in which they established favourable climates to influence, especially during the recent and rapid move to online delivery due to COVID-19. EDs discussed building human and non-human resources, establishing communities of practice and evidence-based practices through collaboration, as well as contributing to the university’s strategic needs. The resources which they created, shared and/or showcased bridged the gap between colleagues who may “never otherwise talk to each other and share ideas” (P-9). These unique circumstances enabled EDs to create a favourable environment in which teaching practice(s) were celebrated, shared and demonstrated - enabling others to learn about what can be effective within the teaching space, and in connections with students. One participant also narrated that her contribution to the course redesign team, in a 3-year redevelopment project, was “adopted” and is “still guid[ing] the skill development across the course” (P-12) today, ensuring a direct connection for students with real-world experiences.

Cultural Challenges

This participants in this study have alluded to cultural challenges that directly impact their ability to enact social influence. These challenges were evident when discussing individual teaching practices; including a lack of evaluative procedures (once change had occurred) and an intrinsic reluctance from academics to alter their practices. EDs are responsible for providing academic support and facilitating a change from traditional and sometimes outdated teaching practices. The responses from participants suggest that the historical cultural nuances of the traditional university ontology, where the academic is seen as the source of all knowledge, may have a direct impact on social influence. Participants’ responses at times demonstrated frustration with their own attempts to bring about social influence. As seen below, although they provide opportunities for change, there is little if any evaluative outcomes to determine if the change(s) have occured.

> We run regular training sessions for our teaching staff - participants usually identify these as informative and that they would do something with what they learn. However, it is difficult to establish how well this translates into changed teaching practice. (P-4)

The twenty-first century university setting is said to be one fraught with a lack of clear boundaries and many “fault lines” (Rowland, 2002). This study has demonstrated that building relationships with others (based on trust and credibility), effective communication, and establishing a favourable environment are fundamentally entwined when EDs influence a change in teaching practice. In achieving this, EDs can indirectly impact the ongoing connections that educators have with students. However, the studied EDs are challenged by the university’s cultural nuances related to their positioning and academics’ reluctance to alter practices.

Limitations

It’s important to acknowledge the limitations of this study. Firstly, participants were recruited solely from one university, and this was the same university in which the researchers were employed. This has implications to the validity and impartiality of the research. Furthermore, neither interviews nor focus groups were organised to gather in-depth insights about participants’ influence attempts. In the future, focus groups using key questions framed according to Pratkanis’s four categories could be beneficial in addressing the fourth category of emotional influence tactics that did not appear in survey data. Nonetheless, the research findings have indicated that further investigations into how EDs influence change in universities and beyond, is necessary.

Conclusion

High-quality teaching practices are fundamentally important in the ongoing connections between students and educators, with EDs playing a strategic and surreptitious role. This research aimed to gain an understanding of how EDs influence academics to implement improvements in their teaching practices, in an Australian research-intensive university. Through the lens of Pratkanis's (2007) social influence tactics, the data demonstrated three aspects of how EDs influence a change in teaching practices and thus reconnect with students. These included: (1) building relationships - trust and credibility, (2) effective communication, and (3) creating a favourable environment to enable a change in teaching practices. Status quo in teaching practices and the lack of consistent evaluative evidence of impact were repeatedly noted, and these cultural challenges were perceived as inhibitors of EDs' influence attempts. Future research is needed to extend our understanding of how EDs influence a change in teaching practices and inadvertently reconnect and build the student-educator relationship.

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reconnect
Reconnecting relationships through technology

Dialogue in the classroom and in a peer-tutoring program: how do we connect and learn in online and face to face spaces?

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University tutorials have been part of course design for decades. Tutorials often promote smaller group discussions, where students collaborate and connect to peers, arguably improving academic outcomes and supporting development of social skills. Since the COVID-19 pandemic, however, many challenges emerged on to how to move towards more cooperative forms of learning, how to support students' connections to a learning community, whilst still maintaining social distancing. This article discusses students' experiences of tutorial sessions implemented prior and after the pandemic, in a first-year course at a Chilean university. Overall results indicate that while there were no significant differences in students' perceptions of learning from tutorials pre and during the pandemic, both groups experienced some opportunities and challenges which are discussed.

Keywords: tutoring; classroom interactions; emergency remote teaching

Introduction

In the past few years, there has been a significant increase in the number of students enrolled in the Pedagogy in History and Social Sciences course. The larger enrolments have been altering the classroom dynamic, decreasing opportunities for meaningful interactions. To address these emergent issues, the course teacher implemented a re-design of the course, which included peer tutorials with a focus on two key dimensions: critical thinking and emotional education.

Tutorial sessions were implemented to two first-year groups of students (hereafter 'tutored students') and involved student tutors selected from upper grades. This article discusses students' experiences from these two peer tutorial interventions with students in Education, and the potential of these interventions in relation to their effectiveness for promoting active and cooperative approaches to learning (Johnson & Johnson, 2018) among students of similar ages. Due to the COVID-19 pandemic, we were able to contrast the tutorial program in its online version and the face to face version. A number of digital tools were used during the courses, including a learning management system (Edmodo), presentation tools such as PowerPoints, YouTube clips, as well as tools used by students to compose their work (e.g. Padlets, Google Docs, and others). In addition, online tutorials used conference call software (Zoom).

This research seeks to contribute to the educational research with a focus on active and developmentally focused learning for life (Watson, 2004). The following questions guided the research: what are the effects of participating in a peer tutoring intervention from the point of view of its actors; and what challenges are observed between face-to-face and online peer tutoring?

Literature review on tutorials

In this article, the concept of peer tutoring implies a relationship between students, with one taking the role of 'a tutor' and the other of 'being tutored'. Underlying this relationship is an element of cooperation in which students of similar ages are supporting each other during the learning process, and therefore tutorials can be considered as a type of cooperative learning (Johnson, 2003). This pedagogical strategy is supported by the theory of social interdependence (Deutsch, 1949), which postulates that when goals are structured with others in a cooperative manner, motivation to achieve them increases. Furthermore, the literature suggests the existence of a strong relationship between cooperative and active learning, in that the latter establishes opportunities for dialogue, where students share and build on each other's understandings of a topic, and jointly make decisions about their learning process (Johnson & Johnson, 2018). Cooperative learning can also be aligned with socio-constructivist theoretical approaches, particularly as it creates dialogic spaces for knowledge co-construction, promoted by both the peer-tutor and the peer-learner. Knowledge co-construction can also be related to Vygotsky's (1978) notion of the "zone of proximal development", where someone's mediation might support a learner's transition process, from an initial point towards their learning potential.

There are various approaches to tutorials. Some tutorial designs contemplate the teacher as a peer guide, while others focus on students of the same or close age (Borrero, 2008; Schwille, 2008; Webb & Mastergeorge, 2003). The latter approach has gained momentum in the past few years, given that positive effects have been identified by several researchers. Comparative research has reported increased richness in peer interaction with improvements in learning processes, and in positive affective attitudes linked to learning (Andreucci & Curiche, 2017; Moliner & Alegre, 2020; Provencio et al., 2018; Torrado-Arenas et al., 2016). In addition, more authentic and personalized guidance has been associated with a peer guided process (Cassany, 1999). As Alzate-Medina and Peña-Borrero (2010) point out there is great merit in tutorials, as they pay particular attention to one's needs. Meta-analyses conducted more than four decades ago also identified positive effects for both, the tutors and the tutored (Cohen et al., 1982). Evidence shows that learning mediation is more effective between students who are close in age – as these students are likely to share similar understandings of life processes, where the tutor might have gone through comparable experiences in recent times (Bowman-Perrott et al., 2013), but also because there is greater horizontality in the relationship between these two (Good & Brophy, 1997). In general, an increase in students' motivation towards studying is reported, as well as better academic performance (Alzate-Medina & Peña-Borrero, 2010). Drawing on the above literature, this research adopts a definition of peer tutoring as a teaching-learning strategy that consists of bringing together students of similar ages to accompany their peers in the development of certain disciplinary content over time. A key element to the peer tutoring described in this paper involves understanding the roles acquired and performed by students of similar ages, and the opportunities for connections between peers that these roles create.

Methodology

The research employed a qualitative design whilst seeking to understand the meanings of the peer tutoring process for the participants themselves, and from there, to interpret possible relationships between their experiences and learning, from the perspective of the actors themselves (Merriam & Tisdell, 2015). That is, the focus was not on measuring specific learning outcomes, or particular factors, but on understanding students' experiences that may be associated with active learning approaches, after the re-design of the course adopted opportunities for peer tutoring.

Research context and participants

A total of 81 students took part in the project conducted during 2019 and 2020. In the first year (2019) 34 students, and in the second year (2020) 31 students of the Pedagogy in History and Social Sciences course participated in the project, as tutored students; in addition, 16 tutors were selected from cohorts of higher courses at the same degree. The sample of participants was selected according to an intentional or opinionated criterion (Scharager, 2001) as we worked with two cohorts of students and the group of tutors. Tutors were volunteers, with criteria for inclusion based on motivation and having taken the course previously.

Design of the tutorials

The design of the project contemplated 4 stages in 2019 (face-to-face mode) which were repeated and adapted during 2020 to the online mode, due to the COVID-19 lockdown restrictions. These included: 1) content design; 2) training of tutors; 3) implementation of tutorials; 4) feedback meetings between the teacher of the course and tutors. Training sessions for tutors were carried out prior to the beginning of the course by the course teacher, and included information about characteristics of tutorials, expected learning and a content guide developed from the literature review. In addition, practical sessions were incorporated in which active interaction for peer tutoring was modeled. Tutors-in-training then applied these modeling strategies and received feedback.

Data collection and analysis

A metacognitive form gathered feedback about the intervention at the end of the course, which included tutored and tutors' perceptions about the experience. The form included open questions such as: What did you learn during the tutorials; How did you feel during the tutorials; What strategies used during the tutorials would you replicate in your pedagogical practice; What were the main strengths and weaknesses of the tutoring workshop to support your learning; as well as a short survey.

A total of 81 metacognitive data points were analyzed, 16 corresponding to tutors and 65 to the tutored students. Data was processed through a content analysis technique, using Atlas-ti software, from which the information was coded and grouped into three main categories: cognitive development and pedagogical training; social dimension of learning; differences between the face-to-face and online modalities. This process allowed us to search for, and infer, the main components of their tutoring process experience (Bardin, 1986). Data collection and analysis also included a review of students' contributions via published posts in the Edmodo forum (the learning management system used in the course), as well as reflections made by tutors each week. There was a dedicated online space where participants were prompted to reflect on their experiences:

> In this space you can include the experiences lived during the tutoring session. You can be guided by the following questions, as well as include other experiences: How did you feel, what would you keep/what would you modify from the process, what caught your attention, etc. Along with this, the ideas pointed out by the tutors in the meetings held between the teacher and the tutors during each week of the peer tutoring strategy, both in face-to-face format in the first year and in online mode in the second year, were considered.

Ethics

Ethics clearance for the conduct of this research was obtained in accordance to regulations in the human ethics committee at the university hosting this research. Pseudonyms are used for all participants in this research.

Results and discussion

Students raised many interesting aspects, but in this paper, we explore three main themes that emerged during the analysis: cognitive development and pedagogical training; social dimension of learning; and differences between the face-to-face and online modalities. Related to the first theme, content analysis revealed repeated occurrences associated with self-regulation of learning, such as planning, time management and monitoring (Bruna et al., 2017) for both tutors and tutored. As Florencia pointed out 'the tutorials gave me structure and order to my readings, and the process of discussing them helped my understanding and retention of the contents' (face-to-face tutored student, 2019). Similarly, Amanda noted 'I learned to organize my reading times and different ways to internalize knowledge from the readings' (face-to-face tutored student, 2019). Rocio also indicated 'I learned to manage my times better' (face-to-face tutor, 2019). In terms of content, participants indicated that they managed to acquire new knowledge in general and all students in both face-to-face and online tutorials considered the level of achievement between 'very good' and 'good' for content learning. Specifically, they detailed conceptual learning associated with socioemotional education and critical thinking. As Rocío indicated 'I learned the theoretical knowledge delivered by the texts regarding critical thinking and socioemotional education' (face-to-face tutor, 2019).

In terms of the social dimension of learning, students highlighted that there were more spaces for dialogue, conversation and collective learning. As Andre's pointed out 'the main strength is collective learning' (online tutored student, 2020). A greater possibility of asking questions, debates and discussions during tutorials, and activities associated with peer interaction such as shared readings, concept mapping and feedback processes were also raised as effective to promote dialogue. As illustrated in the following remark by Andrea 'I loved the development of dialogue or discussions around a common reading, because that way I learned or acquired knowledge, by the tutored and I would like to replicate it' (face-to-face tutor, 2019); and Javier 'I learned to link the content of the readings to a daily and pedagogical praxis, thanks to the communication and exchange of ideas with my group' (face-to-face tutored student, 2019). Students also pointed out that that 'there was a more informal and trusting relationship' (online tutored student, 2020) and Fernando remarked: 'the simple fact of learning based on experience is very gratifying, it leaves a feeling that we have done something good, because we all learn, more than I deliver and teach a content, I learn from them with each of their interventions or criticisms, in short in a reciprocal learning' (online tutor, 2020). As such, these participants identify the tutoring sessions as an instance of horizontality that made reciprocal teaching possible (Palincsar & Brown, 1985).

Within this fluid interaction between tutor and tutored students it becomes possible for them to elaborate, expand or clarify ideas that have been pointed out in a faster way, and consequently, to engage in learning opportunities that seem to have greater relevance, based on feedback response through a dialogic process, which according to Howe et al (2019) is a type of interaction that promotes learning. This is mentioned by Ignacia, as she pointed out ‘maintain a much more fluid dialogue, allowing not only that they can participate when asked, but also that they can interrupt when they feel it is necessary’ (online tutor, 2020). Finally, the participants emphasized that through dialogue, it is possible to better situate the content to their concrete and personal experiences, which supports the anchoring of the constructs. In the words of Andrés, the tutorials created opportunities for ‘sharing personal experiences related to education and the texts discussed’ (online tutored student, 2020). The social dimension of learning is not just about what is learned, but how the learning interaction takes place, and so, it is important that the learning process encourages socially constructed conversations with others (Brown & Adler, 2008). This suggests that context and the affordances of certain spaces over others might be relevant, such as aspects related to interpersonal, social, material, historical and cultural mediation. Peer tutoring involves organizing actors, in a context of greater horizontality and closeness, which seems to respond to many of the aspects highlighted by social learning.

As Goodyear et al (2021) remind us peer tutoring learning activity is epistemically, physically, and socially situated. Material and digital tools, together with epistemic and social elements, are all part of an assemblage that contributes to influence learning processes (Goodyear & Carvalho, 2014). Understanding how these various design elements influence emergent learning is extremely important, particularly since the pivot to online modalities after the pandemic. In terms of the differences between the face-to-face and online modalities, while online technologies may contribute to the continuity of learning, it became apparent that the online modality requires specific design, and what is set for a face-to-face class may not necessarily work in an online space. The pandemic impacted the design of our tutorials challenging what had initially been planned as a face-to-face implementation in 2019 and required re-design and adaption. Participants in the first version of the project did not report facing specific technological difficulties, and they did not comment on digital tools, perhaps as digital tools were recognized as part of an effective and playful pedagogical strategy. In contrast, the use of digital tools in the online version were more overtly pointed out. These included digital tools such as roulettes, Wordwall, PowerPoint, Padlet, Zoom and Mentimeter, which were highlighted by the students. For example, Fabiola pointed out that ‘without a doubt I would replicate the activities carried out with the Wordwall platform. I found it to be an excellent platform and ideal for use in this virtual context. In addition, its templates favor a more didactic and playful development in the classes’ (online tutor, 2020). Hernan remarked that ‘I think I would include these (technological) forms to my pedagogical practice, because it is different to the conventional form of classroom with the teacher only as a narrator and without response’ (online tutored student, 2020). And Ximena added that ‘the strategies used during the tutorials are all replicable in my future pedagogical practice, learning to use tools such as Zoom, Mentimeter, interactive whiteboard, Wordwall, are perfectly more dynamic strategies for a future in face to face and in my future work as a teacher’ (online tutor, 2020). Nevertheless, there were also challenges experienced by both groups of students. Barriers observed in the online modality were linked to student participation, which possibly indicates that the online modality requires greater commitment and internal motivation from students (Ryan & Deci, 2000), but also that the introduction of new tools can add uncertainties about Internet access and connectivity, whilst people also are dealing with remoteness and isolation (Green et al., 2020). As a Fabiola told, ‘sometimes, I felt a strange sensation when they did not turn on their camera...it is incredible how much the black screens affect [us]’ (online tutor, 2020). Challenges related to the face-to-face format related to noise and a lack of dedicated space. Cristian suggested that a major issue was ‘the noise of the room as it created a lot of noise (do to the room) being so small’ (face-to-face tutored student, 2019). Similarly, Juan pointed out that ‘better silence [could have been] achieved between groups, and a room enabled with better spaces would be ideal’ (face-to-face tutored student, 2019).

Conclusion

There are multiple current challenges in teaching and learning in higher education. Some of them include how to encourage active learning and promote students’ meaningful connections to a learning community, which have been arguably hindered since the recent increased numbers of students at the university level in Chile (Organization for Economic Cooperation and Development, 2019). In this paper, we discussed the implementation of peer tutoring, suggesting that participation in both face-to-face and online modalities, have allowed students to develop aspects of their identity as future teachers, which not only are grounded on active learning, but also foreground more collaborative and situated learning experiences (Brown et al., 1989; Johnson & Johnson, 2018). The tutorials encouraged students to connect to peers, to participate in co-construction of knowledge and to engage in self-regulation processes, overall creating a positive atmosphere to influence their learning journeys beyond the traditional teacher-centered modes of teaching and learning.

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reconnect
Reconnecting relationships through technology

Factors Influencing Polytechnic Educators' Behavioural Intentions to use Technology Enhanced Learning Tools: The Structural Equation Modelling Approach

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This study examined factors that affect educators' behavioural intention to use Technology Enhanced Learning (TEL) tools in a polytechnic in Singapore. Five hundred and twenty-five educators completed a survey measuring their responses to six variables in the extended Technology Acceptance Model (TAM). This study is related to the sub-theme of reconnecting people with educational technologies. Social and environmental constructs were included to measure the influence of other persons and the facilitating conditions on the educators' intention to use (IU) TEL tools. Structural Equation Modelling was used to test the research model. The results showed that attitude towards usage (ATU) of TEL tools was the dominant determinant of educators' IU. Overall, attitude toward usage (ATU), perceived usefulness (PU), perceived ease of use (PEU), subjective norm (SN) and facilitating conditions (FC) explained 65.3% of the variance in IU. SN had positive and significant effects on PEU and PU, whereas FC significantly influenced PEU. Finally, the implications of findings for polytechnic educators are discussed in the paper.

Keywords: Technology acceptance model, structural equation modelling, subjective norm, facilitating conditions

Introduction

Digital transformation has escalated in many industries during the COVID-19 pandemic. Higher education also rode the wave of transformation and adopted technology to create effective and seamless learning for students. Despite the promises of technology to improve the quality of teaching and learning, the adoption of TEL tools might be limited by some intrinsic and extrinsic barriers. The intrinsic barriers are typically rooted in educators' underpinning attitudes toward technology and their perceptions of its usefulness and ease of use. Meanwhile, the extrinsic challenges are the constraints of external resources (e.g., technical support, provision of equipment, etc.) (Davis, 1989; Ertmer, 1999). Research showed that teachers' positive attitudes could be fostered by overcoming logistical issues and providing user-friendly tools (Lee et al., 2021). Studies have identified various factors that determine teachers' intention to use technology in teaching and learning and are well conceptualised in Technology Acceptance Model (TAM) (Park et al., 2019; Venkatesh et al., 2003). Hence, this study aims to examine the efficacy of extended TAM to understand polytechnic educators' intention to use technology-enhanced learning (TEL) tools. TEL tools broadly refer to technology applications that enhance teaching, learning and assessment. The application of TEL tools can include but is not limited to Learning Management System, immersive learning (e.g., AR/VR and Mobile/ Web-based interactive software/app), and adaptive learning and assessment (e.g., learning analytics and assessment analytics).

Literature review

Technology Acceptance Model

The initial Technology Acceptance Model (TAM) is a model that posits users' attitude toward the usage (ATU) is influenced by their behavioural intention to use (IU) (Davis, 1989). It postulates that attitude could be predicted by perceived usefulness and perceived ease of use. Perceived usefulness (PU) is defined as the degree of a person's belief that using a system or tool will improve their work performance in productivity and effectiveness. On the other hand, perceived ease of use (PEU) is defined as how a person considers that using a system or tool requires minimum effort, and it is easy to get the tool to do what they intend to do (Davis, 1989).

Studies have shown that perceived ease of use influenced perceived usefulness (Park et al., 2019; Teo, 2010). Four hypotheses were developed based on the initial TAM model.

H1: Attitude towards usage will have a significant influence on intention to use.
H2: Perceived usefulness will have a significant influence on attitude toward usage.
H3: Perceived ease of use will have a significant influence on attitude toward usage.
H4: Perceived ease of use will have a significant influence on perceived usefulness.

Subjective norm and facilitating conditions

Besides the individuals' perceptions, social and environmental factors also influence the degree of technology adoption. Subjective norm (SN) is defined as a person's perception of other persons who are important to them and think they should or should not perform the behaviour (Ajzen, 1991). Based on Ajzen's (1991) theory of planned behaviour, human beings' intention is contingent upon the social pressure they receive from the opinion of others. In the context of adopting technology tools, studies (Agudo-Peregrina et al., 2014; Teo, 2010) have found that the opinion of significant others, such as co-workers and leaders may influence users' intention to use technology in their workplace. Facilitating conditions (FC) are perceived as enablers or barriers in an environment that influence a person's perception of the difficulties in performing a task (Teo, 2010). The facilitating conditions, such as the availability of technical and administrative support, were found to positively affect attitude toward technology use (Ngai et al., 2007; Teo, 2010).

Based on the above-mentioned empirical studies, the three hypotheses below were formulated in this study.

H5: Subjective norm will have a significant influence on perceived usefulness.
H6: Subjective norm will have a significant influence on perceived ease of use.
H7: Facilitating conditions will have a significant influence on perceived ease of use.

The impact of SN and FC on educators' perceptions and attitudes toward the usage of technology tools was inconclusive. For example, Teo (2009) found that SN can predict pre-service teachers' PU significantly, but in his other study (i.e., Teo & van Schaik, 2009), preservice teachers' PU was not influenced by their SN significantly. Furthermore, the participants in these studies were pre-service teachers, and they did not have co-workers or supervisors to interact with. Thus, the influence of SN on their perceptions and intention might not be the same as the educators who had begun their teaching at the polytechnic. Since the impact of social and environmental factors is inconclusive, we decided to investigate the influence of SN and FC in the extended TAM among polytechnic educators. The four constructs selected in the extended TAM are similar to the four direct determinants (i.e., performance expectancy, effort expectancy, social influence, and facilitating conditions) of users' intention and behaviour in the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003). We did not measure technology self-efficacy and anxiety in this study because they are not the direct determinants. Thus, we adopted the extended TAM model (Figure 1) in this study.

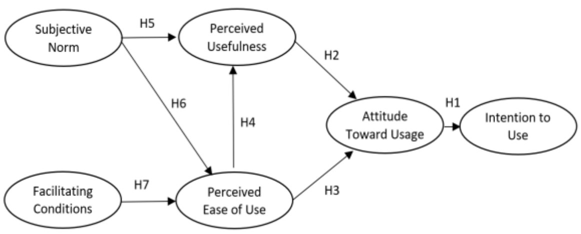

Figure 1: Proposed research model

Method

Research design

This study aims to analyse an extended TAM that predicts the intention to use TEL tools among educators in a polytechnic in Singapore. Initial TAM focuses on the influence of individual perceptions (i.e., PU and PEU) on educators' ATU and IU. In the extended TAM, social and environmental factors (i.e., SN and FC) are included in the model to investigate the influence of other persons and facilitating conditions on educator's perceptions, attitudes, and intention to use TEL tools. A validated survey of the extended TAM used in Teo's study (2009) was adopted in this study. A structural equation modelling (SEM) approach (Kline, 2015) was adopted to analyse the relationship among six variables: intention to use, attitude toward the usage, perceived usefulness; perceived ease of use, subjective norm; and facilitating conditions. Data were collected using a self-report questionnaire that comprised demographic questions and multiple items for each variable. Informed consent was obtained from all the participants, and all ethical requirements were observed. Firstly, data were screened for missing data and outliers. This was followed by establishing convergent and discriminant validity.

Measure

A survey consisting of 17 items, measured with a five-point Likert scale, was used in this study. They were attitude toward usage (ATU) (three items), perceived usefulness (PU) (three items), perceived ease of use (PEU) (three items), subjective norm (SU) (two items), facilitating conditions (FC) (three items), and intention to use (IU) (three items). These items were adapted from a validated survey in Teo's (2010) study.

Research participants and data collection

Participation in this study was voluntary, and 525 faculty members (268 males and 257 females) who served in a polytechnic were recruited. The mode category for participants' age was 41 to 50. This sample represented 41% of the polytechnic's teaching staff total population.

Findings

Descriptive statistics

Table 1 shows that the means of all items were above the midpoint of 3.00, and the standard deviation ranged from 0.54 to 0.73, indicating a narrow spread around the mean. The skewness ranged from -.10 to 0.82, and Kurtosis ranged from 0.29 to 4.03. The data were considered normally distributed based on Kline's (2005) recommendation that the skew and kurtosis indices should be below 3.0 and 8.0, respectively.

Convergent validity

The convergent validity was assessed through (a) item reliability, (b) composite reliability, and (c) the average variance extracted (AVE). Following the recommendation used by Teo (2020), Table 1 shows all items obtained factor loading greater than 0.7 that indicated reliability at the item level. For composite reliability, each variable obtained the value of above 0.7. The convergent validity was adequate as the AVE was greater than 0.5.

Table 1: Result for the measurement Model

Latent variable	Mean (Standard deviation)	Item	Factor loading (>0.7)*	Composite reliability (≥.70)*	Average variance extracted (≥.50)*	*t*-value
Perceived Usefulness (PU)	3.81 (0.62)	PU1	0.87	0.85	0.66	17.62**
		PU2	0.87			17.67**
		PU3	0.70			-
Perceived Ease of Use (PEU)	3.22 (0.71)	PEU1	0.83	0.83	0.61	15.48**
		PEU2	0.84			15.58**
		PEU3	0.67			-
Subjective Norm (SN)	3.57 (0.70)	SN1	0.96	0.71	0.55	21.37**
		SN2	0.86			-
Facilitating Conditions (FC)	3.30 (0.73)	FC1	0.92	0.89	0.73	23.03**
		FC2	0.86			21.70**
		FC3	0.79			-
Attitude Toward Usage (ATU)	4.00 (0.54)	ATU1	0.81	0.86	0.67	21.19**
		ATU2	0.81			21.13**
		ATU3	0.83			-
Intention to Use (IU)	4.02 (0.57)	IU1	0.82	0.75	0.89	25.23**
		IU2	0.86			26.70**
		IU3	0.91			-

* Indicates an acceptance level; **p<0.001

Discriminant validity

The discriminant validity was assessed by comparing the square root of the AVE of each variable with the correlation between that variable and all other variables. Discriminant validity was obtained for all variables (see Table 2) as the square roots of AVEs are higher than the correlations of the variable with all other variables.

Table 2: Discriminant validity

Variables	PU	PEU	SN	FC	ATU	IU
PU	(0.81)					
PEU	0.48**	(0.78)				
SN	0.36**	0.34**	(0.74)			
FC	0.29**	0.49**	0.52**	(0.86)		
ATU	0.70**	0.43**	0.38**	0.20**	(0.82)	
IU	0.57**	0.45**	0.45**	0.31**	0.71**	(0.95)

Notes: Diagonal: square root of average variance. Off-diagonal: correlational between variables **p<.01

Test of the measurement model

This study employed the SEM approach with the software program AMOS (version 22.0) (Arbuckle, 2019) to test the research model. Multiple fit indices with the recommended guidelines were used to evaluate the overall model fit. Table 3 indicates that the measurement model has a good fit.

Table 3: Fit indices for the measurement model

Model fit indices	Measurement model	Research model	Recommended guidelines*
Chi-square (χ^2)	268.94 p<.001	306.53 p<.001	Non-significant
χ^2/df (Normed Chi-square)	2.59	2.81	3
Standardised root mean residual (SRMR)	0.04	0.05	<0.05
Comparative fit index (CFI)	0.97	0.97	≥.9
Tucker-Lewis index (TLI)	0.96	0.96	≥0.9
Root mean square error of approximation (RMSEA)	0.06	0.06	<0.08

* (Kline, 2015; McDonald & Ho, 2002)

Hypothesis testing and effects of determinants

Overall, all seven hypotheses were supported by the data. Figure 2 depicts the path coefficient of each path in the model. ATU, PU, PEU, SN and FC explained 65.3% of the variance in intention IU (see Table 4, R^2=0.653). Meanwhile, the other three endogenous variables, ATU, PU and PEU, had their variance explained by their determinants in amounts of 74.1%, 32.1% and 30.8%, respectively. The most dominant determinant of IU was ATU, with a large total effect of β=0.808, p<0.01. The external variables, FC and SN had indirect total effects on IU (β=0.195 and β= 0.160, p<0.01), and these were mediated by PU, PEU and ATU. Moreover, the path coefficients showed that FC had larger effect (β= 0.419, p<0.01) on PEU compared to SN (β=0.196, p<0.01). Meanwhile, PEU had a smaller effect on educators' ATU (β=0.103, p<0.01) compared to PU (β=0.801, p<0.01).

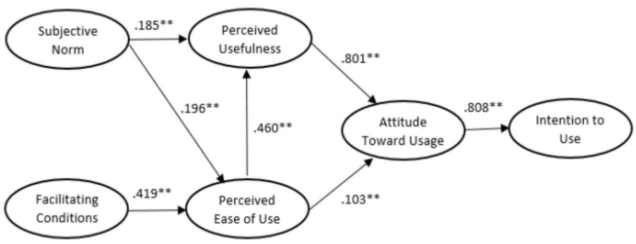

Figure 2: Model of best fit

Table 4. Direct, Indirect, and Total Effects of the Research Model

Outcome	Determinant	Standardised Estimates		
		Direct	Indirect	Total
Intention to Use (IU)	ATU	.808	-	.808
R^2=0.653	PU	-	.647	.647
	PEU	-	.381	.381
	SN	-	.195	.195
	FC	-	.160	.160
Attitude Toward Use (ATU)	PU	.801	-	.801
R^2=0.741	PEU	.103	.368	.472
	SN	-	.241	.241
	FC	-	.197	.197
Perceived Usefulness (PU)	PEU	.460	-	.460
R^2=0.321	SN	.186	.090	.276
	FC	-	.193	.193
Perceived Ease of Use (PEU)	SN	.196	-	.196
R^2=0.308	FC	.419	-	.419

Discussion

The results show that extended TAM is an efficient model for predicting educators' intention to use TEL tools in the polytechnic setting. Similar to existing findings (Ngai et al., 2007; Teo, 2010), educators' IU and ATU are predicted by the core variables (PU and PEU) in TAM and the external variables (FC and SN). When educators believe that TEL tools are easy to use and could improve their work performance, they are likely to use them. However, these perceptions do not remain positive if they do not have the opportunity to develop their technical and pedagogical knowledge continually (Teo, 2010). Lee et al. (2010) also found that providing updated professional development programmes could sustain teachers' positive attitudes towards TEL tools. Thus, the polytechnic should be aware of the teaching staff's learning needs and continue to provide timely and relevant professional development to sustain their intentions and support their technology adoption.

This study found that the external variables (FC and SN) interacted well with TAM core variables (PEU and PU) in explaining ATU and IU. The extended TAM has achieved great explanatory power of educators' intention to use TEL tools. Since FC has a direct effect on educators' PEU and an indirect effect on their IU, we suggest the polytechnic and other higher education institutes put in the effort to improve the technical support and reduce the technical hurdles. This effort will subsequently promote positive intention to use TEL tools. Besides technical support, communities of practice may also encourage teaching staff to adopt TEL tools because members in the communities could be the significant others (i.e., SN) who can influence educators' PE directly and IU indirectly. Institutes can consider having mentors to encourage their mentees to use TEL tools explicitly. For individual educators, active participation in communities of practice may be a good approach to cultivating positive perceptions and attitudes toward adopting TEL tools.

Limitation of study and further research

The variance of intention to use was explained by 65.3%, but the remaining 34.7% of the variance was left unexplained. Some variables have been excluded in this study to determine educators' intension to use. Future studies could design qualitative inquiry to explore other factors that have not been included in the extended TAM. In addition, longitudinal studies may be conducted to trace the changes in the variables that affect educators' IU across times so that the institute could provide timely support when needed.

Conclusion

Overall, the findings show that the extended TAM is efficient in explaining educators' intention to use TEL tools. Understanding the multiple factors that affect educators' intention directly affects institute administrators and educators. The administrators should continue improving the facilitating conditions and cultivating a supportive social environment to promote positive attitudes. Meanwhile, future study can explore whether participation in communities of practice will help to sustain positive perceptions and attitudes of educators.

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reconnect
Reconnecting relationships through technology

Learning from 'failures' in the development of mobile and technology-enhanced learning initiatives

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Mobile and digital technologies can support learning experiences outside of the traditional classroom contexts and provide opportunities for collaborative elearning initiatives. Following design-based research (DBR) principles, curriculum developers face challenges in building mobile learning opportunities that are fit for purpose, adequately supported, and embraced by instructors and students alike. However, published accounts of mobile and technology-enhanced learning initiatives are currently largely restricted to 'successes' and lack descriptions of the processes and challenges involved in development. Critical factors for success – derived from accounts of 'failed' projects – may also be useful to guide the planning of initiatives in development. I present here potential steps towards a guiding framework for mobile and technology-enhanced learning developers that incorporates both an appraisal of these critical success factors within the context of a developing initiative and the instructive value of 'productive failure'.

Keywords: mobile learning, collaborative platforms, design-based research, productive failure.

The transformative potential of mobile learning

Mobile and smartphone ownership is high amongst across students at higher education institutions, with students increasingly using mobile technology to both connect with peers and access learning materials (Bernacki et al., 2020). Educational activities that incorporate mobile applications can facilitate student-directed learning and collaboration (García-Morales et al., 2021), but productively harnessing the potential for mobile learning in higher education requires an understanding of how these initiatives are integrated into the curriculum.

Contextual utility in field-based settings

Authentic, place-based experiential learning that builds understanding of ecosystem dynamics and human impacts is essential for students of ecology. Creating future environmental leaders requires fostering such understanding whilst building transferable skills in collaboration and communication. Mobile and digital technologies can enable student cohorts to share data and learning experiences and allow them to build a common understanding of global environmental challenges, thus providing tantalising opportunities for collaborative international elearning projects.

The powerful potential of mobile app technologies for field-based learning has been realised in numerous citizen science projects that seek to obtain data on species presence or habitat characteristics across broad geographic areas (e.g., iNaturalist: Unger et al., 2020). However, despite potential advantages, the use of mobile tools in field-based learning in higher education contexts appears to be limited. A systematic review in progress (Bone et al., 2022) – ostensibly to examine the institutional and curriculum contexts within which successful field-based mobile learning projects are implemented – found fewer than ten studies describing field-based mobile learning projects published within the last decade. In addition, no included study reported on how institutional factors such as instructor capacity and support may have contributed to project success. Although other projects may have been trialled, implemented and/or developed, it is apparent that the publication of these ideas and unfinished projects – 'failures' – has been low. A 2012 review by Wu et al., found most m-learning studies focused on the development of the tool itself, rather than on student learning experiences, whilst Crompton and Burke (2018) found most (70%) studies reported positive research outcomes, whereas few (4%) reported negative outcomes. These patterns were affirmed by a rapid scan of Google Scholar results from 2018 onwards, using terms such as 'mobile learning project failure' and 'mobile learning project null results', which yielded no first-page results describing failed projects.

Reporting on processes

Initiatives that seek to build technology-enhanced and mobile learning experiences in the curriculum can encounter challenges and barriers at several stages during the development process. These may include the knowledge of, and capacity for, technology-enhanced pedagogies within instructors; students' digital knowledge; the adaptability of the curriculum, and the available technological affordances and institutional support for such projects (e.g., Lašáková et al., 2017; Polly et al., 2021). These initiatives are often developed and implemented through processes that align with a design-based research (DBR) framework (described by Reeves 2006), with DBR approaches now common in educational fields (Tinoca et al., 2022). Phases in the DBR process detail iterative stages of project development that include testing and fine-tuning, the identification and resolution of issues, and reflection and enhancement (Fig. 1).

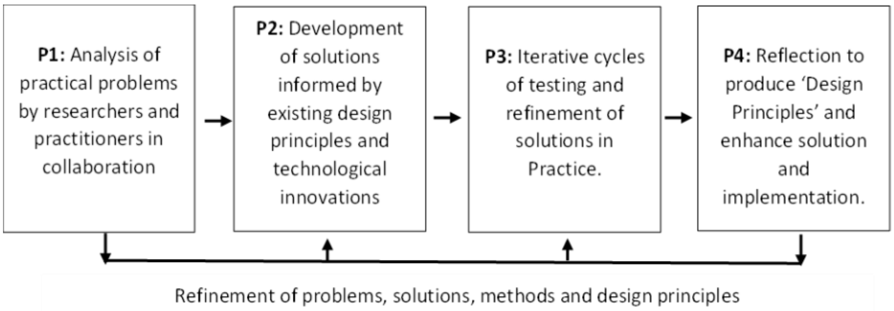

Figure 1: Design-based research (DBR) framework. Adapted from Reeves 2006: p. 59

The DBR framework expresses the ideas that, in phases 2 and 3, solutions will be *informed by existing design principles* and that cycles of *testing and refinement* of solutions in practice will be *iterative.* These processes of testing and refinement will, in turn, be *reflected on* to *enhance solutions and implementation.* Thus, embedded within each step of a DBR process is a sequence of trial, error, refinement and re-trial that may not be described in print or widely disseminated; instead, publications tend to focus on the solutions implemented in practice; somewhere between P3 and P4, with a description of P1 and a description of the *successful* solutions developed in P2. Thus, whilst lessons *are* being learned at each point in this process; our next steps as a growing community are to recognise, describe and communicate these lessons to better inform practitioners.

'Productive failure' as an instructive force in technology-enhanced learning development

Within each of the descriptors of the DBR process, the idea of productive failure is implicit, without being explicitly stated. Lessons are learned at each stage of the process, but these lessons are not being disseminated through traditional publication means. 'Productive failure' as described by scholars such as Kapur (2008) is an instructive concept that incorporates learning from iterative processes of trial and error. Productive failure has a long history of learning from failure in computer science and technology development (e.g., Gregor 2006), and there is growing recognition of its utility in educational design (e.g., Henderson et al., 2022). Productive failure is inherent in open-ended problems and inquiry-based learning and is particularly relevant when incorporated within technology-enhanced educational settings that allow students greater flexibility and autonomy in their learning (Kennedy-Clark et al., 2009; Lodge et al., 2018). As a step towards identifying processes that can enable mobile learning development initiatives, it is also instructive to consider accounts of 'failed' initiatives, and backwards-map these failures to identify points at which intervention might be productive and the possibility of changing direction could be considered.

Cochrane (2012) outlines six critical factors for success in mobile learning initiatives that emphasise the need for: (1) pedagogical integration of technology; (2) lecturer modelling of pedagogical use of tools; (3) creating a supportive learning community; (4) appropriate choice of mobile devices and software; (5) technology and pedagogical support within social constructivist learning paradigms, and (6) sustained interaction and scaffolding of ontological shifts in teaching and learning. I suggest here that these critical factors may also be useful in predicting the likelihood of success for projects yet to be implemented, including those that may also exist outside existing academic development or strategic organisational initiatives.

That these challenges are not currently communicated in the literature is unsurprising; the culture of academic publication is one of positive, successful stories, and the reporting of null results discouraged (Dawson & Dawson 2018). However, the dearth of such stories to draw on means that future initiatives may be more likely to confront similar challenges and blockages and waste resources. In addition, this lack of foresight and clarity on factors contributing to mobile learning project success or 'failure' can restrict strategic implementation of mobile learning projects across curriculum contexts and institutional boundaries. I propose we reimagine how we communicate outcomes of mobile learning initiatives and present here an initial exploration of a possible framework to assess, categorise and describe the trials, tribulations and challenges of their development.

Towards backward-mapping project development

Proposed steps in mapping process
Taking the critical success factors as defined by Cochrane (2012), I first worked to define discrete subfactors that would reasonably contribute to each factor. Next, I described how these subfactors may manifest within the specific institutional context of my international mobile learning initiative in development and define what 'success' would mean. This included an appraisal of both the level of *effort* – human or monetary resources, political capital or social effort – required to reach success, as well as the *consequences* for the initiative of task completion or incompletion. Incorporating these measures of *effort* and *consequence* allowed these subfactors to be appraised in terms of the *risk* involved to the project of task incompletion. Table 1 presents a modified risk matrix based on these effort/consequence assessments, where the failure of initiative components or factors that require little effort and/or are unlikely to be critical to the overall success of the initiative would rank as presenting 'Low' risk, whereas the incompletion of tasks requiring a high degree of difficulty or effort – such as modifying an entire degree – or that are important to the initiative – for example, securing a working technical platform – would be ranked as presenting a 'High' risk to the initiative overall. Consequences of some subfactors failing may be negligible to the overall success of the initiative, whereas others may be essential. Risk levels will also vary according to the specific context and would need to be modified by practitioners.

Table 1. Proposed modified capacity prediction matrix for factor assessment in mobile and technology-enhanced learning initiatives in development

		Consequence of task incompletion				
		Negligible	Minor	Moderate	Significant	Critical
Level of effort involved in completing task	Excessive	Low-Med	Med-High	High	High	High
	Significant	Low-Med	Medium	Med-High	High	High
	Moderate	Low	Low–Med	Medium	Med–High	High
	Minor	Low	Low–Med	Low-Med	Medium	Med-High
	Negligible	Low	Low	Low-Med	Medium	Med-High

Working to assess likelihood of specific tasks being completed may help practitioners: (a) to identify a potential path of 'least resistance' through tasks – one that presents the lowest risk with the highest potential for success; (b) to identify aspects of projects that may need more attention, and (c) make decisions and set priorities for further project development or upgrades.

Describing a single critical success factor in context
Within the context of an existing project in development that seeks to develop a mobile learning system for collaborative field-based learning across international institutional contexts (Bone et al., 2020), I describe below just one of these critical success factors defining several subfactors and assessing their feasibility in context.

Factor: <u>Pedagogical integration of technology into course and assessment</u>
1. Subfactor: Lecturer intent to change curriculum

Assessment criteria: Capacity and intent of lecturers to alter components of the curriculum, including learning activities, learning objectives, assessment tasks and weightings to suit a more social constructivist pedagogy.

2. Subfactor: Lecturer capacity for pedagogical change

Assessment criteria: Prior knowledge and capacity for lecturer to be supported in making pedagogical shifts. Consider both the lecturer's space for change (within the curriculum) and their desire for change

3. Subfactor: Ease of control over curriculum redevelopment
Assessment criteria: How much control does the lecturer have over curriculum changes? Are they the coordinator or part of a teaching team? How strict are departmental requirements for submission of curriculum changes?
4. Subfactor: Gap between existing and desired curriculum
Assessment criteria: How much will the curriculum have to change to embed the planned technology and shift in pedagogy?

Table 2 provides a brief description of the assessments at each subfactor level, and the level of risk determined.

Table 2: Description of subfactors and assessment of their risk of 'failure' using an example of an m-learning critical success factor as described in Cochrane (2012)

Critical success factor	Subfactor	Subfactor assessment	Current risk	Success likelihood
Pedagogical integration of technology into course and assessment	Lecturer intent to change curriculum	Lecturer intent is clear. Centralised, funded supports are available.	Minor effort required; success highly likely = LOW	VERY HIGH
	Lecturer capacity for pedagogical change	Lecturer is also subject coordinator, has high level of control	Minor effort required; task completion likely = LOW–MED	HIGH
	Ease of control over curriculum redevelopment	Curriculum changes need to be submitted for central approvals; some delay possible	Moderate effort required; task completion reasonably likely = MED	MED–HIGH
	Gap between existing and desired curriculum	Minor changes to field trip learning activities required	Minor effort, task completion highly likely = LOW–MED	HIGH

Challenges and next steps

There remains limited discussion on the processes by which mobile and technology-enhanced learning is developed in the higher education curriculum, and limited descriptions of 'failures' in context. Disseminating lessons learned from initiatives in varying development stages, including potential barriers, challenges and strategies, can lead to more robust, sustainable and strategic implementation of mobile learning initiatives across higher education curricula. A framework incorporating lessons learned from 'failed' initiatives has the potential to guide practitioners in planning and developing new projects. Presented here is a first step towards developing such a framework, using critical success factors described in Cochrane (2012) and applying them to the context of an international collaborative m-learning project in development. The next steps will be to further develop the framework, incorporating additional information and parameters from both the exemplar project and from the broader community. I propose initial data be gleaned from the existing ASCILITE community, from both within the ML-SIG and from participants at the ASCILITE 2022 conference. Incorporating these additional data will allow the success factors and subfactors to be refined across multiple contexts, building towards testing validity and application of the framework in practice.

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reconnect
Reconnecting relationships through technology

The Youth Justice Portal and Transformative Digital Education in Criminology

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The ideas in this paper explore how learning design intentions developed by academics, practitioners and learning designers, intersect with students' development of pre-professional identities (PPI) in the field of youth justice. We propose a theoretical framework built on Activity Theory that situates the learning environment as a set of two activity systems – teachers and students – that come together through a boundary object called the 'Youth Justice Portal'. The portal is the main avenue through which teaching, and learning takes place, and we examine how the technical and theoretical framework that we have adopted can be applied in open-ended domains that require the development of students' PPI. The practical implications related to the adoption of the model in disciplines which require placement-based learning opportunities are discussed.
Keywords: Pre-professional identity, youth justice, activity theory, dialogue-based learning

Introduction

Universities should develop in their students the competencies which will enable them to cope with uncertainty, poorly defined situations and conflicting or at least diverging norms, values, interests and reality constructions (Wals and Jickling 2002, p.224).

Higher education offers more than 'job ready graduates', it has the potential to produce active citizens equipped to confront complex social situations in both the context of work and civic life more generally. In the context of criminology more specifically, Thurgood (2020, p. 24) argues that the task of transforming pedagogy in criminology involves awareness that "Deeper skills require instilling if students are to be successful as critically thinking professionals in an increasingly complex arena. This includes producing graduates who can challenge the discipline, their profession, and wider society." In this context, learning opportunities that facilitate the emergence of pre-professional identity (PPI) amongst undergraduate cohorts have been identified as critical. However, little is known about how PPI may be facilitated outside of placement-based Work Integrated Learning (WIL). For example, the affordances of Non-Placement Work Integrated Learning (NPWIL) are relatively unknown. This project advances scholarship on 'at scale' partnership informed NPWIL by exploring how undergraduate students' PPI construction is affected through interactions with a practitioner-based rich media interface known as the Youth Justice Portal (YJP).

It is well documented that placement-based WIL affects pre-professional identities (PPI) by offering learners an 'experience' that aids them in 'sense making', particularly in relation to their future selves and professions (Jackson 2017; Baxter Magolda 1998). PPI has been identified as significant in facilitating the transition from higher education (HE) to the labour market as PPI and employability attributes overlap (Tomlinson and Jackson, 2021; Jackson 2017; Outi Veivo and Salmi 2020). However, the focus on placement and PPI chains WIL to place and time and this can lessen the potential for learners to develop PPI throughout the degree lifecycle, and through *non-placement WIL* experiences.

There has been significant research in the definition and emergence of PPI (Jackson 2017; Tomlinson and Jackson 2021; Outi Veivo and Salmi 2020), the shape of student identities, and the role of the self in 'becoming' (Fellenz, 2016; Baxter Magolda, 1998). Additionally, re-conceptualisations of what is understood as 'acceptable' WIL activities/experiences embrace advances in technology-enabled learning, highlighting the affordances of digital platforms, resources, and virtual environments in increasing student participation in diverse WIL opportunities (Glavas and Schuster 2020; Rowe, Kelliher & Winchester-Seeto 2012; Dean, Eady and Yanmandram 2020). However, there is a notable dearth of research investigating the intersection between the digital, NPWIL and PPI construction in HE. Moreover, few projects have interrogated how pre-existing digital elements with pre-existing learning design intentions interact with a learner's PPI. The question remains - what exactly are learners 'making' of themselves as they interact with digital and virtual forms of NPWIL curricula? It is at this juncture that this project aims to extend the scholarship of NPWILand PPI by exploring the design of an existing digital platform known as the Youth Justice Portal (YJP) through the lens of Activity Theory.

The Youth Justice Portal

The YJP caters to an annual cohort of 600 students, drawing on expertise from practitioners in the youth justice system in an Australian jurisdiction. The depth and breadth of partners contributing to the YJP, result in a distinct, authentic, and holistic focus on the practice of youth justice through rich media content. Practitioners function as 'co-educators', pre-recorded interviews covering themes and debates in youth justice are organised into 'snippets' of insights that inform 'nodes' (See https://tinyurl.com/r6am5bn4). Critical thinking and applied skills are foregrounded through 'wrap-around' learning activities designed with input from practitioners, including interactive case studies requiring learners to exercise consequential thinking through decision making, and assessments are scaffolded to mirror work-related tasks. For example, in synchronous learning opportunities students are engaged in debates and role-plays that require them to take on a practitioner 'position' and enact their role or argue their position from that practitioner's perspective – informed by what they have been learning via the practitioner interviews. Then students reflect on the tensions and conflicts experienced when comparing the research about youth offending against the pragmatic environment of a practitioner.

In line with Paulo Freire's (1970) philosophy of education that challenges the 'banking' model of education as knowledge transmission, the YJP replaces lectures and adopts a student-oriented approach. For Freire this involves a **dialogue-based** approach in which students are actively engaged, leading to the emergence of a 'critical consciousness' (1974). The empowering effects of a dialogue-based approach have been connected to 'emancipatory education' (Nouri and Sajjadi 2014). An essential challenge inherent in a student-oriented approach is a decentralisation of the lecturer and by extension 'the lecture'.

The YJP was designed to deliver at scale, high quality NPWIL to a large multi-disciplinary cohort, with the support of industry and community partners. Exposure to multiple practitioners in the field was viewed as central to the construction of students' PPI. Multiple voices were embedded as 'content nodes' in the YJP and the result has been a polyvocal approach that exposes students to diverse perspectives and settings represented by youth workers, police officers, child and adolescent forensic psychologists, legal aid, magistrates, youth detention officers, advocates, and the president of the Children's Court. As each practitioner narrates their experiences working in the youth justice setting, 'troubling' perspectives emerge with regards to the ideals of youth justice and the practicalities faced by practitioners. The polyvocality of these worlds of different experiences and narratives highlights the incoherence and contradictions that are inevitably present in the youth justice system. In this sense, polyvocality facilitates the problematisation of how youth justice is practised from a range of perspectives and this challenges traditional conceptualisations of higher education which presents 'the lecturer' as a 'sage' whose dominant perspective automatically legitimates what is 'important' knowledge. In facilitating access to multiple perspectives, the YJP is an object informed by the principles of 'emancipatory education'. Nouri and Sajjadi (2014: 81) describe emancipatory education as empowering since it has the capacity to enable students, as citizens, to "select and transform their world". The selection and transformation potential exists in the ways that students construct pre-professional selves through the learning afforded by the practitioner interviews and learning activities that encourage 'reflexivity' and critical thinking.

The YJP is significant because it broadens our understanding of digital NPWIL and its potential for developing students' PPI. This has implications for how traditional placement-based learning is positioned (Dean, Eady and Yanmandram 2020; Schuster and Glavas 2017) and illustrates the potential for digital forms of WIL to complement or even substitute aspects of workplace-based learning. It is also an example of what Bayne et al. (2020) describe as a new mode of communicating and consuming knowledge in academic contexts – a mode that goes beyond text to represent knowledge as an interconnected and yet discrete set of digital artefacts.

Theoretical framework

The theoretical framework that guides this research is third generation Activity Theory (AT) typically associated with the work of Engestrom (2001). AT posits that the analysis of human activity reveals the fundamental characteristics of human behaviour (Kaptelinin & Nardi, 2006). Additionally, all human activity takes place in a sociocultural context and the relationship between individuals (subjects) is mediated through tools which are either conceptual or physical in nature. In our case, the tool that is under investigation is the YJP and AT argues that tools serve as the means through which an intended or purposive objective is carried out (Verenikina, 2010). Through the lens of AT, the YJP is the tool through which students develop their PPI and the tool that teachers use to help promote PPI through the practice of learning design and curriculum development. The importance of AT for this project is twofold. It represents both a grounding philosophical framework for a conception of the production and consumption of knowledge (sociocultural theory) and a lens through which to investigate how the various components in an activity system, such as the use of the YJP can constrain, promote or facilitate the construction of PPI in the student cohort under investigation.

There are three aspects of AT that shape the project. The first is the conception of teaching and learning as a set of activities that intersect, complement and combine to create complex learning environments mediated through and by tools (either conceptual or physical objects), students and teachers and other members of the community. In our case, the YJP is the primary site of learning and its use is subject to the range of implicit and explicit rules that govern the shape of the learning process. The second aspect of AT is that it provides a lens through which learning can be evaluated and, as such, it can be used as a framework to examine the complex set of interactions that constrain and facilitate the process of learning. The third feature of third generation AT is that it describes how multiple activity systems generate contradictions that can help to drive change in complex organisations. It is, in other words, a more expansive framework (Engestrom, 2001) that can be applied to organisations such as universities in which teaching and learning activities can be divided between objectives that shape the student learning experience and objectives that drive teacher-based activities such as facilitation, learning or assessment design.

The focus of this paper is on how AT guides theorisation of the intersection between the learning design intentions that are embedded in the YJP and how it is used as a tool for teaching and learning in the curriculum. The second phase of this project, an empirical exploration of student engagement with the portal, is underway and the outcomes will be the subject of a subsequent report. However, it will be useful to describe the nature of the relationship between teachers and students through the lens of AT to highlight how teacher and learner practices intersect.

A student and teacher activity system

In terms of AT, teachers and learners are positioned as constituting two activity systems each with their own set of rules, tools, communities and ways of structuring how activities are carried out. In a student-based activity system, students might alternate between individual and group work and this may be governed by formative requirements to be met prior to attendance in a tutorial setting (individual student work) or as part of a group assessment activity which requires intentional design of the division of labour to carry out certain tasks. Both of these tasks are student-centred but crucially they both have different objectives which require different sets of tools (conceptual and physical) and they feature a difference in how tasks are distributed (or how the labour is divided). The rules that govern both activity types also differ – one assumes the alignment between the implementation of a ‘flipped model’ and the benefits of self-regulated learning that are conferred on students in meeting learning outcomes (individual student work) and the other is governed by formal assessment tasks that are required to be completed in a group environment. An activity system, therefore, becomes a useful lens for providing a picture of the elements that constitute the learning process and these elements will differ depending on the subject (individual or group, for example) and the objectives that drive the activity in question. Teaching staff, on the other hand, may facilitate in a team-teaching environment or conduct tutorial sessions on their own in online learning settings. The mediating artefacts and rules for these activities will differ. These activities are bounded by their own set of rules each with different objectives.

Learning design intentions of the YJP

Students are required to interact with the YJP as their main source of learning material in the unit and the portal is provided to students by staff to engage with interconnected and authentic content and as a foundation for undertaking formal assessment tasks.

Third generation activity theory provides us with a way to theorise about this relationship by proposing boundary objects or points of collectively meaningful objects between multiple systems – in our case, the two activity systems of students and teachers. In our work, the portal represents the “collectively meaningful object” and the intersection between the “collectively meaningful object” can be considered the boundary object or the space in which students are interrogating, modelling, practising, analysing and potentially integrating the content from the portal into their own emerging pre-professional identities - practising what Engestrom (2001) has called 'expansive learning'. The boundary object was constructed using three learning design intentions. Each learning design intention is underpinned by a theoretical rationale and together they form the philosophical foundation of the YJP.

Learning design intention one – foundations of the learning environment:
To ensure the constructive alignment between learning materials, activities and assessment tasks complemented by the promotion of the active exploration of learning materials. This intention is informed by Biggs' (2003) theory of constructive alignment.

Learning design intention two – dialogic learning:
To encourage the development of professional identity through authentic voices and different perspectives. Students cultivate epistemic cognition (Kitchener, 1983) when they engage in open-ended and complex fields and this encourages the development of dialogic learning approaches in the classroom setting (Cui and Teo, 2021) helping to shape and facilitate 'emancipatory learning'.

Learning design intention three – 'writerly' texts:
To promote and encourage exploration across nodes in the YJP. This is related to the second learning design intention but refers more specifically to the affordances of the YJP. The architecture of the YJP features a set of categories that are linked semantically but do not determine the students' trajectory through the portal. This relatively open architecture promotes exploration and can be characterised as a 'writerly' text (Sumara and Luce-Kapler, 1993) that encourages students to negotiate how the material relates to their own contexts and their PPI.

These learning design intentions represent the teacher-based objectives of the YJP and it is through them that the construction of PPI is developed by students. These intentions form the foundation of the learning design approach that was developed: foundational learning design to frame the student learning experience, epistemic complexity to reflect the real-life complexity of the profession and to encourage dialogic learning in the classroom and the underlying knowledge architecture that promotes the negotiation of meaning in a 'writerly' text characterised by a complex network of perspectives, ideas and professional roles. Taken together, these three intentions form the core of the learning design of the YJP.

What are the next steps?

The next phase builds on the theoretical ideas we have been exploring in this paper. At present, we are collecting qualitative data through student and staff focus groups, student interviews and student photo diaries. Patterns of student behavioural engagement with the YJP are being recorded and analysed using learning analytics tools in the Learning Management System and Google analytics. The qualitative and quantitative data will be analysed through the lens of the three learning design intentions of the YJP. This phase is currently underway and it is expected that initial findings will be available at the end of 2022.

What is the significance of the YJP?

From a technical perspective, the YJP is a 'data structure' that reflects the knowledge architecture of the real-life practice of youth justice. Since content is divorced from the 'data structure' this means that the model can be easily applied to different domains that share similar characteristics to the youth justice. More specifically, the YJP coding and digital design has been developed as a template to house alternate subject content.

The YJP is also significant because it is underpinned by a theoretical framework informed by the sociocultural tradition of teaching and learning that recognises learning as a complex activity of social interaction mediated through conceptual, physical and digital tools. This framework is portable across domains. Additionally, our adopted approach has implications for WiL-based learning in those domains that are interested in promoting students' PPI. If PPI-based learning outcomes can be met using digital tools, this has the potential to reduce the need for students to undertake orthodox, placement-based learning. This can help to reduce the pressure of finding in-situ professional placements which are increasingly difficult for workplaces to offer students.

The YJP illustrates how NPWIL can be implemented in the curriculum and the model of the YJP that we have described has the potential to be applied in at least two ways. First, we have provided a methodological framework which can be used to conceptualise and evaluate the use of digital artefacts in complex domains which include the voices of students, practitioners and academics. Second, areas that share similar characteristics of epistemic and practice-based complexity such as disciplines in the health sciences, for example, could benefit from the approach that is being described in this paper and use the model as a stepping-stone to build digital artefacts that reflect disciplinary contexts.

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reconnect
Reconnecting relationships through technology

How can renewable assignments enhance students' graduate attributes? Insights from an action research project

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This paper presents insights from an ongoing action research project conducted at an Australian regional university that is exploring the potential of renewable assignments for developing students' graduate attributes. A renewable assignment task, where students create artefacts for assessment that become openly licensed, was run in two postgraduate education courses, one course about literacy and the other about guidance counselling. This paper offers an explanation of this work in progress. It concludes with a discussion of some preliminary ideas about the value of renewable assignments for students in relation to expectations shared by in-service professionals, and the graduate attributes that are not always taught explicitly in online education.

Keywords: Renewable assignments, open assessment, graduate attributes, education

Introduction

Online education is on the rise and, at the same time, open education has gained momentum in its progress towards widening access to quality education (McGreal, 2017). Open education is a movement founded on the idea that education should be accessible to all and it encapsulates open educational resources, open technology, open assessment and the sharing of open teaching practices (Cape Town Open Education Declaration, 2007). There is evidence from across the globe highlighting the many benefits of open education including, but not limited to, greater sharing and availability of specialist knowledge and resources, innovations in curriculum, new perspectives of knowledge repositories and frameworks, increased use of technology, and benefits to learners and the learning process (e.g., Miao et al., 2016). Focusing on the combination of online and open education, this paper explores the potential of an open educational practice called 'renewable assignments' (Wiley & Hilton, 2018) – where students share assignment artefacts as open educational resources – to strengthen students' graduate attributes. This paper adopts the definition of graduate attributes, sometimes referred to as graduate capabilities or graduate qualities, provided by Kinash et al. (2016) who described these as the 'soft skills' required by employers such as effective communication and interpersonal skills, ethical conduct and critical thinking, among others. The paper begins with an overview of the literature about online assessment before describing the current project where students at a regional university in Australia will produce two volumes of openly published resources arising from their assessment in online postgraduate education courses. Building on the findings of two previous cycles of research (Author, 2020, 2022), the current action cycle explores how renewable assignments enhance students' graduate attributes.

Literature review

Assessment is a means by which educators can gauge the knowledge and skill of learners and plan for further learning experiences. Traditionally, assessment emphasised the products of learning and de-emphasised the learning process, but a stronger focus on student experiences of learning shifted assessments towards those where students can demonstrate their application of skills and knowledge (Guerrero-Roldán & Noguera, 2018). Technology provides efficacies that save academic time and effort in aspects of the assessment process including, for instance, assessment management, data reporting and analysis, communication with students and staff technological skill development, but technology-enhanced or online assessments are not without problems. There are concerns that technology has made it easier for students to plagiarise and cheat, and online assessments often do not meet the needs of contemporary students and employers (Kinash et al., 2018). In addition, online assessments are not well supported in some contexts. For example, in a Norwegian case study by Raaheim et al. (2018), data from 48 participants highlighted that many university staff lacked knowledge about “alternative forms of assessment, and/or on how to use digital technology in assessment” (p. 224), and that a lack of digital skills and major organisational changes were posing barriers to change. Similarly, in a study where 33 Australian university educators were asked about their perspectives of technology-supported assessment, Bennett et al. (2017) reported that the educators were positive towards such assessment but they felt limited by factors such as time, infrastructure, their and their students’ skills and the support that was needed. These studies emphasise the need for assessments that are relevant to contemporary needs, as well as assessments that are implemented in a systematic and supported manner. There is, therefore, plenty of opportunity for online assessments to be improved to more fully exploit the educational benefits afforded by available technologies.

One possible avenue for improving online assessments is the idea of ‘renewable assignments’ (Wiley & Hilton 2018). Many traditional university assignments require students to create artefacts such as essays, reports, presentations and the like. Since such artefacts are usually only viewed by the assignment marker and are subsequently disposed of by the student, Wiley & Hilton (2018) called these ‘disposable assignments’. Wiley and Hilton (2018) distinguished these from three other types of assignments: authentic, constructionist and renewable. Assignments are ‘authentic’ when artefacts have value beyond student learning, for example, resources that assist other students, whereas ‘constructionist assignments’, describe where students have actively participated in ‘learning by doing’ and in reconstructing knowledge, and the artefacts are made public. With a ‘renewable assignment’, students create an artefact that has value beyond student learning and is publicly shared with an open license (Wiley & Hilton, 2018). Effectively, students create Open Educational Resources (OER) which are “teaching, learning and research materials in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit no-cost access, re-use, re-purpose, adaptation and redistribution by others” (UNESCO, 2019, p. 5). The open license is integral because without it the assignment is not renewable.

There are several known benefits of renewable assignments. Student-generated OER can help learners become actively engaged and motivated to succeed with higher education. Fatayer (2016) provided the example of computing, engineering and mathematics undergraduates who repurposed their course assignments as OER, citing specific student benefits as: a) autonomy and ownership when creating content; b) progressively collating content, c) publishing early via open access websites, d) participating in online knowledge construction communities, and e) engaging as knowledge consumers and producers. The creative processes that students use can also stimulate community and institutional collaboration and co-operation, and disrupt traditional models of education (McGreal, 2017). Such benefits are particularly relevant to the education of teachers where OER is recommended as a key resource (UNESCO, 2019). However, while the benefits of renewable assignments are still emerging, few studies have explored their potential to contribute to students’ graduate attributes. Such research is important as tertiary education moves more towards online delivery. Against the backdrop of pushes for improvements to online assessment practices and growing numbers of online learners, the current study was designed to address the research question, ‘How can renewable assignments enhance students’ graduate attributes?’

Methodology

This study was guided by transformative or emancipatory theories of adult learning (Freire, 2000; Mezirow, 2003) that view learning as a process that “transforms problematic frames of reference . . . to make them more inclusive, discriminating, open, reflective, and emotionally able to change” (Mezirow, 2003). Drawing from the ideas of Habermas, transformative learning often involves activities that are task-oriented or aimed at problem solving (instrumental learning) alongside the critical element of self-reflection (communicative learning) (Mezirow, 2003). Therefore, this study employed both types of activities within an action research project to explore the value of the renewable assignment for the development of graduate attributes.

Action research is a three-step process involving: 1. planning, 2. execution of the plan, and 3. reconnaissance or fact-finding (Lewin, 1946). These steps create a cycle or repeated “spiral of steps” towards a research objective (Lewin, 1946, p. 38). The iterative process of action research was considered the most appropriate for this study because of its emphasis on pragmatism, responding to both the aims of OER and the needs of online teaching and learning. Approval from the university ethics committee (No. H21REA234) was obtained before the study proceeded. This is the third cycle of an action research project that ran first from November 2019 to February 2020 with a second cycle from July to November 2020. Each cycle began by consulting in-service professionals for ideas. These ideas were then transposed into student assignment tasks which students completed. After final course grades were released, students were invited to openly publish the artefacts they had created for the assignment task. The openly published collections were then shared back with in-service professionals for feedback and the cycle was repeated. The first two cycles showed that renewable assignments could improve online student engagement but the cohort numbers were relatively small (2019: n=37; 2020: n=30) compared with the current project (n=249). This third cycle sought to extend learnings beyond student engagement to include the development of graduate attributes as defined by the university and as discussed with in-service professionals.

Planning for the study involved consideration of the context, the students, and the renewable assignment task. The context is a regional university in Australia with three quarters of its students studying online. The courses in which the project ran were only offered online and they were postgraduate courses so all of the students were non-school leavers. Course 1 had 158 students enrolled and Course 2 had 91 students. The majority or 158 students (63.5%) were studying part-time. Table 1 below summarises this data and shows that overall, 160 students (64.3%) passed the courses and were invited to participate in publishing their open assessment resource.

Table 1. Students enrolled in courses

	Course 1	**Course 2**	**Total**
Total course enrolments	158	91	249
Part-time	122	36	158
Full-time	36	55	91
School-leaver	0	0	0
Non school-leaver	158	91	249
Passed the course and invited to participate	102	58	160 (64.3%)
Accepted the invitation to openly publish	48 (47.1%)	23 (39.7%)	71 (44.4%)

Course 1 was an introductory course to guidance counselling in education and the renewable assignment task required students to create case studies detailing targeted mental health conditions and interventions that educators may use to address these. Course 2 was an introductory course to literacy in early childhood and the renewable assignment task required students to create presentations about how they co-created a multimodal text with a young child. To strengthen the relevance of these assessment tasks for both students and the professional community, the researchers and a research assistant held two focus group interviews with in-service educators (Interview 1 n=2; Interview 2 n=10) about their perspectives of contemporary graduate attributes. Questions asked at these interviews included 'What are the skills and knowledge you expect from graduate teachers/guidance counsellors?' and 'Are there any specific areas in their pre-service education that need more emphasis?' The focus group interviews were conducted in November 2021 and each was roughly 30 minutes long. The interview responses informed planning for the OER, and it also informed a survey that will be distributed to participating students once their OER are published.

All students participated in the renewable assignment task as a compulsory component of coursework. Students were supported by the authors as the course facilitators, and a video support presentation which explained the rationale for the assignment, the value of renewable assignments, and the possibility of being invited to openly publish their resources after the course had ended. While the assignment task was compulsory, openly publishing the assignment artefact was voluntary. Student assignments were assessed by independent markers and moderated by the course facilitators as per usual university processes. After students had received their final grades from the completed course, an invitation to openly publish was sent within two weeks to all students who had passed the assignment and the course overall. Students who responded are currently engaged in the process of publishing their work under the guidance of their previous course facilitators (the authors). Each student will also approve the final, published versions of their work and choose the open license under which they wish to release their work. We ensured that students understood their copyright options under open licensing which, at a minimum, requires that any work shared is attributed to individual student creators. The open-source book creation platform being used for the project, Pressbooks (https://pressbooks.com/), allows chapter-level licenses which override the book's open license.

To gather data for the reconnaissance stage of this third cycle, student data will be collected by a survey which will be administered at the end of the project. The survey will ask students whether the renewable assignment helped them develop any of the graduate attributes considered important by the focus group interviewees and by the university. Table 1 shows a relatively low uptake of the opportunity to publish (44.4% overall) so the survey will also help discern what motivates students to participate in renewable assignments through to the point of openly publishing. Data will be analysed qualitatively using a deductive thematic coding process. Presented here are insights arising from our involvement in the renewable assignment process that other online university educators might find useful.

Insights from the project so far

In transformative learning theory, learning is characterised as the transformation of perspectives utilising a process of repeatedly taking action and reflecting on that action or what Freire (2000) called ‘praxis’. Renewable assignments show promise for perspective transformation as students will repurpose their assignment artefacts for a broader professional audience and step more fully into their future professional identities. In their responses to the invitation to openly publish, students have shown enthusiasm for the task through appreciative comments about the opportunity to publish and several students expressing interest in improving their work for open publication. Praxis is illustrated through these comments, with students’ perspectives transforming through a cycle that began with action (the student created the artefact for the renewable assignment), followed by reflection (students evaluated the value of their resource for open publication), followed by another action (students will prepare their resources for publication), followed by another reflection (students will be surveyed about the value of this task for developing their graduate attributes). Adding to the student benefits seen in cycles 1 and 2 of this project (Author, 2020), this cycle will potentially expand our understanding of how participation in renewable assignments develops students’ graduate skills and capabilities.

One way that renewable assignments contribute to students’ graduate attributes is that they assist students with their digital literacy and online communication skills. At the post-graduate level we find that students may have received their initial degree before university education moved online, or their initial degree may have been in a field with disciplinary norms and expectations far different from education. For these students, activities such as renewable assignments help students develop ways of working that are technologically up-to-date and more aligned with the contemporary demands of their future profession. For example, in this project, students are manipulating information communication technologies and digital media such as photos and videos along with increasing their awareness of their digital and professional identities.

Some of the questions we have received from students include queries about attribution of their work, the level of control they have of the publication process, what commitment is required, and whether or not they can publish even though they received a poor passing grade in the assignment task. These questions suggest that students are becoming aware of professional rights, effort and quality. Students have already received their final grade for our courses, but they have shown a willingness to keep working with us to publish their work for no further credit which indicates that students are becoming engaged professionals. Through renewable assignments, students must also confront ethical issues, for example, with academic integrity and the rights of co-contributors. These challenges are similar to those students will face in their future teaching and guidance counselling professions, which is important given the evidence linking student conduct to workplace ethical conduct (Nayak et al., 2015) and a renewable assignment offers a safe and supported space through which students can navigate these ethical challenges.

Furthermore, renewable assignments have the potential to develop students’ graduate attributes through offering students authentic and meaningful learning experiences. The focus group participants spoke about how students’ prior life experiences affected the development of their graduate attributes. When asked about their experiences with mentoring pre-service teachers, one participant stated:

> The graduates that are younger, and it's all very fresh and new, that was more overwhelming for them, but the mums who had to wrangle kids for years and have busy lives, they just had some skills and some confidence.

Another participant remarked ‘It is about getting that theory, those standards and actually making sure they're practicing it in [the classroom].’ These quotes highlighted the idea that our students, who are all non-school leavers, already possess ‘some skills and some confidence’ with the practice of teaching, but they needed to make stronger links between theory and practice. Renewable assignments may contribute by developing pre-service teachers’ theoretical skills and confidence, such that they can participate in professional discourse about contemporary teaching topics. An example of this is that student authors from both courses will speak about their respective open publications in an online event for Open Access Week October 24-30, 2022. This opportunity can help students become effective communicators and, in turn, more employable.

Renewable assignments, therefore, can potentially offer students additional opportunities to enhance their graduate attributes. We anticipate that the final survey will draw out student perspectives more fully about whether renewable assignments helped develop their graduate attributes. We further anticipate employer and professional peer feedback about this same issue when the open publications are shared back with in-service professionals. One limitation of our study is that, restricted by funding, each cycle is based on one semester so the long-term effects of this activity will not be tracked. In other words, the project will not be able to discern whether renewable assignments can motivate students to achieve higher educational outcomes. It may be possible to follow up with students later in their study programme or perhaps post graduation. Future studies that explore renewable assignments longitudinally may provide further insights.

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reconnect
Reconnecting relationships through technology

Designing a feedback framework to reconnect students with learning in a game-based learning environment

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Feedback has great potential to benefit students' learning and skill development. Feedback designed in an effective manner can help improve a student's current performance by supporting their sense of curiosity and motivation and fostering a deeper engagement in the learning. Game-Based Learning (GBL) environments present an appropriate platform to implement feedback to facilitate progress monitoring and enhance curiosity and motivation. Through carefully designed feedback with the support of psychological theories in such environments, learners can become more immersed and interested in their learning. This allows for creating an environment where a learner feels more connected and empowered in their learning journey. This paper proposes a feedback framework with an understanding of the purpose and varieties of feedback mechanisms that can be presented to the learners at different levels within a digital learning environment through a statistics game to stimulate curiosity and motivation and help achieve the learning goals.

Keywords: Feedback, Statistics, Curiosity, Motivation, Game-Based Learning, Psychological Theories.

Introduction

In the current situation, many students lack the desired curiosity and motivation to learn in an academic context (Zichermann & Cunningham, 2011). In educational contexts, feedback is regarded as a significant element to influence curiosity and motivation positively (Rouleau, 2018). In recent times, the focus has shifted from face-to-face teaching to digital learning environments including game-based mechanics with a capacity to elicit curiosity and motivation (Alsawaier, 2018). Game-Based Learning (GBL) platforms can present good and meaningful experiences to deliver effective feedback (Erhel, 2012). For this study, feedback can be defined as information that is communicated to an individual in consequence of their performance to improve their learning by helping them understand their learning gaps and stimulating cognitive processes (Hattie & Timperley, 2007; Shute, 2008).

This paper proposes a design of a feedback framework based on the literature review that can help enhance curiosity and motivation in a GBL environment and empower students for improved learning outcomes.
The design of the feedback framework is based on the following hypothesis:
Hypothesis 1 (H1): Learners with a higher trait of curiosity and motivation engage better and perform well.
Hypothesis 2 (H2): Various types of feedback promote learners' levels of curiosity and motivation differently.

The next section reviews the relevant literature, followed by the design of the statistics game to implement the feedback framework to foster curiosity, motivation, and engagement in a GBL environment based on psychological theories. The conclusions are discussed in the last section.

Literature Review

Curiosity and motivation have been conceptualised as integral components of the learning process and support higher levels of engagement in learners to help them achieve their full potential in a learning environment (Garrosa, 2017; Stumm et al., 2011). Curiosity represents a desire to seek answers to unknown questions by encouraging exploratory behaviour in an individual (Berlyne, 1957). Motivation refers to an internal process that initiates and maintains the persistence of behaviour towards selected goals for an individual (Deci & Ryan, 2000).

Past literature asserts that the relevant psychological theories and models have provided educators with a heuristic approach to improving curiosity and motivation in traditional educational contexts (Arnone & Small, 1995; Deci & Ryan, 2000). The information gap theory formulated by Loewenstein (1994) suggests that the intensity of curiosity becomes higher when the information gap is smaller (Litman et al., 2005). The feeling of deprivation caused by missing information can be reduced by filling the knowledge gap with the presence of appropriate feedback (Arnone & Small, 1995). The Self-Determination Theory (SDT) of motivation states that when an individual's psychological needs for autonomy, competence, and relatedness are fulfilled, they become more self-determined. The Attention, Relevance, Confidence, and Satisfaction (ARCS) model of motivation claims that these four components contribute to the arousal and sustaining of curiosity in an educational environment (Keller, 1987).

Feedback can motivate and encourage a learner, help reduce anxiety, and make them feel cared for (Rowe & Wood, 2008). Feedback allows learners to achieve independence in learning and improves the level of self-regulation through monitoring (Chung & Yuen, 2011). Feedback has been shown to positively influence motivation and directly affect the learner's confidence and satisfaction aligning with ARCS design (Malik, 2014). It can help identify information gaps resulting in enhanced curiosity and intrinsic motivation (Hamzah et al., 2015). Quality feedback can help reduce the gap between high and low-achieving learners (Black & William, 2010), However, designing appropriate, effective, and balanced feedback has been a challenging task for educationalists (Boud, 2013).

The integration of technology in the learning process offers the potential to facilitate progress monitoring through numerous instructional strategies (Erhel, 2012). GBL is one of the interesting technologies in education that involves the addition of an actual game as part of the learning journey to teach new concepts, strategies, and skills to individuals (Alsawaier, 2018). A positive impact of game-based applications on motivation and achievement has been established in a past study (Erhel, 2012). Feedback design plays a significant role in a GBL platform to support players to track their own performance and encourage persistence in their learning efforts (Kiili, 2007).

There are three self-reflective questions that should be answered through feedback for effectiveness. The first question 'Where am I going' is about establishing a clear purpose and goals for learners. The second question 'How am I going' guides monitoring the learner's progress toward the goal so far. 'Where to next' question is about informing the learner about the next step to reach the goal by identifying the activities needed to make further progress (Hattie & Timperley, 2007).

Feedback can be provided at different levels namely: Task, Process, Self-Regulation, and Self level for achieving key learning outcomes (Black & Wiliam, 2010; Hattie & Timperley, 2007). Task level feedback is focused on the accuracy of the task and may include instructions to direct the learner towards correct information such as "You should include more information about the statistical formula". Process level feedback is specific to the activities to complete the task such as "This answer will make more sense if you could discuss all the strategies we talked about earlier.". Self-Regulation type of feedback can help enhance the learner's self-regulation strategies and direct their attention by investing more effort and commitment for further task engagement. One of the examples for such feedback can be "You already have a theoretical understanding of this concept. Check to see whether you have incorporated them in your previous step.". Self-feedback such as "That was an amazing response", and "well done", are considered to be least effective and less powerful (Hattie & Timperley, 2007).

Game Design with Feedback Framework

According to Shute (2008), there are different types of feedback that can be presented based on learning outcomes and learner characteristics. For the purposes of designing the feedback framework for the proposed research, four types of feedback have been considered. The first one is called Verification feedback also known as Knowledge of Result (KR) informs the learner about the correctness of their answer. The second one is called the Knowledge of Correct Response (KCR) type of feedback, where the correct answer is provided for the problem with no additional information. The third one referred to as Elaborated feedback consists of an explanation of the right or wrong answer provided by the learner. It might also guide the learner through appropriate hints or by reviewing instructions. The fourth one named Try-again feedback informs the learner about the incorrect response and allows more opportunities to attempt the question (Shute, 2008).

The feedback framework has been designed to help enhance the curiosity and motivation of a learner through effective and informative feedback strategies in a GBL environment. The foundation and the context of the game are derived from the United Nations Sustainable Development Goals (UNSDG) (Sustainable Development Goals, 2021) to teach basic statistics concepts such as mean, mode, and median as well as higher-level statistical concepts such as hypothesis testing, correlation, and linear regression. The game consists of three layers with each layer having different complexity of educational context to play with. In this multi-level game, a player can choose one of the three UNSDGs; No Poverty (SDG1), Health and Well-being (SDG3), and Quality Education (SDG4) to answer a set of statistics questions. Figure 1 shows the design of the feedback framework for the game.

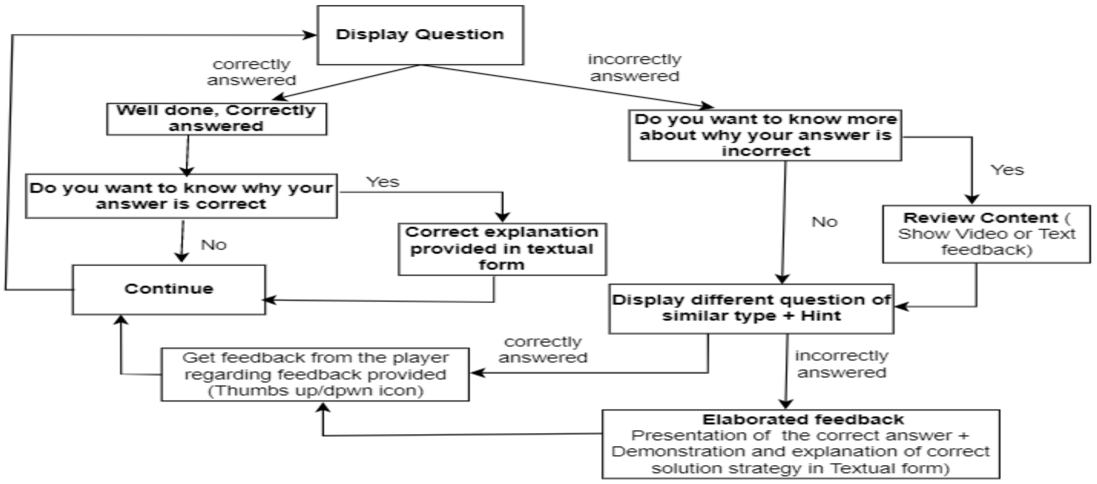

Figure 1: Design of the feedback framework

During the gameplay, the learner will be allowed multiple attempts to complete the question. If the question is answered correctly in the first attempt, there will be an option to review the correct answer demonstrating the use of verification feedback as suggested by Shute (2008). For incorrect answers, they can either review the content in a text or a video mode, or they can choose the option to attempt another question with a similar concept guided by a hint. This is an example of try-again feedback as suggested by Shute (2008). It also supports the sense of autonomy and fosters motivation by providing the choice of receiving feedback through video or text option (Deci, 2000). If they still answer it incorrectly, they can choose an option to get elaborated feedback comprising the knowledge of the correct answer and solution strategy in text form which will allow them to understand the required concept.

The use of feedback text such as ‘well done’ for correct answers indicates the use of self level feedback. Feedback at the task, process, and self-regulation levels have been incorporated through hints and elaborated feedback options in the game. The feedback text provided at all these levels aims to highlight the knowledge gap in the learner and help enhance curiosity and motivation in the learner by supporting the feeling of confidence, competence, and satisfaction. The feedback designed for this game answers three self-reflective questions as suggested by Hattie & Timperley (2007). The first question ‘Where am I going’ is covered by presenting specific learning goals to the learner at the beginning of each level in the game. The second question ‘How am I going’ is answered through a variety of feedback text while the final question ‘Where to next’ will be answered through self-regulated feedback instructions informing learners about their knowledge gaps and guiding them towards the next question to make further progress. The performance score is presented to the learner at the end of each level to keep them aware of their progress. The learner is also provided with an opportunity to provide their opinion about the feedback received.

Additional factors such as positivity and timeliness have also been integrated into the feedback to assess their impact on learning experiences and performance. Positive and timely feedback has been reported to improve performance through increased self-efficacy and desire to learn (Kim & Lee, 2019; Attali & Kliej, 2017).

Figure 2 presents snapshots of the statistics game designed for this research study. This scenario-based game has been designed to assist learners to understand the key concepts and learn formulas, approaches, and methods used in statistics. The game design portrays how statistics knowledge is used in real-life while also demonstrating the importance of UNSDGs.

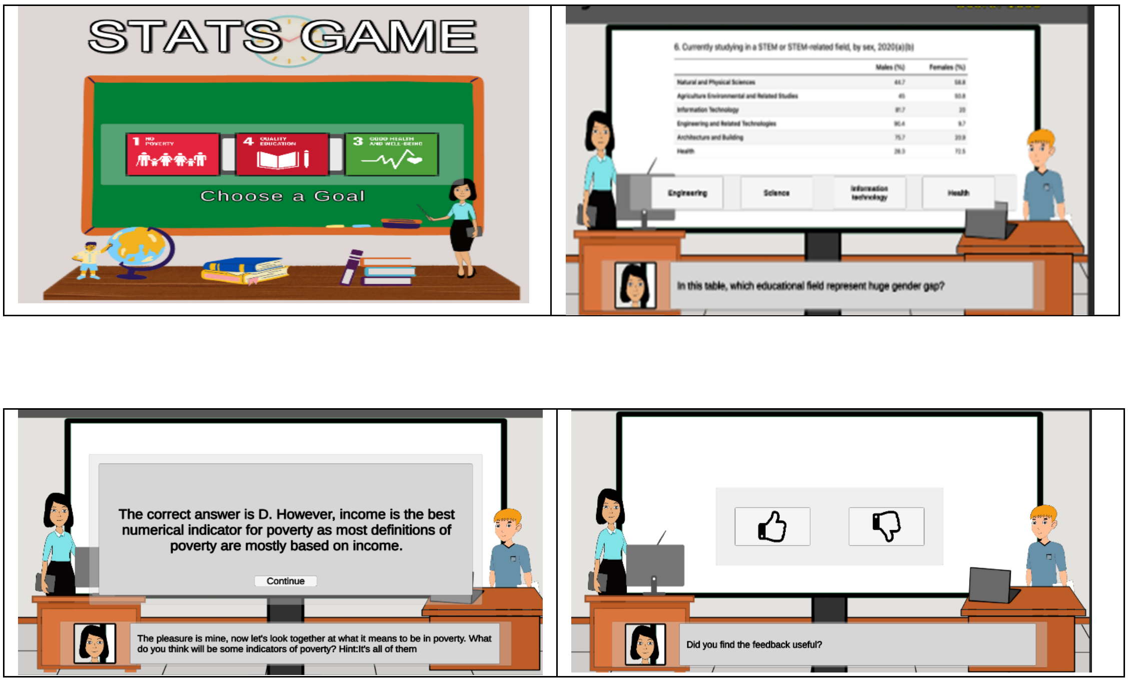

Figure 2: Statistics game snapshots

Research Design

The proposed research is guided by the principles of Design-Based Research (DBR) methodologies including four phases that will allow the development of solutions by identifying the teaching and learning problems and achieving satisfactory outcomes after iterative cycles of testing and refinement (Reeves, 2007). Phase 1 of DBR is to analyse the problem; Phase 2 is to design and develop a potential solution; Phase 3 is to implement and evaluate; and Phase 4 is to reflect on the findings. For our experimental study, Phase 1 has focused on investigating how technology is currently being used to support learning in higher education; Phase 2 has focused on designing and developing a potential solution in a form of a statistics game. The initial game design is based on the literature review done in phase 1 and is informed by the existing design principles; Phase 3 requires us to better understand the effectiveness of the design principles and GBL environments. Multiple studies will be carried out during this iterative phase. The data from the studies will be collected and analysed to understand the effectiveness of feedback strategies. The iterative implementations and evaluations will lead to further design refinements; and in Phase 4 we will reflect on the list of the feedback strategies useful for motivating learners, and how this study intends to explore whether a variety of feedback can influence curiosity and motivational behaviour of learners and if that impact is reflected in the academic performance.

The process of building and evaluating the proposed framework will begin with a small-scale pilot study to investigate the game's feasibility followed by two large-scale subsequent studies. The ethics application to conduct this study is underway. This study will also examine if individual differences such as demographics, gender, personality, or learning style have any relationship to how learners' curiosity and motivational behaviour are stimulated, and performance is demonstrated in a GBL environment.

Conclusion and future work

Boredom, amotivation, disengagement, and disconnection are always a possibility in the learning journey that can be detrimental to the learning process. Well-designed feedback can be an effective facilitator of learning and can help enhance curiosity and motivation by providing required feedback at the correct time in a GBL environment. In this paper, we have proposed and discussed a feedback framework based on psychological theories that present a variety of feedback at different levels as suggested by the literature. This feedback framework has been designed in a GBL environment where statistics is taught to learners through UNSDG examples. To address the issues of disengagement of learners within online environments and help them reconnect with the learning process, this paper draws together a number of psychological theories and motivational models to offer the design of diverse forms of feedback strategies in form of a framework that can improve learners' curiosity, motivation, engagement, and performance in a GBL environment. This framework will be evaluated with university students at the undergraduate level. It is anticipated that results emerging from the proposed study can guide future research and can be of great value to educators.

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reconnect
Reconnecting relationships through technology

Technology's Role in Inclusive Work-Integrated Learning for Students with a Disability

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As highlighted through the COVID-19 pandemic, technology plays a key role towards the goal of equitable higher education. In this paper, we focus on the role of technology in supporting inclusive work-integrated learning (WIL) placements for students with a disability. We present three student vignettes, generated from survey data of the perceptions and experiences of students with a disability in WIL (n=132). We used these vignettes in follow-up focus groups (6 focus groups, n=27) which explored students' ideas on how technology could better support students. From our data, we discuss students' conceptualisations of how potential technological solutions could improve WIL, across both the mode of WIL offered (e.g., online), but also towards supporting deeper relationships and improving the personalisation of WIL. We conclude by recommending greater collaboration between WIL practitioners and learning technologists to explore the role of technology in creating inclusive WIL experiences.

Keywords: work-integrated learning, vignettes, students with a disability, inclusion, equity

Introduction

In Australia, and globally, there is growing emphasis on how universities can support inclusive and scalable work-integrated learning (WIL) placements (Dollinger, Ajjawi & Finneran, forthcoming; Dollinger & Brown, 2019; Gamage, 2021; Kay et al., 2019). WIL, often described as an umbrella term, can extend to a myriad of practices that seek to link the practice of work to students' learning experiences (see Patrick, Peach & Pocknee, 2008), such as simulations or project-based learning. But commonly, the term is used to describe work placements, where students are matched in an industry setting, such as a hospital, school, law office, or business environment, and they undertake a project or set of tasks before reflecting on the experience and/or what they have learned through assessments. The placement itself can vary widely and just like authentic work environments, students report spectrum of experiences, ranging from incredibly positive and transformational to unfulfilling, distressing, or simply bad (Bruno & Dell'Aversana, 2018; Martin & Rees, 2019).

In June 2020, the Australian Government announced the Job-ready Graduates Package and with it, the National Priorities and Industry Linkage Fund (NPILF) which specifically aims to "increase the number of internships, practicums, and other innovative approaches to work-integrated learning" (DESE, 2020, 1). However, while the goal to create more WIL experiences and opportunities for students is admirable, there remains unaddressed complexity in how universities will support inclusive and scalable WIL. Researchers such as Dean and Campbell (2020), for example, have highlighted that there is need for new models of WIL, that consider work allocation for staff, as well as ensuring quality experiences for students. Further, with the growing diversity of the student cohort in higher education, there also remains unanswered questions on how diverse students can be supported in WIL, to support fair and equitable access and experiences (Aprile & Knight, 2020; Bell et al., 2021; Vu, Ferns & Ananthram, 2021).

In our study presented here we address one small, but critical part, of the changing WIL landscape by exploring the perceptions and experiences of students with a disability in WIL. Our study is part of a wider project to establish a National Career Development Learning (CDL) Hub, funded by the National Careers Institute and led by the National Centre for Student Equity in Higher Education (NCSEHE) (NCSEHE, 2021). Through the project, we sought to understand students' perceptions and experiences in WIL, and specifically, gather ideas and suggestions on how technological solutions could help redesign WIL models to be more inclusive to students with a disability. In our study, we defined disability as extending to students with learning, physical or sensory disabilities, as well as mental health, neurodivergent and/or chronic medical conditions. We acknowledge, however, that not all students may consider such conditions disability, and that there is disputed naming in the discourse.

Research Design

Our study adopted a mixed methods design with two phases of data generation. Phase 1 was an anonymous online Qualtrics survey (n=132) which sought to explore students' perceptions and experiences in WIL. The survey was distributed through our university disability support centre, and available to both students who had participated in WIL and those who had not. Following the data collection and analysis of our survey results (using Bazley's 2009, describe, compare, and relate), we created three student vignettes (discussed below) that summarised key themes that students submitted through the survey. We then invited students to participate in Phase 2, a series of 1-hour online focus groups hosted via Zoom (6 focus groups, n=27), where we presented the vignettes and asked students for their ideas and feedback on how technology could have better supported students in the stories. Note: some students who participated in Phase 1, chose not to participate in Phase 2, and vice versa. Our study was approved by the university's Human Research Ethics Committee (reference number: 2022:021).

Our decision to use authentic data-generated student vignettes in our follow-up focus groups was linked to growing literature that showcases the benefits of vignettes in qualitative research to explore complex and potentially sensitive topics (Rizvi, 2019). By using the vignettes from the student data, rather than generating vignettes based on our own biases or assumptions, we ensured the vignettes were authentic and aligned to the students' current place and time. We also hoped the display of vignettes would help normalise the challenges students expressed in the survey, as students could see others may have shared experiences and they were not alone (Lister & McFarlane, 2021). The vignettes were further designed to spark students' reflection on the ways WIL practices could become more inclusive to students with a disability.

To ensure inclusivity in our focus groups for diverse student participants, the three scenarios were read aloud by the facilitator (Dollinger and Finneran) and the text was also shared on the screen for participants to read. Students were given a few moments to reflect on the vignettes before they were invited to discuss and offer solutions as to what the university, industry, and/or the person in the story (i.e., the student) could have done to improve the WIL experience, with a focus on technological solutions. Students were given the option to orally speak, contribute to an anonymous online Padlet, or insert text into the Zoom chat, to allow for a variety of communication channels. All oral data was later transcribed, and then data, regardless of input, was organised by the vignette it related to. Then each researcher independently coded data by theme and lastly met to compare themes and discuss patterns in the data. To present our findings here we will share with the reader each data generated vignette before we discuss the students' ideas and suggestions.

Vignette 1: May

> May has a chronic medical condition and is unsure whether she wants to do a work placement while at the university. She is concerned whether the location will be close to home (she isn't comfortable driving long distances), and the financial sacrifice she will need to make, as she currently works part-time and won't be able to work and do the placement – and study at the same time.

May's story represented several common themes from our survey, as many students expressed uncertainty if they wanted to do a WIL placement and how it would impact their current work-life-wellbeing balance. As shown through May's story, students often expressed concern over driving or traveling long distances for their placements, and the potential income they may have to forgo while on placement.

A prominent student-led suggestion arising from May's vignette was that the WIL placement take a blended or online approach to help May juggle multiple commitments and relieve the stress of traveling. As summarised by one student that would support May 'being able to do a placement from a work-from-home situation, so the work could be done during the day or night when she is not busy'. Students also suggested universities could create work-schemes or scholarships to help support students financially while on placement.

However, another key theme that arose from this vignette was around students' idea of a placement database, where students could search and compare potential WIL supervisors or locations. Students in two focus groups (of six) discussed this idea excitedly, with students suggesting that the database could help students locate placements near their home and/or compare travel options. As one student suggested:

> May is not going to be only person that has these sorts of concerns. I think it's one of those things where if there was an available database of place that are willing to do work placements that could beneficial. That way, you could use it on a radius basis to assess and see the walking distance or what you are willing to travel.

Other students further built on this idea of an online database suggesting that it could also be used to book consultations with university staff to discuss potential placements and to store anonymous student reviews of placement organisations. In particular, students liked the idea of knowing previous students reviews on the inclusivity of the organisation as one student noted, 'I don't want to be in an organisation where they would look down on people with disabilities' as another added, 'yes, because obviously a company is going to be biased, but having anonymous feedback counteracts that'.

Vignette 2: Max

> Max has just started his in-person placement. He has an 'invisible' disability and isn't sure whether he should disclose to his supervisor, however, he is also concerned whether he will be able to manage the existing timelines, as he often works at a slower pace. At the university he is allowed extra time for exams or assessments, but if he tell his supervisor this, will they think he's lying or that he's just lazy?

A common theme to arise from our survey results was that students did not feel comfortable disclosing their disability to industry supervisors and were concerned about potential discrimination or consequences that would arise if they decided to disclose. Several students indicated they underwent severe discomfort to 'mask' their disability, which undoubtedly impacted their ability to learn and enjoy the placement experience. Therefore, it was clear from our data that the story of Max, and his anxiety over disclosure, was an important story for our focus group participants to reflect on and discuss.

Student suggestions arising from this vignette focussed on two aspects. One, that the university should play a greater role in not only supporting students but advocating for them to industry supervisors. Suggestions included a form or survey students could fill in discussing their preferences on how and when disclosure takes place to their disability liaison officer, as well as universities providing online templates of emails or phone call conversations students could use when disclosing. Students also suggested resources, such as videos or podcasts, with student stories – both good and bad – of how they disclosed and what happened, to help normalise disclosure. Another student indicated that, since some industry supervisors might not understand the nature of the disability(ies), that the university could provide a form, with information on the disability and how it may affect the student. As one student reflected:

> [Documentation] would just take that whole need to explain away, but also goes, well, this is-- It also in a way, sets a standard for the work, for the placement, for the employers or potential employers to go, 'Well, this is just part and parcel of what happens when you're dealing with people rather than robots.'

Students also suggested disability liaison officers to set up Zoom calls with themselves, the student, and the industry supervisor to discuss and talk-through any accommodations that might be needed. Though, students noted this meeting should take place after the placement has been secured, for fear that the industry supervisor might otherwise decline the offer to support the placement.

Vignette 3: Chen

> Chen has decided to do an online placement because they focus better at home due to their ADHD. However, one of the big motivations for them in doing a placement was to form meaningful connections in industry and, hopefully, receive mentorship. Will they lose social connection because they opted for online?

As touched upon in the story of Chen, student participants, both in the survey and in focus groups, often spoke to the value of online or blended placements for multiple reasons. This included relieving the stress of in-person interactions, ensuring appropriate ergonomic work equipment, and, in the case of Chen's story, being able to focus better at home. However, students also expressed concern whether online placements would be able to offer the same relationship building opportunities as in-person, and what they might lose by going online.

In the focus groups students reflected on Chen's story. Many participants noted that the future of work might be increasingly online anyway and that learning how to work, and connect, online might be an equally important skillset as communicating in-person. Other students noted the improved accessibility of online meetings, such as subtitles, which in turn better supported the creation of relationships, as they could absorb the dialogue and provide greater contributions and feedback. One student suggested Chen should not worry, as they noted:

> I actually ended up doing my placement online [because of COVID-19]. I was still invited to all the Zooms, so like if they were having big organisational meetings, I was still invited and introduced as the student on placement. I was able to receive connections, and have good connections, so it could be a good experience.

Another student noted that since moving to online learning they feel more connected, 'we're always connected on Microsoft Teams'. But other students added that if Chen was concerned about isolation, potentially having 1-2 scheduled in-person meet-ups with their supervisor could help support the online placement and put a friendly face to the name.

Discussion

Well before the COVID-19 pandemic, researchers and educators have stressed the important role that technology can play in facilitating stronger relationships between university staff, students, and other stakeholders, such as industry supervisors. However, the pandemic accelerated this growing consensus and showcased that technology was an aid, not a barrier, to equitable higher education. Students in our study repeatedly reflected how they conceptualised the value of technology in their WIL experiences, as they suggested ideas for online resources, industry supervisor databases, online or blended placements, and the flexibility and access that online learning afforded them. They saw technology as an enabler to inclusion – and were excited for its potential promise.

However, online WIL is not a panacea and will not 'solve' the challenges to create inclusive and scalable WIL alone. In fact, what we found in our study was that much of students' expressed anxiety and tension around WIL, was *before* the placement even took place. For example, concerns over the placement location, how to travel there, if work equipment would be suitable, if the supervisor would be flexible or welcoming. And it was here, in the pre-placement stage, that students focussed their suggestions on how technology should improve the WIL experience. Ideas such as a database of potential WIL supervisors, that indicated not only distance, but reviews of the organisation, or online forms or resources that helped students decide on disclosure, and how to facilitate those potentially sensitive conversations. Students also felt online resources, created by former students that normalise the experiences, and anxieties of WIL, were key resources that every university could – and should – provide.

Ultimately, our study adds to the growing chorus of scholars who are exploring the role of online WIL in the post-COVID world (Bell et al., 2020; Bilsland, Nagy & Smith, 2020; Dean & Campbell, 2020; Hodges & Martin, 2020). Like them, we too found that online or blended WIL will play a major role in the future of WIL and unlocks value to students who might not otherwise choose to engage in WIL. As the students in our study expressed, the world of work is changing, and if the goal of WIL is to prepare students for the workplace, why too shouldn't WIL change with it? Through online WIL, students may be able to have more comfortable, less anxious, and more productive WIL experiences. However, as showcased here, the role of technology in WIL goes beyond mode, and there is a need for WIL practitioners and learning technologists to work closer together to explore what else technology can offer to support inclusive and equitable WIL.

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reconnect
Reconnecting relationships through technology

Calendar Connections

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Can collaborative creativity help to connect digital practitioners with each other and enhance their well-being? In order to answer this we undertook a piece of qualitative research. Using bricolage as our methodology, we surveyed participants of a collaborative creative project and used grounded theory in order to categorise the responses. In order to illustrate our findings and better explain the nature of the creative project, we share some of the artwork and music that was created by participants as part of this project. We conclude that as well as enhancing well-being, this creative endeavour also added to the personal learning of these participants.

Keywords: Bricolage, Bricoleur, Collaboration, Curation, Reflective practices, Phenomenology

Introduction

As digital educators we realise the importance of creative collaborations for well-being, and have written about this before (Honeychurch and Taleo, 2020, 2021). As seasoned practitioners in open, online spaces we often design and participate in collaborative projects which use technology to create and share digital media, and characterise these practices as being bricolage (Levi-Strauss, 1966; Papert, 1993). Bricolage, as we understand it, is as much an attitude as a practice - it is an approach to meaning that applies not only to our creative practices but also to our research and scholarship. In this paper we describe how we used bricolage as a research method to understand bricolage as a practice and the bricoleur as practitioner. We look at how curation acts as a form of relational agency to make visible our thinking together (Beetham et al, 2022).

Background information

In the November of 2020 members of a collaborative, creative community called Connected Learning Massive Open Online Collaboration (CLMOOC) produced a calendar with the title ‘Collective Hope’. CLMOOC is a group of educators from across the world with a shared interest in connected learning and collaborative practices. The decision to design this calendar was made during the start of the COVID-19 pandemic in 2020. We needed to find a project that would help the community channel emotions during that time. It needed to be creative, not too serious (but also not too frivolous) and to allow a variety of ways to respond. A group of five of us put out a call over social media using the CLMOOC hashtag asking people to submit an image that they had created or taken on the theme of hope. One of the authors took on the task of curation. The final version was uploaded to our community blog (Hodgson, 2020).

The community chose to create a second calendar in December of 2021 (Hodgson, 2021). This time no explicit theme was chosen, though some of us might have assumed/seen/made a connection with the first theme. The same participants as 2021 calendar were invited first and the response was high enough to progress with the project.

Both 2020 and 2021 calendars follow a similar design that is provided in pdf format for self-printing. This was a primary design decision by the curator and community. Producing a physical artefact was something that we all felt was important as a balance to all the digital work we do. In addition to a single page for each month, attention was given to the front and back page and inside covers. Each contributor is acknowledged in the work. Creative Commons licensing was chosen to further encourage openness and reuse of the works.

Methodology

Bricolage was the overall approach for this project. Bricolage, as we understand it, is the practice of drawing from a variety of theoretical approaches while retaining methodological rigor (Kincheloe, 2005; Semetsky, 2011). We were interested in how people chose their images/artefacts and why and in the global nature and seasonal variances of the locations of the people that chose to provide work for the calendars. We wanted to try to influence their answers as little as possible and see what types of response emerged (while acknowledging that researchers are never really 'outside' the research design), so we opted for a phenomenological approach. In phenomenology, the researcher (s) aim to describe phenomena themselves as accurately as possible, while refraining from any pre-given framework (Groenewald, 2004, p.44).

Data Collection

In following the phenomenological approach we chose to find out how and why contributors had chosen their submissions through the method of a semi-structured survey with a set of prompts designed to encourage respondents to recall the situation that they were in when they created their submissions. Because all of the participants of this project live in different locations, data collection was completed online. The AoIR Ethical Guidelines (AoIR, 2019) were followed in this collaboration. From the basis of the CLMOOC community, which has a shared understanding of trust and a clear creative commons approach to work produced, we used a Google Form for each of the participants of the calendar projects to obtain approval to use artwork and words. The authors were explicit that data collected from the survey would be used for an academic paper. All questions were optional and responses encouraged through free text field. A Google Form was directly emailed to each of the participants of the calendar projects with a number of questions and permission was sought to use artwork from the calendar and words provided in the survey for the purposes of a paper such as this. Out of the 17 participants over the two years of the project we had 11 respondents to our survey. All questions were optional and responses encouraged in free text fields. There was also a space for respondents to contribute 'other thoughts'. A summary of the questions follows:

- Question 1: The 2021 Calendar had a theme of Hope. With the first image in front of you/your mind, ask yourself: Why this image? Did the image relate directly to the theme? What were you thinking at the time? What does it mean to you (now)?
- Question 2: The 2022 Calendar had no direct theme but perhaps a reflection on where things were with you. With the second image in front of you/your mind, ask yourself: Why this image? What were you thinking at the time? What does it mean to you (now)?
- Question 3: Thinking about both calendars: Did you consciously make a connection between both images or works for the calendar? What connections can you see now?
- Question 4: What does the calendar mean to you?
- Question 5: Other thoughts

Data Analysis

Because this was a small data set, all responses were coded together. First each respondent was assigned a number and answers to each question were copied. A grounded theory approach was then used in order to look at the repeated words and concepts for each question. Once all of the responses had been marked up, another copy of all responses was made in order to code them according to the themes that were emerging, refining and recoding as appropriate. Because the responses were free text with no word limit, many of these were not limited to one subject, and so were coded with more than one theme. Once all responses had been coded, the themes were grouped into categories of cognate themes. The point of this last exercise was not to resolve all themes into a discrete set of high-level categories, but to get a sense of the types of responses given and their various nuances.

Results

The resulting categories were negative and positive emotions, connections, joy and metacognition. We will briefly demonstrate the results with direct quotes from the participants.

Negative emotions

It is not surprising that, as these two calendars were created during the pandemic and lockdown, a large number of responses spoke about the fear and uncertainty that they had felt at the time, and of the desire for this to be overcome. For example, one respondent wrote that: ‘As I look back now I remember the fear that we felt, and am thankful that we were kept safe from the worst of the pandemic’ (7,1).

Other respondents wrote that the images they had selected represented balance and the rhythms of nature persisting throughout an uncertain world and helping them to forget their fear: ‘To me, their [birds] presence, and their song are a reminder that when "normal" is disrupted, there are nonetheless certain rhythms that remain constant. The image and thought process I followed is just as relevant now’ (5,1).

Positive emotions

Within the responses there were also many references to positive emotions such as happiness and joy as well as peace and hope (again, this latter is not surprising as it was the theme of the first calendar). For example, one response talks about the positive emotions that their chosen image evoked: ‘I knew that hope is about opportunity, about trusting the process. Go for a walk and the world might just give you a gift’ (3,1). While another also reflected upon how the images they had submitted represented their attitude to life: ‘If we keep an open heart, open mind, and open our eyes and ears, we can see the beauty, joy, and blessings that surrounds us….’ (11, 4).

A third respondent spoke about hope throughout their responses, summarising their thoughts with this comment: ‘The calendar itself is representative of the message — we are all in this together, and what I said before— that CLMOOC people epitomize the serendipitous, the spontaneous, and the planned “giving” to the world, a hope I feel for the world’ (9,5).

Connections

Another theme that arose in the responses was that of connections - of connections between the different images (both their own and those of others), and of the connections that respondents felt to others in the group, with some responses linking these two themes together. For example, one respondent wrote that the calendar represented their connections to the project: ‘The calendar means a connection with the CLMOOC members. I always enjoy the direct connection I have with the people that participate. Throughout the year it is a reminder of these connections’ (10,4). Another wrote that the calendar represented the ethos of the community itself: ‘I think that sort of visual consistency [the cover image] says a lot about the CLMOOC community that continues to connect in various ways, always looking for opportunities’ (8,3).

The Joy of Collaboration

One set of responses are particularly noteworthy in their similarity. Question 4 asked what the calendar meant to participants, and almost all responses spoke about the pleasure that these collaborations gave them. For example one respondent said succinctly that it was the: ‘joy of creating together’ (2,4,). Another noted their appreciation for the generosity of this group: ‘I always appreciate the generosity and openness that the participants have in being included in this project as well as being willing to reflect here in this exercise’ (10, 5). The generosity is reflected in making the final project freely available for download, printing and sharing.

Metacognition

The final category of responses might be categorised as being metacognition and reflection. Some participants talked about how the images they had chosen represented learning from experience, for example: ‘This image is about learning from our experiences in order to move forward in meaningful ways’ (4,2). While another respondent wrote that the act of creating was itself illuminating: ‘what for me is powerful is what you can’t see, you’re following a path where the destination is unclear but you are living a moment of illumination’ (1,1). We approach this moving-towards meaning and the act of self-awareness in creating in the discussion section.

Discussion

Bricolage is the attitude and the method of collecting contributions and curating them in the calendar form. The aim of the bricoleur is to bring apparent disparate items together to make a pleasing display for a purpose. This purpose is not only to track calendar dates but to bring together a community through remembering the contributors as we view their evocative digital creations over time. “One of the major purposes of phenomenological description is to build toward meaning” Fraleigh (1991). With the survey results we were able to add meaning to the description as written in the Background Information section above. As this participant noted there was a timelessness about the contributions, ‘…today— it means the same— the vision of what is possible as sudden and new and hopeful in the world’ (9,5).

The contributions came from many different parts of the world and over different seasons. The work of the curator was to respect the requests of the contributor, for example if a particular month was requested and then to sensitively place the works alongside of the music for each month. The works invite a closer inspection and to pause and consider the image or listen to the music. ‘Often people don’t look beyond the obvious’ (1) wrote this contributor in relation to the charcoal drawing provided (Figure 1). Observation and attention to detail is shown in the artist's hand as charcoal maps the eye of the dog. This close up view shows details that might be missed to the distant observer. The image in Figure 2 shows Sarah’s contribution, a striking photo of a sheep on the Isle of Mull in Scotland. She said ‘I chose this image of the sheep as I loved its pugnacious attitude.’ All the twelves images are accompanied by a QR code (Figure 3) that can be scanned to play music composed by another contributor. The monthly tags were hand written by the curator, scanned and added to each month. Figure 4 shows another technique of digital art in this striking piece which is a commentary on video invigilation in education settings. It aligns with the concepts of eyes, seeing, observation, attention and focus. Part of the challenge of the curation work was to match contributions from different continents and provide a cohesive work that could be enjoyed throughout the following year from any hemisphere.

Figure 1: May Month, Image: Simon Ensor, Music: Kevin Hodgson, 2021.

Figure 2: August Month, Image: Sarah Honeychurch, 2021

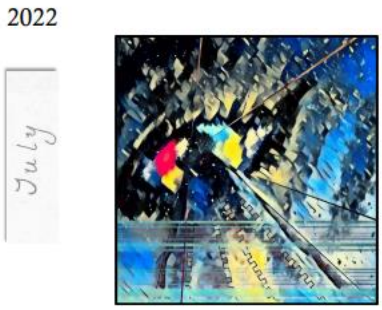

Figure 3: July Month, Image: Matt Offord, 2021.

Figure 4: Music for month of July: 'Gathering at dusk', Kevin Hodgson, 2021.

A recurring theme in the CLMOOC community is one of noticing and observation. Throughout all the images provided we can see a thoughtfulness and awareness of the community. From the images and poetry contributed to both calendars, the handwritten month labels and the music that is provided for the second calendar as shown in the images provided, we can see the care and intention that is taken in this project.

Conclusion and future considerations

What we have learnt is that this project has allowed our community to express emotions, have joy in connection, provide an artefact that continues to connect us throughout the year and encourage attention and care of one another. As well as bringing joy to all of the participants of this project, this creative collaboration helped participants to learn from their experiences and to make sense to them. If there are future iterations of this project it would be good to find out changes in perceptions of participants. This was an informal collaboration between a group of educators, and the positive impact on our well-being leads us to appreciate the important of such projects. When designing distance learning courses in the future, space should be made for such creative projects.

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reconnect
Reconnecting relationships through technology

Collaborating with AIed for better student-teacher reconnection

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The global pandemic has caused much disruption to higher education, but especially that of student-teacher relations as students and teachers struggle to adapt to emergency remote teaching. As the pandemic restrictions ease globally, students and teachers see an opportunity to reconnect. But the development of artificial intelligence in education (AIed) is perceived as a potential disruption to student-teacher relationship. Hence, teachers have understandably viewed AIed with suspicion and with a sense of inevitability. However, teachers should not treat AIed as 'the enemy'. Working collaboratively with AIed could enhance student-teacher reconnection efforts, and by recognizing where AIed should take the lead and where the human teacher should take the lead in building that relationship, the fear that AIed would disrupt student-teacher relations can be dispelled.

Keywords: Artificial Intelligence, Higher Education, Student-teacher reconnection

Introduction

Teaching has always been a complex job (Grossman, 2020), and teaching online even more so. With changing times students expectations have changed and teachers now have to juggle many aspects of teaching on top of the shift to teaching online, with limited success for both teachers and students (Arslan, 2021; Collie, 2021). One of the key concerns is the student-teacher disconnect that has arisen from the sudden shift to deliver education online (Almahasees et al., 2021; Arslan, 2021). Even as general pandemic restrictions gradually ease, this sense of disconnectedness from suddenly studying online is likely to continue because of many reasons and one of them is pandemic concerns continue to linger (Bashir et al., 2021), and the other is student flexibility of studying online (Driscoll et al., 2012). However, student-teacher relationships still remain important (Dhawan, 2020), despite the disruptive effects of COVID-19.

The advancements in Artificial Intelligence (AI) have painted AI as a helpful tool for teachers in reconnecting with student and fostering the relationship (Koh et al., 2022). AI can help take over multiple administrative roles and can perform tasks that teachers perform, theoretically allowing teachers to have more free time to better focus on learning and teaching and devising different ways of connecting with students. However, AI has now started to advance into areas such as the development and creation of study materials, even to some extent, the delivery of course material and information.

Given recent developments of AI in education (AIed) (Hwang et al., 2020), and the resource constraints of many educational institutions (Friedman et al., 2020), many have wondered if this meant that AIed will now be the latest disruption to student-teacher relationship. As such, this paper will investigate *how an AIEd system could contribute to the post-COVID-19 desire for the student-teacher to reconnect.*

AIed and the Role of the Teacher

The initial purpose of AIed was to shift administrative burdens from the teachers so as to allow teachers to theoretically focus on the more human aspects of education (such as empathy, personal guidance etc). Currently, AIed has already progressed to the point of knowledge transmission, where the AIed 'teach' to a limited extent by using pre-built educational packages which would have included the content material, some level of academic support, monitoring and evaluation (Koh et al., 2022). This, in no small way, has alarmed many teachers (Celik et al., 2022), seeing this as a first step to reducing the teacher's role to that of a facilitator, which also has implications on the student's learning experience (Shen & Su, 2020). However, as with the introduction of any technology (not just AIed), the role of the teacher will evolve naturally. For instance, Qbot (Microsoft, 2020) can pick out struggling students and flag them out to the teacher. Teachers can then intervene just-in-time with the right approach given the right background information. This gives students an opportunity to reconnect with their teachers in a meaningful manner, allowing a human touch to be present in the aspect of teaching. AI can also provide a personalised study guide for each student, but the human teacher can add to the study guide by including personal stories relevant for the student to learn, and even ways to motivate the student based on their past interactions with the student.

But this is not only for connecting with struggling students. AI can be used to create engaging content for the teachers who may understandably not be well versed in some software or to help re-enforce certain ideas. Instead of choosing between a ‘sage on the stage’ and ‘a guide on the side’, teachers can work with AI to play both roles, by providing knowledge and encouragement at the same time. AI can then help tweak or personalise the knowledge and the teacher can then add their final personal touch for the student (Joshi et al., 2021).

These examples show that the role of the teacher will shift from a more traditional ‘sage on the stage’ to a ‘guide on the side’. Teachers and AIed will take turns taking the lead on student-teacher reconnections depending on the task at hand. These tasks can be placed along a spectrum of teaching tasks, starting from a total procedural task and ending at pastoral care tasks (Fig 1). This spectrum incorporates some of Bloom’s Taxonomy in terms of the identification of the order of thinking. This helps give certain points along the spectrum easier to identify. However, teaching is not solely about the order of thinking skills. Other aspects such as administrative tasks and pastoral care have been added to give more context to the types of task a teacher would expect in today’s world of online learning. The level of AI involvement depends on the type of task, which can be led more by a teacher or AIed or even co-led. Naturally, as the type of task moves from a more procedural task to a more pastoral care task, the teacher must also increasingly lead the way that the student-teacher connections are formed.

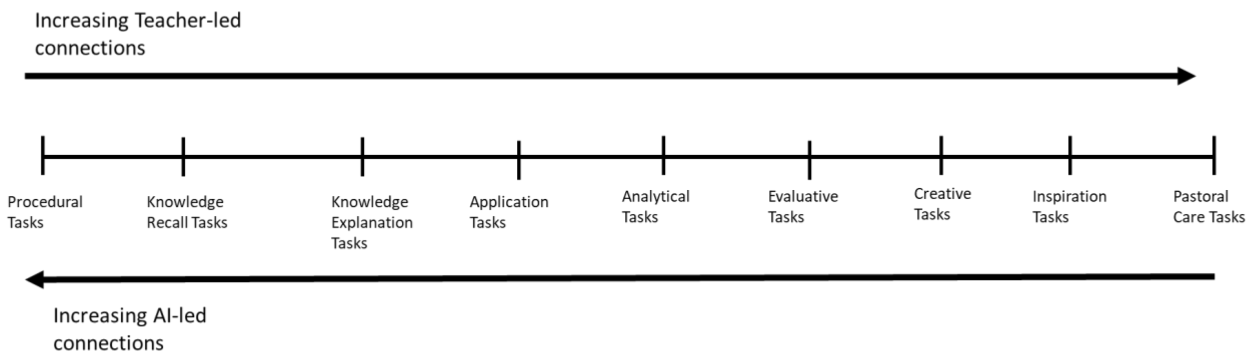

Figure 1: Spectrum of Teacher-AI teaching tasks

Procedural tasks refer to the tasks that usually administrative in nature, such as the request for deadline extensions and reuploading of correct documents. These tasks can be AIed led and the teacher will play a smaller role in such tasks.

Teaching tasks that involve lower order thinking tasks such as knowledge recall and explanation tasks can be more AI led as well. The delivery of content, especially in an online learning environment, can be conducted more by the learning platform. Explanatory questions can also be answered by AIed, although teachers would have to play a bigger role to ensure that the context and content is appropriate. Similarly, as the teaching tasks start to involve higher order thinking skills, the teacher would have to play an increasingly larger role. This would involve evaluative and creative tasks, where a more ‘humanistic’ approach would need to be adopted toward teaching.

But teaching also involves the non-academic skills such as motivating students, inspiring them broadening their horizons. These tasks must be teacher-led, as the all-important student-teacher relationship takes centre stage. AIed can help in a limited aspect, for instance, providing a record of past interactions or possible new aspects, but the teacher must connect with the student to complete these tasks. Pastoral care tasks involve the actual care and counsel of the student’s wellbeing, and the human touch is even more important in this aspect.

Moving from the extremes, teaching tasks involving application and analytical thinking skills tend to be more of a co-led area. AIed can show how well students have been applying certain concepts, but the teacher also needs to provide the context and the relevance of how a concept is applied. Additionally, teachers can provide their personal stories and their personal experiences on how concepts are applied and understood, providing additional opportunities for reconnection.

AIed as a partner

If used properly, AIed can be a partner in helping students reconnect with teachers. By where the task lies on the spectrum (Fig 1), AIed can support the highly important student-teacher relationship by allowing a ‘humanisation’ of the online teaching. Amongst the three types of interactions (learner-content, learner-learner, learner-instructor) identified by Moore (1989), Martin and Bollinger (2018) has found that the learner-instructor interaction to be most important. This is also supported by other studies showing how a good learner-instructor interaction can result in higher levels of motivation and engagement (Koh, 2021; Zilka et al., 2018) and a better learning experience.

A Highly Accessible Student-Teacher Reconnection

In an online learning environment, students are not expected to study only during fixed office hours (Almendingen et al., 2021; Pérez et al., 2020). At that point of study, having a response from the teacher (even if it is via the AIed) helps students to remain connected to the teacher. As AIed takes over procedural tasks and queries, teachers can connect with students on a different level (inspiring task). For instance, a student may ask the AIed about submission deadlines at 3am in the night and then ask the same question again in a few days’ of time. The human teacher may see this as an opportunity to connect with the student to see if there is some level of assessment anxiety. This action will be supported by the AIed’s information and prediction. But most importantly, the AIed and human collaboration would have stretched across the odd hours of the day providing an avenue for connection and reconnection.

This sense of timeliness also speaks to the instantaneity of response. The instant response allows the student to keep the connection with the material that they are studying and give teachers an insight into the student’s learning process. This allows teachers to know when and how to intervene and gives students and teachers an excellent reconnection opportunity. Additionally, it reduces the probability that the teacher forgetting or missing out on the query, all of which communicates a poor nonverbal communication cue to the student (Koh, 2021).

This accessibility also extends beyond that of time. Students no longer need to physically be in the same room as their teacher to form meaningful connections (Luckin et al., 2016). AIed allows students to be able to reach out virtually if they have internet access. This means that specific technological needs (such as the need for laptops, PCs etc) may not be as important as personal mobile phones may be sufficient. The lack of need for specific technology can also be argued as reducing the barriers to connection caused by unequal access to technology (Sharma et al., 2022).

Critically, the accessibility of time and space means that learning can now fit around the other aspects of daily life. Students can choose to hold full time jobs and connect with their teachers in a different manner, bringing different experiences and perspectives into their ‘classroom’. This makes the connection between the student and teacher seem more authentic as the ‘real self’ maybe presented (Al Tawil, 2019). Bringing in personal experiences also help inspire and encourage students accordingly, even in an online environment (Singh, 2021).

New Ways of Learning that Reconnect

AIed will create new opportunities for connection via the new ways of learning. Using the spectrum above, this can be broadly categorised as AI-led and teacher-led (which also implies that it is AI-empowered). AI-led teaching can be seen in the form of the delivery of content and assessments. Personalised content delivery and data-driven productive learning activities can be designed by AIed (Hwang et al., 2020) as part of the teaching tasks of content delivery. In practice, students will get access to the course material, and a study guide that is catered to their learning behaviours and previously identified content. Teachers can complement this process by conducting higher level teaching tasks such as inspiring and motivating students. This could be supported by AIed as the information gathered from the student’s learning behaviour can be applied contextually and appropriately to promote learning performances, enhance motivation and increase engagement.

Whilst AI-graded assessments are still in development (Manyika et al., 2017; UNESCO Education 2030, 2019), it also proposes a new way of student-teacher connection. Assessments will typically fall under the ‘middle’ level of teaching tasks, where both AIed and teachers will have to co-lead in varying degrees. AI-led assessments can be applied in the levels of explanation and description of concepts (Gardner et al., 2021; Jia, 2009). Teachers can provide context to some of the answers provided, but should take the lead in the assessment higher order skills such as creativity and analysis (Jimenez-Mavillard & Suarez, 2022). This new assessment collaboration will also necessitate a new way that students need to connect with teachers. Students will now connect with teachers on the higher order teaching/learning tasks, such as application and analysis, rather than more foundational tasks such as explanation and information recall. Theoretically, AIed can potentially develop to the point where it will conduct continual assessment of students' learning progress (Restrepo-Calle et al., 2018) and allow thus enhancing student-teacher reconnection without worrying about looming examination.

Finally, the social presence aspect should also not be excluded. Studying online can be an isolating experience (Dixson, 2015) and AIed can help breach that divide by supporting a community of inquiry approach. AIed can help drawn connections for students who seem to be struggling in similar areas, setting up breakout rooms with teacher support or even enforcing some rules within online discussion spaces. Relevant content can be selected to support the discussion and the teacher can make use of that selected content to enrich the discussions.

Summary and Future Work

Although it may been tempting to say that the role of teachers will dwindle once AIed is implemented, that is simply not likely to happen (UNESCO Education 2030, 2019). Teachers still provide the 'human touch' in learning which help develop non-academic skills such as emotional intelligence, creativity, and communication skills (Manyika et al., 2017; Martin et al., 2018). Above and beyond the non-academic skills, human teachers are able to inspire and encourage accordingly, using their own experiences and knowledge, even in an online environment (Singh, 2021).. In an AI enhanced online post COVID-19 educational landscape, the student-teacher relationship still remains as critical as ever. As with any tool, AIed can be both disruptive and supportive. However, a good awareness of the task at hand would allow for a better collaborative effort between teachers and AI which in turn aids the way that teacher and students reconnect. In this 'new normal', AIed can enhance the student-teacher reconnection and build better connections depending on how AIed is deployed.

Given the impending march of AI into the online classrooms, a positive AI-Teacher collaboration can be built by having a good understanding on where each task sits on the AIed-Teacher spectrum. Future work can take this understanding into the design of future AIed applications, where the application will be designed to facilitate collaboration with the teachers depending on the task on the spectrum. Future refinements of the spectrum are also welcome. This will provide a fine-grained definition of each point of the spectrum, updating it as the relationship between technology and the human teacher evolves. This will also allow for new avenues of the student-teacher connection to be established and this will then inform future refinements of the spectrum.

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reconnect
Reconnecting relationships through technology

Teaching teachers to propose meaningful learning objectives: A MOOC case study

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Learning objectives designate what students should be able to do to transform their social reality. Evidence shows tertiary education teachers usually do not know how to propose meaningful learning objectives. The aim of this study was to evaluate the effectiveness of a MOOC to teach how to formulate relevant learning objectives. This study has measured participant's retention, performance on the topic, satisfaction and learning perception. A pilot version of this course was made available for 40 days. Out of the 176 participants enrolled, 60.8% completed the course. The average score in the initial test was 5.71, while in the final test was 8.67. 91% of the participants evaluated the course positively. Considering the high retention rate, the proficient performance at the end of the course, and the positive evaluation by participants, it was concluded that the MOOC was effective.

Keywords: Learning objectives, learning outcomes, teacher training, MOOC.

Meaningful learning objectives

In the 1960s and 1970s, the concept of learning objectives was widely disseminated from primary to tertiary education (Gusso, 2013). This concept was initially proposed as a description of what students should learn, defined by student's actions during classes rather than the content taught (Mager, 1962; Vargas, 1974). One of the most recognized proposals in this direction was Bloom's taxonomy (1956), which highlighted that the aim of education should not be memorization, but the development of different abilities to deal with the content (Anderson, 2005).

Since the 1960s, different terms were used indiscriminately to designate educational intention, such as: objectives, goals, intents, aims, outcomes, or tasks (Allan, 2006). And there is a relative consensus that this concept is relevant to "offer a starting point for a viable model for the design of curricula in higher education" (Allan, 2006, p. 93).

In parallel, the contributions of authors such as Paulo Freire helped to spread the idea that the purpose of Education should not be exhausted in what teachers or students do in the classroom. Educational objectives must impact the way students deal with the social needs of their community (Gusso et al., 2020). Thus, Kubo and Botomé (2001) highlighted that the proposition of meaningful learning objectives in tertiary education should consider what the learner should be able to do, after the course, to transform social reality as higher education professionals and as citizens.

Proposing meaningful learning objectives helps to increase students' perception of the relevance of courses, to establish realistic expectations regarding the subject, to define a clear criterion for the evaluation of the educational effectiveness, and to guide all the design of curricula (Cortegoso & Coser, 2011; Vargas, 2009). In addition, recent studies have demonstrated that the presentation of learning objectives has a positive effect on learning retention (Sana et al., 2020), and helps students identify what is most important in a course, helping them to better organise their own studies (Osueke, Mekonnen & Stanton, 2018).

Besides knowing what learning objectives are, it is also relevant to know what they are not. In this sense, an important contribution that helped to make more explicit the core characteristics of learning objectives was presented by Botomé in 1985, in which the author distinguishes meaningful learning objectives from false learning objectives (Cortegoso & Coser, 2011). These are described by the author as phrases that, instead of being learning objectives, only indicate teachers' intentions, activities performed in the classroom, observable actions of students in the teaching context, or even the mere description of content using verbs. Teaching this distinction to teachers contributes to qualify them to propose learning objectives more accurately (Carvalho, 2015).

The idea of learning objectives changes along the decades. Nowadays, it is not characterized as student actions in the classroom to be measured by the teacher (Kubo & Botomé, 2001). Meaningful learning objectives should therefore not be reduced to false learning objectives (Carvalho, 2015). Despite the use of different terminologies in the field of tertiary education, there is a relative consensus in the literature regarding learning objectives as the description of what learners should be able to do, after classes, in society. This conception reinforces the purpose of education as the development of abilities to transform social reality (Gusso et al., 2021). In view of these points, the importance of formulating learning objectives appropriately is evident. Yet, few teacher education programmes emphasise the formulation of meaningful learning objectives as a component of their training curricula.

Research Objective and Method

The aim of this study was to evaluate the effectiveness of a massive open online course (MOOC) for teacher training, whose general objective was to enable participants to propose meaningful learning objectives. The effectiveness was evaluated through the measure of participant's retention, performance on the topic, satisfaction and learning perception.

The MOOC 'propose meaningful learning objectives'

The main learning objective was to "propose meaningful learning objectives", and involved two specific objectives: to characterize the function of learning objectives in higher education and to characterize false learning objectives. The course was elaborated in MOOC (Massive, Open, Online Course) format and offered in a university educational platform. This platform is focused on courses for teacher training and science education and used, at the time of this study, a customized version of the learning system management (LMS) Moodle (v. 3.8). The courses designed for this platform follow principles derived from behavioural sciences to promote performance, retention, and satisfaction of participants (Gusso et al., 2021).

The course was composed of the following stages: I) completion of the participant's profile; II) initial test; III) three teaching units; IV) final test; V) course satisfaction form. Each teaching unit consisted of content in the form of text or interactive video (h5p), with integrated exercises providing immediate feedback to indicate student success or failure. In case of errors, the participant was asked to redo the activity to progress. In the teaching units, proficiency above 90% was required in the exercises of the unit for the student to progress in the course.

The initial and final tests consisted of 16 questions related to the learning objectives of the course. The initial test was inserted as a parameter of students' performance in the topics before taking the course, to allow comparison with the final performance. To be approved in the final test, the student should obtain a performance above 80%, being able to retake the test as many times as necessary until reaching the proficiency criterion. To retake the final test, the student had to wait at least 30 minutes before doing it again.

The satisfaction form contained 15 multiple-choice questions on different aspects of the course and one open question asking for participants' suggestions, criticisms, compliments, or doubts about the course.

Participants

176 participants enrolled in the course, of which, 107 concluded it with proficiency. Among the concluding participants, the average age was 27.57 years (dp = 8.39), and most (82.24%) were female. 81 (75.7%) completers were undergraduate students, 8 (7.47%) either had a PhD or were enrolled in one, as well as 8 either had a master's degree or were enrolled in one. In addition, 45(42%) people indicated that they had previous teaching or research experience. 94 (87.85%) reported having prior experience with online courses.

Procedures

The course was advertised on the website of the university and on the platform's social networks and was made available between 40 days between August and September of 2021. Data regarding the performance, retention and satisfaction of the participants were extracted from the LMS, organised and anonymised by the platform coordinator using Microsoft Excel (v. Microsoft Excel for Mac 2020). Descriptive and inferential analyses were performed using R Studio software (v.1.4).

For the comparison between the performances in the initial and final test, a one-group pretest-posttest quasi-experimental design was used, using a dependent t-test for paired samples. For effect size analysis, Hedges' g was used as a measure.

Results

The results of the course evaluation were organised into three categories: students' performance, retention and satisfaction and learning perception.

Students' performance

Table 1 shows a comparison between the participants' scores in the pre-test (before the course), in the first and in the last attempt of the final test (in which the participant obtained a score above 80% for approval in the course). The average number of attempts to obtain a score above 80% in the final test was 2.85. It is possible to notice an increase in the average score and a decrease in the standard deviation. When comparing the scores using a dependent t-test for paired samples, significant differences were identified both between the pre-test and the first attempt of the post-test, and between the pre-test and the last attempt of the post-test. The calculation of the baseline Hedges' g with the first attempt on the final test resulted in 1.23 (large size), and with the last attempt, 2.15 (large size).

Table 1: Comparison between the scores of the participants in the initial and final tests

	Low score	Best score	**Ave-rage**	St. Dev.	Comparison with pre-test (*teste t*)
Pre-test	2,64	10	**5,71**	1,85	-
Post-test (First try)	3,02	10	**7,83**	1,56	t=14,91 (p=0,00003)
Post-test (Approval try)	8	10	**8,67**	0,55	t=18,53 (p=0,00003)

Retention

Out of the 176 enrolled in the course, 107 (60.8%) completed the final test with proficient performance. This retention rate is expressive, given that the average rate in MOOCs platforms is 6.5% (Jordan, 2014). Four possible aspects were considered as possible determinants of this result. One of the reasons that may have contributed to the high level of retention is the audience profile. 87.85% of the people indicated had already had previous experience with online courses, an aspect considered as a predictor of retention (Goopio & Cheung, 2021). Another aspect was the limited period to finish the course, which may have contributed for the participants to devote more attention to explore all the available content. A third aspect is that the data collection was conducted during a period of disruption of face-to-face teaching activities due to the COVID-19 pandemic, which may have increased student engagement in online activities. Finally, the instructional design of the course itself, which incorporates contributions from behavioural sciences to promote retention (Gusso et al., 2021).

Satisfaction and learning perception

Table 2 presents the participants' perceptions regarding seven aspects of the course. In the first three rows it is possible to observe a high agreement regarding the learning perception of the three main learning objectives proposed in the course. Also noteworthy is the extremely positive evaluation of the course in relation to its teaching method (95.3% of favourable dispositions), and the high percentage of students who would recommend the course to other people (90.7%). Participants were also asked about the overall assessment of the course experience, using a five-point Likert scale (very good - poor). On this measure, 90.6% indicated favourable dispositions (57% very good and 33.6% good), 7.5% neutral dispositions, and only 1.9% unfavourable dispositions (0.9% regular and 0.9% poor).

Table 2: Distribution of students' perceptions regarding different aspects of the course

Evaluated items	Strongly agree	Partly agree	Neither agree nor disa-gree	Partly disa-gree	Strongly disagree
Upon completion of this course, I feel able to formulate learning objectives.	48,6%	49,5%	1,9%	0%	0%
Upon completion of this course, I feel able to characterise the function of learning objectives in higher education.	65,4%	32,7%	1,9%	0%	0%
Upon completion of this course, I feel able to identify false learning objectives.	62,6%	35,5%	1,9%	0%	0%
Language employed in this course is easy to understand.	79,4%	17,8%	1,9%	0,9%	0%
I felt tired when completing the units of this course.	13,1%	40,2%	9,3%	18,7%	18,7%
I positively evaluate the teaching method used in this course.	72,9%	22,4%	2,8%	1,9%	0%
I would recommend this course to a friend or colleague.	70,1%	20,6%	8,4%	0,9%	0%

In the open question of the satisfaction form, which demanded suggestions, criticism, praise, or doubts from the participants, 92 mentions to the course, or to any of its components, were presented. Of these, 46 were compliments, 28 were suggestions, 15 criticisms and 3 doubts. Among the compliments, the most frequent topics were about the course in general (24), about the use of the h5p interactive video lesson resource (13), and about the quantity and types of exercises in the teaching units (13). The suggestions were very diverse, with the two most frequent ones being to replace the content parts in the form of text by interactive video (4), and to adapt the course to also contemplate the needs of teachers of basic education, not only of higher education (3). The main criticism was in relation to the need to retake the final test until obtaining proficiency and the absence of immediate feedbacks in the final test so that students know exactly what they are doing wrong (7).

Conclusion

Considering the high retention rate in the course (60.8%), much higher than reported in other studies with MOOCs, the students' performance in proficiency level (8.67), the very large effect size (Hedges' g=2.15), and the high indicators of satisfaction and perception of learning, it is possible to state that the online course "propose meaningful learning objectives" was effective. The results strengthen the idea that well designed online and massive courses can be a good contribution to assist university teachers training.

In addition, the number of compliments and suggestions to expand the use of the video-interactive resource is remarkable. To the participants, it seems to be more satisfying to watch video lessons in the online system than to read texts, even if they are short. It would be important to evaluate the effects of a possible replacement of texts by videos on performance, retention, and student satisfaction in future studies.

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reconnect
Reconnecting relationships through technology

Turn-it-out? Reframing the Academic Integrity Conversation in Online Legal Education

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The challenge of academic integrity in online study is not a new phenomenon. For undergraduate law students, a finding of academic misconduct is especially serious, having ramifications for student eligibility to be admitted to legal practice. To date, higher education strategies to address plagiarism, contract cheating, and collusion have predominantly focused on detection methodology / technology via assessment. Reconceptualising the challenge of academic integrity in online learning requires an iterative understanding of the motivations of online learners, informed by the unique engagement challenges associated with adult online learning. Arguably, the 'battle' for integrity can never be won via increased detection and punitive measures; rather a focus on fostering student desire to act with integrity, by helping learners to connect academic integrity with their emerging professional identity is key. This connection must be supported by profession-facing teaching and assessment design, with facilitated learning relationships that build skills and confidence.

Keywords: Academic integrity, online legal education, emerging professional identity, authentic assessment.

Engaging with the concept of academic integrity as an adult learner is a challenging prospect, yet this challenge need not, and arguably should not, be taken alone. Considered through a socio-cultural lens, learning and teaching are both underpinned by relationship building with multiple stakeholder groups, effectively these relationships form the safety net for learning to occur. In the context of Higher Education, specifically online legal education, these relationships provide a vital opportunity for teaching to be informed by the goal of helping students develop an emerging professional identity, directly aligned with the profession students seek to enter. Relationships between faculty/student services and learners, not to mention student peer - peer relationships, are pivotal in supporting this process. Learning experiences should be evaluated in terms of how they can build confidence in learning (Keller, 1987) and enhance these relationships. Learning and assessment need to be facilitated in a way that encourages students to "own" the deep conceptual problems embedded within subject matter and connect this understanding to legal practice itself. Understanding and demonstrating academic integrity are critical to both the learner and graduate legal professional. This skill is further enhanced when the discourse around academic integrity is educative (Brimble, 2015) rather than punitive in approach. Addressing academic misconduct needs to be a "collaborative effort" (Ewing, et al.,2015, p.575) between academics, faculty and student support services focused on building competence and relationship with learners, while also building the capacity of academic staff to provide innovative learning In this paper, we consider several practical strategies adopted in an online Bachelor of Laws programme, which foster both engagement, student confidence and academic integrity via the channel of emerging professional identity.

Context

The Bachelor of Laws degree at Charles Sturt University is a 3-year (full-time), 6-year (part-time) online programme of study. The degree is accredited by the Legal Profession Admission Board of NSW, which mandates types of assessment (such as examinations) and accredits content of core subjects (the "Priestley 11") and elective subjects. In terms of teaching, each Priestley 11 subject is an intense and content-heavy journey through 15 weeks of online learning and assessment, culminating in a summative examination.

Generally, the students enrolling in this type of degree align to certain cohort demographics. They are adult learners and frequently first-in-family to have undertaken tertiary education. They are mostly employed and juggling online study with employment and carer responsibilities. Their motivation to study law is often closely tied to a desire to change employment and/or life circumstances. As with many online learners, flexibility in how and when they engage with learning is a key attraction and requirement of online study.

The institutional framework surrounding the enrolment of these learners, Charles Sturt University's Academic Integrity Policy, explicitly requires academics to employ an "educative approach" (Charles Sturt Academic Integrity Policy, 2021). Certainly, this rhetoric is popular among many tertiary institutions (Carroll & Morris, 2015, as cited in Ransome & Newton, 2018). However, interpreting and implementing how such an approach informs learning design and instruction is highly variable and, arguably, "stands outside the mainstream discourse of learning about teaching in higher education" (Ransome & Newton, 2018, p.133). Institutional policy is often left to be translated to learners by the individual academic, on a task-by-task basis, relying heavily on an implicit (yet often incorrect) assumption that those teaching courses are also those who design the assessment regimen. Legal academics have attempted to address academic integrity risk mostly by designing tasks that make it harder to cheat, with a focus on implementing assessment modalities/text types that are less open to plagiarism and cheating (e.g., oral assessment, group work, invigilated exams) and periodic redesigning of the tasks themselves.

At the Centre for Law and Justice, the 'educative approach' to academic integrity is being reconceptualised at a deeper level. Specifically, learner agency in ensuring academic integrity is being progressively engaged, by making explicit the connection between 'learner integrity' and professional identity ("integrity culture"). Confidence is also implicitly nurtured through diverse learning opportunities and relationships that empower individual learning habits and allow for peer-peer consolidation of understanding.

Questioning Our Understanding of Why Students Cheat

There are numerous factors to consider in understanding online law students' motivations to cheat. Success in online legal study requires a significant level of autonomy; the learner needs to be extremely focused, disciplined, and proactive in their learning. These drivers are further accentuated given class attendance is not mandatory, coupled with the oft-marketed element of student choice regarding the 'when', 'how' (and 'if') they engage with learning material. Acknowledging the impact of both learner choice and motivation, we must also consider modality. From a broader perspective, online legal study as a learning environment / experience, is fraught with potential 'threats' to the academic integrity of the learner. Time-poor people, studying in an isolated context are at risk of becoming transactional in their study motivations. The personal and financial costs of online education are high, with students regularly sacrificing time, money, and personal relationships to study. We know that this can create desperation to succeed, which puts students at considerable risk of academic misconduct (Coffey, et al., 2018). The implicit relationship between effective curriculum design, delivery, and learner perception of fairness is well documented by Brimble (2015). Approaches to assessment and delivery that utilise repetitive text types or are inadequately scaffolded foster a perception of "unfairness" and subsequent disengagement by the learner.

The increased commercialisation and availability of cheating sites, coupled with an emerging student perception of progression entitlement, based on personal and financial resources invested, make cheating explicable. Students are also at risk of academic misconduct when they feel they lack the requisite time or skills to successfully complete a task. "When students feel confident, they have the necessary skills to be successful, they are less likely to feel the need to cheat." (Coffey et al., 2018, p.21). Additionally, where there is a disconnect between the perceived relevance of assessment and the skills of lawyering, there is a resulting risk that students will conceptualise assessment tasks as transactional (Harper et al, 2021). Failure to arouse knowledge-seeking curiosity (Keller,1987) can have implications for the progression and retention of learners, but it also can increase the risk of "outsourcing" assignments, plagiarism, collusion, and contract cheating.

For law students, the stakes with academic integrity are especially high. To be admitted into legal practice in New South Wales graduates are required to demonstrate that they meet a character requirement that they are a "fit and proper person" to practise law. A prior finding of academic misconduct or failure to disclose a misconduct finding can mean a law student will not be eligible for admission as a solicitor, despite having completed their undergraduate degree (Wyburn, 2008).

Approaching a Methodology for Engagement and Integrity

Whilst there is no single methodology that successfully addresses the risk of academic misconduct, Coffey et al. (2018) identify several principles educators should consider in developing student integrity, with each strategy reliant on relational understanding and development.

Firstly, assessment and teaching programmes need to foster a relationship in the student's mind between study success and their emerging professional identity. Employing engaging, profession-facing assessments helps engage genuine student participation, and is a pathway for socialisation of learners into the expectations of the profession. Enabling students to connect academic integrity to the identity of a practising lawyer is essential. Pedagogical approaches based on detection/compliance miss a valuable opportunity to shape emerging professional identity. (James & Mahmud, 2014). This thematic is picked up on by several academics.

Secondly, academic integrity must be practically situated and explained within each assessment task. Instruction that explicitly acknowledges the temptation to cheat yet offers a way of navigating both task and information sources, is a powerful tool in building student integrity. Contextualising university academic misconduct policy at course and subject level is essential, and far more effective than a detection-based approach (Ewing et al., 2015).

Finally, assessment and subject design should foster the relationships and critical evaluation skills students need to study effectively together and on their own. Cultivating relationships with faculty, and relationships with peer learners is pivotal. Building student confidence to attempt assessment and seek help when needed increases student progression and helps achieve academic integrity.

Designing for Relevance and Engagement

In CSU's Bachelor of Laws programme, considerable time has been invested in assessment design and curricula which socialise the learner into an emerging professional identity, helping them to make the connection between academic integrity and professional identity. This is supported by building in opportunities for students to seek additional guidance and develop requisite skills. Central to this development is the design and facilitation of learning opportunities that cater to diverse learners. This approach to curriculum design has been informed by an action research methodology that has iteratively and reflectively enhanced the curriculum. It is informed by progression rates, student feedback, and LMS analytics measured over the past 6 years, to meet the needs of online law students and the legal profession.

This praxis was illustrated in the second-year subject, Civil Procedure. Initially, the subject had a high student failure rate (see table below) and low student engagement, presenting a scenario 'ripe' for academic integrity breaches. Weekly tutorials and lectures were expositive, incorporating some multimedia with embedded (pre-recorded) video lectures in the online learning materials. Assessment comprised a 15% quiz, 35% essay and 50% examination. There was a student perception of high failure risk, especially as most learners tend to over-rely on assessment before examinations to achieve passing grade. Waltzer and Dahl (2022, p.1.) identify the relationship between perceived risk of failure and academic integrity breach through "situation specific perception, evaluations and motivations". When students consider they are at risk of failure, the risk of cheating increases.

The subject teaching programme and assessment were redesigned with a profession-facing narrative. Working from the premise that students require a contextual framework to translate procedural law into, we designed a fictional case as the narrative underpinning the whole subject's teaching and assessment regimen. Each assessment task related to the unfolding narrative and required applied problem- solving of procedural rules. Assessment was redesigned to utilise profession appropriate artefacts (file notes, oral application to the court and an annotated statement of claim). Task weightings were adjusted lower, reducing perception of failure risk. Authentic assessment became a central focus of the synchronous weekly tutorials and overall teaching of the subject. This approach was implemented to enhance student motivation and engagement with weekly curriculum. Delivery of each weekly topic utilised case-based learning to enhance authenticity and to situate learning in connection to professional practice.

The use of the case-based narrative, coupled with authentic assessment tasks, directly informed student perception of relevance with each week's learning. Weekly tutorials provided an opportunity to engage with this understanding, via both concept checking within the group, followed by applied problem-solving. The explicit structure and learning opportunity of the online tutorials were entirely transparent and advocated to students frequently, with half of all tutorial time devoted to connecting the learning to the upcoming assessment. As one might expect among pragmatic learners, we found attendance increased when this method was adopted. Students reported in the subject evaluation surveys a significant increase in being able to judge the quality of their own work before submission. The fictional case presented to students allowed them to engage with client issues, while simultaneously scaffolding the understanding and skills required for subsequent assessment completion. The weekly 'case' was also connected to current high-profile litigation taking place in Australian courts (utilising online court files of actual litigation) and related to both the weekly material and upcoming assessment. A master class on pleading was provided by inviting a barrister to present to students, integrating the ‘voice of the profession’ and making assessment readily relatable to professional skill sets. Implementing this approach, students were able to understand the relevance of ‘dry’ procedural rules to the dynamic practice of litigation. Student evaluation survey responses to the statement: “I could see a clear connection between the learning outcomes, learning activities, and assessment tasks in this subject” increased significantly.

We found this approach not only provided a clear conceptual framework for the students, but heightened learner engagement and interest. Analysis of subject evaluation survey results, student progress and failure rates demonstrated the following trends:

Table 1: Cohort numbers, failure rates and subject evaluation survey question responses

Year/Before Changes or After Changes	Cohort size (n=)	Failure rate (% cohort)	Survey completion (n=)	Student agreement rate to Q7 *	Student agreement rate to Q14**	Student agreement rate to Q15***
2018 (before)	43	28%	15	60.0%	86.7%	53.3%
2019 (before)	39	37%	15	73.3%	93.3%	86.7%
2020 (before)	66	33%	19	47.4%	68.4%	57.9%
2021 (after)	82	11%	32	81.3%	96.9%	84.4%
2022 (after)	82	13%	27	88.9%	100%	96.3%

*Question 7 of the subject evaluation survey each year asked, “The learning activities in this subject created opportunities for me to learn from my peers”.
**Question 14 of the subject evaluation survey each year asked, “I could see a clear connection between the learning outcomes, learning activities and assessment tasks in this subject”.
***Question 15 of the subject evaluation survey each year asked, “The learning activities in this subject enabled me to judge the quality of my own work”.

Learners’ weekly learning in the subject was explicitly directed through a matching weekly study guide. These guides act as a “how-to”, regarding organising study time and navigating subject resources each week. This form of scaffolding includes the provision of key concepts for organising notetaking with integrity, which in turn assists the student in making the connection between that week’s learning with upcoming assessment. Informed by a cognitivist approach, study guides effectively help “chunk” weekly content into sequenced, scaffolded, and manageable tasks that give students a methodology of study, relating the weekly content to prior learning and upcoming assessment.

A series of short ‘concept lecture’ podcasts were progressively recorded each week and made available to students, both within the subject site and via external subscription-based platforms. The concept lectures were an opportunity for the academic to provide a less formal, yet highly targeted artefact to assist with student meaning-making around key concepts. This created an additional channel for self-directed mobile learning, away from embedded media and text within the learning management system (Schommer-Aikins &Easter, 2018). This was positively received by students: ‘Podcasts rocked for the drive or train or even a walk!’ (SuES data, 2022).

The importance of peer-peer learning opportunities was acknowledged through the creation of online study groups. Accessible to students on an ‘opt in’ basis, groups of up to 8 students were provisioned in the learning management system, along with the tools associated with Blackboard groups (file sharing, inter-group email, and discussion boards). It is worth noting that, although the online study groups are first made available to students the subject site, students quickly transition to external communication platforms (e.g., social media or meeting platform the group is most comfortable with). This suggests the initial functionality of the study groups acts as a catalyst for student-led personal learning network development. Drawing on the learning theory of connectivism (Kop, et al., 2008), study groups provide a learning opportunity outside of the formal tutorial structure to evaluate, share and create knowledge through peer-to-peer interaction. Groups were supported with the weekly study guides providing “guiding questions” for groups to consider and discuss relating to assessment. This resulted in increased student learning through peer interaction and potentially contributed a decreased feeling of social isolation for online learners.

Importantly, online study groups created a platform for engaging with academic integrity outside of traditional channels. These provided an opportunity for instruction and targeted discussion around the nature of academic integrity on a task-by-task basis and within a group context (e.g., collaborating not colluding, not sharing written work, etc.). Anecdotally, our experience has been that students were more inclined to seek clarification of understanding of both content and integrity requirements (especially regarding assessment) as a group, rather than as individual learners. Group discussion of assessment tasks affirmed and validated questions that individual learners privately had and empowered students with a "collective voice" to approach the instructor for understanding. In turn, this interaction informs the academic of content or assessment requirements that may need to be further explained to the whole class, thus acting as a valuable feedback/feedforward loop.

Collectively, our implementation of the measures detailed above has had surprising outcomes. Subject analytics in those subjects where this programme was adopted showed significant increase in optional weekly tutorial attendance and progress rates, together with strong performance within student satisfaction surveys. Importantly, allegations of contract cheating, collusion and plagiarism in those subjects significantly declined. It is our view that this improvement is at least partially attributable to learner perception of relevance of assessment tasks, their achievability and the unique nature of the factual scenario and text types assessed. However, there is little doubt that the relationships formed between peers, the academic and the profession were central in initiating and maintaining student engagement. Students were empowered to clarify expectations of integrity and content. The perception of the relevance of learning and assessment and the explicit connection of learning to legal practice gave students a pathway to professional identity while enhancing academic integrity.

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reconnect
Reconnecting relationships through technology

Exploring the adoption of desktop simulators in pilot training: An ethnographic approach

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Aviation has been using flight simulators for pilot training for a long time. Desktop simulators are a more cost-effective, efficient and accessible alternative to an expensive high-cost, high-fidelity flight training devices. Despite the benefits, desktop simulators are rarely seen in flight schools and flight instructors hardly recommended them for early stages of training. Therefore, this study investigated the perception of flight instructors about the usefulness of desktop simulators in flight training and the ways they can be used in the early stages the training. An ethnographic study was conducted in a flight school in Australia via observation and in-depth interviews. Despite the documented benefits of using desktop simulators, there seems to be a hesitancy by flight instructors to encourage students to use these devices because students: build bad habits if they misinterpret what they have been taught and practise without supervision, tend not to trim the aircraft, apply too much force on the controls, and look down at the instruments very often and do not look out. We conclude that this negative perception about the technology can be holding back further progress in improving the quality of flight training and preventing students from embracing the technology to enhance their learning.

Keywords: pilot training, aviation education, flight simulator training, desktop simulator

Introduction

Flight training can be improved by embracing new technologies (Hunter, 2021). Flight simulators are evolving at the same pace as technology and playing an essential role in flight training. They are cost-effective and efficient instructional tool that can improve students' performance (Rigby, 2015) in a safe environment. The rapid technological advances in commercial computers has allowed the development of desktop simulators, also known as Personal Computer-Based Aviation Training Devices (PCATDs). These devices are a more affordable alternative to traditional simulators and a valuable instructional tool (Reweti et al., 2017). Since students now can access simulators in their homes, it is important to understand how flight schools can use desktop simulators when students first start learning to fly. Nonetheless, PCATDs are still seen with scepticism and their adoption are slow.

Ensuring that technology is being effectively used for learning is a persistent problem in education, particularly because of rapid technological advances, high costs and slow adoption (Burke et al., 2018). In higher education, millions of dollars have been spent in teaching technologies, however academics and lecturers are not adopting them, due to lack of equipment, time, training or for certain beliefs about teaching and the technologies (Reid, 2014). Given the benefits of PCATDs and flight simulators used at home but the low adoption of the new technology in learning and teaching environments, the objective of this study is to investigate the perception of flight instructors about the usefulness of desktop simulators in flight training and the ways they can be used in the early stages of pilot training. We are particularly interested in understanding the reasons why the technology has not been adopted widely in flight schools in Australia. Therefore, we conducted an exploratory research using an ethnographic approach at one Australian flight school.

Literature review

Flight training organisations worldwide have been investigating ways to enhance training through the use of flight simulators. PCATDs were introduced into the aviation education community as a more affordable alternative to the Flight Training Device (FTD). Instead of using mechanical instrumentation, these devices display the virtual instruments and indicators on the screen, making them a more accessible option for training without compromising the student's performance (Beckman, 2009; Callender et al., 2009; Reweti et al., 2017). The research suggests that PCATDs can be as helpful as FTDs for the early stages of pilot training, especially for developing instrument flying skills. However, PCATDs can be limited to only teaching the procedural elements of flying and may not be suitable for developing fine psychomotor skills, because to the lack of haptic feedback through the flight controls (Reweti et al., 2017).

Students can also benefit from practicing on flight simulator platforms at home, such as Microsoft Simulator X (MSFSX), Lockheed P3d, and X-plane. A study conducted by Beckman (2009) revealed that student pilots find MSFSX useful and effective to practice instrument approach procedures, holding patterns, basic attitude instrument flight and en-route navigation. (Callender et al., 2009) showed that students that train on MSFSX before training in an aircraft perform better than those who train directly on an aircraft. Beckman (2011) concluded that students studying private pilot ground school classes using MSFSX displayed better Aeronautical Decision-Making (ADM) skills than students who only studied the subject through the traditional class format, including oral presentations and PowerPoint.

Method

The project uses ethnography, which is defined as the act of "studying, describing, representing, and theorising with a certain degree of particularity a culture or social world" (Harrison, 2018, p. 4). Based on the ethnographic principle of immersing in the real study context to gain in-depth knowledge (Queirós et al., 2017), the first author spent eight months in a CASA-approved flight school in Brisbane, Australia, one cohort of five student pilots. They were enrolled in the Graduate Diploma in Flight Management, a program offered by the university and delivered by the flight school. The first author adopted an insider role where one does not actively participate in all the activities but does attend the activities. This allows close access to the students, instructors and managers' perceptions and views (Angrosino, 2007). The study received approval from the Griffith University Ethics Committee (#2021/718). All five students form the cohort, three CASA certified instructors actively involved with this cohort were observed and interviewed, while the base manager of the program, the Head of Operations, and the Chief Executive Officer were only interviewed. A total of 11 in-depth interviews, between 30 and 40 minutes, were carried out. Three open-ended questions and covered their view and beliefs on the use of PCATD at the early stages of flight training. Data was collected between 22nd November 2021 and 14th April 2022 while the cohort completed the Recreational Pilot License and Private Pilot License. Daily field notes were taken during lectures, lessons in the aircraft and the simulator and covered the activities undertaken by the students, the tools used, any struggles encountered during the activities, any meaningful communication among them or with the instructors, and any remarks instructors made about the students' progress. The first author, who had no prior flying experience in aircraft or simulator, also took five flight lessons to deeply understand what students go through in the very early stages of flight training and to be able to relate to them. Notes were taken after each lesson about how the first author felt during the lesson and the feedback given by the instructor, which were kept in a reflective journal.

Discourse analysis has been used to analyse the interview transcriptions and notes taken throughout the exchanges amongst students and instructors that the researcher witnessed. This approach is based on the belief that the words chosen to talk about a topic reflect how an individual feels and thinks about it (Willig, 2014). The interview transcripts were read three times focusing on the words participants used to describe their opinion on the use of PCATD. Thematic analysis was used as the approach to determine the resulting themes by searching for common threads the data (Bowen, 2009). Three common themes were found across the data: (i) perceived usefulness of desktop simulators, (ii) encouragement to use simulators and (iii) formation of bad habits (heads down and look in, control force and trim). Each theme will be further developed in the next section.

Results and Discussion

Perceived usefulness of desktop simulators

According to one of the flight school managers, the great advantage of practising flight procedures in the simulator before the flight lessons is that students feel less overwhelmed when they are in the aircraft. It has also been mentioned during the interviews that practising in simulators is especially useful in navigation phase of the Private Pilot License (PPL) training program. The simulator helps students identify visual features that identify the route (e.g. towns, mountains, or roads) so when they are in the aircraft they can easily identify those features. Similar advantages have been reported by Beckman (2009). In a slightly different perspective, the instructors believe simulators are useful once students already know how to fly, so they are aware of the limitations of the simulator and will not have a wrong perception of how the aircraft behaves in flight. From the flight school management perspective, simulators are also useful for students to practise flight procedures as they strengthen the ‘procedural muscle memory’, helping them remember how to configure the aircraft on the ground and when flying. The instructors agree and emphasise that desktop simulators can only be used to practise flight procedures instead of learning to fly because the haptic feedback would be needed. This finding corroborates Reweti et al. (2017) conclusion that desktop simulators are especially useful for learning the procedural elements of flying and that they are limited in developing psychomotor skills due to the lack of haptic feedback from the controls.

Encouragement to use desktop simulators

The instructors did not seem assured that simulators are completely beneficial for students. As one of the instructors mentioned, ‘I would say it’s harmful more often than it’s helpful, but when it does work in the right scenario, it really helps.’ According to the students, instructors are afraid that PCATDs would give them bad habits and, therefore, the use of PCATDs is not encouraged in the flight school. One of the students stressed: ‘at the flight school, they (flight instructors) really hate them [desktop simulators] because they teach you bad habits.’ A student reported hearing the same from their peers, particularly if used before starting the training program. Based on the interviews, it seems the perception is that ‘bad habits’ could be formed if students are not shown the right way to perform an action, procedure, or manoeuvre from the beginning. It is also believed that practice without the presence of an instructor creates the condition to form a bad habit, regardless of how often that behaviour has been repeated or whether making mistakes could lead to learning. One of the students had been practising procedures, landings and en-route navigation on his PCATD at home before starting the training program in the flight school. He believed the simulator had helped him perform well during the flights, since he was familiar with most of the procedures, techniques and visual cues during the flight. The ethnographer mentioned this fact to another instructor, to which he claimed, ‘maybe that’s why he’s quite good at procedures.’ Interestingly, it could be implied that when bad habits are formed, they are easily attributed to the simulator and unsupervised training. However, when a student performs especially well at something, it is not easily acknowledged that it could be due to the unsupervised practice in the desktop simulator.

Formation of bad habits

A habit is a behaviour that is repeated automatically, and may take on average 66 days to be formed (Lally et al., 2010). By analogy, a bad habit is an undesirable behaviour that is repeated automatically. Despite the definition, the concept of bad habit is normally employed by instructors and managers regardless how often that behaviour has been repeated. The term has been used mainly to refer to the learning activity that occurs outside the aircraft and without supervision. The instructors are concerned about students misinterpreting what they were being taught when practising in the simulator by themselves without proper supervision. It seems the term ‘bad habit’ is used to represent a personal judgment based on limited knowledge of what a desktop simulator can contribute to pilot formation and on the assumption that the complex set of skills required to fly an aircraft can be reduced to manually handling and attention allocation. For example, according to one instructor, by practising in the simulator, students tend to focus too much on the inside of the cockpit, instead of outside, which is undesirable. However, according to the CASA’s Recreational Pilot License competence-based syllabus (CASA, 2020), a student performing the tenth flight of their flight training program should be competent in 26 different units of skill.

Currently, there is little evidence in the literature regarding students developing bad habits from using PCATDs. Lubner et al. (2017), for example, advocates that practising in the flight simulator without supervision can cause the development of improper flying skills and result in the negative transfer of learning. Nonetheless, the author does not specify exactly what habits and skills are negatively developed. It appears that instructors and managers place too much emphasis on the possibility of students forming bad habits from using desktop simulators rather than on how they can facilitate learning. It seems that when students do not perform correctly at the early stages of the training, they are considered to have bad habits, rather than it being a natural part of learning. There is still a belief that the student must learn the right way at the first time and should carry throughout the learning journey the only right way to act. There is no acknowledge the performance may be good some days and not so much in other days and that making mistakes is part of the learning process.

The fact that instructors are constantly worried about students misinterpreting the lessons and building bad habits if they practise without supervision in simulators appears to reduce the opportunity for the student to practice before the flight. It was observed that students only read the procedures before the flight, without the opportunity to translate the written instructions into actions. Students may also have been somewhat influenced by the instructors’ belief that extensive simulator practice leads to negative learning. It was observed that some students have doubts whether practising in desktop simulators without supervision could help them.

Heads down and look out
The managers believed students should not overly use the simulators to practise because they tend to look down at the instruments too much. One of the managers explained that ‘because they have done extensive amounts of simulator, they know how to fly by instruments, (…) but not by visual attitude’. According to another manager, ‘one of the downsides of the desktop simulators is that it just bends their neck down and they focus on the procedures. It’s a really hard habit to break, to get them to look out.’ To break that habit, one of the managers mentioned that ‘quite often I do have to cover instruments to get them to see what the aeroplane looks like. So that is where it is a very useful tool, but it’s not effective in the right way.’ One of the managers believed that when starting training with no prior exposure to simulators, students are the easiest to train because ‘they come with no premeditated ideas’ and therefore they do not have to ‘break that habit’. However, it stands out that during the first author’s flight lessons, she was told by the instructor that she had the habit of looking down too much. Interestingly, this happened even though the first author have not had any previous exposure to simulator training or desktop simulators. And the exact same behaviour at the very first flights was reported by other students in the cohort who also have never used desktop simulators before. This evidence could indicate that students tend to look down too much by instinct, or for any other reason, at the early stages of the training, regardless of their experience with desktop simulators. In fact, Dubois et al. (2015) suggest that novice pilots tend to look down too much, overly focusing on reading the gauges and instruments. Attributing this habit to the use of simulators seems not to be based on research evidence but rather on pre-assumptions. It could therefore be implied that simulators might be blamed for creating bad habits as a way of portraying resistance to changes that the technology could bring into flight training.

Controls force
Another bad habit related to simulator training is applying too much force on the controls when the students transition to an aircraft. It has been explained that students can be ‘too rough’ with the controls in the aircraft because they would fly as if they were flying in the simulator. Nonetheless, the first author was told during her flight lessons that she was being rough on the controls and needed to be gentler with the yoke. It stands out that the first author did not have any practice in desktop simulators either, yet she was told to have that habit too. It could then be implied that students tend to hold the controls too hard at the beginning or for other reasons, regardless of having been practising in simulators.

Another anecdotal evidence came from the instructor’s feedback to one of the students who was a military pilot before. The instructor also recognised that the student was being ‘too rough’ on the control, but instead, he justified the excessive control input as part of the students’ learning process to transition from one type of aircraft to another, and not a bad habit. It seems the concept of bad habit depends on contextual factors and not on the action itself; if a habit, on the eyes of the instructor, was acquired in a desktop simulator and not an aircraft, and it is undesirable or not compatible with the expectation, then it is a bad habit.

Trim
Another bad habit linked to simulator training is students not trimming the aircraft to relieve pressure on the control yoke. It has been reported that students do not tend to trim the aircraft because when they practise in the simulator, they do not get feedback from the controls, and therefore, it is harder for them to get used to trimming the aircraft. It has been explained that feeling the resistance from the controls is fundamental for trimming, which students cannot get when practising in the simulator. One of the managers emphasised the importance of getting into the habit of trimming the aircraft by stating ‘if you can’t trim the plane, you can’t fly a plane, the plane is flying you and not the other way around (…), and that’s where the [the desktop simulators students have access in the University] can potentially cause some conflict.’ Nevertheless, there is no research evidence associating the habit of students not trimming to practice in simulators. The first author realised during her flight lessons that it was not hard to remember to trim as the resistance of the controls could feel excessive at times, and it would not feel comfortable. Moreover, instructors teach students acronyms for the order of procedures they have to perform, which helps them remember to trim.

Conclusion

This study explored the perception by instructors of utilising desktop simulators in a flight school and the encouragement for its use in the early stages of pilot training. Although it has been recognised that the devices are useful for students to practise flight procedures, there seems to be hesitancy towards the technology in flight schools, because of the perception that students will acquire bad habits, particularly if they misinterpret what they have been taught or practise without supervision. The examples of students' tendency to not trim the aircraft, applying too much force on the controls, looking down at the instruments too much and not looking out of the aircraft are common. As demonstrated though, these bad habits can be associated to the lack of experience of the students and can be part of the learning process.

The negative perceptions about the technology in the flight school could be explained by a hesitancy to accept change in how flight training has been conducted traditionally. Since simulator sessions are generally carried out in a one-on-one format where one instructor is needed per student, the concept of unsupervised practice on a PCATD and instructors not being needed for students to refine the skills could explain the hesitancy towards the technology. Similarly to the proposition of (Lei & Morrow, 2010), in order to overcome this barrier, we need to assist managers flight school managers and instructors to understand the benefits of the new technology and pedagogy, involve them in the decision-making progress so the process and better explain how the bad behaviours could be compensated in a flight lesson. The negative perception associated with desktop simulators could refrain managers, instructors and students from embracing what the technology has to offer, which could ultimately be holding back aviation. Further research is needed to prove whether using desktop simulators leads students to develop bad habits. Future studies could explore the relationship between VR and the development of bad habits during simulation practice. One limitation of this study was the small sample of participants. This may have resulted from the cohort undertaking the training in the context of the COVID-19 global pandemic, and as such more research would be beneficial.

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reconnect
Reconnecting relationships through technology

Transition as one step on a transformational journey

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Developing a sense of belonging is intimately linked to a successful transition and to student. The pandemic has acerbated existing problems with students across the sector reporting difficulties connecting with each other and their universities. This paper reports a simple activity to encourage meaningful dialogue between students and teachers in the first weeks of study. The 'My journey' activity involves students and teachers discussing key points and decisions in their educational journeys. It has been successfully used in-class, and synchronously and asynchronously online. The journeys are also captured through an interactive map to celebrate diversity.

Keywords: Transition, belonging, engagement.

Importance of sense of belonging

Prior to the pandemic, students' sense of belonging had been established as intimately related to their academic success and how much they enjoy their studies and time at university (Freeman, Anderman and Jensen, 2008; Strayhorn, 2018; Eloff, O'Neil and Kanengoni, 2021). Those who feel accepted, valued, fit in and connected to their peers, teachers and studies, succeed. Those who do not are less likely engage as well with the curriculum, even if it is well designed (Kift and Nelson, 2005). They are less satisfied, achieve lower grades and are more likely to leave. Figure 1 shows the clear relationship between overall satisfaction, grades and belonging at The University of Sydney in 2019. Unfortunately, as Figure 2 shows, the percentage of commencing and continuing coursework students who are positive about their sense of belonging, as measured through the national Student Experience Survey (SES)[1] is historically low at Sydney and across many Australian universities.

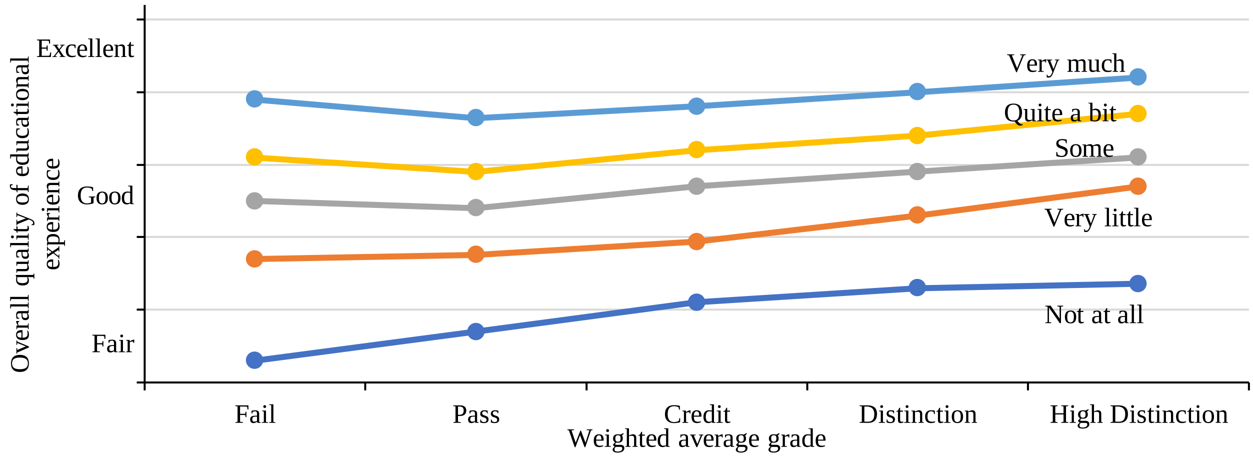

Figure 1: Mean overall quality of educational experience, by weighted average grade and sense of belonging. The overall quality of educational experience and sense of belonging are from the SES. The overall quality has been converted from the SES percentage scale to a 4-point scale (fair, good, excellent).

As widely reported in the media[2], remote learning and the wider impact of the pandemic led to a striking drop in sense of belonging in the SES for 2020. As shown in Figure 2, there was around a 10% decrease in student satisfaction at Sydney and across the sector. At Sydney, only around 30% of students reported feeling a sense of belonging. Whilst there was some improvement in 2021, the results suggest that students are struggling to make

[1] The SES is a government survey and results are available to the public on the QILT website.
[2] For example, see articles in The Guardian and The Australian.

connections and to feel part of our universities. As detailed by Pownall, Harris and Blundell-Birtill (2021), lockdowns and remote learning have further heightened the need to purposefully design relationship-rich educational environments and activities which are aligned to the 'Five Senses of Student Success' model (Chester et al., 2013; Lizzio, 2006). Further recognising that remote learning has likely to have exacerbated existing inequities (Bayrakdar and Guveli, 2020; Moreno and Gortazar, 2020), it is important that we work to actively encourage a sense of belonging and connection in students (Bridgeman and Weeks, 2021).

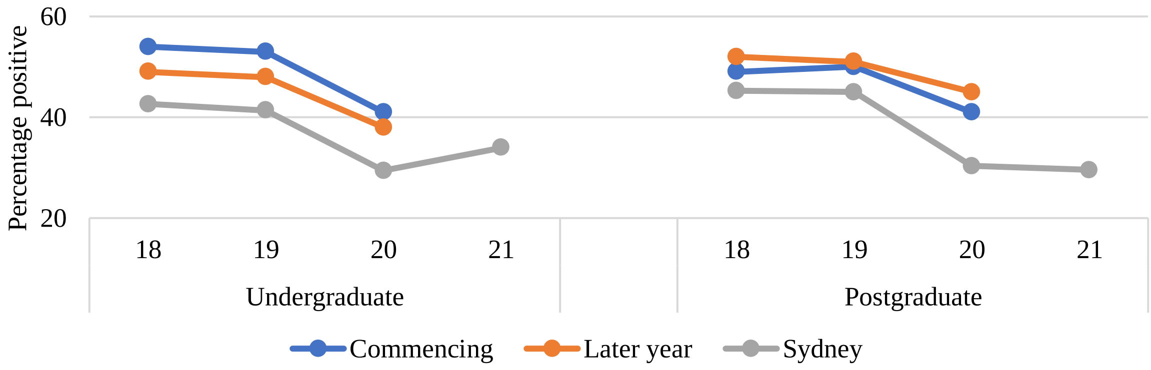

Figure 2: Percentage of students positive about developing a sense of belonging at university, from the SES.

Connectedness: imposter syndrome and sense of belonging

Students' sense of belonging varies hugely by race, institution type and first-generation status (Ahn & Davis, 2020; Gopalan & Brady, 2020). As many of us will know from our own experiences, the first year and especially the first few weeks are where students may struggle to establish a strong sense of belonging (Christie et al., 2008). This can impact the whole of their university experience (Ahn & Davis, 2020; Humphrey & Lowe, 2017; Kahu & Nelson, 2017) and contribute to attrition rates (Kift, 2015). As Kift & Nelson (2005) and Tinto (1975) have both stressed, the development of a sense of belonging, and transition generally, occurs in the curriculum and in the classroom. As current students have spent a large part of their formative years interacting through devices, opportunities to engage meaningfully with each other and with their teachers have to be intentionally designed into teaching activities. Belonging and resilience are built from real relationships and the first few weeks of class provide the main and potentially only place to achieve this.

Purposefully designed activities

Given the central importance of transition in developing a sense of belonging and in setting students up for success, evidence-based activities have been developed at Sydney and these are embedded in 'transition units' in every undergraduate degree, with the aim of ensuring that every new student experiences them as part of the taught curriculum. These activities were co-designed with students and staff from across the institution, using ideas from 'wise interventions' (Walton 2014) shown to help develop belonging and overcome the types of difficulties experienced by students new to higher education (Tinto 1975). Table 1 summarises these activities and their purpose. This paper describes the "My journey" activity which is both the most widely used and has proven the most successful in connecting staff and students during the pandemic. The aim of the activity is to provide an "ice breaker" that involves a meaningful conversation between students and teachers highlighting the struggles, successes and worries that all have faced as a result of the decisions and events that has led them to university. It aims to show students that their teachers (and vice-versa) are 'real people', who themselves found the transition to university confronting but ultimately transformational.

My journey - fostering a sense of belonging

This activity is simple and yet can be used and adapted to multiple modes and contexts. Ideally it is designed to be done during the first class or in the first few weeks of semester. It is designed to draw out the benefits of a diverse cohort and build lasting and purposeful connections with a shared sense of purpose. It can be combined with an Acknowledgement of Country to recognise the unique places on which our campuses are built and the ongoing connection of the traditional owners with its values and culture. It can be run in small classes (e.g. tutorials) or large classes (e.g. lectures) and online or face-to-face. Although originally developed to encourage meaningful, relationship-rich dialogue, it can also be run asynchronously. The synchronous version has also been used equally successfully in work meetings as an ‘ice breaker’ activity. Although based on the interventions described by Walton (2014), the idea for the activity came through the authors’ experiences teaching large first year classes, where talking about mistakes and challenges from our own first days at university had proven effective in involving all students. By admitting to our own cases of imposter syndrome, such dialogue had proven useful in building initial relationships with practical benefits for retention and outcomes.

Table 1: Transition activities and their relationship to the 5 Senses of Student Success model (Lizzio, 2006).

Activity	**5 senses**	**Brief description**
Early in semester		
My journey	Connectedness	*Students share and reflect in a meaningful and reflective way on their own journeys to the University*
Values affirmation	Connectedness and purpose	Students identify their personal values and the relationship of these values to their life and career goals
Expected norms	Resourcefulness	Students co-develop a set of class norms for behaviour that meets class expectations
Professional purpose	Purpose	*Students develop an understanding of what their career-related values are, and how they can be developed whilst at university*
Time management	Capability	Students learn how to plan how to manage their time leading to an assessment deadline
Chatterbox	Capability	Students share and reflect on choices made or course content
Middle of the semester		
Academic integrity	Culture	Students develop an understanding of the nuances of integrity, and feel empowered in making future decisions
Facing challenges positively	Capability	Students learn how to approach assessments in a positive frame of mind and reframe challenges as a natural experience
End of semester		
My journey revisited	Purpose	Students reflect on their transition journey and how their studies are shaped by their values and professional purpose

Synchronous version
In the first part of the synchronous version activity, the teacher shares their own educational story by reflecting on the important steps in their journey to the University of Sydney. Teachers are encouraged to be brief (5 minutes), friendly and warm by thinking about:

- The places they have lived, schools (and universities) they have attended
- Their memories of the first days at university and the first 6 weeks (or so) of their time at Sydney – what were they worried, excited or confused about?

An example is available at https://youtu.be/gu7WB2dG2Sw. In the story described, the teacher (one of the authors) reflects on a transformational educational journey across institutions in the UK and Australia, as the first person in his family to attend university. The first days at university are described with an acquired realisation of classic imposter syndrome (Gadsby, 2022; Ramsey & Brown, 2018) - a recurring theme in many such journeys described by teachers at Sydney. The story is also designed to encourage humility, openness and empathy. Students are then requested to pair up (with their neighbour in a face-to-face class or in a breakout room online) and to similarly take 5 minutes to tell their story to each other, at a level they are comfortable with.

Asynchronous version
In the asynchronous version, a discussion board thread for each tutorial group is set up and the teacher posts a short piece of writing about their journey along the same lines. Students are then encouraged to post their own journey and to comment on other students' journeys that they find interesting or related to their own. Alongside being an opportunity to develop a sense of community in an asynchronous mode, this is a good opportunity to introduce a short writing task for diagnostic purposes. A text version of the same journey featured in the video linked above is available at https://bit.ly/journey-to-sydney.

Capturing class journeys in an online map
To capture and celebrate the diversity of learners, the Google Maps library and API (Google Maps Platform, 2022) was used together with some customised Javascript, server side code and a database. For each course (or

for each tutorial group), students click on their place of origin and then on each important step on their physical and/or virtual journey to Sydney. The journey corresponding to the example above is shown in Figure 3. After submitting, each journey is stored so that the results for the whole class can be displayed together, as shown in Figure 4. Teachers can use this visualisation to prompt discussion and celebrate the diversity that makes our higher education system so rich. Figure 5 shows a ‘heat map’ representation of the whole cohort for 2021.

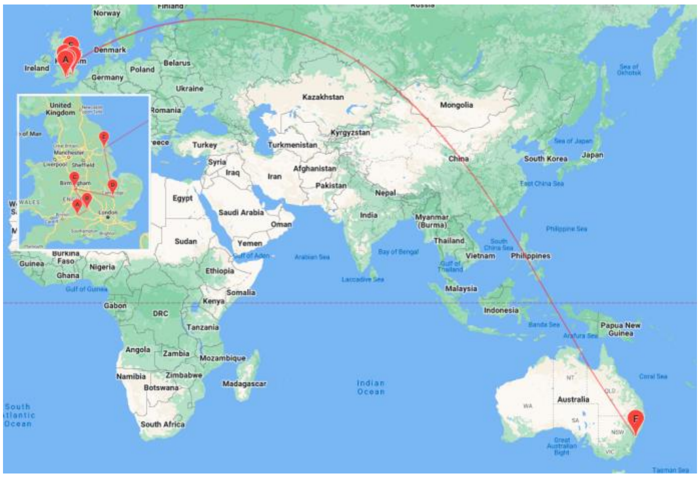

Figure 3: Example of a journey to Sydney, captured on Google maps. The inset shows the details for the teacher’s journey in the UK.

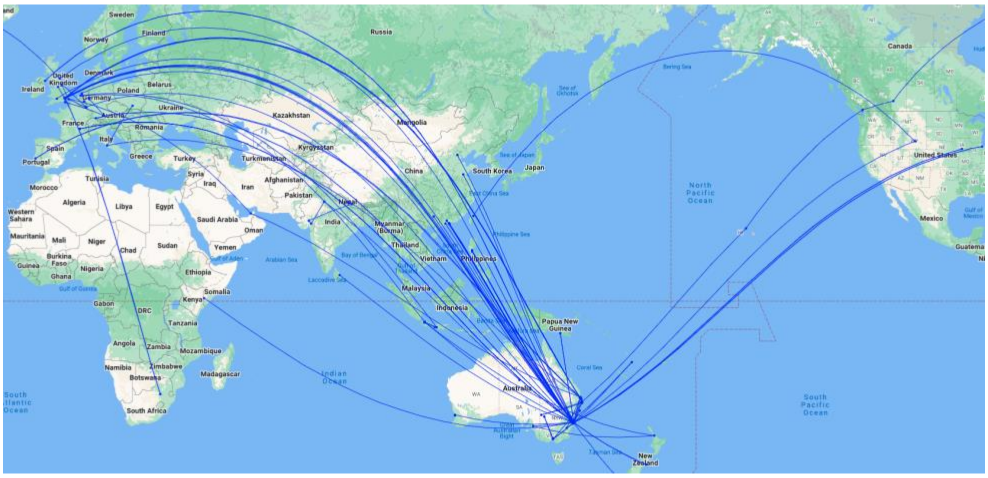

Figure 4: Example of the journeys of a class, captured on Google Maps.

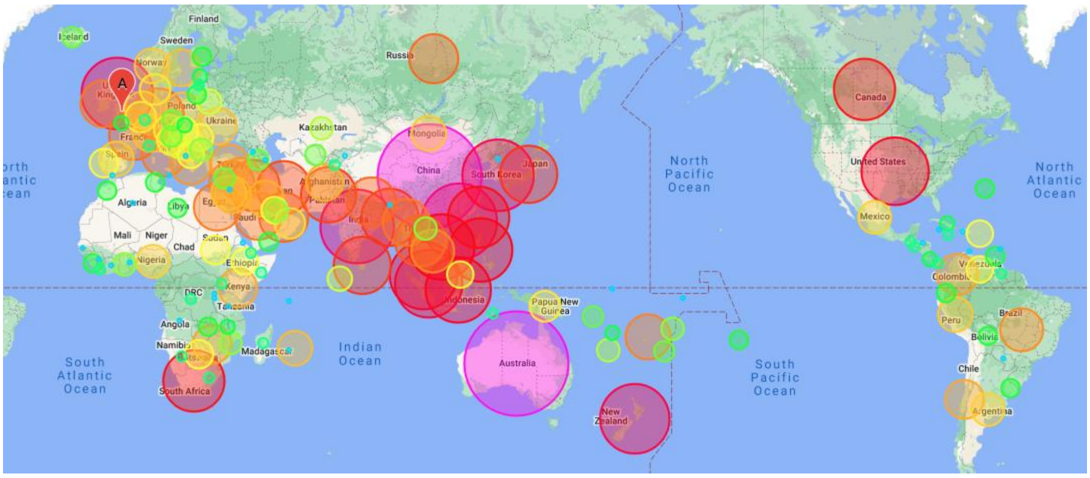

Figure 5: Places of origin for all students at the University of Sydney.

Conclusion

Since the start of the transition initiative at Sydney, the My Journey activity has been successfully implemented in around 30 units of study comprising around 10,000 unique students. Informal student and teacher feedback has been very positive with high levels of engagement in the classes. Plans to measure the effectiveness of the transition activities have been complicated by the pandemic with recent surveys highlighting students' struggles in making friends and developing meaningful relationships. The University plans to analyse data relating to the effectiveness of the transition activities over the next few years.

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reconnect
Reconnecting relationships through technology

Exploring adult learners' experience with VR-generated feedback for improving online presentation

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Poor presentations could be due to presenters' lack of presentation skills, and lack of informed knowledge for improvement and feedback to self-monitor the speaking process. In a typical training setting, feedback involves using either video or human-intensive feedback that may not explicitly and effectively target at oral speaking components such as facial expression, eye contact, and gestures. Authentic feedback should be real-timed and aimed to improve presenters' speaking skills and help them make decisions for targeted improvement. This pilot study reports 50 participants' experiences. It investigates two groups of participants (VR and Non-VR) and their oral speaking experience, informed by feedback (VR-generated system or human supported), and analyses milestones in their presentations. Participants in the VR group receive VR-generated feedback while those in the Non-VR group receive computer and human feedback. Both groups work towards improving their speaking skills in subsequent presentation activities. Preliminary findings and implications will be discussed.

Keywords: Feedback, listenability, online presentation performance, speaking pace, virtual reality system

Introduction

Oral presentation is a core competence in a large variety of professions in the world. The quality of a presentation influences professional performance, career development, and effective communication in society (Van Ginkel et al., 2015). However, effective presentation skills are not mastered by everyone. Industries and institutions usually have extensive presentation training for their members, but its success relies on lots of human resources and different scenarios. An individual's competence in presentation determines whether the learners can fully comprehend and interpret what the individual has conveyed. An effective oral presentation is more than just proper pronunciation, intonation or articulation, and it would involve eye contact, gestures, verbal fluency and handling of questions that help learners to internalize and deepen their thinking (Ho, 2014). Poor presentation could be due to the lack of presentation skills, self-knowledge, attitude, or limited feedback and guidance during training (Van Ginkel et al., 2017). According to Knowle's characteristics of andragogy, adult learners are more self-directed, and they know how to better understand and appreciate the learning process and experience compared to child learners (Knowle et al., 2015). Transformational learning is the 'social process of construing and appropriating a new or revised interpretation of the meaning of one's experience as a guide to action' (Taylor, 2001, p. 220). Transformative learning is an essential part of adult learning as it determines adult learners' course of actions (Authors, 2022). Through transformational learning, adult learners are able to critically reflect on their learning and take action to improve. Hence, it is crucial for adult learners to add value to their training by taking account of their learning experience and be self-directed in working to improve their oral presentation skills.

Feedback is the key to improving oral presentation skills. Effective feedback could encourage learners' oral presentation performance (Van Ginkel et al., 2017). Compared to human feedback, VR is an automatic descriptor of presentation behaviour with multimodal data for oral presentation skills. From the previous studies, it is observed that the feedback presented inside Virtual Reality (VR) simulations is composed of multiple dimensions.

(1) the timing of the feedback (real-time or delayed) Studies have suggested that immediate feedback has a significant impact on learning (Van Ginkel et al., 2015). The real-time feedback within the VR presentation system could remind the presenters of the time given to their eye gazing, their voice volume, speech pace and fix these for them at one selected point during the presentation process (e.g., Belboukhaddaoui, & Van Ginkel, 2019). The delayed feedback includes pause timings, measures of voice qualities, the use of gestures (e.g., gestures to emphasise, gestures too much), gaze direction and time (e.g., El-Yamri et al., 2019).

(2) the modality of the feedback (visual, auditory, haptic) The feedback could be presented in the form of texts, pictures, video, and audio to help users reflect on their performance (e.g., Schneider et al., 2019).

(3) the complexity of the feedback The VR can provide detailed data for the presenter, such as the pause times, the frequency of using one word and, even, confidence level (e.g., Chollet et al., 2015; Hinojo-Lucena et al., 2020). These multi-sensor data could be analysed and transcribed as comprehensible feedback for the presenters to reflect on their presentation performance. Past methods to provide feedback on oral presentations include video recording and/or human feedback but these are not explicitly targeted at oral speaking components such as facial expression, eye-contact and expression of words spoken. Therefore, there is a need for consistent and concrete evidence on these non-verbal dimensions to be included in feedback to presenters to improve their oral presentations.

VR with 3D interactive environments provides support for situated and constructivist-based learning activities by allowing participants to immerse and interact directly with the people and surrounding (e.g., Chiou, 2020; Schneider et al.,2019). The VR environment can provide good control of the presented stimulus and open up various feedback channels (Theelen et al., 2020). The VR presentation training could support presenters in various aspects during and after the VR training process to improve their oral presentation skills.

First, presenters could receive real-time feedback and adjust their behaviours promptly during the VR presentation training process. The VR-feedback system is designed to support the development of oral speaking skills by providing more complex feedback such as eye contact and body gestures. Second, it allows presenters to review their practice and receive delayed feedback after the VR training. Presenters could review their presentation videos and look at their performance development based on the objective measurements. Third, some research also designs the reflection session within the VR system, and presenters have opportunities to practise behaviours repeatedly following the instructions from the system. Fourth, some of the studies employed design-based research as a methodology. This methodology incorporates the process of designing, developing, and evaluating the VR presentation training prototype. The process of practising, improving and reflecting helps presenters master presentation skills effectively. A wide range of institutions or individuals could employ this method for job interviews, public speaking training, work or academic presentation and many other real-life scenarios to benefit individuals who have the need to improve their oral presentation skills. The studies require a formative evaluation process, which consists of several iterations for investigating the effective implementation of VR modules for improving oral presentation skills. Therefore, this study examines the development of presenters' oral presentation skills with the support of VR-feedback system. As part of the major study, this pilot study investigates listenability and speaking pace of the speakers. Specifically, this pilot study focuses on two research questions:
1. What are the participants' perception of virtual presentations experienced in the three oral presentations?
2. Are there significant differences between the VR and Non-VR groups' performance in terms of their (a) listenability? (b) speaking pace?

Method

A pilot study was conducted from November 2021 to February 2022 on a group of 50 participants in Singapore. It adopted a randomised controlled, single-blinded 2-group pre-test and post-test design. The research assistant responsible for data collection was blinded to the group allocation (VR or Non-VR group) of the participants. Participants were anonymised and randomised to the intervention (with VR) and control groups. The team explored VR training strategies to improve trainers' speaking in a training situation. Developed in 2016, VirtualSpeech was adopted for this study because it is easy to use. The team adopted the Essential Public Speaking package for this study. Through email, participants were invited to take part in this study. The participants were briefed about the experiment and their consent obtained. The participants took part in three oral presentation activities (Stages 3, 4 and 5) as shown in Figure 1, each stage lasting around 15 minutes. At Stage 3 and 4, both groups were given the same treatment. However, at Stage 5, the VR group would wear the Oculus while the Non-VR group would not wear the Oculus to carry out their presentations.
Stage 3 All participants did a warm-up practice to prepare them for the subsequent stages via an impromptu speech exercise. ***Stage 4*** All participants orally presented a 5-minute presentation to a small group of virtual audience in a simulated zoom meeting setting. Prior to the presentation, they were given 10 minutes to prepare a script on the topic of "Living in the COVID-19 pandemic". ***Stage 5*** All participants were given another 10 minutes to use the feedback given by VirtualSpeech to enhance their presentation. They were then tasked to

orally present the same 5-minute presentation to a larger group of audience in a simulated TEDx Style Theatre setting. The randomly categorised participants in the VR group were required to put on a VR Oculus headset for the assessment of their presentation. This allowed participants to be immersed in the environment for their presentation. The participants in the Non-VR group continued to use the computer as the mode of assessment in the presence of the human

After each stage of their experience, the participants were required to complete a survey and reflection log. All videos recorded were anonymized for data analysis. To answer research question 1, the participants' responses were captured via the self-evaluation survey (Table 1). To answer research question 2, the VR system generated the score of each participant based on their listenability (Table 2) and speaking pace (Table 3) were measured. The mean for listenability and speaking pace were calculated for both groups. T-tests were carried out to identify if there are any significant differences between the means. Figure 1 shows participants taking part in the different stages.

Stage 3

Stage 4

Stage 5

(a) VR group

(b) Non-VR group

Figure 1: Stages of the research and data collection

Findings

Table 1 shows all participants' scores based on their experiences in Stages 3, 4 and 5. With 1 being very bad and 5 being very good, the average score was 3.5 out of 5-point Likert scale. The participants were asked if they thought the practice in Stage 3 prepares them for using technology in presentation. With 1 being strongly disagree and 5 being strongly agree, the average score is 3.6. For Stage 4 and Stage 5, 4-point Likert scale was used. The average scores were 2.5 and 2.88 for Stage 4 and Stage 5 respectively.

Table 2 shows the listenability scores of the participants in Stages 3, 4 and 5. The findings show that the VR group obtained higher mean scores for all the three stages. The difference between the mean score for listenability of the VR group and Non-VR group in Stage 5 is especially large; the values are 8.56 and 2.56 respectively. There was a significant difference between the mean for listenability of the VR and Non-VR groups ($p < 0.05$). This could suggest that participants' listenability improved with the VR intervention in Stage 5. The values of the standard deviation for the VR group and Non-VR group are 0.712 and 1.89 in Stage 5, which might suggest that the differences of listenability in the VR group are smaller than the Non-VR group in Stage 5.

Table 1: Participants' scores obtained in Stages 3, 4 and 5

Presentation learning activities	Mean	Standard Deviation
Stage 3 (Warm up: Practice with online stimuli)		
Q1. What is your experience like in this station?	3.50	0.814
Q2. How does this station prepare you for presentation?	3.36	0.851

Stage 4 (Zoom presentation to a small group of virtual audience)		
Q1. Does this session... (exceed my expectations, meet my expectations, meet some expectations, does not meet my expectations)?	2.50	0.707
Stage 5 (Presentation to a larger group of audience in simulated TEDx Style Theatre)		
Q1. Does this session... (exceed my expectations, meet my expectations, meet some expectations, does not meet my expectations)?	2.88	0.773

N = 50

Table 2: Comparison of listenability between VR group and Non-VR group in Stages 3, 4 and 5

	VR Group		Non-VR Group		T-test	
	Mean	Standard Deviation	Mean	Standard Deviation	df	p
Stage 3	5.48	1.33	5.20	1.55	48	0.497
Stage 4	2.80	1.98	2.48	1.87	48	0.560
Stage 5	8.56	0.712	2.56	1.89	48	1.54E-19

N = 50 *P< 0.05*

For speaking pace (Table 3), there is no significant difference between the mean values of the VR and Non-VR groups at Stage 5. The mean values for speaking pace in Stage 3, 4 and 5 for the VR group were 3.92, 5.52 and 5.96 respectively and those for the Non-VR group were 2.76, 5.00, and 4.76 respectively. The results suggest that the speaking pace of the VR group gradually improved after practice at every stage except the non-VR group.

Table 3: Comparison of speaking pace between VR group and Non-VR group in Stages 3, 4 and 5

	VR Group		Non-VR Group		T-test	
	Mean	Standard Deviation	Mean	Standard Deviation	df	p
Stage 3	3.92	3.15	2.76	2.65	48	0.165
Stage 4	5.52	2.57	5.00	2.99	48	0.512
Stage 5	5.96	2.51	4.76	2.83	48	0.119

N = 50 *P< 0.05*

Conclusion

This preliminary study focuses on developing the presenters' oral presentation skills with the support of VR-feedback system and two features, listenability and speaking pace, were the primary focus in the VR-feedback environment. As there is no significant difference for the speaking pace between the VR and Non-VR groups, additional tests may be needed to examine the effect. From the data, it could be concluded that the VR-feedback environment has provided a positive effect and more guidance is given to presenters who practise using online presentations. The implications of this study are that VR is an appropriate medium to train adult learners in listenability in oral presentations. Although speaking pace was not shown to be significant, the VR group still attained a higher mean score as compared to the Non-VR group. This shows that VR is able to improve adult learners' speaking pace for presentations. So, the use of VR in oral presentation training could still be the mainspring for confidence in adult learners. Listenability and speaking pace are important in presentations be it online or onsite because they help to engage the audience during the presentation. In this study, the sample size was small (N = 25 per group), and, therefore, the outcomes of this study cannot be generalised. It is recommended that a larger sample size be used for future studies. Other features like gestures and eye-contact are equally important to assess adult learners during presentations. Hence, these other features could be explored in future studies as well.

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reconnect
Reconnecting relationships through technology

Putting whanaungatanga at the heart of students' online learning experiences

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This paper explores the role of relationships in students' experiences of online learning during the COVID-19 pandemic in Aotearoa| New Zealand. Students' voices are foregrounded through narratives and the analysis of four discrete stories of these specific circumstances. Using a conceptual framing of whanaungatanga, a Māori view of the process of establishing and maintaining relationships, we move beyond who is involved in the relationship to explore how relationships are developed and what counts from the students' perspectives. Sharing, an ethic of care, a sense of belonging, collaboration, scaffolding of learning, and feedback acknowledging students' efforts were all considered important aspects of relationships between students and faculty which were enacted online. The importance of broader institutional relationships, such as those with the library and student support services, were also foregrounded.

Keywords: student voice, narratives, online learning experiences, relationships, whanaungatanga.

Background and introduction

Equity in online learning is of critical importance particularly in the pandemic context. It has often been noted in relation to material, social and political dimensions (Bayne et al. 2020), however less has been said about the cultural imperatives of inclusion (MacKenzie et al 2021). Educational institutions in Aotearoa are required to uphold their obligations of the Treaty of Waitangi| *Te Tiriti o Waitangi*[1]. One strategy has been through explicit focus on culturally responsive pedagogy (CRP) which has grown in importance particularly in the early childhood and compulsory schooling sectors (Ministry of Education 2011, 2017). In tertiary education this is reflected through inclusion of Māori values and explicit graduate attributes such as bicultural competence and confidence. Other approaches include challenging the way institutional work is measured and valued through embedding of Māori values in programmes and standards through the Ako Aronui framework (Buissink et al, 2017). Whilst the government has progressed the vision of tertiary success for everyone (Tertiary Education Commission, 2022) to be more inclusive, equitable and connected for Māori and Pasifika learners, converting the vision into practice is somewhat more of a challenge. To this end *Ngā Hau e Whā o Tāwhirimātea* (Rātima et al 2021) offers a framework for tertiary educators to become more responsive and culturally adept in our teaching. This connects with the re-theorisation of CRP by Berryman, Lawrence and Lamont (2018) as cultural relationships for responsive pedagogy. This research positions relationships as central and foundational with responsive pedagogy, which concurs with research demonstrating that relationships are key to authentic learning for Māori and non Māori alike (Blackberry & Kearney, 2020; Rangiwai, et al, 2020).

Methods

This paper discusses part of a larger research project exploring Aotearoa university students' experiences of online learning during the pandemic (Brown et al,, 2021). The authors include Māori, Pākehā, and Tauiwi researchers[2]. The project team worked in collaboration with national student associations (including Māori students association Te Mana Ākonga) to invite student participation in the survey.

An explanatory sequential mixed method research design was adopted for the main study (Creswell & Plano Clark, 2011). A national online questionnaire, conducted in the later part of 2020, resulted in 952 valid

[1] The founding document of New Zealand written te reo Māori and English see https://waitangitribunal.govt.nz
[2] Pākehā is te reo Māori for non-Maori, and Tauiwi is te reo Māori for foreigners.

responses from all eight Aotearoa universities. Although the majority of students were Pākehā/ New Zealand European (55%), other ethnicities represented included Asian (20%), Māori (5%) and the Pacific Islands (8%). Survey participants, who indicated their interest in participating in an interview, were invited to participate in an online focus group or interview. Semi-structured interviews, conducted with 41 participants online, and provided stories of learning during the pandemic. The four participants selected represented a diversity of experiences of the overall participant group. Participants' discrete stories of the specific circumstances of learning online as a result of the pandemic were constructed into narratives (Reissman, 2003) and then further analysed for emerging themes pertaining to relationships. Ethics approval was gained prior to the commencement of the research.

Conceptual framing

In this paper we draw on the Māori concept of *whanaungatanga* which is one of the five interdependent and co-existing components of the *Ngā Hau e Whā o Tāwhirimātea* model (Rātima et al, 2021). "Whanaungatanga is the process of establishing and maintaining relationships." It is about bringing "people together around a common cause or association. This can be based on such things as kinship ties, connections to place(s), interests, the environment and, of course, shared learning experiences." (p. 28). We draw on whanaungatanga as a conceptual framing to enhance our understanding of Māori worldviews, and foreground examples of responsive pedagogies that are culturally connected and supportive of Māori learners. The paper aims to demonstrate the centrality of relationships to the learning process and how, when educators work alongside learners and engage in responsive praxis, it enhances students' learning experiences. The guiding question for this paper is "What were the elements of whanaungatanga that were critically important for students' learning in Aotearoa during the pandemic and what can we learn from this?".

Narratives

Ben is a first year student for whom routine is very important. He has previous experience studying online through home school. Describing himself as autistic he was comfortable learning on his own. However, he missed campus during lockdown as he liked the library as a place to study and learn. Despite his familiarity with online learning he found it hard to collaborate online and missed face to face group work. He appreciated lecturers and support services who were able to provide the personal touch.

Rachel is an international student from South America living in Aotearoa with her immediate family. Her work required her to advance her qualifications and whilst most of her degree is online she did have in person requirements. She enjoys online learning and uses social media groups as additional support and connection as she likes expressing her ideas in writing rather than verbally. She appreciated the support from the university.

Julie is in her 4th year and lives with a flatmate she isn't close to so finding a space to study/work at home was hard. As a teacher she also had her own online students and had to set a routine but found it hard to introduce fun into the class. In her studies whilst online materials did help provide an overview of content, recorded videos were unhelpful. It was hard to stay motivated and focused.

Kate is in 2nd year and lives with her husband, and daughter. With a living room that doubles as work and study space, Kate does her university work between 9pm and 2am whilst her daughter sleeps. This made online learning lonely and disconnected and she had to rely on friends and Q&A forums. She found all the screen reading hard and looked forward to getting back on campus to share ideas, stress and worries and to reconnect.

Discussion

In our research project students weren't asked specifically about relationships, rather they were asked what aspects of learning online were helpful for them and which were challenging. Our preliminary report showed that social learning, care and connection were critical elements of learning (Brown et al,, 2021). However, in exploring the four students' narratives through the lens of whanaungatanga we illuminate a multifaceted view of the role of relationships in learning and teaching.

For Māori, the concept of 'nō hea' (where you are from) precedes the concept of 'ko wai' (who you are). "In sharing with learners information about their connections to people and places, their experiences and their own learning journeys, educators model their desire to connect with students" (Rātima et al 2021, p 29). This was valued by Kate who described how her lecturers would "*give their life experiences as well*" and as a consequence she felt they were more accepting of her personal challenges noting “s*he understands how I find it difficult. So, she was really good actually. She was amazing.*”

Reaching out to students with **care** and consideration opens the concept of relationships to include students’ physical, emotional and spiritual wellbeing. When Rachel suffered a medical incident she appreciated that teachers were *“so kind”* and how having *“this support like telling me, …. that they give you extensions”* helped her feel at ease. For Kate, her classes were an essential space to ask for clarification. “*the teacher would come around in the lecture and ask me, are you okay? Do you need me to go through anything with you?*” And if I was doing some work, I could always ask them, “could you help me”?' Moving online this experience was different. However, knowing lecturers cared about her learning was critical for maintaining whanaungatanga as Kate indicated “*I Zoomed my lecturer because she was happy to Zoom*”.

The value of ako or reciprocal teaching and learning where the educator moves alongside the learner, shifts the power of the learning context. Rachel found it empowering to be able to contribute to the class and described if she was “*searching Facebook and found really a lot of [new] things”* that she was encouraged to share *“with the class and the teacher*”. When Rachel missed a few classes due to health, her sense of belonging was enhanced when the “*teachers asked me to be a speaker. It empowered me … that I had to talk and to share, encouraged me to participat*e.”

Whilst the above examples were between the educator and student, building a strong culture of collaboration and support between peers is also an important component of whanaungatanga. Whilst for Kate this wasn’t a course requirement, it was an essential lifeline to keep her on track. Having a young child at home meant Kate’s participation online was not synchronous and she missed out on her usual ways of interacting “*I suppose at that time, no one's around like the lecturers and not around 9, 10, 11, 12. So, it was hard to get motivated because I had no feedback from anyone. I wasn't sure if I was on the right track*”. Kate and a friend developed a way of working together where “*My friend, she supported me, usually on Zoom in the evenings as she works. And so, we Zoom together and just sit down and do our work and then we could ask each if we wanted to, but we used to work in silence.*”

Educators can support peer learning by providing opportunities for students to learn together. Ben described how he collaborated “*through Google Docs”* as part of group assessment and how with another student *“she had a look and then I… we both sort of went back and forth via text or via Messenger, via email and said you know, you better change this bit or do you want me to change that and that sort of thing.*” Using technology for informal learning conversations enabled Ben and Kate to work more effectively in partnership with peers. As Rātima et al note (2021) “building a strong culture of collaboration (through assessment, curriculum and learning activities) is a hallmark of whanaungatanga (p.31). Peer tutoring was another strategy students drew on. Kate and Julie found it easier to run ideas past friends, “ *I would ask my friend - Is this a stupid question?’ If she said no, then ask my teacher*” (Kate), similarly “*the stupid questions that you just come up with and you don't want to email the lecturer. You kind of want to be able to ask a friend.*” (Julie).

Supportive peers also created a culture of well-being and belonging. Kate looked forward to going to campus as it gave her the chance to talk with other students, share ideas, stress and worries and to reconnect. Being on the campus and sharing her feelings lessened her stress and relieved her from all the pressure of home. Social media also played a role in this affective dimension of learning “*we also have our special groups that we can talk to, … on Facebook and in WhatsApp. So, we were there and it was easy for some people to express [themselves]”* (Rachel). Virtual whanaungatanga is a concept which “enables relationships to be formed, strengthened and maintained in culturally recognisable ways.” (Keegan & Sciasa, 2018, p.365).

Providing feedback that is “purposeful and constructive, and that acknowledges effort and achievement is another way for educators to demonstrate they value the learning relationship with their students. Teachers need to balance constructive criticism with positive reinforcement” (Ratima et al 2022 p 42). As Ben noted for one assignment for which he got a low mark and was just told it should be better, “*I actually had to, basically ask for a re-submission to actually get the feedback”.* However, in another course a recent PhD graduate took over from the lecturer who was very busy and set up a forum to have discussions about the assignment topic and that was really engaging as students could bounce ideas off each other *“I'd say “hey, is this the right idea? Am I on the right track*?” Julie really found the lack of peer feedback impacted on her results which were “a *lot lower. And I think the major reason is just, normally you’d talk to people. because I didn't want to study at home alone … and it's not that the people would give you answers or anything. You’d just all be able to like, hive mind*”.

Institutions also play a role in relationships and can enhance students' learning. Simple acknowledgements as Ben described "*I got a "good work done" … letter from the university saying "congratulations you've done really well." So that's my little pick me up when I feel like real bad. Before I study.*" Direct support in terms of a loaned device was not just an enabler for learning but indicated mattering "I*f you cannot have a computer, they [university] gave it to me. So that things help because if you don't have a good device, that's a problem.*" (Rachel). Academic services also played a critical role "*The Disability Support Office, did get hold of me to get someone to do note-taking, that was pretty cool, which made things a bit easier*." (Ben) Rachel had a similar experience "*I am dyslexic and the disability department was behind me. "Are you okay? Do you need anything*?" *And they supported me, but they sent me to the Studiosity program to check my assignment*".

Relationships can also be enhanced through the use of a *poutama* or scaffold. Establishing norms and expectations can provide clarity and consistency and as Julie indicated encouraged her to learn "*like big, sheets which are big overviews of the entire topic. Those were the best things to be able to look at through lockdown. Try and guide yourself to where you were"* (Julie). Otherwise, it was*"kind of frustrating"* because *"you'd spend most of your time trying to find what information you needed or like, where was the next lecture hidden*." (Julie)

There were, however, times when the relationship broke down. Ben did find developing connections hard virtually. He described how it "*was a bit annoying"* when half the group didn't show up for the project and how in the online forum they just had *"less and less people got involved. So, I think in some ways some people lost interest.*". Even though he describes himself as solitary he does prefer to collaborate face to face for "*when they are in front of you, they can't ignore an email, and they can't quite ignore you standing over them*" In Julie's case she indicated that "*a lot of the lecturers would just post previous years' recordings. The Echo recordings from last year, which was a little bit cruel"* as they had told them in previous years not to rely on the *"zoom, echo recordings, you don't learn as well from them. And suddenly, that was all we had to learn off.*" One explanation is not so much about the content but the break in relationship where students felt the lecture wasn't specifically for them. As Rachel reflected, their online classes included both live and recorded sessions and she preferred live *"because in the lives you interact. You ask questions, you add things.".* Establishing and maintaining protocols of engagement and learning is critical to reduce the risk of relationships being damaged.

So what role did relationships play in supporting learning for these four students?

Ben valued his relationships with the institution, particularly with the student support services. He didn't "need" peers to support him in his learning unless it was a formal requirement. What was most important to him in his lecturer relationships was feedback whether this was via the formal assessment process or asynchronous discussions. This connects to the aspect of whanaungatanga around reaffirming success and expectations.

Rachel built relationships with peers through social media and valued it when her lecturers acknowledged her life experiences, and she could actively contribute to the class. Synchronous engagement was a key for her. Relationships were enhanced when the institution checked in with her and practically supported her learning needs. This connects to the aspect of whanaungatanga of the learning partnership.

Julie valued it when her lecturer scaffolded her learning by providing structure and direction so she could just get on with her work. She found pre-recordings disconnected her from her learning. Relationships with her peers were critical to her learning success as she relied on these for keeping on track and validating her learning journey. This connects to the aspect of whanaungatanga of the value of learning with others.

Kate felt able to approach her lecturers when they shared their personal experiences and checked in on her learning. However peer relationships were critical to her motivation and success as she valued having a partner to learn with. Peers were also critically important in supporting the affective dimension of her learning. This connects to the aspect of whanaungatanga of showing care for students' learning.

Conclusion

Reflecting on the value of using a cultural approach for responsive pedagogy we were able to broaden our view of relationships beyond interactions between teachers, students, content and technology to understand some of the nuances embedded in whanaungatanga. This included the use of poutama to guide students through the learning process which was particularly important when access to teachers and peers was restricted during the pandemic. Mattering was also demonstrated institutionally where support services recognised issues around digital access or learning difficulties which gave students a sense of belonging. Validation of students' efforts and learning journeys was demonstrated through feedback, ako by enabling students' contribution to the learning process of the class, and respecting and encouraging students' knowledge contributions. Holistic care for the student, acknowledging where they are coming from culturally, emotionally and spiritually and what they bring to class, provides students with a sense of place in the learning environment and supports the success of their learning journey.

This research demonstrates the need to think beyond the traditional approaches to design and teaching by putting not just the learner but whanaungatanga at the centre of the process. Social connection and relationships are an integral part of culturally responsive pedagogical frameworks in Aotearoa. Success in online learning during the pandemic is not so much about the "what" of teaching but "how" we go about it. Places and spaces (virtual and physical) of belonging need to account for diverse individual and cultural variation of learners. As we reflect on these student experiences' we see further opportunities, not evident in these research findings, to enhance and sustain meaningful and reciprocal relationships with students, particularly Māori students. Whilst *Ngā Hau e Whā o Tāwhirimātea* is situated in Aotearoa the value of whanaungatanga in teaching and learning is equally as relevant globally as it can benefit all students. We encourage educators to "consider this" as a start to deepen their commitment to building relationships with learners in culturally responsive ways (Rātima et al., 2021).

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reconnect
Reconnecting relationships through technology

Whakapiri (Engagement): Using an Indigenous engagement framework to enhance online teaching

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Massey University staff used a New Zealand indigenous (Māori) engagement framework, developed for working with at-risk youth, to restructure the content and student engagement for an online introductory course with a non-traditional student cohort. Each online teaching page embedded three sections reflecting the concepts of Whakapiri (Engagement), Whakamārama (Enlightenment) and Whakamana (Empowerment). This sequenced content provision for students, guiding them through an initial topic overview and learning outcomes through to core teaching content and learning activities and finally onto assessments, putting their learning to practice. This framework also underpinned staff engagement approaches with students, focusing on ensuring staff presence online, proactive contact, recognition for learning illustrated, encouragement of class engagement, clarity in course guidance and assessment feedback that praised and empowered change. Compared to the old course, subsequent deliveries showed greater course engagement, improved class GPA of 36%-50%, and feedback confirms a consistently positive and connected student learning experience.

Keywords: Non-traditional students, Online teaching, Indigenous engagement framework

The challenge

The development of positive student-teacher relationships is foundational to good teaching, but this can be a challenge for three key reasons. First, the international higher-education environment is increasingly online and asynchronous, a space within which many lecturers lack knowledge or expertise in design and assessment (García-Morales, Garrido-Moreno, & Martín-Rojas, 2021). A second challenge, particularly for indigenous students, is the predominance of courses that are mono-cultural in content and design, devoid of the multicultural worldviews, knowledge and teaching pedagogy expected of a culturally responsive learning experience for an increasingly non-Western student body (Morong & DesBiens, 2016). The third challenge is the need to design for engagement with an increasing number of 'non-traditional' students who are mature and not necessarily technologically savvy, yet are juggling full-time work and family commitments while trying to study part-time and online (Stone & O'Shea, 2019). A potential solution to these challenges is the integration of practical indigenous relational frameworks within current online teaching pedagogy. Research now shows that course design reflecting indigenous knowledge and engagement practices enhances educators relationship building capacity with students (Barkaskas & Gladwin, 2021), increases both indigenous and non-indigenous student engagement (Reano, 2020), and improves online curriculum design (Wilks, Wilson, & Kinnane, 2017).

In 2020, staff at Massey University were tasked with the redesign of an old course which was to become a foundational course in the newly developed *Mental Health and Addiction Programme*. This introductory course faced all the relational challenges previously identified, in that it was to be (a) delivered online, (b) culturally responsive to a student cohort comprised of a significant number who identify as Māori (the indigenous people of Aotearoa New Zealand) and (c) designed for a largely non-traditional student cohort upskilling for work in the health sector. To meet these challenges, staff utilised a Māori engagement framework to structure both the design of their online teaching platform and their student engagement approach. This manuscript describes this course and engagement redesign and provides both quantitative and qualitative evidence of the success of this approach for reconnecting students with educators and enhancing the student learning experience.

The student cohort

Massey University's *Mental Health and Addiction Programme* was designed in response to national concern over the increasing rates of mental health and addiction, particularly in Māori and Pacific Island communities,

and the lack of workforce education pathways required to meet these challenges (Patterson, Durie, Disley, & Tiatia-Seath, 2018). Programme staff, working with mental health and addiction sector workforce development agencies, determined that the cohort entering our foundational course would be *non-traditional*, reflecting students that are (a) older than 25, (b) first in their families to attend university, (c) currently working in the sector, (d) enrolled part-time, (e) studying online, (f) from lower socioeconomic families, and (g) with a higher proportion than usual coming from minority ethnic communities, particularly Māori and Pacific Island.
Many if not all of the cohort characteristics noted above were also identified as key risk factors for potential failure or dropout from higher-education (Pearson, 2019). Mitigation of these risk factors required an approach sensitive to the often precarious and stressful context of these students. This meant balancing *Transactional Distance*, such that they received sufficient structure to reduce stress and develop fluidity with content, but were offered sufficient opportunities for dialogue to satisfy autonomy over their learning journey (Moore, 2019). Further, it required a focus on the engagement factors known to support non-traditional student cohort retention, including prioritising regular dialogue and meaningful engagement activities, welcoming the sharing of their own experiences as part of the learning process, and encouraging positive engagement and reflective discussions with other students in the class (Stone, Downing, & Dyment, 2021; Stone & O'Shea, 2019).

The *Whakapiri* (Engagement) Framework

Sir Mason Durie's *Whakapiri (Engagement) Framework* was originally developed as a guide for health professionals working with disengaged Māori youth populations, but is now recognised as having broad application to many different hard-to-reach cohorts (Lang & Gardiner, 2014). This framework highlights that our ability to act in an enlightened manner is the result of a process of learning and engagement. Specifically, it starts with *Whakapiri* (Engagement), which serves to develop trust and respect between two parties. Once trust and respect are established the second step of *Whakamārama* (Enlightenment) can occur, a stage at which the parties meet to discuss, debate and come to an understanding about the issues at hand. The result is *Whakamana* (Empowerment) of the individual – the youth in the original framework conceptualisation – to act independently for their betterment, applying the knowledge and understanding of the issue they have developed.

Given the utility of the *Whakapiri* framework for reaching disengaged youth, programme staff identified it as an ideal framework for engaging with their student cohort. The potential utility of this framework as guide was evident for two components of course delivery: (1) as a structure for the weekly delivery of content in the online learning environment, and (2) as a guiding framework for structuring the online engagement and interactions between staff and students.

Applying the Whakapiri (Engagement) Framework: Online environment

The *Whakapiri (Engagement) Framework* components (engagement, enlightenment and empowerment) reflect a clear structure for the sequenced delivery of online course content and assessments, in a manner similar to which *SOLO Taxonomy* builds students capacity through increasing stages of content complexity (Biggs & Collis, 2014). It also offers an online design structure for content that meets critical online design requirements for learning, including creating a sense of unity between potentially diverse weekly topics, a clear visual hierarchy of information and distinction between the aims of each components, a visual rhythm for motivating movement from one component to the next, and a clear balance to each page which offered little chance for visual asymmetry between the three key components (Bader & Lowenthal, 2018).

Whakapiri (Engagement): In the *Whakapiri* framework, initial engagement is critical to establishing the positive relationships upon which trust is established and learning can begin. Applied to an online learning environment this means that initial engagement needs to be calm, respectful, clear in its guidance, culturally relevant and respectful of diversity. Programme staff operationalised this by providing an initial section labelled 'Whakapiri' which offered students a definition of this term and why it was being used, a simple and warm welcome, an overview of the topic under study that week, and learning outcomes and expectations, delivered both in writing and via video. This presented a low-stress initiation to the weekly focus, re-engaged students with teaching staff, helped clarify the key concepts under focus that week, and helped students establish trust in staff guidance.

Whakamārama (Enlightenment): In the *Whakapiri* framework, enlightenment is founded on trustworthy engagement and is the result of two or more parties joining to explore, discuss, debate and come to an agreement on an issue. Applied to an online learning environment this means that (a) learning is a process affecting both parties, not simply the student, and (b) learning requires interaction not static observation. Programme staff operationalised this with e-books that sequenced student progression through learning materials from simple to complex issues, offered in multiple media formats including written content, visual imagery, podcasts, and videos. Dialogue and class engagement on this content (student-student and student-staff) were facilitated via an online forum that specifically sought critical reflection on key concepts and encouraged students to draw on their own lived experiences as a framing narrative for their responses. The e-book content for each week also integrated private and formative assessment activities for students to gauge their understanding of content and prompt revision of gaps in their knowledge or understanding.

Whakamana (Empowerment): In the *Whakapiri* framework, empowerment is the result of enlightenment and reflects a state in which individuals can act with knowledge and insight gained through shared understanding of an issue (i.e., they are empowered by knowledge). Applied to an online learning environment this requires the provision of activities or assessments relevant to the weekly content within which students can demonstrate their knowledge and mastery of this area. Programme staff operationalised this in two ways. First, they used multiple short quizzes in which students demonstrate their knowledge of the content under study that week. While individually these weekly courses only reflected 3% of the students' overall course mark, offering a low-risk test of knowledge, collectively the 10 quizzes across the course accounted for 30% of their final mark. Second, students were directed to complete weekly entries in their reflective journals (worth 30% of the overall course mark) allowing them to demonstrate their learning journey from initial understanding of specific weekly topics, their final understanding, and the learning activities or content that facilitated their enlightenment.

A focus on Te Reo Māori (Māori language) and Māori worldview in online design: Working toward cultural responsiveness and relevance, programme staff embedded Māori language and worldviews in their online design in three ways. First, Māori terms (and English definitions) were used as standard terminology for key course structure and content components. For example, *Tangata whai ora* (a person seeking wellbeing) replaced the terms 'client' or 'patient', standardising use of this term and helping shift student understanding of mental health and addiction service users from passive *medical patients* (a Western worldview) toward active individual agents *seeking wellbeing* (a Māori worldview). Second, Māori terms with accompanying English translations were used as standard for all online navigation links, such as 'Ngā Aromatawai' (Assessments), 'Wāhi Kōrero' (Communication), and 'Wāhanga Tuatahi' (Week 1). Third, programme staff prioritised the description of concepts, issues, and approaches within mental health and addiction each week from a Māori and a Pacific worldview prior to referencing the currently dominant Western worldview. This sought both to legitimise Māori and Pacific worldviews as valid and also expand student understanding beyond the dominant Western worldview, particularly regarding how issues can be understood, and solutions sought.

Applying the Whakapiri (Engagement) Framework: Online teaching approach

In addition to acting as a structure for online course design, the *Whakapiri (Engagement) Framework* also offered a clear guide for reconnecting students with programme staff in a process that supported the development of respectful and trusting relationships. In fact, this framework supported relationship building in a manner that clearly reflected the five R's critical for developing an online learning experience supportive of indigenous learners: *respect*, *relevance*, *reciprocity*, *responsibility*, and *relationships* (Tessaro et al., 2018). This framework also facilitated the development of relationships in a manner supportive of non-traditional students, including early and individualised contact, consistent online staff presence for support, quick response times to queries, public recognition of learning and encouragement of interaction with classmates, recognition of lived experiences as valuable learning narratives, and acknowledgement of the multiple identities and commitments these students have besides study (Stone et al., 2021).

Whakapiri (Engagement): The nature of both initial and ongoing engagement between staff and students was critical to the establishment and maintenance of strong relationships throughout this course. Programme staff sought to shape this engagement in three ways. First, reflecting the desire to illustrate *respectful* engagement at the outset, programme staff provided a pre-semester 'Ngā mihi' (Introduction) forum in which students were encouraged to introduce themselves and their reason for taking the course. Staff responded quickly to every student post, specifically responding in a manner that publicly recognised and positively responded to (a) their reason for entering the course, (b) experiences shaping their reasoning, and (c) encouraging their participation in class activities to come. Second, highlighting their *responsibility* to maintain consistent and protective relationships with students, programme staff provided guidance and motivation to engage each week that was consistent and clear in timing, instruction, and layout. Written in colloquial and accessible language, these messages provided (a) an initial overview of the topic and expectations of activities to complete, (b) a mid-week check-in identifying progress students had hopefully made and praising students already engaging online, and (c) an end-of-week wrap-up detailing key take-home messages for students to have learned from this content.

Whakamārama (Enlightenment): Programme staff sought to lead and encourage culturally *relevant* engagement throughout the course, but particularly in the *Whakamārama* sections where students explored and debated concepts together. Programme staff accomplished this in guidance throughout student discussions and debates. Specifically, in their response and encouragement to student posts they sought to emphasise the importance of Māori knowledge, worldviews and explanations as critical for a multicultural understanding of key concepts. This helped broaden student views initially shaped by the predominant Western worldview and clarified Māori and non-Māori student understanding of issues and how they may be resolved through different cultural lenses. *Whakamana (empowerment):* A key focus of programme staff was the empowerment of students not only regarding their learning but also their willingness to engage in *relationship* building and give back to others in the class. In this regard, programme staff specifically encouraged *reciprocal* student-student and student-staff relationships at every engagement opportunity. For example, programme staff always publicly praised student feedback and illustration of learning in forum discussions, specifically highlighting how student personal narratives offered further insight into lived experience of key concepts for the class (student-staff reciprocity). Further, students were always encouraged to review and respond to other student critiques or appraisal of course concepts (student-student reciprocity) as a means for critical enlightenment and relationship building.

A focus on Te Reo Māori (the Māori language) in student engagement: Reflecting a desire for culturally responsive engagement with all students (whether Māori or non-Māori), in every written, video, or oral communication with students, programme staff utilised Māori greetings, salutations and exclamations, including examples such as ‘Kia ora’ (Hello), ‘Tino kino te pai’ (That is awesome), ‘Ngā mihi nui’ (Kindest regards) and ‘Mauri ora’ (May the vitality of life be with you).

The Outcomes of Applying the Whakapiri (Engagement) Framework

An audit of course administrative data and student feedback shows the significant improvements in class success, staff and student engagement, and the student learning experience resulting from the integration of the *Whakapiri (Engagement) Framework* framework. Figure 1 uses standard university course completion data aggregated at the group level to offer a breakdown of the proportion of student passes (by grade), student failures and students disengaging with the course since 2019.

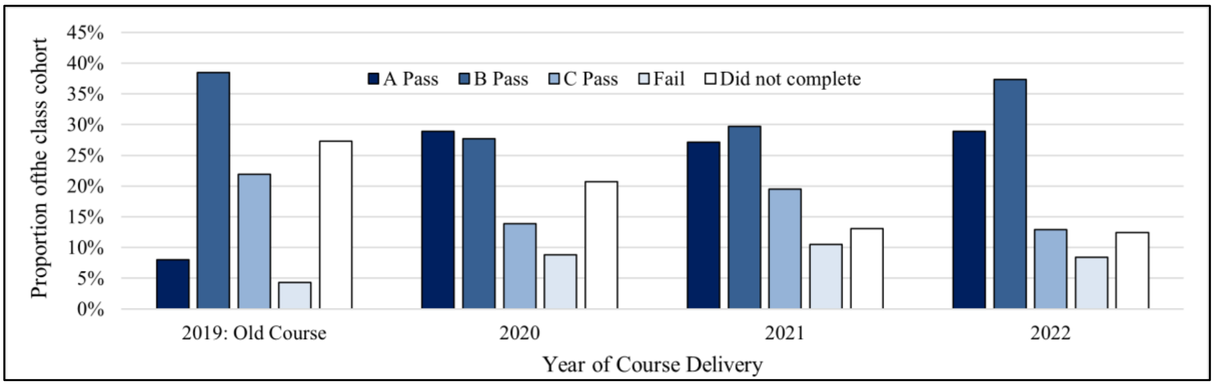

Figure 1: Proportion of student passes, failures, and non-completions 2019-2022

Between 2019 and 2020 there was a substantial improvement in class passing grades. In particular, the proportion of A-level passes more than tripled from 2019 (8%) to 2020 (29%). This predominance of A and B-level passes has been maintained across 2021 and 2022 deliveries. The proportion of students disengaging from the course (i.e., those identified as ‘Did not complete’) has also consistently fallen from 2019 (27%) to 2022 (12%), indicating the success of the new course delivery in engaging and retaining students. Interestingly, the proportion of students receiving a failing grade has doubled between 2019 (4%) and 2022 (8%). Review of this student sub-cohort indicates that (paradoxically) this increased failure rate is a result of the enhanced staff-student engagement. Specifically, this is a sub-cohort who previously would have disengaged from study early in the old course, but the enhanced staff engagement and relationship building from 2020 onward saw this sub-cohort remain in the course, though their achievement was still not sufficient to pass. Overall, and despite the slight increase in students failing, the improvements made to the course and increased retention of students has seen class GPA consistently improve compared to the 2019 class by 36% (2020), 42% (2021) and 53% (2022).

Our programme uses standardised, voluntary and anonymous course completion surveys to request student feedback on their learning experience. These surveys are embedded in the final week of the class online Moodle site using the Moodle *Survey* tool, and they help teaching staff highlight areas of strength or weakness in course design and delivery. An audit of anonymous student feedback since 2020 shows an overwhelmingly positive learning experience, confirming the value on implementing the *Whakapiri (Engagement) Framework*. As identified in Table 1, integration of this framework has resulted in students consistently praising the sequenced online course layout, the staff engagement with and communication to students, the inclusion of both Māori language and worldviews. Overall, students now consistently rate this course as one of their favourites.

Table 1. Student feedback on specific aspects of the new course

Aspect of the course	Student feedback (Year of course delivery)
Course layout	I think it is the best laid out and best supported course I have ever done. (2020) I wish all of my courses were set out like this one. (2021) The way the [Moodle] site was organised was amazingly helpful. (2022)
Staff-student engagement	They were so encouraging, helpful and quick to respond. (2020) Having positive and engaging staff makes a huge difference. (2021) Thank you for teaching this course in an engaging, respectful and encouraging manner. (2022)
Staff communication with students	Communication was spot on and regular and they were so understanding. (2020) All communication was respectful, uplifting, encouraging, fair, justified, prompt and warm. (2021) They were great communicators, compassionate and honest. (2022)
Inclusion of Māori language and worldview	I really liked the inclusion of Māori language throughout the course. (2020) I really, really liked the Māori and Pacific inclusion throughout. (2021) I love how it incorporates Māori and Pasifika worldviews. (2022)

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This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named in this document are responsible for the ethical conduct of this research. If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact Professor Craig Johnson, Director (Research Ethics), email humanethics@massey.ac.nz

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reconnect
Reconnecting relationships through technology

Quasi-synchronous discussions: A proposal to measure the effect of Teams on cooperation, belonging, emotion and interactions

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As students begin to reconnect after the COVID-19 pandemic, changing student expectations around online engagement seem to be suggesting that new approaches should be adopted. Recent research has found that students who engaged with each other in a discussion task in a synchronous mode were more willing to work together, felt more positive and more like they belonged than students in an asynchronous mode. We wish to extend these findings by investigating whether Microsoft Teams promotes a *quasi-synchronous* mode of discussion and has a similar beneficial effect. The proposed study adopts a mixed-methods approach of quasi-experimental design to address this question. Students will be randomly assigned to groups of five and provided with online forums (control) then re-form and use Teams (experimental) for a discussion task. Data will be collected through survey, digital artefacts and interviews. We aim to contribute robust, empirical evidence on the effects of Teams on student engagement, which will be of interest to educational leaders and teachers.

Keywords: cooperative learning, group work, quasi-synchronous discussions, social interdependence theory, Microsoft Teams, online forums.

Introduction

In the COVID-19 pandemic of the last two years, tertiary educators have had no option but to reconnect to – or connect for the first time to – technologies to transition their on-campus classes to online. Some teachers have turned to two staples in the online learning toolbox, the online discussion and the virtual classroom, to foster student interaction with content, the teacher and each other. However, anecdotal evidence hints at the reluctance of students to interact with each other unless these activities are marked and, teachers express their dismay at the small number of students who attend their carefully planned synchronous classes. It seems students are reluctant to engage with each other online. One of the more novel responses, though, that we have seen over this period is the co-opting of the workplace productivity tool *Microsoft Teams* (Teams) for learning. As Teams has already proven popular in workplaces, it perhaps is inevitable that it has found its way into university classrooms. And so far, for those educators who have opted for Teams, it seems to be working. The early reports of using Teams for learning in formal contexts have been overwhelmingly positive and its popularity is predicted to grow (Roy & Sankey, 2021). However, the number of papers that report on studies grounded in a theoretical framework are limited. Both students and teachers seem to be enjoying the experience of using Teams, but we have little empirical understanding of how Teams actually influences the way students think and behave.

This paper outlines a planned study into the effects of Teams on student learning. Grounded in a Social Interdependence Theoretical framework, the proposed research aims to fill the gap in the literature by providing scholarly knowledge on the value of Teams for learning. Members of the research team come from three Australian and one New Zealand university. The research is being conducted at each university over the next 12 months, thus providing a large data set across different institutions to base our findings.

Background

Online teaching and learning have now become a norm in the COVID-19 era, which shows no signs of disappearing any time soon. As teaching and learning move online, we are struggling to design learning activities that motivate students to engage with each other. The lack of student engagement is a serious problem if we are going to continue to teach online as student interactions of any kind, with each other, the subject content and the teacher, have been proven to improve learning (Bernard et al., 2009). So, we must ask 'how do we get our students to engage with each other?'

While there are a variety of online tools that could be used to promote engagement, the most common and persistent is the *online forum*, which has been with us since *e-Learning* began in the 90s. The online forum is the default tool for discussions and is central to the Learning Management System (LMS), the mainstay of online learning in higher education. Even today, the online forum is still perhaps the most commonly used tool for class discussions and announcements. However, over the last two years of lockdowns in which classes have been forced to move online, we have seen teachers adopting novel approaches to continue their classes, like using the workplace productivity tool, Microsoft Teams (Teams). Though Teams has carved out a large market share in business since its launch in 2017 (Tsai, 2018), scholarly research into its educational value and best use is only beginning, but so far, the results are encouraging.

Survey evaluations of students' perceptions and satisfaction with using Teams have found that students have liked it, found it easy to use and useful. In formal learning contexts, Teams has been found to be superior to social networking sites (Sobaih et al., 2021), supportive of student-student and student-teacher interactions (Rojabi, 2020) and superior to Moodle, a popular LMS, for chat, video conferencing and screen sharing and content creation (Krašna & Pesek, 2020). On the negative side, some student surveys have revealed that students find it difficult to keep track of assessment items in Teams, and that it is not as good as Moodle for the presentation and organisation of course content (Krašna & Pesek, 2020). Some students too, complained about external factors, such as Internet instability, which negatively impacted their Teams experience (Duong & Nguyen, 2021), but this cannot be attributed as a shortcoming of Teams. The negative findings, though, are far outweighed by the positive. It seems that during the enforced lockdown period, in the papers reviewed here anyway, students have responded in a positive way to a transition to Teams as a new way to reconnect with each other.

Teachers too have enjoyed using Teams. One teacher opined that Teams was a 'a great tool' (Poston et al., 2020), another reported that she had 'a good laugh together' with her students and that the student feedback was 'overwhelmingly positive' (Jones, 2021). Surveys of teachers have indicated that using Teams was 'user-friendly' and an effective way to promote networks with their students (Shanmuga Sundari & Karthikeyan, 2022), and that it improved staff morale (Henderson et al., 2020) and was 'very good' for assignment and grading, student-teacher interactions and classroom organisation (Olugbade & Olurinola, 2021). Overall, based on these findings, far from being a catastrophe for students and teachers, Teams has been a well-liked and effective option for handling the transition to online.

Supporting this view for Australia specifically, in a workshop held in April 2021, staff from 32 Australasian universities participated in an online survey and discussions on virtual collaboration and groupwork in online learning and assessment, as part of the ACODE 83 workshop facilitated by CQ University (Roy & Sankey, 2021). When asked which tools could be better utilised in learning and teaching, they identified the potential of Teams, reporting numerous benefits such as its currency in the world of work, proximity to other Office 365 applications and its potential for 'conversation-centric' (p.2) collaboration. TEAMs is first and foremost a tool for collaboration, which is in contrast to the LMS, which is content centric. This hints at a different type of teaching approach that can be afforded by TEAMs to what LMS users are familiar with. Martin and Tapp (2019) in their report of using Teams to teach a law subject, argue that Teams promotes a social constructivist pedagogy. A platform does not delimit the teaching approach, but the unique affordances of Teams and the fact that it is a technology that many graduates will encounter in their first job begs the question, *could Teams promote a more effective and relevant teaching and learning experience than the solidly entrenched LMS?*

In a study of turn-taking amongst students using Internet Relay Chat (IRC), Garcia and Jacobs (1999) explain that though participants are engaged at the same time in the discussion, there is a short lag between message composition and message delivery. They coined this mode *quasi-synchronous*. The chat function in Teams is quasi-synchronous as it is a messaging application. Evidently, synchrony plays an important role in how students work together. A recent study found that students who engaged with each other on a discussion task in a synchronous mode were more willing to work together, had more positive feelings towards that work and felt like they belonged more to the group than students in an asynchronous mode (Peterson et al., 2019). Very little of the Teams research to date has been grounded in a theoretical framework and so the rigour and trustworthiness of the findings is limited. We aim to fill this gap by conducting theoretically grounded research that extends on the Peterson study by investigating how Teams, a quasi-synchronous technology, compares with the online forum, an asynchronous tool.

Theoretical framework

The research design of the proposed study is guided by that of Peterson et al. (2019) and uses the same Social Interdependence theoretical framework to investigate the effects of Teams on student's willingness to work together. Social Interdependence Theory states that "the outcomes of individuals are affected by their own and others' actions" (Johnson & Johnson, 2009, p. 366). According to this theory, the way in which participants interact with each other influences their motivational and affective states, such as their cooperativeness, belongingness, affect and behaviour (Deutsch, 2012; Johnson & Johnson, 1989, 2009). If the quasi-synchronous affordance of Teams has a similar effect on cooperativeness as synchronous interactions, we should expect Teams to boost students cooperativeness when compared to the asynchronous mode.

We are also interested in the effect of Teams on students' sense of belonging and emotion. Belonging refers to the basic need to form stable, mutually caring relationships with others (Baumeister & Leary, 1995). A sense of belonging is a driver of cooperation (Johnson & Johnson, 1989) and has strong effects on emotion and cognition (Baumeister & Leary, 1995). Evidently, synchrony also plays a part in how much individuals feel like they belong. Students studying synchronously, face-to-face and online, were found to have a greater sense of belonging than asynchronous online students and were more motivated, cooperative and better able to deal with different points of view (Saltarelli & Roseth, 2014). We are interested to find out if Teams users feel like the belong more than online discussion users. We also want to investigate the effect of Teams on students' emotions. Emotion refers to a temporary, specific feeling which may be positive or negative (Schunk et al., 2013). We know that the prospect of doing group work, especially online, makes many students break out in a cold sweat. So it would be useful to understand if using Teams can mitigate this deleterious effect and deliver a similar emotional boost as the online discussion (Peterson et al., 2019).

Our final focus is to investigate whether students in Teams have discernible differences in how they interact with each other than students in online discussions. Any strategy that boosts student interactions - with each other, subject content or the teacher - positively affects learning (Bernard et al., 2009). Peterson et al. (2019) found that synchronous students were more able to take risks and speak with authority than asynchronous students. In other words, they exhibited more sophisticated cognitive processing. Perhaps using Teams will have a similar effect on thinking?

In sum, in the Peterson study (2019), the synchronous mode of group discussion was found to be superior to the asynchronous mode in conferring on students motivational and behavioural benefits. We theorise that Teams, a quasi-synchronous modality, sits close to the synchronous end of the *asynchronous-synchronous continuum* (see Figure 1).

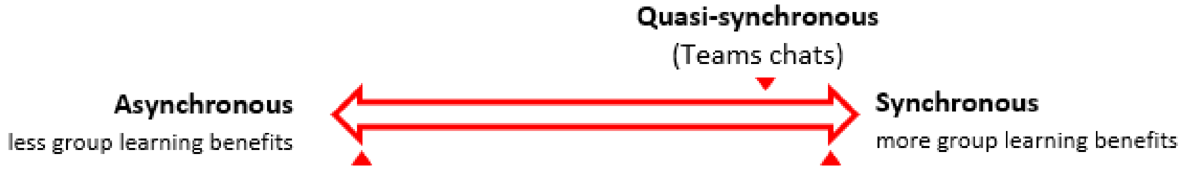

Figure 1: Showing where Teams sits on the asynchronous–synchronous continuum

Research problem

We want to know if Teams is better for group work than online forums. We theorise that the quasi-synchrony of Teams will have a stronger positive impact on student *cooperativeness*, *belonging* and *emotion* than the asynchrony of the online forum for group discussions. We also believe that the nature and affordances of the two platforms will influence how students interact with each other. Specifically, we want to answer the following five research questions:

1. Is there a significant difference in cooperativeness between students using online forums and Teams?
2. Is there a significant difference in belonging between students using online forums and Teams?
3. Is there a significant difference in emotion between students using online forums and Teams?

4. How do students interact with each other in online forums and Teams?
5. What do students think of using Teams for learning when compared to online forums?

Context & recruitment

The proposed research (CQU HREC Approval 23607) will be conducted first at Central Queensland University and then at universities in which the research team members are situated, thus generating a large data set across different higher education settings. We will be seeking subjects in which students are able and encouraged to interact with each other in an informal way to provide each other support and seek and provide help. Teachers of the subjects will be provided with training in how to use and promote Teams for such a purpose. In a related study, not detailed in this paper, we will be investigating how teachers' personal approach to learning impacts on their ability to support a social constructivist approach (Martin & Tapp, 2019) using Teams. Potential participants will be notified by their teacher of the nature of the study and will be formally invited to participate by a member of the research team who has no direct involvement in the teaching or assessing of students in the subject. Participants will be encouraged to participate in a 20-minute interview with the offer of going in a draw to win one of two $50 gift vouchers.

Methodology

The proposed study uses a mixed-methods approach of quasi-experimental design. Students in participating subjects will be assigned randomly to groups of five and will use an online forum (control) for a discussion task throughout the first half of the subject. In the second half, new teams of five will be formed who will then use Teams (experimental) for the same purpose, thus giving students a similar experience of using the two tools from scratch with new team members. The sources of the scales used to answer RQs 1-3 as well as the methods planned to answer other research questions are shown Table 1.

Table 1: Research Questions and Methods

Research Question	Method
RQ1 Cooperation	Perceptions of cooperation | competition | individualism scales (Peterson, 2020, p. 89)
RQ2 Belonging	Relatedness scale (Furrer & Skinner, 2003))
RQ3 Emotion	Positive emotion, negative emotion scales (Linnenbrink, 2005) (Linnenbrink, 2005)
RQ4 Interactions	Secondary data (chat logs); Interview
RQ5 Experience	Interview

An online Qualtrics form will be used to survey participants' measures of cooperation, belonging and emotion. The original scales consist of 26 items which we have reduced to 17 for speed of completion, which we hope will increase the response rate. We have also slightly modified the items to suit our context. Each item requires respondents to rate themselves against statements like *'I want to do better than other students in my group'* (competition) and *'I felt accepted by others in my group'* (belonging) and '*While working with my group, I generally felt bored'* (negative emotion) from 1 (*strongly disagree)* to 5 *(strongly agree).* To answer RQs 1–3, participants will be surveyed at two times in the subject using: T1 will be at the half-way point to gauge the three effects in the first condition (online forums) and T2 will be at the conclusion of the subject to measure the effects in the second condition (Teams). We will use SPSS to conduct paired samples T-Tests to investigate whether there is a significant difference between the two conditions for each of the three constructs measured as well as a one-way repeated measures MANOVA as we conceptualise that these three variables are related personal factors that influence participants feelings towards working with each other.

To answer RQ4, we will collect secondary data from participants in the two conditions, which will consist of logs, page views and actual posts between participants. We will initially do a count of conversations, posts, words and words per conversation in the two conditions. We will conduct a thematic analysis of this data using Braun and Clarke's six-step methodology (2006): data familiarisation, code generation, theme search, theme definition/naming and report. Emerging patterns and themes from this thematic analysis will be used as the basis for the 20-minute interviews, to provide richness to our analysis. To answer RQ5, participants will be asked about their experience of using both tools, which one they found easier to use and for what reasons.

Significance & Expected Outcomes

We expect that students will derive more benefits from using Teams than online forums for group discussions. Besides the pedagogical value of using a technology that promotes cooperativeness, we also argue that it makes sense to use technologies that prepare our graduates for the world of work (Sankey, 2020). We hope our findings will support this argument by providing solid evidence of the educational effects of Teams on student motivation and behaviour. The findings from this study, grounded in a theoretical framework, will provide solid empirical data for university leaders contemplating the integration of Teams into their learning environment, or even the replacement of their LMS at some point in the future, with an alternative platform that has different affordances. Designers of learning and teachers interested in using technologies that promote student engagement and social learning will also find the outcomes of this study of interest.

As new technologies emerge that have distinct affordances to what have gone before, we also need to revise our approaches to teaching. In the COVID normal era, in which online learning is even more established, we need to understand how to design learning experiences making best use of the available technologies to assist students to reconnect. We hope that our study will give weight to the idea that quasi-synchronous learning made possible by technologies like Teams opens doors to thinking about learning and designing learning in different ways. It is possible that we are at the beginning of a new approach of teaching, leaving behind the content-centric nature of the LMS to the social constructivist possibilities of quasi-synchronous technologies like Teams.

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reconnect
Reconnecting relationships through technology

Creative practices: thinking and thriving together

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In this concise paper, the authors provide a forum for thinking about creative and collaborative inquiry in research-informed practice. Higher educators may benefit from creative academic and professional development, beyond traditional programs in contemporary, technology-enhanced learning. Creative practice may take many forms. An educational developer and an educational technologist reflect on their practice through the forms of vignette and poetry, to exemplify how narrative can reveal insights that may otherwise have remained hidden. In telling our stories, we encourage other academics and professionals to use creative and collaborative ways to reconnect and thrive. Further research on creative practice may lead to more fictional, interdisciplinary ways of connecting and continuing professional development.

Keywords: academic development; professional development; creative inquiry; collaboration

Introduction

How to best develop innovative teaching and learning practice, technology-supported or otherwise, is a perennial question. Academic development varies depending on context, time, and place (Gibbs, 2013). Increasingly, higher education institutions value technology-enhanced, contemporary learning, and twenty-first century skills such as critical thinking, creativity and data or digital literacy (to name a few). Such skills are core capabilities for society (and hence for educators and students alike), and are urgently needed to solve the wicked problems of our time (Vallis & Redmond, 2021).

Accordingly, much effort is invested in designing programs to upskill academics and professionals in contemporary, technology-enhanced teaching and learning approaches. For decades, higher education institutions have created strategic initiatives and frameworks as guides and quality assurance to work towards such goals (Fraser, 2004; Newland & Handley, 2016). One example is the Higher Education Academy Fellowship, which assesses professional development by a reflective account of practice against a set of rigorous criteria (*UK Professional Standards Framework (PSF)*, 2011). Many websites and resources have been developed to help improve teaching practice with technology, based on a multitude of evidence-based professional learning outcomes and frameworks. Teaching in higher education necessarily draws on such institutional support and professional development to encourage collaborative, experiential learning (Mantai & Huber, 2021). Educational technology is often perceived as a catalyst for educational change and development in these contexts (Matzen & Edmunds, 2007). However, professional development in educational technology risks being perceived as procedural instruction in using software, a Learning Management Systems (LMS), and learning resources as a way of digitising rather than fundamentally changing traditional pedagogies (Cowling et al., 2022).

In this paper we step away from such formal training programs. Instead, we draw on our experiences as educational developer and educational technologist to present another approach: creative and collaborative inquiry as academic and professional development. Creative practice may be defined more broadly than individual artistry or aesthetic artistic practice, as many understand the term historically (Pope, 2005). Creativity is about thinking differently and shines light on ambiguous, unclear situations. We build on Budge and Clarke's assertion that academic development is an inherently creative act (2012). Educators may use collaborative and creative inquiry as a practice to further develop reflexive and cognitive skills through joint sense-making (Skains, 2018). For example, critical digital literacies and pedagogical skills may be learned through playing and participating in online, creative communities (Honeychurch & Taleo, 2021).

In narrative forms, educators can creatively probe their practice, their commonalities, and differences in a deeper way (Langer, 2016). By telling stories, academics might reflect on their teaching and attitudes to educational technology (Cousins & Bissar, 2012). The process of creating a shared account of work encourages creativity, but also collegiality and community (Vallis & Lopomo Beteto, in press). Drafting and feedback is central to creative writing. In creating narratives together, in whichever form we choose, we take a risk to express ourselves in a personal way and trust others to accept our experimental works. Now, more than ever, educators can benefit from engaging creatively and critically with each other, and with educational technology, for professional development.

Below the authors discuss how this collaborative research informed our own creative practice, to think and thrive together in higher education. We present two brief examples of creative inquiry, vignette, and poetry, where writing is used to explore, understand and represent challenging human experiences. In the conclusion, the authors collaboratively integrate these creative reflections for further insights.

Stories from the field

Technology-enhanced teaching and learning may draw upon creative practices in less academic modes. Creative, collaborative processes help educators think across traditional divides and open new paths to explore (Taleo & Vallis, in press). Educators face complex and ill-defined challenges in teaching, and a creative approach may break through fixed conceptions to a new understanding. Such educational design and development may develop in unexpected ways and is less constrained by past structures (Golding, 2014). An emphasis on praxis, both individual and in communities and networks, experimenting: these help teaching and learning with technology, now ubiquitous (Jordan, 2020).

Beyond educational technology, educators generally agree that teacher-student and peer relationships are important to learning. Relationships matter in learning and teaching, and we can apply a similar ethos in professional or academic development, whether technology-enhanced or otherwise. Critical conversations and reflecting collaboratively on teaching practices with colleagues can also lead to unexpected insights and transformative learning (Budge & Clarke, 2012; Zeivots et al., 2021). Professional development workshops and self-help resources, no matter how well-designed, may lack this collaborative aspect of learning.

Vignette

The vignette below illustrates an educational developer’s perspective on the often challenging nature of such relationships that are not readily quantifiable or aligned to a professional development framework.

> Adrenalin. Breathlessness. At the meeting, it finally dawns on me. The feedback from design workshops I’ve facilitated, the draft design diagram and learning design plan that we agreed upon—none of these will be used in the subject’s curriculum development. The head teacher says they like some of the online activities suggested. They are grateful for my technical support, and they’ll be in touch soon. My throat is dry.
>
> Yet this is ridiculous. No actual disaster has occurred. On the contrary, the team are friendly and warming to change. I speak slowly, deliberately, saying something like, ‘We’ll need a bit more lead-time to design and develop for really good online experiences. Maybe we could include some of the workshop feedback into our design.’ My body says otherwise. It wants change now! I calm myself by typing notes. We just have different schedules and priorities. I ask after other deadlines. Maybe I could anticipate pain points and blockers in the design process where I could offer support and value. We agree to meet again soon and regroup. In the meantime, I will prototype some examples to show, rather than tell.

This is an unfinished story. Writing about this incident obliged me to reflect in a personal and professional way on the need for greater collaboration between educators and negotiation around project processes and outcomes. It foregrounds the relational aspects of team project work that may not surface in traditional professional development programs or research agendas around educational technology. I could speculate on what might have happened if I had invited the head teacher to tell a story about this meeting and educational development. With story, perhaps, we could think together and unpack the puzzle of this misunderstanding and move forward on the “curious axis of human connection” (Costello, 2022).

Poetical inquiry

Poetry is another way to understand more clearly the thinking of the writer (Lapum, 2010). This can reveal questions and highlight processes in the work of the professional. The poetic format can vary and be used as a tool to follow the poet's thinking at the time of creating, akin to a creative diary. The following extract of a poem describes working in the educational technology field (Taleo, 2022).
Through writing this poem I am sharing my learning and reflecting on aspects of change. In this poem I reflect on educational design and my role in that process of both making and deconstructing. I acknowledge the unknown journey that comes out of these practices.

I am a change driver
I pick up the screwdriver
fitting it into the screw
work
work
Work
sharing my learnings
connecting with others
moving their journey
along
along
along a path
of building or repairing
deconstructing or making
think
think
think of a future
we push towards the unknown…

Perhaps the unknown is the outcome of change. This poem continues to resonate throughout the author's year of changing roles in the education field. Creative practice can assist in making sense of the entanglement of pedagogy and technology and need not be approached in a linear or discrete way (Fawns, 2022).

Teaching and learning are highly relational, and "attending to relationships with care" is no less important in academic development (Budge & Clarke, 2012, p. 62). Thinking and working together makes sense for a postdigital world where we are constantly connected (Jordan, 2020). Expressing different perspectives in different forms can help practitioners move forward in their work. It is reaching for an ideal that works around and across the binaries: art and science, education, and technology, off campus and on campus. Neither is privileged.

Conclusion

Collaborating in creative ways builds relationships and helps us think together. Creating and telling stories, using poetic inquiry, writing vignettes; these processes help clarify ideas, designs, and the path ahead. These paths tangle technology and pedagogy, in ways different to many academic research projects and professional development programs. Such collaboration necessarily jumps the boundaries and power dynamics of traditional roles and responsibilities, disciplines, and faculties.

In this paper we make visible the results of one collaboration and co-creation process between an educational technologist and an educational developer, while acknowledging that there are many other possibilities. Writing vignette and poetry allowed us to experiment with the possibilities and pitfalls of teaching and learning that is interwoven with technology. Educators may find many other creative forms, adapting them for their own educational context to further develop practice and research.

Through writing this paper the authors demonstrated how creative engagement with academic development and education technology foregrounded the importance of relationships. We thrived by sharing creative skills while discussing ideas, co-writing in a shared document space, and editing each other's work. Despite sickness, disruption through travel, and other work pressures, we cared for the writing and thinking processes which helped our practice flourish during fractured times. The authors share these stories to encourage a future where more space is created for reflective, creative research and practice.

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reconnect
Reconnecting relationships through technology

Recorded audio feedback: bridging the chasm between educator and student in online assessment

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Provision of detailed and constructive feedback on written assessments is a challenge in many contexts. Increasing instructor workloads due to growth in class sizes further complicates having personalised feedback to student achievements. This paper reports using recorded audio feedback on written assessments and evaluating student perceptions of this feedback using a mixed methods approach. Students receiving recorded audio feedback were surveyed and their perceptions towards the feedback they received further probed via semi-structured interviews. Survey numerical data indicate that students found the feedback convenient and easy to access, clear and easy to understand and more personal than written feedback. Survey open responses and interview responses were thematically analysed and identified major themes and subthemes that supported and further explained the numerical data. This study helps describe student perceptions to recorded audio feedback, which may be a useful tool for helping connect instructors and their students in different learning environments.

Keywords: Audio feedback, assessment, online learning, higher education

Introduction

Feedback is a critical element of learning and assessment that broadly describes the degree to which students have met learning outcomes or assessment criteria. Previous work by Boud and Molloy (2013) highlights the importance of feedback, and proposes that feedback should be timely and tailored to their individual performance. Boud (2010) further states feedback should be specific, provide actionable suggestions for improvement and support future tasks that build on the skills or knowledge being assessed. These requirements suggest that providing personalised feedback to students is important for supporting their academic development. However, increased pressure on instructors due to factors that include massification of class sizes and transitioning to online learning can make providing individualised feedback more challenging (Henderson et al., 2019). Both resource limitations and other challenges emerging in response to the COVID-19 pandemic have pre-empted a need for strategies to maintain effective feedback under these conditions.

Audio feedback has been implemented across different countries and disciplines in higher education and shows promise as either an alternative or a supplement to traditional written formats. A recent survey of 4514 Australian university students describe that audio feedback is considered more personalised than written feedback (Ryan et al., 2019), a finding echoed by other smaller studies (Morris & Chikwa, 2016). Furthermore, studies also report that audio feedback provides a quantitatively greater amount of feedback relative to written feedback (Cann, 2014; Nemec & Dintzner, 2016). This is generally echoed by Carruthers et al. (2015), who described that audio feedback is perceived by students as being more detailed. The language utilised in audio feedback may also be different to written feedback, as Nemec and Dintzner (2016) note that audio feedback incorporated significantly fewer words associated with negative emotions, and significantly more certainty words and words associated with cognitive process. Despite these advantages however, several limitations have been noted in implementing audio feedback.

Studies of audio feedback have highlighted some considerations and conflicting results which should be addressed. Multiple studies have been unable to determine any impact of audio feedback on improving student academic performance relative to written feedback (Chalmers et al., 2014; Morris & Chikwa, 2016). Other studies have attempted to determine whether providing feedback via recorded audio saves instructor time relative to written feedback. Evidence of audio feedback taking longer, the same time and a shorter period have been noted (Cann, 2014; Carruthers et al., 2015; Lunt & Curran, 2010). Aside from differences in workload, some authors have also highlighted technological implications in incorporating audio feedback (Hennessy &

Forrester, 2014). Different approaches for delivering the feedback to students, including recording directly into a virtual learning environment, recording locally and emailing the student, or uploading to a cloud-based server, all have time and cost implications for instructors. Depending on how this feedback is delivered, students may be unable to copy audio recordings or export these from the server hosting the file, limiting the ability of students to refer to the feedback in the future. Similar to written feedback, providing a consistent quantity and quality of audio feedback across large cohorts may also be difficult when multiple markers are involved.

Study aims

This project aimed to evaluate student perceptions towards audio feedback. Specifically, this study aimed to explore how students perceived recorded audio feedback in regard to the amount of detail, accessibility and whether recorded audio feedback was perceived as more personal that written feedback.

Methodology

An explanatory, sequential mixed methods approach was used in this study, in which both quantitative and qualitative data collection and analysis techniques were chronologically undertaken over two parts. Recorded audio feedback was utilised in two undergraduate subjects over a two-year period at a metropolitan Australian university. In both subjects, recorded audio feedback was provided as part of a 1000-word written assessment. The assessment was submitted using Moodle, the university's learning management system (LMS), and both grades and feedback were provided using an embedded Turnitin module (https://turnitin.com). Recorded audio feedback was provided using the instructor recording function of Turnitin, with audio recordings made using either a headset or internal laptop microphone. Students were also provided with non-personalised written feedback using the QuickMarks function of Turnitin Studio.

Following the release of student grades and feedback, students receiving recorded audio feedback were sent an anonymous survey. The survey incorporated nine questions that asked students to rate their level of agreement using a 5-point Likert scale (1 = "strongly disagree to 5 = "strongly agree") and three open response questions. A cohort of students (N=4) recruited in-class were interviewed using a semi-structured interview conducted online using Zoom. Recruitment for interviews and the interviews themselves were conducted by an academic who was not involved in subject teaching, coordination or grading to minimise potential bias of responses. Participation in the survey and interviews was voluntary. Survey open response questions and transcripts of semi-structured interviews were thematically analysed as described by Braun and Clarke (2006). Survey responses and interview transcripts were analysed using a semantic, inductive approach, whereby codes were identified based on explicit meanings in qualitative data without reference to previous research. Ethics approval was provided by the institutional human ethics committee under project HEC20520 prior to data collection.

Survey responses

Recorded audio feedback was implemented in two subjects from 2021 to 2022. Following the release of grades and feedback for the subject, students who received recorded audio feedback in both subjects were sent an anonymous survey. The aggregated response rate of the survey for both subjects was 23% (n =135). The aggregated results of the Likert scale items of the survey are presented in Table 1.

Five of the survey items queried student agreement with different aspects of the recorded audio feedback they received compared with written feedback. A relatively small proportion of students indicated they were less likely to access audio feedback or to incorporated audio feedback in their work (42.9% and 54.3% respectively). However, this did not appear to be due to an unwillingness to access and incorporate audio feedback, but instead that there was no detected difference between written feedback (37% and 34% neither agree or disagree). In contrast, students found the recorded audio feedback they received relatively more detailed and more personal than written feedback, with total agreement for both survey items >65%. In total, 68.6% of students preferred receiving recorded audio feedback to written feedback and 91% were satisfied with receiving recorded audio and generalised comments (QuickMark) as their feedback format.

Table 1: Summary of survey Likert scale responses

Survey Item	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Percentage agreement[1]
I was more likely to access the audio feedback I received than written feedback	0	7	13	10	5	42.9%
I was more likely to incorporate the audio feedback I received than written feedback into my work	0	4	12	16	3	54.3%
I found the audio feedback I received convenient and easy to access	0	0	1	14	20	97.1%
I found the audio feedback I received more detailed than written feedback	0	3	9	8	15	65.7%
I found the audio feedback I received clear and easy to understand	0	1	1	16	17	94.3%
I found the audio feedback I received more personal than written feedback	0	1	1	10	23	94.3%
I preferred the audio feedback I received to written feedback	1	4	6	15	9	68.6%
Overall, I was satisfied with having audio feedback and generalised comments as my feedback format.	0	2	1	16	16	91.4%
In future, I would like audio feedback used in other assessments or subjects.	1	1	6	18	9	77.1%

[1]Percentage of students who either agree or strongly agree with the survey item

Thematic analysis

The survey included three open response questions; *In your opinion, what were the main benefits or advantages of audio feedback*, *In your opinion, what were the main drawbacks or disadvantages of audio feedback*, and *Please leave any other comments below*. Responses to these questions and transcripts of semi-structured interviews were thematically analysed. An initial set of 15 themes were developed from the responses, which were further condensed to 4 main themes split into 9 subthemes, as shown in Table 2.

Table 2: Thematic analysis of survey open responses and interview transcripts

Theme	Subthemes	Subtheme description	Codes (n)[1]
Proximity	Personalisation	Comments mentioning audio feedback being “personal” or “personalised”	24
	Emotional response	Comments mentioning any emotion reaction (positive or negative) to audio feedback	18
Cognition	Understanding	Comments mentioning improvements/difficulties in understanding audio feedback	15
	Recall	Comments mentioning improvements/difficulties in recalling audio feedback	3
Feedback Quality	Detail	Comments mentioning increases/decreases in detail or amount of feedback provided through audio	29
	Grade justification	Comments relating audio feedback provided to grades	8
Delivery	Practicality	Comments mentioning practical implementation of audio feedback framed through time constraints	21
	Navigating feedback	Comments describing ease/difficulty in finding where in written work feedback relates to	10
	Accessibility issues	Comments mentioning issues in accessing feedback due to hearing impairment	9
	Technology issues	Comments mentioning issues in accessing or interpreting feedback due to technology requirements	5

[1]Number of codes from subtheme applied to dataset (n = 143)

The thematic analysis, similar to the survey Likert scale questions, identified a number of aspects of recorded audio feedback that appear overrepresented in the survey open response and interview transcript data. The personalisation, emotional response, understanding, detail and practicality subthemes collectively account for >75% of coded responses. Due to space limitations, we have opted to focus our discussion of the data on these 5 subthemes.

Personalisation

The personalisation subtheme is one of the strongest identified in the survey open response and interview data. This seems fitting, given that the survey item relating to audio feedback being more personal had 94.3% agreement. In many cases, references to this subtheme were also coded to the emotional response, understanding subthemes or amount/detail subthemes.

> It was a lot more, I guess, like personal or something. But because I usually just get written feedback and I feel like, listening to someone talk about my work was a lot more like easier to pick up. And I felt like it wasn't just ticking boxes, it was [instructor] as a person, like, responding back to my work. So I felt like [they] knew what was going on and then was able to explain it really well. The pros and cons of what I could improve on and everything. (Interview participant)

Emotional response

The emotional response subtheme was particularly interesting to note, and often touched on the topic of student anxieties in receiving grades and feedback.

> I feel that audio feedback felt less condescending than regular written feedback, not being able to hear the tone of the feedback personally made it feel a little condescending. I find great anxiety in reading feedback rather than hearing it. (Survey response)

Understanding and Detail

The understanding and detail subthemes were frequently coupled, with some participants stating that feedback was 'easy to understand' as well as being 'detailed' or 'nuanced'. Deeper explanation for why participants felt this way was generally not provided, however some participants mentioned that the verbal feedback felt more constructive and that it was easier to identify areas for improvement. Many participants also mentioned that the recorded audio feedback had a 'greater depth' or was 'more comprehensive'.

> I had feedback that I could actually work with. I have literature reviews to do this semester and I felt as though I know where I went wrong and how I can improve. And what I don't as need to improve on as much from last semester. Whereas often in the past with written feedback it just leaves my mind. I sort of read it, see the mark, and it's not much of a learning experience. (Interview participant)

Practicality

This subtheme overall was broader than the other subthemes and was generally demonstrated by participant comments relating to implementation of the audio feedback by the instructors. Multiple participants commented that they would expect feedback to be faster or easier for instructors to provide in this format. Interestingly, one participant also commented that there might be a 'higher chance at a marker withholding as much negative feedback as they might normally supply'. Drawing conclusions from this subtheme is difficult given the range of responses, but it potentially highlights the different expectations that students might have of instructors in trialling new feedback approaches.

Discussion

This study adds further dimension to existing literature regarding student perceptions of feedback and considerations for how recorded audio may be received. A large Australian-based study of both staff and students conducted by Henderson et al. (2019) identified fourteen perceived challenges to providing effective feedback. Major themes identified included specificity and volume, with staff and students describing challenges in providing more and tailored feedback (Henderson et al., 2019). It is noteworthy that in the study by Henderson et al. (2019), 18% of students expressed desire for richer feedback modes, including face to face and audio recordings. Our study complements these findings, with a majority of students in the survey Likert responses expressing a preference for audio feedback to written feedback and would like to see audio feedback used in other assessments and subjects.

Student anxieties in assessment have been previously identified. Falchikov and Boud (2007) suggest that negative emotional responses in assessment can have profound and long-lasting consequences for the personal and academic development of the student. Our data identifying the emotional response subtheme would indicate that recorded audio feedback has the potential to modulate student negative emotions when receiving feedback. It is plausible that additional emotional information conveyed by the instructor's tone of voice helps 'soften the blow' of receiving critique. This aspect was occasionally linked to the personalisation and understanding subthemes, with participants mentioning that having an improved understanding of the feedback or connection to the instructor was reassuring. We believe that this additional emotional connection to the instructor may be beneficial to promote student feelings of belonging within the subject, and will aim to explore this aspect further in future studies.

We acknowledge that this study had several limitations. The most significant limitation being that students could not directly compare recorded audio feedback to written feedback within the same subject, as only one written assessment was incorporated in each subject. Furthermore, relative to the number of students receiving audio feedback and being surveyed, the number of survey respondents and the number of interview participants was small. Multiple instructors were also involved in grading and providing feedback, with the format and length of each audio feedback recording not being controlled for.

Conclusions

Implementing effective feedback strategies is critical to informing students of their academic progress and achievement, in addition to supporting future development. Use of recorded audio feedback has the potential to improve the quality of feedback through increasing the personalisation of feedback to individual students. This may improve the connection between instructor and student, fostering a greater sense of belonging within the student cohort and broader institution.

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reconnect
Reconnecting relationships through technology

Flexible Learning and the Virtual Campus

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Recent global events put a spotlight on learning modes that are flexible and support diverse learners. Vital to this conversation is a redefinition of the concept and practice of a 'virtual campus'. One in which learners have a renewed sense of place, inclusive of options for learning in synchronous and asynchronous modes. This paper proposes the principles of HyFlex design to facilitate the reconnection of students, teachers, and technology. Furthermore, these principles are extended into a new model of interconnected attributes - student choice, flat learning, and access. The discussion provides insights into these attributes and reimagines effective contextual approaches. Success through student-driven flexible and inclusive course design is shared encouraging the reader to consider their own adoption and adaption of these principles.

Keywords: HyFlex, Blended, Hybrid, Online, Asynchronous

Virtual campuses, defined as online spaces designed by institutions and organisations where learning takes place, have become more critical than ever. The experience of emergency remote teaching (ERT) spotlighted the capacity for higher education institutes (HEIs) to provide learning experiences despite pressure from unforeseen forces. Many students and academics were in unfamiliar waters as they navigated new ways of interacting with each other, content, and technology. In hindsight, there is no real reason HEIs could not have been better prepared, and those that already had virtual campuses did continue to provide for their students. Since the return to on-campus activities, it is evident that a) students do not necessarily want to be on-campus, and b) ERT is not the same as well-designed online teaching and learning. The challenge for learning designers, and academics, is how to best leverage the experiences from learning in lockdown aligned with knowledge gained from online learning and teaching in the past 30+ years. One solution is the hybrid model of teaching and learning and, more specifically, a HyFlex, student-driven approach.

The 2022 Horizon Report (Pelletier et al., 2022) puts hybrid and online learning as a key 'social trend' and the 'mainstreaming of Hybrid/Remote learning modes' in the 'key technologies and practice'. An interesting point is the identification of the need for a whole cultural shift to avoid any backlash from negative experiences of ERT. Pelletier et al. (2022) believe that this will require "changing hearts and minds, shifting the institution's culture, and rethinking the practice of education itself" (p. 26). This shift heralds not a new approach but a more systemic approach. One in which the idea of the virtual campus is symbiotic with the on-campus and one in which synchronous and asynchronous experiences are of equal value to the academic and the student.

Introducing HyFlex

The term HyFlex, first coined by Beatty (2006), combines 'hybrid' and 'flexible'. It has its roots in hybrid teaching and learning fueled by the rise in access to networked technologies. Beatty (2007) made an analogy of a bridge that links on-campus (on one side) and online (on the other). However, with the return to on-campus many students have chosen to stay online. As such, Beatty (2022) wondered if the bridge has been crossed. Has the online side of the river become the go-to place, and should the focus be on designing for HyFlex online?

Commonly, students in a hybrid course attend classes either online or on-campus and synchronous sessions would include a hybrid of students from both locations. Another approach might give students a choice about how and if they attend, allowing for flexibility. Also included in the options would be a robust asynchronous component. When the hybrid and the flexible merge, we have HyFlex. More importantly, what sets HyFlex apart from other types of hybrid learning is that it is a student-directed hybrid.

The definition of HyFlex developed for this paper is one in which students have the flexibility to choose the time, place, and mode in which they learn. They must still achieve the learning outcomes and the same level of *personal learning 'satisfaction' regardless of their choices. The modes include any combination of asynchronous, synchronous online and synchronous on-campus. Students can achieve their learning goals using any of these modes, but they are not dependent on each other*. The learning designer is essential as they must masterfully design flexible experiences, provide choice, allow for student agency and autonomy, and meet the learning outcomes.

Context-specific HyFlex

Beatty (2019) developed four principles for HyFlex: choice, accessibility, reusability, and equivalency. However, the learning designer/teacher/instructor has flexibility around the extent that each of these is evident in the learning environment. For this paper, the authors' experience as learning designers and teachers in hybrid environments has been used to evaluate their work at a regional university in Australia and as a result they wish to propose a new model of intersecting HyFlex attributes. Figure 1 illustrates their proposition - flat learning, choice, and access as the three main attributes. Equivalency, connected learning design and reusability sit between these critical attributes. The following section discusses the three attributes and presents examples illustrating how HyFlex design and delivery have supported the reconnection of students, teachers, and technology.

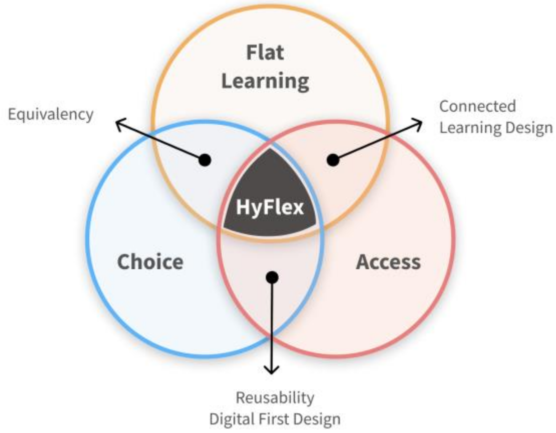

Figure 1: Context-specific attributes of HyFlex learning

The Attribute of Choice

Choice is the consistent and grounding factor in what makes a course HyFlex. When learners have a choice without compromising the learning experience, they have true flexibility. The choices must include access to multiple resources, pathways, multimedia, and modes.

The mantra of 'student-centred learning' is common in higher education. However, there is a difference between student-centred and learner-choice. The learning designer is responsible for creating courses that provide students with authentic learning experiences. These types of experiences may not provide choice when the learning designer has structured the experiences in a way that does not offer options yet may still be student centred. For there to be choice, the learning journey needs to be controlled by the learner with various ways to travel. One of the most challenging aspects of learner choice is that the teacher/instructor must be willing to 'let go' of a significant amount of control. They need to trust the student to make choices that may differ from those previously imagined by the designer/teacher/instructor and not cause disadvantage.

If the student is allowed to make choices, they will develop the necessary skills to create successful decisions about what they need to achieve the learning outcomes. When a student expresses their dislike for being given 'too many' choices, this is likely due to their unfamiliarity with this approach. In these circumstances, the designer/teacher/instructor must scaffold the experience without diminishing the choices. The student needs to be supported to explore the choices in a safe environment, one in which risk is considered a positive attribute to undertake.

One successful yet small change might be how students are offered an assignment task. For example, a list of topics to choose from (something that looks like student choice) can be shifted to ask the learner to formulate a question to guide their research. The authors tried this and anecdotally observed an increase in learner autonomy and motivation. Ultimately this change returned a higher quality assignment and feedback from the students that they “enjoyed the assignment”, hence reconnecting the learner to the learning.

Technology is central to why HyFlex environments can be created by providing multimedia resources and experiences. Increased access to technology means reduced barriers to producing quality resources by the designer and the student. Traditional instructional design recommends avoiding ‘redundancy’ of materials (Reiser & Dempsey, 2012). That would require eliminating all but one mode to say the same thing (text and image; video and text; audio and text). However, in a HyFlex model, having multiple ways for the learner to explore content initiates flexibility and assures that the learner is not ‘missing’ part of the learning. Consider that a learner may prefer to watch a short video rather than read the text. If the video and text are different, the student must engage with both modes or risk missing some of the information or learning experience.

The Attribute of Flat Learning

The main deviation from Beatty’s principles that the authors are proposing is flat learning. Lindsay (2016) described this as a multimodal pedagogical approach to learning with and from others where all learners have the freedom to communicate ‘across’ rather than up or down. Hence there is a similarity to Hyflex, and is a term that encompasses all of Beatty’s principles.

Flat learning means there is no hierarchy. No one group delivers information to another group, and all voices are equal. Online technologies are beneficial to help forge connections and support everyday workflow, communication, and collaboration. However, it is possible to have flat learning in on-campus environments and even more so if the experience is hybrid. The implicit message is that learning occurs not in isolation but is social and requires interaction. Reconnecting the student to the teacher and other students. Using flat learning as a framework for good design helps to situate the idea of working with others at a distance and in person. When the starting point is the assumption that it is possible to have a meaningful connection, communication, and collaboration using technologies, the results will follow.

HyFlex learning and teaching flattens all learning because good teaching is not about learning content or content delivery. Underpinning this is a social constructivist and connectivist context in which learners are connected through different modalities using various technologies (Web 2.0, mobile devices). The learning itself becomes the energy that drives the curriculum. Student agency and autonomy through digital literacy/fluency and knowledge management can make the teacher irrelevant; however, an astute online teacher implementing HyFlex approaches understands this and uses multiple opportunities to connect their students within and beyond. Flat learning orchestrates choice and access by consistently providing all learning materials and opportunities for interaction and collaboration, hence reconnecting the student through the technology.

Flat learning can be initiated by minimising closed environments. All HEIs in Australia have Learning Management Systems. When a range of possible EdTech tools are also utilised, it can provide choice and access. Some tools include Padlet and VoiceThread, which have been used in the courses designed by the authors. These tools also provide access to guests outside, allowing experts to collaborate on ideas and concepts. A synchronous ‘backchannel’ is another way that EdTech can be leveraged. As Dalgarno (2014) described, polysynchronous approaches accept that students are likely to use back channels when working on assignments or listening to lectures. His work recognised that “Multiple streams of interaction can allow for a much more active learning experience” (p. 675). Current practice tends to divide the synchronous online and on-campus cohorts, and a backchannel using tools like Twitter, MS Teams chat, Padlet or a learning environment like Zoom or Engageli help to close that divide.

The Attribute of Access

Accessibility has multiple meanings depending on the person and the context. For HyFlex learning design, accessibility is about giving the learner options that provide flexible access to content, ideas, and collaborations. There must be access to the learning at a time and a place that best suits individual learners.

The importance of technology to facilitate access cannot be overstated. There are more ways than ever to access education due to network capabilities, software, and hardware. With the rise in access to networked technologies, there has been an increase in enrolment into post-secondary formal education by groups of people who would previously not have been able to do further study. Data shows that participation rates in Australia for women increased from 513,420 in 2004 to 915,344 in 2020 (DEWR, 2022a, 2022b). Assistive technologies have become much more commonplace, such as text-to-speech software, voice recognition, reading pens, proofreading software, the ability to adjust text size and colour, virtual reality and augmented reality. Creating audio and video content is possible without access to high-end equipment. For example, a low-end video produced through screen recording zoom meetings means that a range of media can be produced and is acceptable. Increasingly the ease with which techniques such as captioning can be added to resources also increases access to the content in the resource.

The courses evaluated for this paper revealed that an essential part of the overall satisfaction and increase in access were the well-designed asynchronous experiences. Current technologies provide asynchronous experiences that provide high-quality interactions and allow the learner to choose when and how they will interact. The ongoing assumption that synchronous experiences are the lifeblood of learning – one in which the teacher interacts in real-time with the learner – needs to be critiqued.

Leveraging the Asynchronous

HyFlex refers to hybrid and flexible, but what does that look like when the mode is entirely online. The authors propose that hybrid could be between the asynchronous online learning space (a well-designed series of learning activities in the LMS), the synchronous online experience (tutorial, workshops, lectures in a video conferencing platform or Engageli), and the asynchronous online collaborative spaces (forums, Padlet or VoiceThread).

The authors found that leveraging asynchronous social learning spaces adds significant value to the students learning experience. In the HyFlex course, this experience is one of the students' choices, and success is due to the level of student motivation and engagement, not the requirement to participate. Unfortunately, many HEI courses still build asynchronous activity around text-based forums and discussion boards. At a time when students have become accustomed to asynchronous social networking that is informal, spontaneous, and often image or videos, the text-based forums no longer have the appeal that perhaps they once did (Clinton & Kelly, 2020). There are alternatives without moving the formal educational experience to social networking platforms. While there are numerous tools that are used in HEIs one tool that the authors have been using is VoiceThread.

VoiceThread, available since 2007, is a multi-purpose solution to the perplexing problem of HyFlex asynchronous online learning. As a tool, it can address an alternative to students not attending synchronous tutorials while encouraging community building and socialisation of learning. In one example, each of the designed VoiceThreads contained a series of slides, and each slide had a comment from the teacher with an activity for the students to do. A very sparse start grew organically as the students responded. One example of a practical approach was an asynchronous interview between two colleagues: teacher and discipline expert. The teacher left the first comment, and the colleague responded eight days later: flexibility and access for academics. The students started asking questions, and the one slide ended up being over 90 minutes of conversation from 45 comments and 11 students. The VoiceThread that housed the slide had 120 comments and 38 people viewing. That represented 100% of the enrolled students choosing to participate through flexible access, choice of response mode and flat learning with anyone, anytime.

Students were surveyed after the first iteration of the VoiceThread use and commented that they felt socially connected to their peers due to the nature of the technology. Over 80% of all student comments in the six-module topics were created using video, and a small percentage (around 7%) were text only. Students observed that they felt able to comment in ways that they would not have during a synchronous tutorial. They noticed the increase in participation from their peers and were very grateful for the opportunity. Reconnecting to their peers through the technology at a time when they were often stretched in their capacity to study, work and maintain family relationships.

Another example is where a research assessment came to life using VoiceThread for shared project development and peer review. This time each student added one slide, including a research question and draft method. For four weeks, peer and teacher comments and questions helped individuals refine and refocus their proposed research. Once the project was complete, they returned to the VoiceThread and shared outcomes. Students asynchronously had equal opportunity to share feedback and learn in ways not as effectively possible through synchronous modes or text-based forums.

What the authors discovered is the way that the VoiceThread grows through the student's participation. While the overall designs are well thought out, the teachers chose not to control the amount of student interaction. They generated their momentum through their conversations with each other. Most interestingly was the way the students perceived that they were collaborating, yet that was not explicitly built into the design.

Conclusion

This paper is presented as part evaluation and part provocation. One key idea is the interconnection between virtual and physical campuses through the application of designed asynchronous learning. Another is HyFlex learning and the attributes of choice, flat learning, and access that provide true flexibility for learners. Gone are the days when 'attendance' at synchronous (online or on-campus) events determined privileged access to learning, other learners, and essential resources. When implementing a HyFlex approach, the authors found that students flourished when empowered to make ongoing choices between learning modes. Ultimately once students have experienced flexibility, they have no desire to go back to being restricted in their learning experiences.

The authors ask the reader to consider their learning design and to what extent they are currently creating a HyFlex environment for their students. Furthermore, if they are not, why is that, and in what ways could they change their learning design and approach or overcome other barriers to include choice, flat learning and access.

Disclaimer: The authors are not affiliated with VoiceThread or HyFlex.

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reconnect
Reconnecting relationships through technology

Conversations that count in online student engagement – a Case Study

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A challenge all teachers face is how to engage students meaningfully in their learning. The impact of Covid has made online learning in higher education more prevalent. While many students and teachers have readily adjusted to these new learning environments others have found the shift difficult. To enable students' adjustment to new ways of learning teachers and course designers should consider approaches which encourage and support positive experiences and attitudes towards online learning. Students' participation and engagement grows when good course design and a variety of learning activities are used and conveyed to them in clear communication that guides their learning processes. This case study looks at one teacher's intentions and actions to improve student engagement within a health science core course through collecting 'student voice', students' perspectives of what helped their learning and what could be improved to enhance their learning online.

Keywords: student engagement, student voice, learning interactions

Introduction

Creating meaningful student engagement in learning has long been a challenge in higher education. Frameworks on student engagement differ in focus from students' personal and study characteristics and behaviours, institutional approaches and provisions, curriculum design promoting active learning, to the interactions that occur between students, teachers, and content (Martin et al., 2020; Trowler, 2010). Successful student engagement in learning has been linked with purposeful course design for active participation, strategies that develop deep learning (Biggs & Tang, 2011), and improvements in student retention and outcomes (Krause & Armitage, 2014). There is consensus that student engagement is complex and requires a wide range or holistic understanding of all the characteristics that influence engagement and support the diversity of students in higher education (Leach, 2014). Nevertheless, the changes of the past few years have pushed the need for closer inspection of what online student engagement looks like. In particular, creating learning spaces within asynchronous and synchronous environments that enhance students' connections to their studies through building student, teacher and content interactions.

Online student Engagement

A shift to online study requires adjustments to teaching and learning practices associated with campus-based university learning environments (Redmond et al., 2018). Established in-class techniques for student success (such as collaborative learning) may not work in distance courses, as student's background characteristics including experience with and access to current technologies, and their previous online experiences can impact on opportunity and attitudes towards engaging (Dumford & Miller, 2018; Ferrer et al., 2022). In exploring disadvantages and advantages of online engagement, Dumford and Miller (2018) found previous experience with online learning environments important in the transition to fully online environments, with different student characteristics affecting their preferences for online learning and subsequent academic success.

Student's level of study, preferences and interest in online learning can also affect their emotional engagement, and consequently their participation and performance (Quigley et al., 2022). In adapting to new environments these students may require additional help with digital fluency, and motivation and self-management approaches to be incorporated into their course for them to be successful in their learning (Brown et al., 2015; Dumford & Miller, 2018). Building a community of learners helps learners to find support amongst their peers (Álvarez & Montes, 2021). Consequently, the learning and teaching interactions between students and with teachers in in virtual or online environments need to be specifically addressed.

To counter the issues of readjustment to new ways of learning, teachers and course designers should consider pathways that encourage and support positive attitudes towards learning (Cranfield et al., 2021). Indeed, the educator's own attitudes about what can be achieved in online learning environments and their participation in online activities becomes crucial. Students view and conclude teacher engagement with specific course activities aligns with the teacher's recognition of task relevancy to learning (Ferrer et al., 2022). Drawing on self-determination theory, Ferrer et al. (2022) found undergraduate business students with high extrinsic motivation or low internal motivation were at equal risk of being disengaged with learning online and require support to connect with knowledge and participate in learning tasks. Pathways that encourage positive attitudes towards learning help students make the connections between learning outcomes and their own goals. By reenforcing the interrelationships between different modes, the content is presented in, and teachers demonstrating their own comfort moving within the online learning space, students can be encouraged to engage (Ferrer et al., 2022). In addition, having a sense of control over the activities they can participate in, students' attitudes to online learning can be changed from negative to positive (Redmond et al., 2018). Thus, teacher to student communications need to clearly identify how interactions with content and peers can take place, and how learning tasks help students to reach their learning goals.

Redmond et al. (2018) proposed an online engagement framework with five communication points that need addressing to help all students adjust to learning in new online environments. Students' social engagement needs to be developed through the presence of activities that encourage student participation in building their learning community. While cognitive engagement is encouraged through teacher directed active learning strategies, students need to be able to relate to the necessity of developing multidisciplinary metacognitive skills such as critical thinking and inquiry. In creating opportunities for students to find relevance in subject content and learning tasks and communicating this relevance to their peers, behavioural engagement can be increased. Consequently, students are more likely to seek help or help their peers when required. This commitment to wider social and behavioural interaction helps to build students' emotional engagement and the development of positive attitudes towards learning and the online learning environment.

Studying student engagement during the shift to emergency online learning in Lebanon, India, and Japan Abou-Khalil et al. (2021) used Moore's interaction model to analyse the relationships 313 students perceived important to their engagement in the new learning conditions. They found students from diverse backgrounds and those facing technological barriers in study prioritized engaging with learning material under clear teacher guidance over peer interaction. In these situations, the communications which set students up for learning and learning interactivity become more important than the activities themselves. However, few studies consider the nature of conversations or communications which support these interactions. With the impact of Covid making online learning mainstream, we need to consider the conversations that count in teacher intentions and student responses to courses designed for active student learning. This qualitative case study uses Redmond et al (2018) and Moore's interaction model to report on one teacher's intentions in using asynchronous and synchronous online communication approaches to initiate student interactions with the teacher, their peers, and the course content, based on the students' perspectives of what worked well for their learning.

The study context

Flexible and blended distance learning approaches have been an integral part of the university's delivery of courses well before the covid pandemic (Brown et al., 2015). Health Science course materials, teaching, and learning interactions take place within the LMS linking to a wide range of asynchronous and synchronous learning spaces (including Kura Cloud, Zoom, Teams, Discord) to enable students to connect with course content, their cohort and teacher. Therefore, the shift to fully online learning has been for many academics and students a relatively straightforward transition. However, for full internal, campus-based students and teachers in some disciplines the shift was challenging as normal teaching-learning and peer-to-peer interactions of tutorials moved to unfamiliar environments. Face-to-face tutorials in an undergraduate core health sciences course that forms this case study were moved online (n=65 students in early 2020,) few changes to the fully online course offerings (n=166 students) were required. In 2021 and 2022 tutorials for all students were provided online (n=257 and n=200 respectively).

The teacher adjusted their practice to suit the change in environment. As part of course delivery in 2021, the teacher gathered ethics approved, mid-course, anonymized, qualitative student comments on the activities and interactions that helped their learning. The purpose was to understand what activities worked well for the students and what in course improvements the teacher could make to improve student engagement. In response to feedback changes were made; the same mid-course survey was conducted with the 2022 cohort. The teacher's narrative of their teaching intentions and communication-based activities to support student learning pre-commencement and during the courses were inductively analysed generating the themes of presence, presentations, process, and participation (Table 1).

Table 1: Enhancements teacher could make to improve student learning

Theme	Student Feedback
Presence	More student presence in the discussion forums
Presentation	Wider variety of content formats including video, audio, subtitles or closed captions on videos. Visual images of content relationships suitable for dyslexic students. Summary of important points raised in discussion.
Process	Transparent connections between textbook and course materials. Better flow of weekly lessons. Online reminders of task progress.
Participation	Clearer indications of teacher office/tutorial hours. Tutorial options that suit parents

Results

Presence

Evidence of teacher and student presence (contribution) in online learning processes and activities are considered as an indication of their social engagement. The teacher prioritised relationship building as beneficial to students' learning in setting up and delivering their course. Consequently, they were present regularly throughout the course. The teacher-student path for interactions was formed from course commencement to gain students' trust, to create a safe learning environment, provide the opportunity for student inquiry and to facilitate learning. This interaction helped 2022 students find a sense of belonging and connection to learning opportunities as explained 'Our lecturer is super supportive, approachable and provides so many different learning tools each week to aid our learning' and 'excellent communication from (teacher) and she makes small bite sized parts, so I don't feel overwhelmed and have managed to keep on track'.

Online personalised teacher and Pacific learning advisor video introductions informed students on what they needed to do to get ready for learning. The actions taken by the teacher allowed students to know "who was behind the screen" (Álvarez & Montes, 2021, p. 231). Having modelled an introduction, students were invited to introduce themselves in a shared space. Modelling a task indicates to students that the teacher has an interest in what they have been asked to do (Biggs & Tang, 2011). As a student confirms 'I have found (teacher) has been excellent at communicating with us what is actually required from us for each task. It helped me focus on the right information'.

Student Discussion forums provided opportunities for students to respond to topical problems or issues initially posed by the teacher. The teacher then provided a fortnightly summary of students' responses from the forum in the end of week video, demonstrating that student voices had been heard and valued, 'talking about the study content makes it more relatable to life experiences, … the most successful learning'.

Presentation

The teacher believed the look and feel of the learning space was important to allow students to engage in learning processes. The content design required "careful curation" to be engaging, relevant, and organized sequentially (Álvarez & Montes, 2021; Ferrer et al., 2022, p. 333). Consistency of presentation (for example, use of e-books and step-by-step scaffolding for assessment) increased cognitive engagement in allowing students to easily navigate through the course to engage with content. Curation was enhanced with clear communication in expectations.

A key element was the rotating weekly newsletter on the course landing page. This contained messages on the tasks (content and learning activities) that needed to be achieved. The variety of media content encouraged interest in the course and therefore motivation (Álvarez & Montes, 2021). The opportunities for learning in self-paced interactive and noninteractive tasks helped one student to 'expand my lens over everything I choose to read or watch' resulting in '... more information to be retained and to be able to explore several directives of thought and not just the one.' The different learning formats helped another student to make connections to ‘cement their learning’ and to earn ‘marks towards grades from alternatives to essays and exams’. Positively reenforcing the interconnection between different formats for materials emphasized the importance of the whole (Ferrer et al., 2022).

Process

Process communication, as clarity in conveying steps student need to take, increased opportunities for cognitive and emotional engagement. By reducing surprises students focused more on ‘getting into a good workflow’, which reduced the pressure on learning and helped them develop the ‘valuable skills’ necessary in their discipline. As a student explained, knowing ‘the learning outcomes prior to each lesson have allowed me to focus my attention to ensure I am learning the essential components of the lesson’. Weekly workbooks and check-your-knowledge activities required students to study the content and to test this knowledge in a low risk but rewarding manner. This means the student ‘can see if we missed a point – to go back and re-read or go our notes and check we’ve understood it fully’.

Using course progress tools where students tick-off tasks encouraged their progress towards the end goal. The clarity of progress instructions helped some students feel the workload was achievable - ‘The completion indicator, progress bar and tick boxes provided a useful guide to how we were progressing! I’d love it if all papers had this tool’- however, other students found this ‘annoying’.

Of particular importance to students were the weekly Friday Wrap-up personalised videos. In these the teacher summarized the week’s key learning and activities, progress in the course and summarized students’ postings from course discussion boards. These weekly reflections on learning process ended with a personal note and photograph from the teacher, reminding students of teacher interest in their progress.

Participation

Participation as a choice places the control of learning in the student space, intersecting with their motivation and self-determination characteristics. The teacher viewed participation in learning activities as a two-way process of engagement. Opportunity to participate must be present (Cranfield et al., 2021), as must encouragement from peers and teacher in collaborative engagement. This adds to a sense of belonging, as one student stated, ‘I really enjoyed our zoom sessions, I learned a lot and enjoyed the class culture’. Self-paced learning and flexible delivery allowed the online students to adjust to the many competing demands on their time or attention. Multimedia delivery providing direction week by week, small set weekly tasks in workbooks helped students set their own learning pace. The end of week wrap-up of questions flowing out of asynchronous discussion and synchronous tutorials demonstrated the teacher was active in the course and valued students’ input. However, it was the personal touches – teacher comments and photos of daily life that drew students back to the weekly wrap-up.

Implications

The use of student voice to determine what is effective for their learning is a critical part of development student engagement within online learning. Initiating conversations which help students build social, behavioral, and cognitive engagement online at the start of course takes time, skill and commitment. Within course opportunities for meaningful student interactions with the teacher, their peers, knowledge and learning activities need to be integrated. The significance of teacher presence and timely feedback needs to be recognised in staff resources and workload allocations (Ferrer et al., 2022). Institution and LMS messages are perceived by students as impersonal and distant which add to students’ stress in new environments (Quigley et al., 2022) In contrast, this case study has shown that immediate and personable communication helps student both unfamiliar and familiar with online delivery to engage, make connections and belong in the course. It also shows the importance of gathering in-course student feedback on the effectiveness of teaching and learning activities. This feedback can provide confirmation of effective teaching practice as well as opportunities for improving student engagement in the reminder of the course or next delivery.

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reconnect
Reconnecting relationships through technology

Connecting students with 'industry': A pilot implementation of authentic assessment tasks in business education

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Universities are continuing to encourage academics to implement more authentic assessment strategies into their teaching and learning activities to ensure that students are work-ready on graduation. Connecting students with the expectations of industry through these assessments encourages students to identify key competencies which need to be strengthened in order to ensure they are employable upon graduation. Since COVID-19 struck in early 2020, we have all had to consider how technology can assist in connecting people to continue to be able to work. This is no truer than with students and teaching staff as well as connecting students with industry. This paper reports on the implementation of a new authentic assessment project for business students where students worked both face-to-face and online to complete a major work-based project.

Keywords: authentic assessment, industry connection, business education

Background

Authenticity. True to Life. Work-Read graduates. All terms that we, as academics, continue to have included in our communications from our faculties, universities, governments and business. Since the 1990's the development of student graduate attributes has been a focus of many universities in Australia, and around the world, whilst today, more than ever, we are being encouraged to focus on ensuring our students are Work-Ready when they emerge from their studies as fresh graduates. The combination of these foci has led to a much greater emphasis on teaching and learning, and particularly on assessment practices.

Researchers have long discussed the importance of assessment in higher education and more recently this has led to discussions of assessment as a key component of the student learning experience. Authors such as Kinash et al. (2018) and Boud (2010) have discussed the significant impact that well designed assessment has on the quality of student learning as well as the ability to evaluate student progress in a course.

Authentic assessment has been defined in many ways over recent years (e.g. Boud & Falchikov, 2006) however it is primarily considered to be "an assessment that calls for students to utilize the same set of knowledge, competencies and attitudes that they should apply in the "criterion situation" in real-life" (Sokhanvar et al., 2021, p. 1). Akbari et al. (2021, p. 70) identified that the main reason for including authentic assessment in higher education courses is to ensure that students acquire the skills and competencies needed when entering the post-graduation job market. Studies of authentic assessment implemented in business curriculum have shown that where students see the significance of the task it can motivate them and lead to feelings of contentment (Nikolova & Andersen, 2017; James & Casidy, 2016).

The design of the authentic assessment task is a crucial element to ensuring that students will engage with and be motivated to complete the task at hand. Numerous guides have been published on the key features that should be included. These are fidelity of the task, including realistic conditions, using a variety of resources and producing a valuable and professional product (Colthorpe et al. 2021). With the advent of COVID-19, work has increasingly and quickly moved to the online environment. Authentic assessment tasks in current times are required to not only show how students can apply knowledge to practice, but also deal with the issues of having to communicate more effectively online.

This paper reviews a work in progress case study of the initial implementation of a course (subject) wide authentic assessment scenario. An application for negligible risk ethics was submitted and advice was received that ethics approval was not required for this study. Anecdotal feedback from the students together with anonymous survey responses have been used to analyse this approach to assessment.

Case Study

This case study takes place in the business academic unit of an Australian university based on a metropolitan campus. Students enroll in either face-to-face or external offerings however all of the learning materials for the course are available on the course learning management system (LMS). Courses are delivered over a 10-week study period with a two week break after six weeks.

The pilot implementation of this whole of course authentic assessment project was undertaken in a third-year undergraduate business course, Managing Decision Making, with a specific focus on decision making (hereon referred to as “MDM”). This course is one of eight courses that comprise the major in the Bachelor of Business (Management) program. The project was developed as a staged implementation over the past three (3) years with components being moved from formative to summative assessment to ensure that the work was adequately scaffolded and feedback given so that students could improve their performance throughout the study period.

The course assessment structure has evolved over many years of the author being involved in the teaching of this course as it has generally been one in which different methods of assessment have been tested. Table 1 below outlines the alterations that have been made to the assessment tasks over the past few years, some of which were due to changes in assessment procedures being prescribed by the academic unit.

Table 1: Assessment structure of MDM

Assessment	**2018**	**2019**	**2020 and 2021**
Continuous Assessment	Not Used	Not Used	Online Activities (20%) • DSI/Personality quiz (25%) • Problem Analysis (50%) • Excel Quiz (25%)
Minor Assessment	Online Activities (40%) • Intro quiz (12.5%) • DSI/Personality quiz (12.5%) • Problem Analysis (25%) • Excel Quiz (12.5%) • Blog (37.5%)	Online Activities (40%) • Problem Analysis (25%) • Literature Review (37.5%) • Blog (37.5%)	Report (30%)
Major Assessment	Group Project (60%) • Individual Literature Review (15%) • Group Video Report (30%) • Group Model (40%) • Individual Reflection (15%)	Group Project (60%) • Group Video Report (40%) • Group Model (40%) • Individual Reflection (20%)	Team Project (50%) • Team Model (60%) • Individual Reflection (40%)

The business academic unit altered the approach to assessment where the number of submission points were considerably reduced. This was undertaken as a result of feedback from students regarding the large number of courses that had implemented continuous assessment, or continuous assessment style, with weekly submission requirements causing stress and anxiety for many students enrolled in business courses. The author made significant reduction in the tasks required by the students over this time, whilst reflecting on how this may be similar, or different, to actual practice in the business world. Constructive alignment was used to ensure that all course learning objectives were still being assessed and that the assessment was giving students the opportunity to apply their knowledge to real-world business practices.

The Inbox Challenge

With the reduction in permissible assessment tasks and the author’s desire for the assessment tasks to take the next step to being as authentic as possible, "The Inbox Challenge" (TIC) assessment was implemented for the first time in 2022. This task was first identified by the author in a professional development webinar they attended at the commencement of 2020 and was being developed in parallel with the changes identified in Table 1 above. It was identified that not only would the task be required to adequately reflect the types of tasks undertaken in a business environment, but also consider the nature of work in a post-COVID-19 environment where many workers need to work from home on a more regular basis, due to illness or government requirements to isolate.

An investigation of the literature published on authentic assessment over the past five years found no discussion of this type of task or the success/failure of recent implementations of any similar authentic assessment tasks. Although nothing is currently published in referred journals about the Inbox Challenge assessment, the author is aware that similar tasks are currently being implemented and trialled in other universities around the world.

The assessment tasks were discussed with the Dean of Programs and the Program Director, and changes approved in late 2021. The assessment tasks for MDM were then altered to the structure shown in Table 2.

Table 2: The Inbox Challenge Assessment Structure 2022

Assessment	2022
Report	Problem Analysis Report (30%)
Continuous Assessment	Online Activities (70%) • DSI/Personality quiz (10%) • Team Contract (10%) • Model Design (30%) • VIVA (10%) • Model Development and Instruction Manual (20%) • Individual Reflection (20%)

The premise of the course wide authentic assessment scenario (TIC) was that the student was being employed by MDM Consulting, a management company who problem solves for small businesses, providing technology-based decision-making solutions for their clients along with management advice. Students are sent an introductory email from the managing director of MDM Consulting welcoming them as a new employee for the short-term internship (12 weeks). Along with the welcome email, they are sent a series of documents to read, representing what a new employee may expect on their first day in the job. Table 3 sets out the information passed on to students at the commencement of the course to introduce the project.

Table 3: The Inbox Challenge documentation

Document	Contents
Welcome letter	Welcome from General manager
Induction checklist	List of tasks and due dates (summative tasks highlighted in red)
Expectations document	Includes list of do's and don'ts
Professional development schedule	Timeline of workshops, pre-workshop requirements and what to bring to each workshop
Client brief	Details of the team project requirements from the client's perspective
Decision style article	Copy of a journal article outlining the importance of understanding your own (and other's) decision style.

The students were treated as employees throughout the interactions with the teaching staff to ensure fidelity of the tasks being undertaken. Workshop classes (offered face-to-face and online) were identified as Professional Development sessions and students were required to sign-in. Each session was not only dedicated to linking the theory to practice but also giving student teams time to meet and discuss their projects.

Students first work on analysing the problems being experienced by the business in their Problem Analysis report. The problems are presented in the form of a video for the students to observe issues being experienced. Students then work with a team to develop a decision support tool, in the form of an MS Excel spreadsheet and accompanying instruction manual, for the client to assist in making financial decisions for the client's business. The team project tasks are presented as a project with milestone deliverables from which they are able to receive feedback from the client. These deliverables include team contract, model design, and one on one meeting (VIVA) to ensure each member of the team is contributing and understanding the issues of the project. During class meeting time team are able to ask questions of the client (class instructor) to ensure they are working on the right track as well as presenting questions to their manger (course coordinator) regarding the approach the team is taking with the technicalities of their model design.

Technology support tools were used extensively throughout the assessment task including staff to student and student to student video conferencing (using Zoom), online chat groups (Messenger, WeChat and Whatsapp), video reviews and information sessions (using Panopto) as well as “company” based emails from “manager” (staff member) to “employee” (student). All of this was combined with significant resources being made available on the Moodle course site.

Discussion

As with any new initiative students were quite wary of the tasks being introduced and the impact that this may have on their overall grades, particularly when working in a team for a large component of the assessment. The course results showed a minor (1%) increase in the course pass rate from 2021 to 2022 but a major increase of 10% in the course pass rate compared with 2019 (note 2020 not considered due to effects of COVID-19). This shows that the changes made to the assessment structure across the last 3 years may have had a positive effect on the student grade distribution.

The teaching team noted that student engagement in the tasks and student class attendance was greater than in previous years. When students were questioned about this in general discussion it was identified that they didn’t want to miss out on information that would assist in the development of the team project. In addition, they noted that time in class to meet with their team and work on the project was very beneficial. The ability for students to connect with each other during the class time (be that face-to-face for the internal students or in the virtual classrooms for the external students) was appreciated. Students related well to the expectations document that they received on day 1, with students respecting each of these expectations throughout the study period. One of the teaching staff noted that 100% of students who were unable to attend class due to illness or other commitments emailed each week they were unable to attend with an apology and an update of their progress as well as any questions that they had. This was in complete contrast to another course being taught concurrently by this staff member.

Student comments about the authentic assessment task in the anonymous surveys conducted included:

> *‘It gave an insight as to the level that MS Excel can be used for real business situations and teamwork situations’*
> *‘That all the information wasn’t there was a good thing – that’s very real world’*
> *‘I think because it was a real-life situation, it was easier to understand who the clients were, what background they have and what they need’*

Although there was a lot of anecdotal feedback about TIC that was positive there was also some negative commentary about the workload and the number of submissions required. Some students were critical of the lack of information or the requirement to ask questions of the “client” to ensure that they had all the information necessary to complete the tasks.

Conclusion

New assessment design is difficult but can be rewarding. Being able to see students effectively engaged in what could be a workplace project, and treating the students as employees gave them a sense of understanding as to possible activities in their future management careers. This is supported by Sokhanvar et al. (2021) who identified in their extensive review of authentic assessment studies that students “were overall welcoming and receptive to the idea of authentic assessment and found it equitable, helpful, and related to their future occupations” (p. 8).

That said, this is a work in progress and there are a number of factors that can be improved for future offerings. These include giving the students a clearer understanding as to why this approach is being taken, making the tasks a little clearer in their design and setting up better communication channels for the students to contact the “client” and the “manager”.

Colthorpe et al. (2021) identified that where students had a specific target audience for the product of their assessment it added authenticity to the task as well as driving the students to be more professional in their approach to the assessment task being completed.

Future offerings of this course will implement these strategies, consider a more authentic audience for the project results and continue to strive to develop the employability skills and knowledge required for our future business leaders.

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reconnect
Reconnecting relationships through technology

How can EdTech support graduate employability?

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Pressure is mounting upon universities to ensure that our graduates are employable. Business and governments increasingly demand that graduates are equipped with skills and competencies that map into labour market needs. But students often struggle to choose courses, subjects and activities that will support their career goals and aspirations. This paper introduces an approach designed at UTS which aims to embed a skills analytics tool at key transition points for our students. The need to support such tools will a well-grounded learning design is discussed, along with the need to move beyond a "one size fits all" model for supporting EdTech tools. A solution that utilises a series of modules in the LMS is introduced.

Keywords: Graduate Employability, Skills Analytics, Learning Analytics

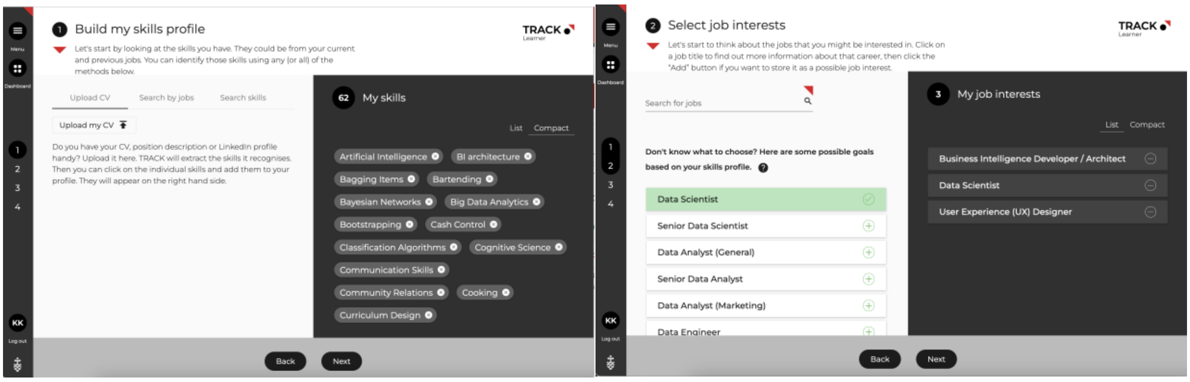
The skills shortage and graduate employability

The modern conceptualisation of employment is rapidly shifting. While our parents planned to work for the same company for life, our children are likely to change career many times. Indeed, estimates are emerging that the current generation of school leavers can expect to have around 17 jobs across 5 careers in their lifetime (McPherson, 2017). At the same time, in the wake of the COVID-19 pandemic and an associated dramatic restructuring of the global workforce (Lund et al., 2021) the shift towards flexible, skills-based learning has gained even more prominence. A wide range of government departments, industry bodies, and employers are increasingly talking of skills shortages and how we might work to rectify them. For example, the Business Council of Australia (BCA) has recently argued that long term growth of the future workforce will need a "skills passport" that recognises short courses and micro-credentials and somehow works like a digital CV (BCA, 2021). Similarly, we see government organisations such as the National Skills Commission (NSC) working to map the skills required in Australian jobs to those taught in the Vocational Education and Training (VET) sector. Notably, the NSC is now commencing a Pilot Project to map the Higher Education (HE) sector, a development that will increasingly affect the way that universities think about their curriculum content and graduate employability. Finally, the Job Ready Graduates policy introduced by the coalition in 2020 (DESE, 2020) sends a very clear message about government expectations that university graduates be immediately job ready upon graduation, while making a number of rather unjustified assumptions about what skills are actually sought in the modern Australian workforce (ABC, 2020), and suffering from a wide number of structural problems that are likely to lead to ongoing inequity for many of our students (Norton, 2022). Despite this emerging interest across the sector, a long undercurrent of work has questioned the assumption that lifelong learning is a purely positive agenda to pursue. For example, Field (2011) sketches out a history of lifelong learning, drawing attention to a series of epochs where different narratives have prevailed, and highlighting a set of critiques that have been tied to the concept around neoliberal agendas and welfare reform. Similarly, Tight (1998) cautions that the economic perspective of lifelong learning can lead to a form of entrapment, where highly stressed and already busy workers are still expected to upskill but provided with very little space to do so. Nonetheless, the current Australian political context suggests that skills based training is here to stay for the foreseeable future. How might we use EdTech to support graduates in meeting this agenda without adding undue stress to teaching teams and students?

This skills dominated narrative often fails to recognise the complexity of the learning required over a lifetime of professional practice. People transition multiple times throughout their career (Poquet et al., 2021), often reframing themselves in new professional contexts (Buckingham Shum et al., 2022). Students need to learn how to think like the professionals that they are trying to become. They need to find a purpose in their studies and connect with it throughout their lifetime, even as it evolves and changes. However, it is very difficult to articulate the specific competencies that a profession requires. Indeed, it is often easier for professionals to recognise mistakes made by someone attempting to learn an epistemic game associated with a profession than it is to explicitly list what people *should* be doing ahead of time (Markauskaite and Goodyear, 2017). Within this context it becomes vital that we develop methods to help students find appropriate pathways towards career goals that they identify, and to understand the complex skills (Kirschner and Van Merriënboer, 2008) that they need to master in order to achieve those goals. Furthermore, universities need to do more than support our students in developing a rich portfolio of attributes and skills; we also need to help them to *demonstrate* those attributes, in a manner that employers can understand and interpret.

An emerging EdTech Solution

At UTS a large program of work that uses *skills based curriculum analytics* (Kitto et al., 2020) is attempting to improve graduate employability through the development of web based applications that are embedded into the whole of course student experience at key transition points. Tools are designed to provide a scaffold (Reiser, 2004) that helps students to undertake the open ended and complex task of career planning. Students build up a *skills profile* that they can use to: set career goals; explore skills gaps between their skill profile and the skills they will need for an identified goal; and, identify training pathways through the curriculum that we offer. For example, Figure 1 shows two interfaces that help students work to build up a skills profile by explicitly claiming skills from past experiences and then think about possible career goals for which they might be a good fit.



(a) (b)

Figure 1: (a) A pilot interface that enables students to build up a skills profile by thinking about past jobs, uploading their CV, or claiming skills manually, (b) and then identify possible career goals.

As discussed in detail by Reiser (2004), EdTech tools have the potential to provide scaffolding by both (i) structuring the task at hand, and (ii) problematising aspects of the subject matter. Our tool supports students in both ways as follows:

1. First, it structures the open ended task of career planning, which can overwhelm students with its complexity. In asking students to explicitly claim skills that they possess, the tool helps them to articulate what they know. It then provides them with a way to think about jobs that they might want to set as goals in the same language of skills, which helps them to articulate what they *need* to know.
2. Second, it problematises the student's mental model of themselves, by highlighting the skills gap between a student's current skills profile and their career goals. This helps to provide impetus for planning a pathway through their studies that will help to close that gap, connecting them more firmly to subject choices by providing an understanding of why they are studying what they are.

The tool is built using data and analytics services provided by Lightcast (the new name for the merged Burning Glass and Emsi companies who have provided labour market data for over a decade). A set of APIs enable us to access data about labour market movements, and skills required for different jobs, as well as providing a number of services grounded in Natural Language Processing (NLP) that perform rankings and similarity evaluations over skills and occupations. Wrapped around these analytics services (many of which we are now building upon and extending) is a web based framework with an Angular front end, GraphQL middle layer which enables us to decouple front end development from the back end, and a Node based back end. This design makes tools accessible from multiple domains (i.e. not just the learning management system, LMS), with various application components reused as appropriate. For example, a decision support tool to help people choose data and analytics microcredentials based upon their skill gap against a competency framework has also been created. While some trials have been run with students and various staff at UTS to date, the development strategy has been largely researcher based. More participatory approaches are planned for future work to upgrade the tools.

Using Learning Design to support usage at key transition points

This is a student facing Learning Analytics (LA) tool, which raises an interesting question about how it can be embedded in a university setting. Its purpose is to help students improve their approach to goal setting about their careers, and their planning as they navigate through course structures that are often quite complex. Career planning is not a task that is often assessed in a university context. However, simply pointing students to an EdTech based tool that they "may want to explore" rarely results in significant uptake of the service (Kitto et al., 2017). Instead, such tools must be embedded in an appropriate learning design which both helps students to understand their purpose and works to contextualise the tool to the specific scenario in which it is being used (Shibani et al., 2019). This tension raises an interesting challenge for a class of EdTech and LA tools that aim to support student learning of skills that related to longer term lifelong learning goals, and less related to the immediate requirements of the specific course in which students are enrolled. How can we embed such tools into a course's design without disrupting the course structure itself?

Kift's (2015) transition pedagogy approach proposes that the First Year Experience (FYE) is critical not just for successful transition to university study, but also for building up the academic literacies required for a lifetime of successful professional practice. For example, McIntosh (2016) shows that students at her university were more concerned with career options within the first three months of commencing their studies, with a slight rise again towards the end of first year (which is correlated with course choice). These are two key transition points where it seems likely that an appropriately designed learning activity might lead to better long term career outcomes for students. However, beyond the FYE there are likely to be a number of other key transition points where students are focused upon career goals and employability which provides an opportunity for designing a successful intervention. For example, Maertz et al. (2014) suggest that a success factor for students commencing an internship involves establishing "clear internship work and learning goals that support clear overall academic/career/life goals" (p134). Thus, helping students to think about their career goals more clearly *before* their internship could lead to better outcomes as they transition into the workforce.

Depending upon a course's structure, some key transition points for supporting students in thinking about their future employability include: orientation; at the end of first semester; when choosing majors and other optional subjects; before, during and after an internship-like experience; and, towards the end of a degree as they actively start looking for employment. At each of these transition points a cohort of students is likely to be thinking about their future, and open to activities to support this. However, as Shibani et al. (2019) argue, in attempting to build tools that are scalable it is all too common to adopt a one size fits all mentality, which fails to contextualise their use to the different problems that students are likely to be facing throughout this whole of course journey. For this reason, at UTS we are working to construct learning activities that can be assembled to support student learning in a way that is contextualised to student needs across each of the above key transition points. This helps course teams to adopt tools off the shelf as required, while providing the flexibility necessary to contextualise activities to a variety of different student needs. This facilitates tool reuse across the institution, but with different learning designs that reflect the different transition points that students are undergoing.

At present, this contextualization process is managed using a set of reusable Canvas pages. These are labelled such that they can be flexibly assembled in a way that supports student goal setting and development at the various transition points listed above. A basic set of "how to" pages support the use of the tool itself, but these are then framed by "activity" pages that scaffold the use of the tool within the context of the transition that they are designed for. Course teams that decide to embed a skills related employability activity using this suite of tools will be able to browse the existing learning resources, and then import and modify the ones that suit their context.

The how-to pages

A basic set of how-to pages are provided in all modules. They work to:

1. Introduce the tool and what it is for.
2. Provide a step by step guide to logging onto it and then using it to construct a skill profile and set some employability related goals.
3. Answer a set of FAQs about the tool and queries that students are likely to have while using it.

As such these pages provide a minimal set of help style resources that get students up and running with using the tool. However, they do not provide any motivation as to *why* students might want to use the tool, or what they might gain in doing so. This motivation is provided through the choice of a relevant activity module.

The activity pages

Activity pages provide scaffolding for the use of the tool, contextualised to the transition that students are currently experiencing. Their modular design makes it easy for course teams to identify activities that might be relevant for their subject, and to export them to their specific subject ready for extension and modification. As new transition scenarios are identified they can be created and added to the collection of activities, so building up a library of common resources that can be adapted by course teams as required.

Activity pages are designed to lead students through a sequence of challenges that provoke reflection about the transition that they are currently undergoing, problematising their skill gap and asking them to plan how they might address it during that transition. Students undertake activities that encourage them to think about why they are studying and what they hope to achieve during the transition. They are then supported in building up their skills profile (or extending an existing one if they have already used the tool), and explicitly setting some career or capability goals, which are stated in terms of occupations that they are interested in pursuing. At this point students are directed to different activities in the tool depending upon which transition they are undergoing:

- **At the end of first semester, when choosing majors and other optional subjects.** These activity modules encourage students to think about how their choices will help them to fill the skills gap that they identify between their existing skills and their employability related goals. They are encouraged to think about which skills are most transferrable between their different goals, and to be more strategic about identifying subject selections that will provide them with the skills that occur frequently in the labour market.
- **When undertaking an internship-like experience.** Students are guided through a sequence of activities that help them to think about what types of skills they most need to enhance their skills profile and reduce their skills gap. They are encouraged to plan out what types of activities are most likely to provide them with these skills, and to think about how they might take a more intentional approach towards undertaking these activities through negotiation with their mentors and supervisors. During the internship itself students are guided in thinking about the skills that they are acquiring, and updating their skills profile accordingly. After the internship students are then encouraged to rethink their career goals, removing ones they no longer want to prioritise and adding new goals that they have identified. They can work through activities where they link the skills that they consider most important for their career goals with artifacts from their internship that provide evidence of them having that skill.
- **Towards the end of a degree.** As students start looking for employment, they are supported in identifying the skills that they consider most important for the jobs that they are planning to apply for. They explore recent ads for those jobs and store selection criteria that appear in them. They are then encouraged to link skills to those criteria, again linking them to evidence that they possess those skills.

Next steps and future work

Trials are underway with various classes and student cohorts which will serve to further extend and develop both the tool itself and the learning design in which it is embedded. A number of upgrades to the tool itself are also underway, and participatory methods are being planned for some of this work.

We note that the current functionality of Canvas Commons does not really support the type of structure we would like to enable for sharing these resources. Firstly, we would like to ensure that certain pages are imported (e.g. the "how-to" pages), while leaving others as more optional. At present this is not possible. This is an issue, as the creation of reusable learning objects is likely to require that the object can be structured beyond simple pages. Similarly, it is not currently possible to control which activity is imported into a subject. This is problematic as it is possible that students might be provided with the same activity across multiple subjects with the current shareable structure. This could be handled in the curriculum information system at UTS as this is modernized, but it could also be tracked in a tool like Canvas commons which would enable course teams to see which subjects had already imported an activity and so discourage repetition. Finally, we would like to enable course teams to create new activity pages and export them to an institutionally shared library of activity pages for this tool, but that is not currently possible in modern LMS environments. We encourage LMS vendors to think about how these types of extensions might be enabled in their systems to support reusable learning objects.

Despite these limitations, this paper has attempted to demonstrate how EdTech tools can help connect students to the workforce, but only through an appropriate use of learning design. As higher education attempts to train students in complex competencies like career planning it becomes increasingly important that we adopt a whole of course approach, and this paper has taken one small step in that direction.

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reconnect
Reconnecting relationships through technology

Diverse definitions of engagement: Personalised learning analytics to support staff and students

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Although teachers design learning experiences, their pedagogical and pastoral connections to students and teaching are often unaccounted for in learning analytics approaches. What is needed for analytics to reconnect teachers and students at a unit and program level, and help unit and program coordinators support those students who need it most? We present the approaches and findings from a pilot initiative where a freely available learning analytics platform allowed unit coordinators to define their own contextually unique measures of engagement and allowed program coordinators to see across units. We discuss the forms of outreach afforded by the initiative, the support provided to coordinators, and the implications of learning analytics that are not one-size-fits-all on using data meaningfully to support human connection.

Keywords: learning analytics; student support; student engagement; relational pedagogy.

Background

Learning analytics and student support

Learning analytics have been a part of the higher education landscape for over a decade. Catalysed by the increased availability of data about students and their learning behaviours, early work in the field focused on supporting students by ostensibly predicting their future performance. The field has also addressed analytics around social networks, discourse, assessment and feedback, learning design, and even student affect (Joksimović et al., 2019). Throughout this journey of learning analytics research and practice, the fundamental aim has always been to understand and enhance student learning. To do this, learning analytics relies on a complex interplay of sociotechnical elements including data, software and algorithms, teachers, university administration, policy, ethics, and, of course, students. Work around predictive modelling, for example, can involve machine learning algorithms that consider demographic and learning behaviour data from learning management systems, presenting to teachers a visual representations of predicted student academic outcomes that can then inform educational interventions (Herodotou et al., 2019). These interventions can range from automated, system-generated ‘nudges’, to personalised messages designed by teachers, to invoking institutional student support mechanisms (Wong and Li, 2018; Arthars et al., 2019; Lim et al., 2019).

Although learning analytics holds much promise, it has faced a number of challenges. Some notable criticisms include the lack of consideration of learning design or learning and teaching context and whether teachers and their pedagogical knowledge are involved in the use of learning analytics (Guzman-Valenzuela et al., 2021). Predictive analytics have also been challenged about their reliance on standardised variables or indicators, with an emphasis that instructional contexts are critical to consider when using learning analytics, and that generic one-size-fits-all models of student success are overly crude and ineffective (Gasevic et al., 2016). Moreover, there have been impassioned calls to rediscover the humanity in learning and teaching through data, and reconnect teachers with students at a human level through an ethic of care (Parkes et al., 2020):

> … interventions should start with (and be built around) human interactions. Genuine staff-student interaction is increasingly difficult to achieve in [higher education]’s massification environment where students are often reduced to mere numbers… however, [learning analytics] offers staff an opportunity to initiate contact with those specific students who may benefit from such human interaction. (p. 120).

Context and urgency of using program-level analytics for student support

Indeed, highly individualised teacher-driven approaches to supporting students are a fixture of many higher education teachers' roles. Rarely, though, are there initiatives implemented across multiple units of study or across departments or faculties. This is an area where the increased availability of data and learning analytics may have a key role to play. Additionally, recently introduced federal legislation in Australia affecting access to the Higher Education Contribution Scheme (HECS-HELP), which is offered to domestic students to reduce and offset the cost of their course fees, has produced a more urgent need to support students in a targeted way. The Job-ready graduates package (JRG), announced in 2020 by the former federal government, introduced several reforms including restricting access to HECS-HELP if students do not maintain a pass rate of 50% for their enrolled units. When these reforms were announced it was quickly identified that teachers, being the people that students have the most and closest contact with at university, were likely best placed to provide additional support to those who may be impacted by these changes. However, with the impacts only being realised at program level across multiple units of study, it was important to both address the nuances of teaching and curriculum design within individual units as well as be able to measure and support student engagement across units.

Measures of student (dis)engagement

Kahu's (2013) framework views engagement as a multilevel phenomenon of socio-cultural processes. These processes can be influenced by institutional and personal factors, and are obviously embedded within a wider social context. Things that can influence engagement include structural influences such as a student's family, support and workload, and the curriculum, assessment and policies of an institution. In addition, there are factors such as the teaching staff, their workload, students' motivation, personal identity, and feelings of self-efficacy. Finally, engagement also includes behavioural and cognitive factors such as ability to concentrate, participate and interact.

In this paper, we present the methodology and early findings for a pilot initiative to measure and support student engagement across programs. Importantly, our approach privileged the nuances of individual units of study as determined by teachers and their understanding of how the design of their curriculum related to indicators of student disengagement. We describe how various educational contexts informed the indicators and rules used to identify disengaged students at a unit level and how this was then aggregated to provide tailored support at a program level. Internally the goals of this were to address the immediate needs of supporting students before they were impacted by the new punitive legislation, and here we also demonstrate that individualised approaches to learning analytics can be meaningfully implemented at scale across multiple units.

A teacher-driven approach to measuring and supporting student engagement

From unit-level to program-level learning analytics for student support

In the initial pilot in semester 2, 2021, the Bachelor of Science (BSc) and the Bachelor of Liberal Arts and Sciences (BLAS) were involved. The BSc has a pool of options rather than a set of core units and so an analysis of enrolment patterns was performed to identify the minimum number of units to ensure >95% of the total cohort was covered in at least two units of study. In the BLAS, there is a compulsory unit and so this and the most commonly co-enrolled units were selected. Ensuring that a majority of students were in at least two units was intended to provide accurate engagement information across their studies rather than just in individual units. In semester 1, 2022, the Bachelor of Engineering, Bachelor of Advanced Computing, Bachelor of Arts, and Bachelor of Economics were added following a similar model to ensure adequate coverage across the major liberal studies degrees with large domestic cohorts. Alongside the approach of picking commonly-taken units, students in these degrees often take units from other faculties and this assisted ensuring coverage whilst minimising the overall coordination effort. Each unit coordinator was supported to identify appropriate engagement indicators for their units and to provide personalised communications for students flagged by these indicators. For each of the degrees, a senior faculty academic leader (the 'program coordinator') was also provided with aggregated data across their degrees so that students appearing to be disengaged across their studies could be contacted by an experienced academic advisor.

Helping teachers define, measure, and support (dis)engagement

Our underlying assumptions were that unit coordinators knew their units and cohorts better than someone outside the unit, and that they would have a better idea of what might constitute (dis)engagement. In large universities such as ours there is a temptation to use institution-wide indicators such as LMS access or predictive analytics to identify at-risk students, but broad-brush approaches run the risk of targeting the wrong students and missing those who are really struggling. They also ignore important variations in approaches by individual teachers and unintentionally separate teachers from their responsibility in supporting students by 'outsourcing' it to central teams. As Kift (2008) powerfully stated, a successful transition is "everybody's business". Each unit coordinator in the pilot met with a member of the project team to discuss potential indicators and rules that might be used to identify disengaged students in their respective units at two points in the semester. The first point ('early') was in the lead up to census date and the second point ('late') was towards the end of semester when students would be beginning to prepare for exams or submitting final assignments. Our aim was to minimise extra workload for teachers, so we focused on data already available for each unit; according to Kahu's (2013) framework, these were primarily related to behavioural engagement and proximal consequences of engagement.

Once we had settled on combinations of indicators (e.g. quiz score or attendance count) and rules (e.g. less than 50%) to be used in each unit, the project team arranged for this data to be made available in the Student Relationship Engagement System (SRES) in an aggregated form. Typically, this form of nuanced (that is, not one-size-fits-all) learning analytics is difficult to achieve with large cohorts, across multiple units and programs. SRES was critical here because of its ability to allow unit coordinators to select, collect, and analyse data that is meaningful for them in their teaching and unit requirement contexts (Liu, D., Bartimote-Aufflick, K., Pardo, A., & Bridgeman, A, 2017). The system then allowed the project team to combine these engagement measures across units to identify students who may be disengaged across programs.

Across the 46 units in the pilot (23 each semester), there were a wide variety of different indicators and rules chosen by unit coordinators to determine student (dis)engagement (Table 1), closely linked to the learning design of each unit. Because student contact was made at two points in each semester, coordinators were also able to adjust the indicators and rules according to the most relevant data at those points in time. The indicators selected early in the semester differed substantially from those selected late in the semester (Table 2). The wide variety of indicators selected was also apparent, as was the nuance of most indicators towards the learning design of each unit.

Table 1: A sample of representative indicators and rules determined by unit coordinators to identify students who were more disengaged towards the beginning of semester.

	Engineering 1	**Math 1**	**Data science 1**	**Chemistry 1**	**Biology 1**	**Economics 1**	**Vet science 1**	**Philosophy 1**
Lab reports	Low submission				Zero score			
Assignments		Low submission						
Introductory module				Incomplete attempt				
Attendance			Low					No attendance
Assessments				Incomplete attempt	No attempt		Fail	No attempts
LMS access data						Low time	Low views	No logins

Supporting students, at scale

As discussed above, once the individual unit data were aggregated at both the 'early' and 'late' stages and across all units, program coordinators prepared targeted outreach through SRES. This took the form of a personalised email, complemented by a text message directing students to check their email. These messages provided information to students about the possible impact of the JRG on their study progression, student support programs, an encouragement to contact individual unit coordinators, and an offer to support the student directly. These emails were crafted to be caring and human and in the authentic 'voice' of the program coordinator. 'Early' emails included information about census date, and 'late' emails included both information about the upcoming discontinue fail date, and final exam or assessment support. Unit coordinators were also provided with information about students who showed disengagement indicators in their individual units of study.

Table 2: Variety and number of engagement indicators selected by unit coordinators across all units involved in the pilot across two semesters. There were 23 units in the pilot in each semester.

Indicator	Type of indicator	Semester 2, 2021		Semester 1, 2022	
		Early	Late	Early	Late
Gatekeeper/checkpoint quiz/module	Behaviour	6	3	3	0
Introductory survey	Behaviour	1	0	0	0
Weekly quizzes submission	Behaviour	8	3	3	1
Weekly quizzes performance	Achievement	0	3	5	2
Weekly activity/exercise completion	Behaviour	3	0	1	0
Summative assessment submission	Behaviour	9	10	9	11
Summative assessment performance	Achievement	0	11	6	13
Lab attendance	Behaviour	3	2	1	0
Class attendance	Behaviour	2	0	6	0
Low LMS logins or page views	Behaviour	19	2	7	0
Online module progress	Behaviour	0	1	0	0
Discussion board activity	Behaviour	1	0	0	0
Lab/logbook submission	Behaviour	3	0	2	0
Group processes	Behaviour	0	0	2	1

The emails sent by program coordinators resulted in an average open rate of just under 30%, and approximately 20% of the students contacted responded either with further information or a request for support. Student responses indicated that disengagement was primarily due to (a) personal or health challenges with COVID a major factor, but that (b) work commitments and (c) problems with enrolment systems also affected their engagement. Program coordinators supported these students individually, referring them to other services where relevant.

Discussion and future work

The variability of indicators chosen by unit coordinators to measure student (dis)engagement in this pilot shows the importance of teacher-driven use of learning analytics. Across the two semesters, 14 distinct engagement identifiers (Table 2) were decided upon in concert with unit coordinators across 46 units of study. This revealed that teachers have very different conceptions of what constitutes positive engagement in their contexts, linked to varying teaching approaches, unit requirements, class types, assessment tasks, etc. LMS logins or pageviews were a dominant indicator used in 'early' semester 2 2021 in units where other indicators could not be easily identified, but as noted above are broad-brush, and feedback from unit coordinators suggested that they had little predictive value. Useful analytics are the product of intentional design and many of the units in the pilot already had highly individualised but long-standing context-driven approaches to supporting student engagement using SRES. While this project illustrated the need for a good deal of support when implementing meaningful engagement support strategies, there is a clear benefit to teachers, units, and students in the reflective process required to develop these. In turn, approaches to utilising learning analytics must afford flexibility in order to be appropriately informed by teachers and their learning designs. Future work in this space should involve the evaluation of the extent indicators recognise student (dis)engagement within individual teaching contexts.

The 14 distinct engagement identifiers can be separated into two types (Table 2) and a pattern in their use was seen; behavioural identifiers were more likely to be used in the early stages of semester, and achievement identifiers in the later stages. This may largely be due to the availability of data, with behavioural data more prevalent earlier in the semester, but could also relate to a tendency to set ‘easy’ assessments earlier in the semester which are considered less reliable indicators of eventual success. We propose here that we collectively may be over-privileging achievement as an indicator for engagement, but also reflect on the fact that while achievement is the ultimate indicator for success in individual units of study, students’ eventual success at university is a combination of academic achievement but also the sense of belonging they develop through their education journeys. This involves genuine connections and care, a process that can be supported by using data in a nuanced and flexible way.

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reconnect
Reconnecting relationships through technology

Defining a next-generation ecosystem for online learning: from changing the platform to shifting the paradigm

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While disruptive and disconnecting, the events of the last two years have also created a rich opportunity to change how we think about what we do and the contexts we work in. This conceptual paper explores the development of a more complex realisation of the ecological view of online learning and educational technologies as a new paradigm to reconnect people with technology in the organisational context. Drawing on a range of disciplines and practices, a 'next-generation' ecosystem establishes the social and organisational domains as critical additions to the technological and pedagogical domains. Also explored are the ways in which third space practitioners are pivotal in the design and delivery of such an ecosystem, and examples of the ecosystem development in practice. By considering and designing a wide range of experiences and practice domains, the 'next-generation ecosystem' concept may provide a way to meaningfully reconnect people with educational technology.

Keywords: Ecosystem, virtual learning environment, change, third space, organisational practice

Introduction

While the COVID-19 pandemic brought on a mass pivot to online delivery in the higher education sector, not all institutions experienced this shift in the same way. University of New England (UNE), as a primarily online university with a long history of online delivery and infrastructure and practices already in place, had no need to pivot. UNE did, however, encounter other challenges - the sudden large-scale emergence of other institutions into the online learning domain brought our identity as an institution into relief. As an institution whose staff worked largely on a physical campus, we also shared the universal experience of suddenly finding our individual identities entangled with the online environment as digital place (Gourlay, 2022).

The pandemic also coincided with two other major organisational changes. UNE underwent a major restructure at the end of 2020, and saw a complete change not only to organisational structure but to resourcing and practices. An entirely new division was established with carriage of the business, the strategy and the technologies of online educational delivery. UNE has also been undertaking a review of its Learning Management System (LMS) and other major virtual learning environment (VLE) platforms via full-scale tender evaluation processes – an initiative that carries the potential for large-scale change.

Finally, in late 2021 a storm cell event occurred on UNE's campus, creating significant damage to physical infrastructure. This further compelled staff into digital spaces for work, during a time when much of the rest of the sector was returning to campus-based work.

These significant events worked together in concert to create widespread uncertainty and anxiety about the future, resulting in a sense of disconnect from our previous ways of understanding and enacting our work. Our digital environment was poised and ready to reconnect us in new and dynamic ways, but it was clear that existing ways of thinking about online learning and VLEs as a collection of tools and techniques would not enable this reconnection. Continuing the common sector narrative of 'implementing a new LMS platform' and conceptualising our work practices separately would only serve to further disconnect.

What these experiences highlighted was the need to think in much more rich and complex ways about how our staff, our students and our technologies connect. We needed to move beyond thinking about the suite of platforms we curate and the pedagogies that take place within them, and instead take a complex and connected view of our full context. We needed more than a change of platforms to reconnect us – we needed to shift the paradigm.

Designing a paradigm

In considering a new paradigm, it was necessary to look at the current sector landscape, and then draw in new lenses from different bodies of literature to frame thinking, beginning with educational technology and then connecting outwards into pedagogical, organisational and behavioural domains to establish a much broader perspective.

The conceptualisation of educational technologies in the sector has been a long-evolving space, and while much progress has been made in understanding technologies not as 'other' or a ‘bolt-on’ but a key environment for teaching and learning, there are two dominant narratives that emerge:

- A dichotomy view, where concepts like pedagogy and technology (Fawns, 2022; Laanpere at al, 2014; Sankey, 2020a) or online and face-to-face (Gourlay, 2021; Mihai, 2022) exist in tension and practices are characterised along a continuum; and
- An ecological view, where ‘ecosystem’ or ‘ecology’ is used to describe a subset environment, such as an integrated collection of technologies (Kiely, 2022; Sankey, 2020b) or the interactions between people and technology characterised in the teaching and learning domain (Ellis & Goodyear, 2009; Reyna, 2011)

What is missing from these conceptualisations is the organisational context – as Orlikowski & Scott (2008) note, technology is frequently characterised as separate from work and organisational practice. This seems particularly true in the educational technology space, where theory and practice focus on the teaching and learning domain and the technology-mediated design and delivery of educational products. Yet how people behave and interact, the identities we hold, the decisions that we make, the processes and policies we develop, are core parts of our experience as people. Surely, these should also be considered key components of an ‘ecosystem’.

To realise this, it necessitates a transition away from thinking about the elements of a system to the relationships and interactions between them. The psychological and organisational literatures offer some key theoretical lenses for this, such as sociomateriality, sociotechnical theory, affordances theory and behavioural economics. Navarro-Bringas et al (2020) apply a sociotechnical theory approach that brings the organisational perspective into consideration, but in regards to physical learning spaces. Orlikowski & Scott (2008) draw the organisational and technical together through establishing sociomateriality, but the teaching and learning perspective is missing. Ostern & Rosemann (2021) draw on affordances theory to quantify a range of relationships and interactions between humans and technologies. Wordham et al (2018) apply behavioural economics and behavioural design as a frame for organisational efficacy – the ‘people side’ of technology implementation and change.

Fawns (2022) offers the concept of ‘entangled pedagogy’, where technologies and practices are interrelated with values and agency and other cultural domains, but the organisational perspective is still limited to teaching and learning practice. Gourlay (2021) connects sociomateriality to teaching and learning to disrupt the digital vs face-to-face dichotomy and connect context to practice, but invites consideration of organisational practice and policy for future exploration.

Drawing all of these lenses together allows us to create a rich and complex picture of an ecosystem, that captures the organic interrelationships between the technical domain, the learning and teaching domain and the social and organisational domains. This can frame the definition of a ‘next generation’ realisation of the ecosystem concept as such (illustrated by Figure 1).

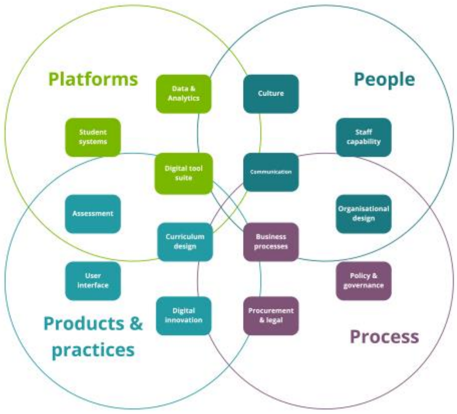

Figure 1: Next-generation ecosystem model

Next-generation ecosystem: The people, platforms, processes, products and practices that work together to shape online learning

Designing and delivering an ecosystem

Defining a next-generation ecosystem is an act of change, and in complex organisational contexts, change's biggest challenge is impact. A complex and emergent approach, rather than a linear approach, is necessary to move from innovation to adoption (Cooksey, 2011). Another challenge is the drawing in of people, processes and practices as a key components of the ecosystem - it's critical to intentionally address these as something dynamic that can be acted upon and recreated through design expertise (Hambeukers, 2018).

A high-agency avenue to address these challenges is third-space practitioners (Whitchurch, 2008), who not only bring pedagogical and technical expertise but design and change expertise and the lived professional experience of the organisational context. The business and organisational learning literatures provide some key strategies through which third space staff can be empowered to both design an ecosystem and effectively implement change to deliver it.

Hambeukers (2018) describes a model that connects Peter Senge's Organisational Learning disciplines with design and technology disciplines, and the concept of organisational learning design (Thorneycroft, 2020) can be overlaid to extend design expertise to cultural and interpersonal domains, providing an effective lens for conceptualising the affordances of third space practitioners across the ecosystem context.

As change agents, third space practitioners can move fluidly across boundaries to connect and engage. They can act as the brokers, nodes and informal influential leaders that Cooksey (2011) notes as critical for embedding innovation into complex organisational contexts. They can also act to establish 'cultural islands' (Lipshitz, Friedman & Popper, 2006) that enable cross-organisational learning conversations (Gravett et al, 2022) to establish common understandings, cultural growth, and develop teaching and organisational practices.

As designers, third space practitioners can establish new ways of working that are grounded in context to maximise outcomes. Business Process Re-engineering (BPR) provides an avenue for considering and acting on business processes as a design domain. Empowering third space staff to engage in BPR has significant transformational potential, bringing the ownership and creativity that Ackermann et al (1999) note as essential to domains that are often treated as only administrative or managerial.

Third space practitioners can also draw on their organisational expertise to establish a rich institutional 'data practice' - normalising the use of data to inform decisions and directions in all domains (Diaz et al. 2018; Soulski, 2018). Staff in third space roles in online learning often have enhanced data fluency and ability to translate data into practice developed from learning analytics and technical analytics contexts, and access to organisational data that may be under-utilised but has the potential to significantly impact practice.

By empowering third space staff to work in these new domains, a fully realised ecosystem for online learning can be designed and delivered in ways that meaningfully connect staff to the new paradigm.

Ecosystem in practice

UNE has begun implementing the next-generation ecosystem model through empowering its third space practitioners, establishing a range of projects and initiatives that focus on the intentional design and curation of various components of the ecosystem. A small subset of these are captured here to illustrate how the ecosystem concept can be applied in practice:

Platform

- Undertaking major platform tenders in parallel, rather than isolation, to reinforce interconnection
- Adopting a top-down design approach to procuring and integrating technologies rather than a 'plug-in', bottom-up approach

People

Intentionally designing 'cultural islands' with strong identities through:

- Embedding communities of practice at core team and portfolio levels
- Establishing university-wide consultative groups to connect key stakeholders across faculty and discipline siloes

Practices

- Establishing an integrated organisational model that embeds third space practice in fluid ways across the institution
- Leading assessment policy renewal through drawing on third space expertise and surfacing key organisational data sets to design policy that serves practice rather than practices that serve policy

Processes

Engaging core teams in BPR to design and implement new processes in a range of areas such as online unit development, online examinations, media production and student support processes.

Products

Enhancing curriculum and teaching practice through frameworks and processes that are owned, designed and driven by third space practitioners.

Conclusion

After a turbulent two years where significant changes forced us to reconsider who we are and how we work, reconnecting people with educational technology in the UNE context required us to think in new ways. By harnessing the power of third space practitioners and drawing on theory and practice from a diverse range of disciplines, we have defined a rich and complex 'next-generation ecosystem' approach that allows us to move beyond a change of platform to establish a new paradigm for online learning.

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reconnect
Reconnecting relationships through technology

Emerging design solutions for hybridised learning spaces: addressing social practice, privacy and participation

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The term ‘hybrid learning space’ (HLS) is loosely used to describe a fusion of learning opportunities and teaching approaches that span physical and virtual spaces. This paper outlines ***ongoing*** work to define the contemporary ‘hybridised space’ and build a pattern language that offers reusable design solutions to the challenges of delivering learning and teaching in these new and emerging settings. This paper explores architectural motifs, social practice, privacy and participation to draw out successful design principles for linking HLS to effective pedagogy.

Keywords: Hybrid Learning Spaces, Social Practice, Privacy, Participation, Architecture

Defining the hybrid learning space

The conceptualisation of the Hybridised Learning Space (HLS) has continued to evolve to a point where it has reached widespread acceptance in the educational sector as a valid descriptive terminology for a particular type of educational manifestation and a key component of the future campus design. HLS have been deployed in multiple forms, with varying success and often with contested understandings (Gil et al., 2022):

> “As we have come to accept the duality of physical and virtual learning spaces as a permanent feature of our educational landscape, we begin to question its validity. Is this really a dichotomy, or is it a continuum?” (p.9)

For Kohls (2017) the HLS incorporates elements that span the physical, digital, information, conceptual, navigational, and social space. In his design patterns paper he describes how the dichotomy of digital and non-digital artefacts can be resolved in a hybrid learning space by seamlessly bridging different types of artefacts, making digital data touchable, enhancing physical objects with digital information and, digitising physical objects. Yet, hybridised spaces are of course not new. The notion of bringing real and virtual participants together has materialised in a range of forms including for example hybrid meeting and conferencing and, has been theorised through work around telepresence, participation and technological efficacy (Lombard et al., 2015). There is also an important strand of applied research that has been developed around active learning spaces (Loughlin et al., 2015) that provides meaningful and valuable insights into the technologically enhanced classroom that moves away from classical teacher to student transmission model to relations that are decentred and group based. In this paper the focus is on hybridised spaces within a learning context and therefore the HLS cannot be separated from discussions of teaching and its configuration and enactment within these evolving settings (Köppe, et al., 2017):

> “Hybrid pedagogy means the interplay and mix-up of pedagogical concepts that are traditionally separated. It aims at dissolving the dichotomies within education such as physical -digital, academic-nonacademic, online- offline, formal-informal, learning-teaching and individual-collective.” (p.98)

Many previous studies have reported the crossovers between space design and pedagogy (Ellis & Goodyear, 2016) but this paper privileges the importance of the hybridised space for learning and teaching and the role that identity, privacy and participation play in grounding effective teaching and how blending social practice and architectural motifs provides an important design lens. Of particular interest here is how the crossover between digital and physical space creates new affordances, enhances the experiential value of both domains and, becomes a *site* where digital placemaking and novel pedagogies may emerge (Cohen et al., 2020).

Approach and methodology: building reusable design solutions

The value of using patterns to consolidate approaches to design solutions was popularised in the mid-1970s by Christopher Alexander. He developed the first pattern language for architectural design and defined how a design pattern abstracts and generalises the essence of a successful design solution within a three-part rule which shows the relation between a certain context, a problem and a solution (Alexander, 1977). In the mid-1990s the software developer community started to adopt the Alexander style to portray the themes that reappear in different computing and software development domains (Gamma et al., 1995). The design pattern approach is now used in various disciplines such as interaction design (Borchers, 2001) and socio-technical systems (Schümmer, 2007). Existing educational patterns cover areas such as learning with technology (Warburton & Mor, 2015), or general pedagogical practices (Mor et al., 2014). Our approach here, drawing on methodologies identified in the literature, has been threefold:

- to look for existing patterns and principles of good practice in learning space design and extract their essence as design patterns using the 'Rule of Three' (Alexander, 1977).
- mine the literature for extant patterns that can be adapted and shaped to inform design decisions in this emerging sphere.
- to document emergent patterns in a proto-pattern form for later iteration and refactoring.

2.1 Limitations

The design patterns presented in this paper remain in development and are intended to be used in designing solutions in a higher education learning and teaching context without any specific disciplinary bias. However, there are many elements within the patterns that offer transferable insights to other educational settings and indeed beyond, for example events and conferences that run in a hybridised environment

Theoretical motifs

A number of theoretical motifs (described below) run through these patterns and underpin the forces (*tensions*) that exist within this particular design space. Hybridity can be seen as presenting a range of differing challenges that include: technical (cameras, ambient noise, microphones, Internet bandwidth); social practice (relationships, presence, activity versus passivity, convergent versus divergent modes of thinking, public - private boundaries); socio-technical (systems design); and finally, pedagogical.

Motif one: the social nature of space (architecture)

Space is not neutral. It shapes, interacts and moulds the behaviours and sensibilities of actors within it and provides different affordances according to the many configurations of light, distance, colour, line of sight, and so on. As Čiupailaitė (2016) describes:

> "The properties of space: openness, linkage, control, linearity and others are related to cultural provisions regarding social activity meanings, human behaviour models and preferences in respect of spatial configurations e.g., in the libraries one kind of work is performed while in the cafes are practiced in other way. Work can be performed in the cafe and in the library, still human expectations in respect of noise and quiet or people closeness will be different."

If architects are able to play with the both the emotive and social affordances of the spaces they design then so too can educators. The ability to create expectations, for example the square which presupposes the existence of a cafe where one may sit to watch people go by, is not dissimilar to the lecture theatre with its tiered ranks, podium and the behavioural expectations of a passive audience and active speaker.

Motif two: social practice (relations)

Social practice provides a lens to both interpret and organise activity within hybridised spaces. Through intentional identification of the elements of social practice it allows for design decisions to be made at the interfaces of structure, cognitive processes, embodiment and performance (see *Figure 1*). Here structure refers to the social systems in which individuals operate, materiality denotes the physical environment, and embodiment is our interaction with it through our body, and our mental image of that. Performances relate to the ways in which we communicate our identity, intentions and relationships through action. Our cognitive mental processes shape our interpretation of the social, physical and digital environment and determine our actions or performance.

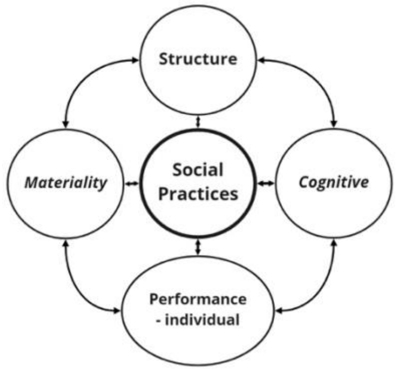

Figure 1: Elements of social practice

Practice theories come from different perspectives and bring diverse emphasis (Grootenboer, et al., 2017). Yet, all agree on the situatedness of practices and their synergy with the context – physical, social, cultural, organisational and technological – in which they are embedded. We define a practice as a pattern of action, aimed at achieving a specific goal in a given context. A participant in a practice identifies, or "reads" the contextual cues to determine the appropriate practice, and then interprets signals from the environment or from other participants to proceed from one action to another, until an end state is identified – either the goals have been attained, or they are deemed unattainable. All human activity is organised into systems of practices. Arguably, this is what we call "culture". Here hybridity takes on a surprising twist: we are adept at reading the context we are in and identifying the appropriate practices and our roles within them. In hybrid spaces, we receive an inherently mixed signal – by definition the situation interleaves elements of disparate contexts. We are chameleons on a chequered tablecloth. This creates tensions and dissonances, when our assumptions fail and our actions fall out of sync.

As Benyon (2014) writes and Leijon (2016) observes, we read space as a social text – inferring function and conventions from it, determining which practices are admissible and expected in it. When we walk into a tiered auditorium, we assume our role as student or teacher, and take our place accordingly. As student, we will remain silent until the teacher asks for questions. When we enter a library, we will find a table and sit quietly, engaging in independent study. Hybrid spaces create ambiguous social text for the actors within them.

Design Patterns

Within the space constraints of a concise paper the authors have chosen to fully render one design pattern and reference the remainder patterns in a simplified synopsis format (Table 1). The full patterns are available on the supporting website (https://hls-d3.iucc.ac.il/) and open to active input and engagement. The patterns follow an adapted Alexandrian form and a descriptor of each section has been added to direct the reader.

Pattern: Readable space for hybridised learning

Domain: A meta pattern that identifies the forces and constraints that exists in any hybridised learning environment and the importance of creating readable 'space and place' as a social text that can affect and frame social practice.

Context *(where this design pattern is effective):* You have identified a need for creating a hybrid learning community - your learners are distributed in both their spatial and temporal existence. They may be in different phases in life (e.g., some are high school students, some higher education, some at work seeking professional development). You are also aware that your learners are likely to be heterogeneous in terms of their technical and virtually mediated experience which will impact how comfortably they can be brought to this novel setting.

Problem *(statement of the challenge that this particular pattern addresses)***:** You want to build a hybrid learning space that supports high quality learning, confident teaching and, a feeling of openness to engagement while providing a feeling of safety for those participating. You want the space to feel simple, inviting, and safe. However, hybrid spaces act as ambiguous social texts where we experience multiple scenes at once, and are not sure which set of norms, conventions, and practices to assume e.g., when our teacher's children enter the frame in their pajamas – should we respond as we would if we were in their home or as we would in class?

Forces *(what are the elements that are in tension within the problem space):*

- Public-private boundaries are understood differentially in virtual versus physical spaces.
- Identity is developed, managed and understood differently within a hybrid space.
- Our sense of identity and place is disrupted if others are let into our [private] spaces.
- The places from which we observe and participate are not neutral. Framing (from cinematography) can both switch and change perceptions.
- Movement can disturb a stable dynamic preventing some learners from participating.
- Sound (audio) changes in different settings and can privilege certain types of behaviours and reactions.
- Light and lighting affects mood.
- [Non] corporeality is a factor that subtly alters the mechanisms by which learners engage.
- Power can be distributed in new and unexpected ways e.g., the ability to mute a virtual participant.
- Phenomenological aspects can become heightened in significance. Prior experience dominates many dimensions and underpin assumptions we may make when performing in both virtual and physical spaces.
- Spatial architecture can affect modes of thinking and behaviours: from divergent and convergent modes to active and passive behaviours.

Solution *(measures that can be taken to resolve the forces and bring harmony to the problem):*

Therefore, set the design parameters by carefully considering how the connected places are presented to the learners as a program of sensual experience. This means, determining not only the socio-technical elements that afford teaching but also the impact of the structures themself. What are the elements of its materiality being presented - depressing, inspiring, tactile-ness (odour and colour)? Each design pattern listed in (Table 1) addresses the forces within this meta-design pattern and can be orchestrated to build a successful design solution.

Case Studies *(examples of successful practice and related patterns):*

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- Kohls, C. (2019). Hybrid Learning Spaces for Design Thinking. *Open Education Studies,* 1:228-244.
- Future Learning Spaces: Flex Space at https://flexspace.org/ and University of Utrecht learning spaces at https://www.uu.nl/en/education/future-learning-spaces

Overview of all HLS design patterns

Table 1: Overview of the current design patterns with title, synopsis and related theoretical motif/s and the suggested values that these represent (*refer Conclusion*). Full patterns at https://hls-d3.iucc.ac.il/

Pattern title	Synopsis	Motif/s and values
1. Readable space for hybridised learning	Set the design parameters based on the social affordances of space and place for learning and teaching.	Social practice; space as text; equity
2. Placemaking for identity	Identity and public-private boundaries need to be defined and managed. Designing a 'gradient of intimacy' allows for differentiated areas of pubic versus private to be demarcated within the learning space.	Public-private boundary and identity; space as text
3. Safe spaces	Design spaces for differing levels of participation with sensitivity to safety and equity of participation.	Structural; space as text; protection
4. Setting the frame	Use design considerations from film making to solve the *on-screen* framing of learner participation in a hybrid setting.	Embodiment and presence; social practice; empowerment

5. Capability and confidence	Building capability in 'technology, pedagogy, content knowledge' (Mischra & Koeler, 2006) underpins confident and effective teaching and learning.	Performance and cognition; social practice
6. Learning Pods	Design an *attendance* format that acknowledges that learners want to participate in often self-determined configurations away from the standard lecture theatre or classroom delivery.	Social practice; connectedness
7. Team teaching	Blend face-2-face and online settings using a methodology that supports decentred and shared teaching approach to best engage leaners within and across the shared classroom space.	Social practice; equity; empowerment

Conclusions and next steps

The paper here represents a work in progress with an offering of one meta and six associated design patterns that can be linked together to provide a usable foundation for building a hybrid learning space/classroom. The complicated dynamics of extended social spaces that are used for learning can promote certain types of challenging behaviours: shyness, anxiety, removed inhibitions. Designing for equitable access and participation from active to passive is not straightforward. Certain settings will privilege certain types of presence where telematic presence versus physical presence need to be designed for if they are to be successfully merged. The use of different theoretical motifs and linking to extant case studies provides interesting design configurations that move beyond the more simplistic technological solutions of bringing virtual participants into a physical setting to create a hybridised classroom experience. These patterns form a deeper language that draws together technical, social and architectural solutions that speak to hybridised settings within learning spaces critical to the design of the future campus. As part of this paper we have also surfaced the following values:

- equity (maximising access);
- connectedness (connecting learning to learners' own context);
- protection (safeguarding learners' privacy and wellbeing);
- empowerment (of learners and teachers).

And from these values we have been able to derive principles that address **flexibility, choice, access, clarity and safety which are embedded within the design patterns listed above.**

In summary, these design patterns (and values) are in development and currently being extended with invited commentary from a wide expert-practitioner audience. The aim is to expose these patterns more widely, develop further case studies and provide a high-quality pattern language to the community that will help novice designers of hybrid spaces find successful solutions to the particular challenges they are facing.

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reconnect
Reconnecting relationships through technology

Lightweight Mapping of Identify Verification Methods and Secondary Course Aspects: "Swiss Cheese" Modelling

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Curriculum mapping in Australia has grown from early notions of constructive alignment to a governed ongoing commitment by institutions to the curriculum structures they have developed. These consider primary aspects of a degree: learning outcomes and how they are achieved. In this paper I describe the need for a descriptive set of mappings for secondary (or quality) aspects of a degree. Notably, mapping the identity verified assessment mechanisms used across a degree can support conversations with accreditors and reviewers around defences against cheating. In 2020 and 2021, many universities were forced to cancel paper-based examinations and academics altered their assessment mechanisms. Mapping the mechanisms that were adopted can reconnect those individual choices with their purpose within the degree. The paper is an experience report from the development of an accreditation submission for a suite of computer science cognate degrees. Other descriptive mappings developed within the submission are also described.

Keywords: Curriculum mapping, identity verified assessment, plagiarism.

Introduction

In Australia, course and curriculum mapping developed from Biggs's notion of constructive alignment – a learning design approach of identifying specific learning outcomes and then constructively designing the learning activities to meet those objectives (Biggs 1996). This developed from Cohen's (1987) earlier work on "instructional alignment" – the match between curriculum and assessment methods – though commentary on producing visual maps of curricula as part of the planning process can be found from the 1970s (Hausmann, 1974). This approach to curriculum design has collaborative benefits, as the mapping process fosters conversation between colleagues about degree content (Uchiyama & Rudin, 2009). Weingards-de Meij and Merx (2018) found that online mapping improves the visibility of this exercise, improving collaboration.

Curriculum maps can be used in a variety of ways. Veltri et al. (2015) propose using the curriculum map as an instrument for improving Information Systems courses by measuring aspects such as the relative weighting of different outcomes within the assessment in a subject, the depth to which an outcome is covered, and the saturation of coverage of an outcome by multiple units within a degree. Rawle et al. (2017) found that there are differences between disciplines within an institution in how curriculum maps are developed and how they are used by academics. Recently, Kay et al. (2022) suggest the incorporation of mapping into an open-learner model – a data representation of a student's progress against a hierarchy of objectives, from analytics of their activities.

Curriculum maps have become part of the governance processes of universities. For example, by 2008, most undergraduate medical schools in Canada and the UK had begun producing curriculum maps of their courses (Willet, 2008). In 2022, many Australian universities use curriculum management systems, e.g. CourseLoop. which can hold curriculum maps against specified standards. These maps become a governed commitment to the curriculum structure that has been developed. Changes may require several committee stages of approval.

The governed maps typically cover the primary aspects of a course: the learning outcomes and how they are achieved. In this paper, I suggest there is also a need to produce descriptive maps that can describe secondary aspects of a course at a moment in time. Particularly, consider the question "Which forms of identity verification in assessment (IVA) are used in subjects across a degree?" In 2020 and 2021, like many institutions, the University of New England (UNE) lost the capacity to offer supervised paper-based examinations. Computer science academics reacted rapidly by adopting alternative assessment mechanisms. In 2022, how should the degrees' IVA strategies be described to an accreditor? Mapping the IVA strategies adopted in subjects across the degree can reconnect those individual decisions with their purpose within the degree structure. Descriptive mappings also enable quality questions to be discussed across the sweep of a degree: e.g., is there *enough* identity verification in the degree and are the methods *sufficiently* robust and diverse?

The paper is presented as an experience report and case study from a particular context: the need to generate mappings and structural diagrams for our 2022 accreditation submission to the Australian Computer Society (ACS). Secondary mappings were also necessary for some other factors. For example, identifying which topics within *non-mandatory* alternative bodies of knowledge are currently covered within our degrees.

Mapping Identity Verification as a "Swiss Cheese" Model of Mitigation

In 2020, like many institutions, UNE lost the ability to offer supervised paper-based examinations but was able to offer online proctored examinations through a third-party proctoring provider. Because data sharing with the proctoring company was not part of students' agreement with the university at the time of enrolment, university policy had to permit students to opt out of online proctoring if they did not accept this data sharing. Many computer science students opted out, frequently objecting to the requirement to install proctoring software that they viewed as spyware or to clauses in the proctoring vendor's Terms of Service or Privacy Policy. In some computer science subjects in 2020 that retained proctored examinations, opt-out rates were above 50%.

Some academics saw an inequity in the fact that any student who wished to avoid being proctored could decide to object to data sharing. Most computer science subjects dropped proctored exams and focused solely on the alternative assessment that students opting out of a proctored exam would take. For example, some academics asked students to produce video talk-throughs of programs they had produced or video reflections on test answers, so that part of a student's submission would include them discussing their work in an identifiable manner. Others took approaches of personalising assessment. Over 2020 and 2021, the approaches to mitigating and preventing academic misconduct between students rapidly diversified. As this occurred by *force majeure*, it occurred on an subject-by-subject basis as academics made their own choices.

Within the university, policy and processes around academic integrity and how students apply for an exemption from online proctoring have evolved. However, these institutional approaches focus on the broad institutional context, rather than discipline-specific matters, such as computer science's high opt-out rate from proctoring.

In late 2021 and early 2022, I faced the issue of compiling our 2022 accreditation submission to the Australian Computer Society, including addressing the clause "There will be mechanisms to address identity management in a virtual environment" (McDonald, 2021, p.17). Given that proctored examinations now only existed in a subset of subjects and given that students can, in policy, opt out of proctoring by rejecting the privacy agreement, how should I accurately describe and present our identity management strategy, to enable the conversations on identity management we need to have with our reviewers? It is no longer about the proctoring policy, but about the variety of mechanisms that academics have adopted within the subjects they coordinate.

The strategy I adopted was to create mappings of the mechanisms of IVA used in each subject across each degree. This is inspired by Reason's (1990) observation, when developing the Swiss Cheese model of accident causation, that each layer of defence is an imperfect barrier, which will prevent some forms of threat but is susceptible to others. By using a variety of mitigation approaches across the subjects within a degree, the range of techniques that a cheating student would need to employ across a degree becomes larger. I argue this makes it more difficult (or at least, more effort) to traverse a degree illicitly successfully. Past literature suggests that using varied or multi-layered approaches within a subject's assessment may help deter students from engaging in cheating (Baird & Clare, 2017; Rundle et al., 2020). Mapping those strategies across the degree enables a shift in perspective to seeing the degree, rather than an individual subject within it, as the item being defended against cheating. As it is the degree, not each subject, that is accredited, this seems appropriate.

In our submission, this is presented as a matrix of the identity verification or mitigation methods in each unit. An excerpt of one diagram is shown in Figure 1. This provides an *at-a-glance* summary of the current IVA strategy, to engage the accreditation panel in a conversation around the level of granularity at which this should be modelled and what breadth and depth of measures are deemed sufficient. The mechanisms were identified by examining the handbook and learning management system content for each subject, and then asking academics to review and amend the matrix that was generated. It forms a categorisation that is local to our discipline within our institution at a point in time:

- Proctored exams
- Plagiarism detection software, e.g. TurnItIn
- Oral or live assessments, in which an academic interacts directly with the student
- Video submissions, in which a student's face or voice appear
- Personalised assessment. This may be through adapting the tasks or questions given to each student, or it may be inherent personalisation that occurs through the nature of the assessment work
- Group work, which would require the complicity of the group rather than only an individual student
- Data trails, such as version control logs of students' work in progress.

Some assessments may use multiple forms of mitigation: for example, a group software project that involves video demonstrations and talk-throughs of their work, with the software development captured in version control, and individual reflections on students' work in the project that can be subject to TurnItIn. However, to enable an *at-a-glance* map, we capture the data only at subject level.

	Proctored online exam	TurnItIn	Oral or live assessment	Video submissions	Personalised assessment	Project work	Group work	Data trails
Core								
COSC101 Software Development Studio 1				✔			✔	
COSC110 Introduction to Programming and the Unix Environment	✔	✔			✔			
COSC120 Object Oriented Programming				✔				
COSC210 Database Management Systems		✔						
COSC220 Software Development Studio 2		✔		✔		✔	✔	✔
COSC260 Web Programming	✔							
COSC510 Software Project Management	✔	✔		✔			✔	
COSC560 Advanced Web Programming	✔			✔		✔		
COSC570 User Experience & Interaction Design		✔		✔		✔		
Research and Capstone								
COSC594 Information Technology Project: Proposal and Design		✔	✔	✔		✔	✔	
COSC595 Information Technology Project: Implementation		✔	✔	✔		✔	✔	
Listed group 1								
COSC520 Parallel and Distributed Computing								

Figure 1: An excerpt of a table mapping IVA strategies across a degree.

Descriptive (Less Governed) Mappings

The primary aspect of this paper is the introduction of IVA mappings. Part of the rationale for choosing this approach, however, was that other accreditation aspects can also be answered using descriptive mappings.

For example, ACS's accreditation criteria (McDonald, 2021, p.19) identifies discipline specific knowledge areas as "those identified in international curricula, standards and other sources relevant to the program's domain," and states that "There is no requirement to adopt such a curriculum, but the program should be influenced by it". This is a looser relationship than a governed curriculum map. Rather than specifying coverage criteria, it asks how the course is *influenced* by an international curricula and there may be more than one to choose from. There can also be a different strength of relationship between different mappings. The specialist accreditation requirement for Data Science degrees requires that a program will "contain at least [one equivalent full-time year] of content drawn from an appropriate Data Science body of knowledge … compatible with CBoK." (McDonald, 2021, p.20). The ACS Core Body of Knowledge (CBoK) is the primary content specification courses must adhere to, but specialist courses are asked to draw enough content from “an appropriate” data science body of knowledge compatible with it.

Though not part of our accreditation submission, we have in the past been asked by stakeholders to account for the range of programming languages we use within a degree. This is another descriptive mapping rather than a governed specification: the programming language used does not always appear in the learning outcomes.

In each of these cases, the criteria suggest a quality judgment across the course: whether there is *enough* influence from the identified bodies of knowledge. This is similar to the Swiss Cheese modelling of IVA methods, in that we present a matrix across the degree, to enable reviewers to consider whether coverage is broad enough and strong enough.

The use of descriptive mappings also supports their use as a design tool, in keeping with the early uses of curriculum maps (Cohen, 1987) and their use in collaborative design (Uchiyama & Rudin, 2009). If maps are convenient and fast to update and visualise, they can be used as an interactive artifact in team discussions. Changes can be sketched out and the academic team can consider where it wishes to introduce new forms of IVA, programming languages, or secondary content.

Lightweight Production of Descriptive Mappings

A potential limitation of using a mappings approach is that it introduces the burden of creating and maintaining the additional mappings. This can be significant: for our accreditation, forty-two diagrams and mappings were created. As well as the descriptive mappings, this also included visualisations for curriculum structure and for CBoK coverage, that present an overview of each degree in a format that is familiar to the panel. To be able to use the mappings as a design tool after the accreditation (for considering changes), I also wanted them to be fast to update so that potential changes could be sketched out quickly and shown to team meetings.

With so many mappings or diagrams to produce, I needed to create an efficient means for their production and to ensure consistency in how a subject appears in multiple degrees. (The same subject cannot contain video assessment in one degree, but lack it in another.) As a lightweight mechanism for this, I used a static site generator designed for education (Billingsley, 2021) to produce the diagrams, as illustrated in Figure 2. This permitted the documentation lead to define category definitions and pages that would be produced. The site loaded brief degree (“course”) and subject (“unit”) definitions dynamically from two JavaScript files, and automatically rendered mappings and structural diagrams. This allowed other academics to edit their subject definition, hit reload in their browser, and all forty-two tables and diagrams would be updated consistently.

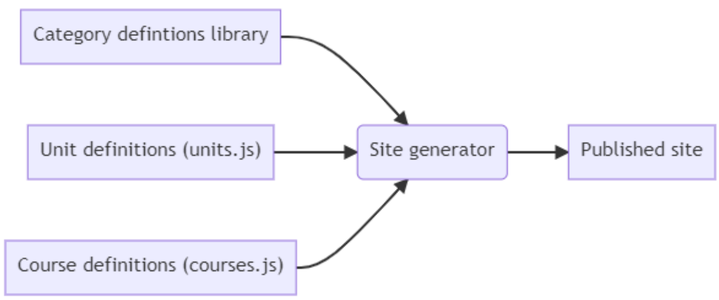

Figure 2: Producing secondary mappings and structural diagrams using a static site generator

Being code, the site is kept under version control and managed in a Git repository. However, as the subject definitions are loaded dynamically, it was possible to enable instant collaboration by cloning it into a shared folder (via OneDrive). Academics could make their changes without worrying about cloning or committing to the repository themselves. Periodically, I would commit the accrued changes from the team. Although the mappings tool itself is not the main contribution, it is described to demonstrate that it is feasible to produce and maintain many different mappings if they can be generated from easily-edited common data sources.

Conclusion

In our case study, the descriptive mappings filled their purpose. While the final version of the accreditation report is still with the accreditors, the documentation was used (and put on-screen by the panel in some panel sessions) and the overall quality of documentation was commended in the debriefing session. As a design team, it enabled us as a team to visualise and discuss the layout of our degrees. Since the submission, the ability to produce lightweight mappings has also helped me to sketch out and present to our team potential designs for future minors or majors.

The Swiss Cheese approach to mapping and describing the IVA strategy within the degree enabled conversations that otherwise it would have been difficult to hold: what is the IVA strategy for the degree, now that we cannot solely rely on proctored examinations? Policies and approaches to academic integrity are often set at an institutional level; the IVA mappings enabled us to hold discussions at the degree level. It also enabled a broader conversation to be held. Whereas the handbook only has one field for IVA (whether there is a supervised examination), the IVA mappings supported discussion of more diverse strategies.

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reconnect
Reconnecting relationships through technology

Developing a learning analytics resource with meaningful data for first year teachers

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It is known that due to the large, diverse sets of data captured in learning analytics, clear display of information is crucial to its success. Here, we describe a concise learning analytics resource, the Cohort Snapshot, that has been developed using a human centred approach, with input from experienced academics from across the institution. Meaningful data is presented as a unit level summary and includes program enrolment, student demographics, grade distributions and LMS activity. The data that was used to develop the resource was accessed via the university's data warehouse which was synthesised using the R programming language. The Cohort Snapshot provides teaching academics, including sessional staff, access to data, to allow the adaption of teaching pedagogy to meet the needs of increasingly diverse student cohorts in a regional Australian university.

Keywords: Learning analytics, first year experience, student retention

Introduction

Learning analytics are applied in higher education for a variety of purposes from providing information on student demographics to monitoring student engagement and patterns of study and success. The usage and reliance on an ever-widening choice of data is only growing (Kitto et al., 2020), however the practical outcomes can be underwhelming. Part of the problem is that technical experts in the field of data science often develop tools without adequate input from teaching academics (Kitto et al., 2020; Jivet et al., 2017). As a result, decisions around the development of tools can be driven by data-related factors rather than the practical context. Thus, there are calls to ensure that educational scenarios inform the data generation rather than technology functionality (Kitto et al., 2020; Jivet et al., 2017) by taking a human-centred approach to learning analytics (Buckingham Shum et al., 2019) and incorporating a breadth of experience in learning analytics development (Sarmiento & Wise., 2022). There is extensive data available, however, how to curate and present the data to teaching academics remains a challenge.

Charles Sturt University is a large regional university with a high proportion of students from a low socio-economic (LSES) background and regional, rural and remote (RRR) students; two groups of students who have been shown to be less likely to complete their program compared to individuals from metropolitan areas (Department of Education, Skills & Employment [DESE], 2019). Having a high proportion of students from non-traditional backgrounds presents pedagogical challenges in teaching. In 2008, the Bradley Review recommended that participation of students from under-represented backgrounds including RRR, LSES and Australian First Nations individuals be increased in higher education to promote economic sustainability in Australia. The proportion of students from non-traditional and disadvantaged backgrounds continues to increase (National Data - NCSEHE). With widening participation, teaching practices need to be adapted to meet the needs of increasingly diverse cohorts of students to increase student retention and success of equity groups in Australian universities (Devlin et al., 2012).

It is essential that teaching academics are engaging and provide inclusive learning environments to support students as they transition to university. Universities continue to investigate ways to improve student experience and engagement, particularly in first year, to increase overall student success and progression (Kift, 2015). Providing students with a sense of connectedness and belonging impacts student engagement and student success (Kahu & Nelson, 2018) and students from non-traditional and under-represented backgrounds require additional support (Devlin et al., 2012). Student data can be used to provide teaching academics with deeper insights into the diversity of their cohorts and to create a more inclusive teaching environment (Muir et al., 2019).

Here, we model the design and distribution of a concise learning analytics resource, the Cohort Snapshot, that has been developed using a human-centred approach with input from experienced academics from across the institution. Much of the data presented in the Cohort Snapshot is available to staff across multiple platforms, however, accessing the information required a significant time investment and/or data requests. Sessional or new academics face additional challenges including learning what information is available, identifying the correct tools and obtaining authorisation for access, which may not always be granted (Baik et al., 2018). As a result, unit coordinators have varying levels of understanding of the learning needs of their cohorts. . *Some academics are left in the dark, others in dappled light with only a few living in sunshine. We should all be able to enjoy the sunshine.* In addition, access to this information needs to be timely. The Cohort Snapshot is composed of data analyses of regularly updated data from across multiple sources to provide an overview of a student cohort in a unit of study. Providing teaching academic staff with a simple tool for reviewing students within their cohort will enable staff to employ adaptive and inclusive teaching pedagogies as the number of students from diverse backgrounds continues to increase. Learning analytics data from a range of sources are used to synthesise a single resource that provides a meaningful unit overview; delivering unstructured data to teaching academics as actionable information

Methods

In 2021, the Cohort Snapshot was developed to share with academics who teach into approximately 100 first year units as part of a larger retention project (Linden, 2022). Development of the Cohort Snapshot was based on a theoretical framework, SHEILA (Supporting Higher Education to Integrate Learning Analytics) (Tsai et al., 2018). The key dimensions from this framework that we have implemented pertain to understanding the context (information poor sessional and new academics), effectively engaging stakeholders, establishing monitoring frameworks and understanding the capacity to effect change. Central to the design was understanding the internal capacity for change needed rapid synthesisation of appropriate data sources into a resource that was not going to overwhelm already busy academic staff. Stakeholder engagement was implemented through training workshops for sessional staff to use the Cohort Snapshot as well as information sheets, along with the use of an iterative design process implemented over three semesters where we monitored feedback from various stakeholders such as Division staff, school leadership and staff from across the three faculties and made improvements for the next session. Feedback included making headings clearer as well as some more specific session information in some sections. The data that was used to develop the resource was accessed via the university's data warehouse and included students' academic progress, unit and program enrolments, student demographics, LMS activity and grades. All data was presented for a given unit and compared against the university average. A data scientist synthesised the templates using the R programming language to write scripts that summarised and displayed the data, synthesising a clean skin html file for academic staff to view. Unit level data is displayed in html and updated regularly prior to the start of semester until census as during this time the enrolment data is constantly changing. The secure link to the html page (click here to see a mock Cohort Snapshot) was distributed via an email containing information of the interpretation and significance of the report (click here to view) and is now available to all unit coordinators in the University.

Results and Discussion

Who is enrolled?

The first section of the Cohort Snapshot lists the most common programs that the students in the unit are enrolled in and the corresponding progress rate (Figure 1). This allows academics to ensure that resources are relevant to create an inclusive environment and increasing engagement (Bakharia et al., 2016; Sanger & Gleason, 2020). Knowing who is enrolled in a unit is of particular importance for foundational units where you have large cohorts of students from many programs, with some programs having higher progress rates than others as seen in Figure 1. Academics can ensure that they have focused tutorial questions or case studies that include the various disciplines of enrolment within the unit, and adapt assessment questions and exam question options to have continuous student engagement throughout the semester.

As shown in previous studies, program enrolment knowledge will support student engagement and overall graduate learning outcomes of application of knowledge into their program (Sanger & Gleason, 2020). Feedback from academic staff suggests they were able to quickly apply small modifications that make the resources relevant for a diverse range of programs, with a focus on the programs that have a lower progress rate than others for the unit of study, "*I found it helpful for preparing this weeks tute actually. […] I have lots of different disciplines attending my class, […] I tend to give examples from within my field or my own research but this week I tailored it to the policing students, so I found that really helpful as did the students.*"

Program	n in this session	Combined 30 session progress rate for last 3 years
Bachelor of Emergency Management	29	61% (from 138 grades)
Bachelor of Policing	21	91% (from 74 grades)
Bachelor of Public Safety and Security	3	57% (from 14 grades)
Bachelor of Criminal Justice	2	96% (from 25 grades)
Associate Student	1	No grades available
Bachelor of Border Management	1	75% (from 4 grades)
Bachelor of Geospatial Science	1	100% (from 1 grades)
Bachelor of Information Technology	1	No grades available

Figure 1 Program Enrolments: Current programs that enrolled students are completing.

Student demographics

The cohort snapshot provides academics with a list of demographics, such as the proportion of enrolled students who are First in Family to attend university and the average age of students within the unit compared to current enrolment average at Charles Sturt (Figure 2). This can be used by the academic at an individual level by looking at specific demographics and have a targeted approach to support services provided, for example ensuring the textbook is freely available online through library services with clear links. Academics could also ensure that if they have a high number of regional or remote students that the textbook is downloadable to avoid issues with internet during the semester of study. Demographics could also be looked at in combination with each other, for example if there is a high proportion of students that are LSES and First in Family focusing awareness on free support services, including webinars and scholarships that the university offers to support students for successful transition to university, and progression through the program. Literature shows that students without family or social history of university are unaware of the volume of assistance available and therefore creating awareness is vital for the retention of these students. The embedding of services into foundational units allows students to begin creating relationships with various services at selected timepoints in their program (Sanger & Gleason, 2020; Tualaulelei et al., 2021).

	All Charles Sturt, N = 65,312[1]	**ABC123**, N = 59[1]
Age	29 (23, 39)	31 (24, 40)
Female	41,855 (64%)	25 (42%)
Domestic	58,446 (89%)	59 (100%)
Australian First Nations	2,300 (3.5%)	1 (1.7%)
Low SES	14,069 (22%)	20 (34%)
Med SES	31,830 (49%)	28 (47%)
High SES	11,919 (18%)	11 (19%)
University level educated parents	23,307 (36%)	27 (46%)
Regional or remote	28,973 (44%)	35 (59%)
Commencing	16,550 (25%)	31 (53%)
Studying online	31,596 (70%)	56 (98%)
GPA	.00 (4.00, 5.70)	5.00 (3.70, 5.40)
Credit points	32 (0, 72)	0 (0, 28)

[1] Median (IQR); n (%)

Figure 2 Student Demographics

Understanding of your program needs and support required by the various demographics can increase engagement, for example implementing links with specific services such as the Division of Library services or Academic Skills if there is a high proportion of First in Family or regional and remote students (Sanger & Gleason, 2020; Tualaulelei et al., 2021). The individual demographics within a unit allow staff to consider verification to their teaching style to help with student success (Sanger & Gleason, 2020). Feedback from staff was positive with instant actions being taken, *"In terms of my cohort snapshot, I had not previously thought to specifically discuss the academic skills team to my students [...]but now I plan to"*

Charles Sturt has a high proportion of online students. As seen in figure 2, within this unit the percentage of students studying online is 98%, shown by the blue circle. Academics need to focus on this demographic with specific strategies of engagement creating opportunities for meaningful interaction and online spaces for peer to peer communicating. Academic staff have since adapted supportive learning environments through set up of Jamboards, Padlets and smaller discussion groups to create safe spaces for meaningful interactions and have reported increased levels of student engagement. Identifying and engaging with the online students improves first year experience as well as increases student success (Tualaulelei et al., 2021; Bowden, 2021; Kift, 2015).

Former Fails

Providing a list from the students who are currently enrolled who have failed the unit previously allows staff to reach out to those students. Proactive contact has been shown to increase the positive student experience in units and contribute to student success (Sanger & Gleason, 2020). By knowing students' history with the unit, academics can have a targeted approach at supporting these high-risk students from the very beginning. For example, in semester 2 2022, 46 students in one unit and 18 students in another unit were contacted by the subject tutor regarding a former fail and encouraged to access additional support services including one-on-one tutor support. Conversations with students could begin by pointing out any changes that have occurred in the unit since their last attempt. Academic feedback identifies that they are not always aware of the repeating students, "*Not realising previously how many students fell into this category, the snapshot has shown me that there are quite a few in this position, and that they may require further support.*" It has been evidenced that starting conversations with students gives the students an opportunity to feel connected not only with the unit content by with the academic if further support is required such as conversations around available support services (Sanger & Gleason, 2020; Tualaulelei et al., 2021).

Academic History and LMS activity

The Unit Academic History section displays the unit progress rates, proportion of students who receive a zero-fail grades (data not shown) and the grade distribution over the previous 3 years of the unit against the university average (Figure 3a). Continuing academics, and more often sessional staff, do not always have easy access to the historical aspect of the unit grades or trends. Setting out clear expectations for students and creating supporting documentation and resources based on historical data is difficult if staff do not have access to it (Baik et al., 2018; Bowden, 2021; Heffernan, 2018; Muir et al., 2019). Figure 3b shows the activity of students across the first six weeks of semester and the number of interactions students have had. The LMS becomes available to students in week –2 and in that week that approximately 30% of students had accessed the LMS with 15% accessing the LMS once and 15% accessing 2-5 times. Understanding the views and contact students have with the LMS can assist teaching academics with the type and number of resources that they have available on their LMS for students at particular times during the semester. This also helps teaching academics to design activities that may help identify disengaged students that might be likely to receive a zero-fail grade (Linden et al., 2021). Importantly, high student engagement is directly linked to successful student outcomes (Foster & Siddle, 2019).

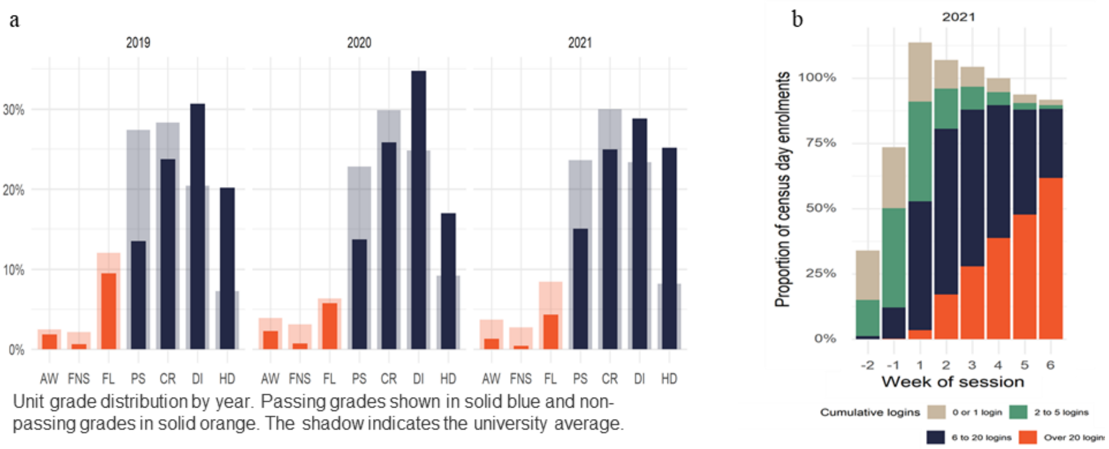

Figure 3 Grade Distributions and LMS Activity: (a) The grades distributions from the previous three years displayed over the shadowed university average; (b) LMS activity displayed as the number of cumulative logins.

Conclusion

The Cohort Snapshot has enabled academics to make informed variations to units to ensure safe teaching spaces with meaningful interactions, targeted support and improve their teaching pedagogy to ensure student success. The Cohort Snapshot delivers data from various sources in digestible, easy to access form through clear presentation of the data to benefit teaching academics, students and the institution. The theoretical framework and the ways of informing the teaching academics of the potential application of the data is what makes this resource impactful. The resource results in a deeper level of understanding of student cohorts and can be used to create inclusive teaching environments, improve curriculum and assessment design and ultimately improve educational experiences which will result in higher completion rates and increased student satisfaction. The Cohort Snapshot is currently a live dashboard accessible to teaching academics. Future improvements will include specific examples of how the data can be implemented within units. The Cohort Snapshot ensures that key learning analytics are easily accessible to all academic staff as they can *enjoy the sunshine* as they work in supporting their students for successful outcomes.

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reconnect
Reconnecting relationships through technology

Thanks for the feedback: Reconnecting students with educators using a metacommunication feedback tool

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Given the vast number of learning and teaching tools available to assist in the online delivery of courses, academics and educators have found it difficult to identify which tools students find the most useful for learning. This paper discusses the development of a new tool conceptualised and developed by the authors of this concise paper, which is designed to elicit immediate student feedback about online learning content and activities. Results from a small pilot study examining the potential of the tool to measure and improve student engagement in a second-year criminology elective delivered online are also presented. Providing opportunities for students to give immediate feedback is vital to improving the quality of learning and teaching. Educators can (re)connect with students studying online, improve their understanding of the needs of online learners, and tailor learning content and activities throughout the semester leading to improved student satisfaction, student-teacher relationships, and learner outcomes.

Keywords: Online learning, student engagement, student feedback, interactive tools

Background

The student cohort is changing with more students studying online than ever before. The typical university student is no longer the domestic school leaver studying on-campus. Today, university cohorts are diverse, consisting of a wide range of students who differ in age, cultural background, socio-economic status, geographical location, and physical and cognitive abilities (Department of Education, Skills, and Employment, 2021). As such, there has been an increased demand for flexible online learning environments that meet the needs of this diverse cohort who may be limited in their ability to study on-campus (Dyment et al., 2020). This demand has led most Australian universities to provide opportunities for students to study online or multimodally (a combination of on-campus and online). However, many higher educational institutes are ill-equipped for online teaching.

Attempts to transition from traditional face-to-face only mode to multimodal modes rely on lecture capture tools and the digitisation of texts. While this was a well-intentioned attempt to meet the needs of all students, research has found that this passive, teacher-centred approach to content delivery disengages students (Dyment et al., 2020; Smith & Kaya, 2021; Wammes et al., 2019). As a result, educators are exploring how new technologies could be used to deliver course content in more engaging ways. However, given the extensive availability of new educational tools, it can be difficult to identify which tool(s) students find most useful and engaging. As such, the authors of this paper designed and implemented a new user reaction toolbar to elicit immediate student feedback on the educational technologies used in an online course. Through identifying which educational technologies students engage with most, educators can better understand the needs of students, promptly address any issues throughout the semester, and improve student satisfaction and student-teacher relationships.

Project Description

Reaction icons are a ubiquitous feature of social media networking sites, such as Facebook, Instagram, Twitter, WhatsApp, and TikTok (Eftekhar et al., 2014; Hayes et al., 2016; Meier et al., 2014; Sumner et al., 2018). Identified as a form of metacommunication, reaction icons allow users to communicate an array of content-based messages using minimalistic nonverbal communication (Bryant et al., 2011; Hayes et al., 2016). With research showing that reactions are used in social media to convey enjoyment, approval of content, or acknowledge interest (Sumner et al., 2018), the authors of this paper hypothesised that reactions could be used in online learning environments to obtain immediate student feedback on learning content and activities as one way to assess whether students find the learning materials and activities useful and engaging. The reaction toolbar was developed using learning tools interoperability (LTI) specifications and was designed to mimic the visual appearance of user reaction tools used on the popular social media networking site, Facebook. Figure 1 shows the final design of the reaction toolbar. A prompt question, ‘Did you find this useful?’, precedes three reaction icons – thumbs up, thumbs down, and provide feedback. Figure 2 shows the seamless placement of the reaction toolbar under a podcast learning activity.

Figure 1: The developed tool called the ‘Reaction Toolbar’

Figure 2: The reaction toolbar inserted under a podcast

Feedback provided by students is anonymous which helps to facilitate a safe learning space where students can express themselves honestly without fear of being identified or judged (Shaheen et al., 2021). Once selected, the thumbs up and down icons are highlighted in yellow (Figures 3 and 4, respectively). The feedback icon turns yellow once feedback is provided in the pop-up comment box (Figures 5 and 6, respectively). Each interaction made by a student is saved and can be changed or updated at any time by the student. For example, if a student provides feedback and the educator responds to it (e.g., makes a change), then the student can return to the comment and edit it. Students can only see their own feedback and comments.

Figure 3: Thumbs up: the learning content or activity was useful

Figure 4: Thumbs down: the learning content or activity was not useful

Figure 5: Student has provided feedback on the learning content or activity

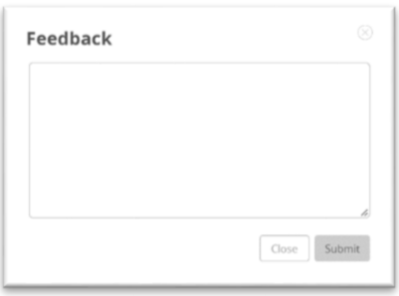

Figure 6: Pop-up comment box

A summary of reactions and feedback (Table 1) was also developed to allow the educator to address any identified issues for the current cohort. Through examining the feedback and adapting the learning content and activities to meet the needs and expectations of students, the feedback loop can be closed (Harvey, 2022). Research has shown that closing the feedback loop is vital to increasing student engagement and satisfaction, as it signals to students that they are valued by the institution (Young & Jerome, 2020). As such, the educator in the pilot regularly analysed the feedback provided by students and responded by thanking students for their feedback and providing solutions to issues raised. Closing the loop is also important to educational institutions because research has shown that if students do not see improvements made as a result of their feedback, they are less likely to provide feedback in the future (Leckey & Neill, 2001; Watson, 2003).

Table 1: Reaction toolbar summary

Description Of Element	POSITIVE	NEGATIVE	COURSE AVE (%)	AVE (%)	COMMENTS
Course Totals	**24**	**1**	**92**	**84**	**1**
ILARs	**10**	**0**	**100**	**74**	**0**
Group Discussion	9	0	100		0
Latest Annoucements	1	0	100		0
Illustrations	**0**	**0**	**—**	**100**	**0**
Photos	**0**	**0**	**—**	**100**	**0**
Others	**2**	**0**	**100**	**58**	**0**
Activity 1.2	1	0	100		0
Learning Activity 3.1	1	0	100		0
Videos	**4**	**0**	**100**	**94**	**1**
Vimeo	1	0	100		1
Youtube	3	0	100		0
H5Ps	**8**	**1**	**78**	**96**	**0**
Question Set	4	0	100		0
Course Presentation	2	1	33		0
Image Hotspots	2	0	100		0
Texts	**0**	**0**	**—**	**76**	**0**

Methodology

To test the functionality and potential of the reaction toolbar, a small, mixed methods pilot study was conducted in a second-year criminology elective in Semester 1, 2022. The study was approved by the institution's Human Research Ethics Committee (H22REA014). After gaining ethics approval, a total of 104 reaction toolbars were attached to all online learning content and activities including videos, discussions, H5P content, podcasts, Mentimeter, Padlet, images, and a Latest Announcements feed. An animated video explaining the reaction toolbar was created and posted in the Announcement Forum in the learning management system (Moodle), along with the study information and participant information sheet. In addition, a questionnaire was provided to students via the institutional survey tool to examine their experiences in the course. The questionnaire consisted of five questions and took students 10-15 minutes to complete. The questions focused on overall course satisfaction, engagement with course materials, and the best/worst aspects of the course, with a final open-ended question for additional feedback. Time was allocated during the last class of the semester to allow students to complete the questionnaire. A total of 14 students were enrolled in the course.

Results

Preliminary results from the pilot show that students value the current learning content and activities used in the course. Table 2 below summarises the results of the pilot study. Eleven students from a possible 14 (78% response rate) provided immediate feedback using the reaction toolbar to 24% of the learning content and activities. In total, there were 24 positive reactions, one negative reaction, and one positive comment thanking the teacher for the short course content videos which the student found 'very easy to listen to and engaging'.

In addition to these results, feedback provided via the questionnaire further indicated that students found the online learning content and activities 'extremely useful' and contributed to an increase in their engagement with the course. This was particularly prevalent for the following learning content and activities: module notes (delivered via Moodle books), interactive learning activities (e.g., in-line discussions, H5P activities), and online lectures. Comparing current data to data from the same course in Semester 1, 2021 further demonstrates that replacing traditional forms of content delivery (e.g., PDF documents) with new technologies (i.e., Moodle books, H5P activities) improves student engagement (Figure 7).

Table 2: Number of learning content and activities in pilot course and reactions

Learning content and activities	Total	Reactions
Videos	52	4
Course content videos	*13*	*1*
External videos (e.g., YouTube)	*39*	*3*
In-line discussions	23	9
H5P content	19	9
Question set	*12*	*4*
Image hotspot	*4*	*2*
Course presentation	*3*	*3*
Padlet	4	1
Podcast	2	2
Image	2	0
Mentimeter	1	0
Latest announcement feed	1	1
Total	**104**	**25**

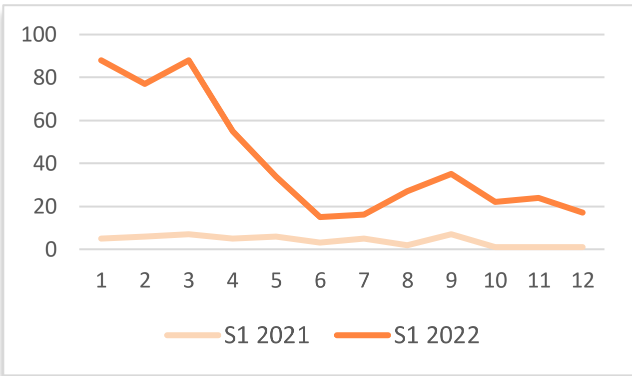

Figure 7: Changes in student engagement between S1 2021 and S1 2022

Discussion

The reaction toolbar developed for this project aims to allow educators to create a learning experience for students based on frequent feedback, which is critical to learning (Schell et al., 2013). As Harvey (2011) notes, student feedback is "one of the most effective tools in the ongoing improvement of the quality of higher education" (p. 21). It can assist educators understand the learning experiences of students, evaluate student reactions to current learning content and activities, and improve course design and delivery (Marsh, 2007). While there are some concerns that students are over-surveyed, studies have shown that providing regular feedback gives students an increased sense of being supported and valued (Lane & Meth, 2021).

The shift from on-campus to online learning environments has significantly impacted student-teacher relationships (Vagos & Carvalhais, 2022). Contact hours have decreased, which has impacted the ability of teachers to assess student reactions to learning content and activities (Almahasees et al., 2021). While face-to-face modalities provide opportunities for teachers to observe nonverbal communication (e.g., head nod) used to evaluate student interest and engagement, online teaching does not afford the same opportunity (Sumner et al., 2018). Although online students can provide feedback through online student evaluations, these are frequently distributed towards the middle or end of the teaching period. As such, feedback provided is most likely to be used to adjust learning content and activities for the next course delivery and cohort. Any current issues are unlikely to be addressed, which may lead to student dissatisfaction (Marsh, 2007).

The reaction toolbar created and developed by the authors of this paper provides a new approach to collecting student reactions and feedback. While the findings of this pilot study are limited due to the small number of participants, the results are encouraging. It suggests that through listening and responding to student feedback, educators can (re)connect with students studying online and multimodally, improve their understanding of online learner needs, and make timely improvements to learning content and activities. With the ever-increasing number of educational technologies on offer, this approach has the potential to future-proof online learning environments and ensure that learning content and activities always meet the needs of the students.

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reconnect
Reconnecting relationships through technology

Bridging education to employment through virtual experience placement

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The transition from education to employment is a pivotal point for students. Workplace experience can play a key role in a student's transition to full-time work. Despite the important role in bridging the gap between education and employment, students' participation in work-integrated learning (WIL) experiences varies significantly across disciplines. Through participant surveys, we examined students' reasons for, and benefits of, undertaking WIL opportunities online through Forage: a platform facilitating access to virtual and simulated placements in partnership with employer organisations. Virtual and simulated WIL experiences have gained interest, particularly during the COVID-19 pandemic. Our findings show that virtual or simulated WIL experiences are inclusive opportunities that can assist students, including those studying in areas with a historically low prevalence of WIL, in both career and organisation exploration.

Keywords: Work-integrated learning; Transition to work; Virtual placement; Skills development

Introduction

The transition from education to employment is a pivotal point in a young person's life. However, research indicates that by the age of 25, 50% of Australians have not transitioned to full-time work (FYA, 2018). Workplace experience and engagement with employers during their education have been found to play a positive role in a student's subsequent transition to the workplace. Students in Australia who undertake paid work experience transition to full-time employment faster, with those undertaking 5000 hours of work experience transitioning 12 months faster (FYA, 2018). Students who complete courses with a high prevalence of work-integrated learning (WIL) are more successful in transitioning from education to the workplace and are more likely to report job and career satisfaction at age 25 compared with those who complete courses with a low prevalence of WIL (Hurley et al., 2020). Encouraging and supporting university students to engage in WIL that is both relevant and authentic is important and both employers and educational institutions play a critical role.

The shift towards flexible working arrangements and remote work, which has increased during the COVID-19 pandemic, may limit students' opportunities to engage in-person with employers. However, this shift also presents an opportunity for students to engage with employers online, presenting opportunities to integrate work and learning through supporting technologies. Kay et al. (2019) noted that "developments in technology have enabled more rapid connections, both nationally and internationally, which has broadened opportunities for students to liaise with fellow students, supervisors, and employers globally" (p. 403). Technology offers great potential to connect students, employers, and educational institutions and support, rather than hinder, the transition to work. One growing area, particularly during the pandemic, in which technology has great potential is creating accessible opportunities for experiential learning that develops employability skills, such as virtual work experience. However, there is a gap in our understanding of students' motivations for and experiences of undertaking virtual work experience.

In this paper, we examine current literature about types and modes of WIL and explore an online platform (Forage) that offers free and accessible virtual work experience programs in a simulated environment. We examine student responses to engaging with the Forage platform for work experience programs to consider their aims for, and outcomes from, engaging with the platform.

Approaches to Work Integrated Learning (WIL)

Definitions of WIL are broad and the recent diversity of practices, which has increased as a direct result of COVID-19, makes clarity difficult (Wood et al., 2020). The term WIL refers to a "a broad range of experience-based education models and curriculum approaches where students engage with industry and community organisations" (Wood et al., 2020, p.332). Universities Australia (2018) breaks WIL down into four main types: 1) placements, 2) projects, 3) fieldwork, and 4) simulations. Placements are paid or unpaid internships where a student spends time at a workplace. Projects are activities completed by students which are designed by the employer and educational institution. Fieldwork involves activities occurring outside of the university (e.g., practicum placement, or clinical internships). Simulations can occur within the setting of the educational institution (e.g., on campus) or in a virtual environment such as through online simulated workplace experiences (e.g., Forage).

In addition to the four *types* of WIL (placements, projects, fieldwork, and simulations), four different *modes* of WIL have been identified in a recent meta-analysis by Wood et al. (2020). These modes include 1) conventional (face to face), 2) remote (distance using technology), 3) virtual, and 4) simulated. Simulated WIL is defined as "an immersive WIL experience in a context created to emulate the functions of a workplace with input by the workplace/community, educational institution, and the student" (Wood et al., p.333). Diversity in the types and modes of WIL may assist in addressing the challenges associated with providing inclusive and equitable WIL opportunities (Kay et al., 2019; Wood, Zegwaard & Turnbull, 2020). While in-person placements tend to be preferred over virtual placements, as replicating a tangible experience with a simulated one is difficult to do, in-person placements are harder to attain, less able to scale, and more costly to implement. While not a direct replica of in-person placements, simulated or virtual placements create the opportunity for access to more students. Wood et al. (2020) notes that there has been an increase in the use of remote and simulated activities to develop employability skills, particularly considering restrictions from the pandemic and in cases where it is difficult to find placements for all students. Consequently, virtual, and simulated WIL opportunities are gaining interest as they have the potential to provide more accessible and inclusive opportunities for a greater number of students to participate in.

Innovative models of WIL were being developed in the field prior to the pandemic. In a key Australian study, Kay et al., (2019) explored innovative models of WIL such as micro placements, online projects or placements, and WIL in Incubators and Start-ups, along with other contemporary approaches. Micro placements are of particular interest for this study as the Forage virtual experience programs can provide multiple micro placements for students seeking to develop work experience or different career options before deciding study or work.

WIL has the potential to provide authentic experience for the development of professional skills for employability (Bayerlein, 2020; Bayerlein & Jeske 2018; Kay et al., 2019; Wood et al., 2020). WIL can provide opportunities for professional learning (Knouse & Fontenot, 2008) and enhanced opportunities for employment, including a higher starting salary (Gault, Leach, & Duey, 2010; Knouse & Fontenot, 2008). WIL can also provide students with the opportunity to explore career options, which can assist in career planning (Rastegari Henneberry & Radmehr, 2020; Zegwaard & McCurdy, 2014). Although work-integrated learning (WIL) is a key feature of some areas of university curricula (e.g., Agriculture, Environmental and Related Studies, Education, and Health), it is underutilised in others (e.g., Natural and Physical Sciences, Management and Commerce, and Society and Culture) (Universities Australia, 2018). Hurley et al.'s (2021) analysis of the Longitudinal Study of Australian Youth (LSAY) data found that "university graduates in areas of study with a high prevalence of work integrated learning (WIL) have consistently better labour market outcomes" (Hurley et al., 2021, p. 4). Given its link to enhanced employment opportunities and outcomes, there is a strong case for encouraging broader student engagement in WIL.

Forage Virtual Experience Programs

Forage (https://www.theforage.com) was designed to prepare students for the reality of today's world of work. While students may aspire to work in a particular profession or for a specific employer, the reality of what that looks like daily is often black-boxed. The founders of Forage wanted to equip students, before graduating, with an understanding of the day-to-day realities of different workplaces and jobs. To achieve this goal, they created a platform containing virtual work placements developed in conjunction with more than 500 partner organisations. Partner organisations include Fortune 500 companies such as J.P. Morgan, GE, Visa, and Ernst and Young. All virtual placements are offered free to students and education providers to participate in and use.

Students are not required to apply or have any experience to participate in a virtual internship. It is free for students to sign up and they can engage with one or more virtual internships in their own time, at their own pace. Once a student selects and is enrolled in a virtual internship they engage with a series of tasks. After viewing an instructional video (from real employees) they can access curated resources to help them complete the task. Curated resources include background information and context about the organisation, details of the task, and resources to assist with their learning. The average internship takes 5-6 hours to complete and once complete, a certificate is awarded.

Forage's virtual experience programs are offered in a simulated environment. This approach allows Forage to offer organisation-specific virtual internships, which differs from other platforms that base their internships around a single organisation (real or fictional) and industry. By offering a range of organisation-specific internships, Forage is creating opportunities for students to experience and be inducted into multiple professional roles and organisational contexts. The programs can be considered WIL *virtual placement* practice when utilised within curricula or it can be considered a *micro placement* (Kay et al., 2019) or a *simulation* activity when utilised outside an educational setting for example for professional skill development. The Forage placements are virtual/simulated experiential learning programs designed with industry to replicate tasks and roles that the student would encounter in the workplace. The activities are specific to each of the companies represented which is an innovative approach as the students encounter real-world settings and related tasks.

Methods

This research aimed to understand how virtual internships can assist students and employers in bridging the transition from education to employment.

We considered the following research questions:

1. What is the demand for virtual placements through Forage globally and in Australia?
2. What do students aim to achieve through engaging in a virtual placement using Forage?
3. What do students report as the key benefits of completing Forage virtual placements?

Data collection consisted of deidentified enrolment information collected through the Forage platform over a four-year period (June 2017 to October 2021), which included the students' gender, country, education institution, level and discipline of study, and reason for enrolling. While all students were asked to complete enrolment information, only data from consenting students was used for this study. More than half of the students provided consent for their data to be used (1,205,838 out of 2,038,541 enrolments). Data collection also consisted of an online student survey of students who enrolled in Forage's virtual placements in 2021 and consented to their data being used. Developed as part of Forage's Voice of the Student initiative, the survey sought to provide deep, detailed student insights to help employers better understand the audience they are serving. It also enabled Forage to better understand the student experience on their platform, as questions related to career awareness, discovery, confidence, and feedback. The survey contained conditional logic, meaning not all students were asked all (45) multiple choice questions. Depending on the answers they gave to questions, they may skip past certain (irrelevant) questions. Response options to demographic questions (e.g., ethnicity, region, household income, career stage, area of study etc) were consistent with those commonly seen in user surveys. Other response options were based on Forage's understanding of their users informed by previous research, user interviews and product usage. For example, when Forage asked, "*what else could we do to better support you*?" the response options were informed by qualitative feedback received from students in prior interviews and surveys. A total of 1,700 survey responses were received, of which 276 students had already completed their Forage virtual placement.

Findings

Between June 2017 and October 2021 there have been 2,038,542 enrolments in the Forage platform globally. The largest number of enrolments are from India (45%), followed by the UK (20%), Australia (14%), and the USA (10%). A total of 234,311 enrolments have come from students in Australia. 16% of respondents indicated that they would need an employment sponsored visa to work in Australia, suggesting there is demand for virtual placements by international as well as domestic students.

The majority of Australian students came from higher education (84%) with 59% who were currently enrolled in or had completed an undergraduate degree and 25% in a postgraduate degree. Only 8% of students came from Vocational Education and Training and a further 8% of enrolments came from High School. Table 1 shows enrolments by major in Australia, with two-thirds of enrolments coming from three areas: Business/Commerce (39%), STEM (20%), and Law (16%).

Table 1: Forage enrolments by major (Australia)

Major	Percentage of enrolments	Number of enrolments
Business/Commerce	39%	65,284
STEM	20%	33,033
Law	16%	27,094
Computer Science/IT	7%	11,876
Other	6%	9,574
Arts/Social Sciences	4%	6,513
Health & Medicine	4%	5,901
Finance	3%	5,402
No major	1%	877

To understand students' aims for completing a virtual placement with Forage, students were asked to select one or more responses from a list of choices. Table 2 outlines the percentage of students who selected each response, noting they were able to select as many as they liked.

Table 2: Reason for enrolling in a virtual placement

Reason	Percentage of responses
Gain skills	84%
Improve CV	71%
Increase job opportunities	68%
Explore working in a particular industry	47%
Explore working at a particular organisation	47%
Get in front of employers	35%
Other	3%

Students who enrolled in a virtual placement on Forage in 2021 were asked whether completing a placement that focuses on a specific work environment (i.e., a specific organisation such as KMPG) would help them to be better prepared and make more educated decisions. Table 3 outlines student responses, noting multiple responses could be selected.

Table 3: 2021 Forage survey responses

	% Students who agreed
Be better prepare for the workforce	80%
Make more empowered decisions about what career is right for you	68%
Make more educated decisions about what company is right for you	63%

When asked whether they felt ready for the world of work, only 59% of respondents said yes, while 41% reported that they did not feel ready. 83% of respondents reported feeling anxious about applying for a job and almost all (98%) of respondents felt they would benefit from more practical training.

Discussion and Conclusion

Our findings indicate that there is clear demand for virtual placements in Australia, particularly for university students wanting to increase their employability skills and job opportunities. However, the proportion of students engaged in virtual placements who are completing a Business/Commerce major is surprising given it is a discipline reported as having a low prevalence of WIL (Hurley et al., 2020). One possible explanation for this is that the platform offers placements that align with the roles and organisations students from this discipline would typically transition into. This finding indicates that there is a demand for virtual WIL placements for Business/Commerce students in Australia.

While the findings reflect career exploration as a key benefit of WIL (Rastegari Henneberry & Radmehr, 2020; Zegwaard & McCurdy, 2014), they also extend these findings to indicate that organisation exploration is also a potential benefit of WIL. Having a strong understanding of who an organisation is and what they do is important for graduates who may be considering where they want to work and the type of day-to-day work they want to do. Virtual internships can assist in developing and strengthening this understanding. In this regard, organisation-specific virtual internships may be of more value than generic industry-based virtual internships as they allow students to develop an understanding not only of the type of work that is required in a specific role but also an understanding of the organisation(s) they are considering working for. A platform such as Forage is therefore beneficial in making organisations and internships accessible to students who may face challenges finding a single in-person internship. Although our findings indicate that virtual internships are beneficial for students as they can assist in their preparation for the workforce and enable them to make more educated and empowered decisions, there is a need to consider what more can be done to develop job-readiness and to support students in transitioning to fulltime work. Further research is needed to understand how best to address practical training needs identified by students to assist them in gaining relevant workplace skills.

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reconnect
Reconnecting relationships through technology

In the business of connecting: Nudging students

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We have long been leveraging the use of technologies to help build and sustain connections in the online environment. The pandemic opened our eyes to the value of these connections and the ability to better use technologies to facilitate them. Now we must question what more we can do. Creating communities through safe environments, building trust, showing students our 'human' sides through rapport building and teacher presence which may have previously been hidden in plain sight when operating in a face-to-face mode are a good start. By breaking down traditional barriers brought about through power relationships, the foundations of a quality learning experience are both created and maintained.
Using case scenarios and personal narrative from two metropolitan university business schools, we explore techniques that have been used to build connections during lockdowns and begin to reconnect as we emerge from the pandemic. We found that nudging our students through initial uncomfortableness really helped them feel part of a community of learners, one which we also belonged.

Keywords: connections; reconnecting; nudge theory; social networks; teacher presence

Introduction

The COVID-19 pandemic and resultant lockdowns meant that for most of 2020 and 2021 teaching and learning was conducted online. While 2022 has seen borders reopen across Australia, other countries, particularly in Asia including China, Hong Kong and Japan have remained closed to tourists and their residents have remained limited in their ability to leave (Marlow, 2021; Shad, 2022). These lockdowns have also meant that students may be physically and socially disconnected in their private and learning lives leading to a range of issues from motivation to crises of confidence (McEwen, 2019).

In business, connections matter. Learning to social network and making connections during studies often opens opportunities not previously possible. Hence as students continue or commence their studies it is our role as educators, to find ways to nurture and create connections for our students both with each other and us (Bryant, 2022). Further, as a result of the past 2+ pandemic years we need to focus on the facilitation of effective ways to reconnect them to each other, to faculty and to the university. In the process of teaching business students, the classroom activities and interactions seek to replicate business behaviours and model to students the benefits of connecting with each other and also inviting them to connect with us. The buildings provide a physical reminder of the connection to the Institution and the Alma Mata they will join. Just as when working in a business, people make connections with each other, the managers, and the company as part of their daily occurrences, sometimes planned and often opportune. From the corridor chat, the morning coffee rituals, the meetings that linger, the 'face time' with your manager, all these informal and formal opportunities align to create and support the development of connections that tie us to each other. Some ties will be strong and others weak, but these ties are noted to support communication and form relational support for the organisation as well. Even weak ties are important (McMillan, 2022), and we therefore looked to create these ties to both connect and reconnect our students.

Background - Connecting and reconnecting

> Connections matter. Strong ties with family, friends and the community **provide us with happiness, security, support and a sense of purpose**. Being connected to others is important for our mental and physical wellbeing and can be a protective factor against anxiety and depression (Connections matter, 2022).

Connection is important as it creates belonging. Furthermore, as social beings, connections help us to regulate our emotions, and can lead to higher self-esteem and empathy. Creating a sense of belonging can support student success (Strayhorn, 2019) and supports teachers to remain in the field while increasing work satisfaction (Benson, 2021).
The last 2.5 years of learning and teaching in an online or blended mode has reduced the opportunities for teachers to incidentally connect with their students before and after class, in the corridors or over seemingly unrelated to class matters. The chats that make a student feel seen and heard. The moment of shared experience that connect us in a way that is experienced often through visual cues and clues as well as other heuristic measures have been at best nuanced and often lost during fully online learning.

However, seeing our students as a whole person with interests beyond our class supports their learning (Gonzales, 2016). The move to fully or even partial online learning was often undertaken in a panic-gogy manner (Baker, 2020) focused more on delivery of material than the teacher- and student-student connection that until then had often occurred organically or at least particularly so. Connection occurs through a meeting of minds, purpose, intentions, and experiences.

Technology is the spark

Technology provided a solid basis to connect with students during the pandemic, from delivery of materials to enabling voice and pictures and to some cases, virtual field trips, technology was the 'Knight in Shining Armour' as the world closed its borders and its classrooms. However, access to technology is not equal and complexities such as internet speed, hardware, software, and digital literacies all had and have a place for consideration when looking at connection (Selwyn, 2016).

Beyond the technology, finding ways to create and maintain 'people' connection was now delegated to the educators. Two disciplines Organisational Behaviour (self-efficacy) and Behavioural Economics (Nudge Theory) serve as a solid foundation upon which to build and support connection becoming a framework to engage our students in 'connecting' behaviour. Given the recognised impact on both teacher satisfaction and student outcomes our work has focused on how connection could be built and / or maintained for our students.

Teacher presence – hiding in plain sight

The community of inquiry model (Garrison & Vaughn, 2008) is well validated and underpins quality online learning. Figure 1 is a reproduction of the model and demonstrates that each presence (social, cognitive and teacher) must be enacted to ensure a good educational experience. Studies have shown that learners' academic performance can be improved by higher levels of social presence (Joksimovic et al., 2105). The majority of academics have excellent teacher presence, particularly in their day-to-day communications with students. As students and staff moved rapidly into the online space during the pandemic, we could no longer rely on these automatic foundational actions and needed to make our interactions more deliberate. Setting the right climate became imperative for strengthening the learning community.

Figure 1: Community of Inquiry model with 'Setting Climate' highlighted – adapted from Garrison & Vaughn, (2008)

Our Context and Methodology

By way of exploring our work in this context, we use two reflective narratives to consider how we 'set the climate' by connecting and reconnecting to our students and they to each other in the wake of the pandemic experience. Reflective narratives are sense making activities that also consider what was done and seek evidence of impact (Andersen, Ravn, & Thomson, 2020). This was developed using previous and subsequent observations that organic connections occur before class, after class, in the hallways waiting for class, in the rush to get to another class and in pubs and cafes as students see familiar faces, hear familiar stories and strike up conversations about shared interest, likes and dislikes. These were all now absent.

Scenario 1

A large compulsory core program "ethics and sustainability". As students studied online two words were a constant on the screen "disconnected, reconnecting". At a deeper level these words tell us much about the students and their experiences. Their struggles to connect, reconnect and stay connected over this time have been evident. Quite simply, the digital literacy needed to learn fully online, along with access to internet and good computing materials (i.e. a computer mouse, microphone and webcam) were being managed and supported by the universities and their IT departments, yet it was the educators in the classrooms that had a more difficult and less visible problem - how to connect students to each other, us and the university.

Small talk that is not so small
Over that time, pets became teaching assistants and each lesson turned into a 'study in the wild' (Bruun & Stentoft, 2019) to innovate both materials and delivery to ensure each student had a transformative educational experience and made connections. With online learning there are potentially fewer organic moments to capitalise upon. Therefore, connection had to be a deliberate and focused strategy deployed and built upon over the teaching period. Our role was to nudge (Thaler & Sunstein, 2008) students towards each other and ensure they had the efficacy to make a connection once presented with the opportunity.

In deploying a 'moments to connect' model, the process was to nudge (Thaler & Sunstein, 2008) students to undertake certain actions. Commencing with a class song each day provided an upbeat signal learning was about to commence but the song 'nudged' students to talk and say hello rather than sit in silence with screens blank and cameras turned off. The start of class provided an informal connection point, but it also provided a digital connection point as I checked both signal strength and was able to undertake any 'trouble shooting' for technical problems for us all during this time. The small talk was not so small, instead this became a time to connect and reconnect each week, with each other and what was happening around us. Students talked about the weather and life and posted emojis and talked to my dancing cat (who now has a TikTok Account and has shared her study Spotify playlist!). Weak, but important ties were forming. Social presence was building.

The next nudge was one to the connection of campus. With many of our students now never planning to attend, I started to share stories of the campus too, of our Indigenous heritage and land and how I missed the moments of reflection on who had walked there before us, this story telling connected our students to the campus in a meaningful manner and reminded them of the importance of Indigenous considerations when conducting business. This was about tying students to the 'grounds'.

One more nudge provided a 'blessing' to connect via social media. We knew students have been using social media to connect beyond the classroom for years, but it was time to make this organic process explicit. The nudge to be part of one of these informal groups has seen WeChat groups grow to over 400 members (of a 700-person class). As these are student lead and co-created, it seems these ties are stronger but less visible to us.

Scenario 2

An elective unit on leadership from a large postgraduate program undertaken by students from across 10 business disciplines. It was relatively small (in comparison to other compulsory business units) with students all studying 'remotely' in the second half of 2021.

We began with some well-known activities to help students build trust and connections such as playing music on entry and using that as a conversation starter. Inviting students to share their favourite piece of music for example and being able to search and play it was responsive and highly appreciated. As students entered the online classroom, we also had them 'check-in' using a QR code (a very familiar activity in their lives during the pandemic) which took them to a simple 3 question survey: How are you feeling today (great; average; not so good); tell us about your engagement with this week's content (not much; some; all); how can we help? (open). Then after class we followed up with students whose answers concerned us or those who had not checked in at all. Again, students told us how much they appreciated this small nudge.

The importance of preparation
Since our unit was very much a blended style whereby 'lecture content' had been chunked (Humphries & Clark, 2021) and delivered predominantly by short videos along with interactive online activities, we were keen to ensure students engaged with the weekly content before attending the online (live) class. We made a point of naming and thanking students who had done this pre-work, further adding to the social presence (Koszalka et al., 2021).

There has been an ongoing debate over whether we should insist on students turning on their cameras in Zoom or allowing them their choice (Terada, 2021). We never mandated it in our class but suggested that if students were not comfortable then they use their favourite leader as their Zoom profile picture (or their cat or anything they liked rather than having a black box). We engaged in small talk at the start of class with those who did this by commenting on their chosen leader and asking them follow-up questions.

We recapped weekly content through Kahoot quizzes which added an element of immediacy and fun. We made a big deal of cheering the winners and tried to encourage everyone to take part. We noticed (and I am sure the students did too) that it was familiar names who were winning the Kahoots as to those whom we had just mentioned as having engaged in the pre-work.

Reducing cognitive load
Rather than introduce new technologies we focused on making use of what they knew. For example, the simple Zoom tools such as asking students to add their ideas and answers in the chat – then saving that and sharing back with the class afterwards for their notes. This allowed many students to answer, not only one who was confident enough to speak out. Similarly, use of the 'reactions' in Zoom was a way of students being able to connect with us through a 'text style' language they are very comfortable with.

And finally, to make up for those missed corridor conversations with the teacher, we stayed online for 10 minutes after every online workshop/tutorial to answer questions. Just as we might 'hang around' in the corridor, we were 'hanging around' online. By giving students some space to speak out (when most students had left the room) we found the quieter ones would often make good use of that time and appreciated this final nudge.

Discussion and Implications

The human desire to connect is strong and despite the disruptions the pandemic has presented, our students, given opportunities will connect organically online just as they did face to face. However, without the visual cues and clues our students need purposeful moments to connect, make small talk and build trust in our online classes too. Finding times and opportunities to nudge them together and build the efficacy to do so becomes an important part of the teaching role.

Blended learning approaches have been around for decades but more recently the online component of the 'blend' has become more predominant. It will likely remain so for some time to come thus opportunities to connect organically need to become purposeful and directed. By deliberate designing of connection points, students are facilitated to 'discover' opportunities to connect. It is our role to support the lurkers, and those hidden by 'the cloak of invisibility' to join the enthusiasts and make connections as they will need to in their future careers. Offering students opportunities to build their social presence, combined with our purposeful teacher presence provides the ultimate climate setting for a successful learning experience (Garrison & Vaughn, 2008).

Students were clear by their interactions that they enjoyed and appreciated what we were doing. From building their own WeChat channels, finding us when on campus, and comments such as '*I am feeling positive about your use of technology—other teachers are more passive about online learning … I'm feeling optimistic.*' (Student from scenario 1) as early as mid 2020 told us we were making a difference. *'Love the way of teaching! It is really interactive.'* and *'Good use of online learning platforms. Great Zoom discussion'* (students from scenario 2).

The implications for technologists, learning designers and educators are clear. We must prepare our students for our learning environments by ensuring students have the technical capability to be connected i.e. the computers internet and digital literacy (Huber & Shalavin, 2018; Selwyn, 2016). But it is more than the technical availability that is required. The knowledge and skills to leverage the technology to replicate the interactions that in turn become the connecting pieces enable us to connect and reconnect our students, to build networks with both strong and weak ties. In their future working environments, it is highly likely they will be doing more remote working than ever before and having the skills embedded to operate and be comfortable doing so is only setting them up for success (Abe et al., 2021). As educators our role is to foster connections to us, each other, our institutions, and nudge (Thaler & Sunstein, 2008) our students to connect and reconnect in any means they have available to them.

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reconnect
Reconnecting relationships through technology

A Framework for Amplifying the Teaching-Research Nexus Impact: Leveraging Altmetrics via Figshare

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This concise paper explores as work in progress a collaborative discussion-based webinar series that develops and amplifies understandings of the teaching-research nexus. Aimed at early and mid-career university academics, the series implements a design-based research framework using alternative publishing via Figshare and dissemination through social media networks of the recordings of live online webinars. The webinars feature a panel of invited Deans Teaching and Learning from across the university in collaboration with three higher education research specialists. Results of ongoing analysis of development, engagement, outcomes, and impact are presented, and a preliminary framework is advanced for developing and amplifying understanding of the teaching-research nexus.

Keywords: Altmetrics, Teaching-Research Nexus, Researcher development, Higher Education

Introduction

University academics typical workload encompasses three main domains: research, teaching, service. The intersection between research and teaching has been called the teaching-research nexus. The reality at many universities is the expectation, whether implicit or explicit, that early and mid-career academics must negotiate this nexus, demonstrating the ability to narrate activities, impact and engagement in this space as they build their academic profiles. Different strategies for supporting the development of a personal narrative and evidence around the nexus have been suggested (Geschwind & Broström, 2015; Taylor, 2007). With the rapid development of alternative research impact metrics (Williams & Padula, 2015) and shifts in the adoption of synchronous and asynchronous collaboration technologies in response to COVID-19 (Lowenthal et al., 2020) there are new opportunities for creatively exploring ways of supporting the development of the teaching-research nexus across universities (Blaschke, 2020). One such strategy we proposed and have prototyped is the facilitating of dynamic collaborative conversations hosted by a panel of Associate Deans Teaching and Learning and educational specialists via a six-part webinar series – both live and recorded. We developed a framework around the webinar series to amplify its impact through hosting the episode recordings on an institutional Figshare platform and social media mentions to demonstrate impact through tracking associated Altmetrics scores.

Methodology

The Higher Education Teaching Research Nexus (#THETRN) project involves the collaborative development of a six episode (bi-monthly) webinar series designed to scaffold early-career (ECR) and mid-career (MCR) researcher capabilities across the university. A series of topics focus upon the nexus between teaching and research in different disciplines. The webinar series is conducted live and recorded for asynchronous viewing and curating as a Professional Development resource. Each webinar is comprised of a core group/panel including five invited Deans Teaching and Learning and three teaching and learning specialists that crosses several of the university faculties exploring open educational practice and research, with episode guests from all of the 10 university faculties throughout the 6 episodes over 2022. The webinar series follows a dynamic conversational model that was developed across an earlier webinar series designed to explore teaching and research issues in response to COVID-19 throughout 2020 and 2021 (Deneen et al., 2021). We use design-based research (DBR) as a foundational model (McKenney & Reeves, 2019) to develop and evaluate the impact of a webinar series for the goal of developing and amplifying the teaching-research nexus impact across the university. DBR is comprised of four phases: analysis and exploration of a problem and potential design principles, initial prototyping of a solution/intervention, implementation and evaluation followed by a redesign-evaluation loop, development of transferable design principles. In this paper we explore the initial design prototype in the first three episodes of the six-part series. Doing so at this point allows for analysis and adjustment of the model and a reflection on the ongoing impact evidence relevant to the framework.

Research question

What is an effective model/framework for developing and amplifying the impact of the teaching-research nexus in response to COVID-19?

Competitive internal funding was applied for and received for administration and dissemination of the webinar series and for evaluating the impact of the 6 webinar episodes. The series is a collaboration between the Centre for the Study of Higher Education, the Researcher Development Unit, and the faculty Associate Deans Teaching and Learning.

Framework

Prior to COVID-19 most researcher development and professional development seminars were delivered face-to-face in physical rooms on campus. During COVID-19 seminars were delivered live online, with up-coming events advertised through Centre webpages and registration details circulated via email newsletters alongside Twitter and Yammer social networks. These online seminars or webinars are recorded and shared asynchronously post event on a university-branded Vimeo subscription platform embedded within a university webpage with episodes advertised through a university-wide email newsletter. With the THETRN framework the ‘traditional’ webinar series model is enhanced (amplified) through the addition of the university hosted Figshare publication platform that is used to host and curate the recorded webinar episodes, and publicly publish each episode with associated metadata and a unique Digital Object Identifier (DOI), as illustrated in Figure 1. Each published episode recording is then described and embedded in a university hosted SOTL network blog post and shared on three social media networks including Twitter, LinkedIn, and the university Yammer network. The social media mentions drive asynchronous participants to view or download each episode from Figshare. By including the episode DOI in social media mentions each episode gains an Altmetrics score that is then automatically curated into the panel members research elements profiles, providing an additional impact metric and research feedback loop making the intersection of the TRN more explicit.

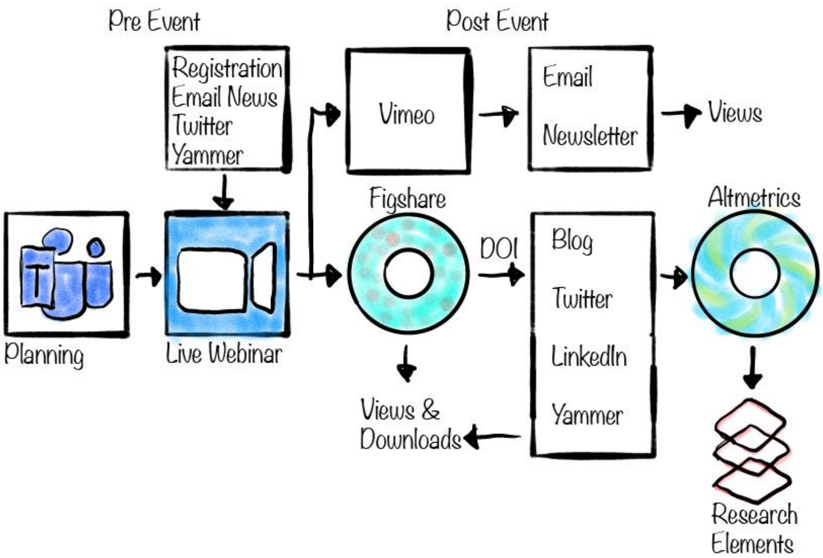

Figure 1: A framework for amplifying researcher development impact

The collaborative webinar design team meet via Zoom monthly prior to each episode to brainstorm and choose topics that are currently relevant to the target participants. Microsoft Teams is used to facilitate documentation of the design process, share relevant resources, and coordinate the webinar development team. We chose Figshare as the hosting platform for the episode recordings as it is supported through an institutional license subscription, can be directly automatically linked to a user’s institutional research profile, guarantees a permanent DOI for hosted media, and supports direct sharing to the two main social media platforms that we tracked through Altmetrics (Twitter and LinkedIn).

Initial Findings

In this section we explore an initial analysis of the first three episodes through anonymous participation and social media metrics.

The participants of the THETRN webinar series include the discussion panel as described previously and the target audience participants (ECRs and MCRs). A demographic poll conducted during the second episode of the series (Figure 2) indicated that the series attracts 64% of synchronous participants from its main target group.

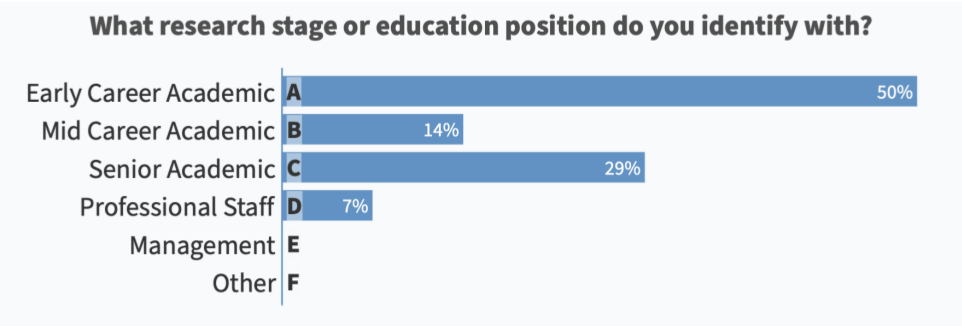

Figure 2: THETRN Webinar participant demographic poll results.

Topics explored in the first three episodes of the webinar series have included:

1. Altmetrics for amplifying research impact.
2. Developing your teaching-research nexus: Identity, performance and methodologies.
3. Narrating your TR Nexus, publication, impact and engagement, funding and resource building, Meta-Nexuses: Joining and developing TR networks and moving beyond the academy.

Table 1 collates and compares basic episode metrics between traditional and altmetrics metrics.

Table 1: Initial Impact Metrics

	Episode#1	Episode#2	Episode#3
Live Webinar Attendees	20	17	15
Weeks since recording	16	8	1
Traditional Website Views	65	75	15
Vimeo Views	8	21	5
Figshare Views	351	195	93
Figshare Downloads	32	10	10
Twitter Post views	259	855	171
LinkedIn Post views	233	220	50
Yammer Post views	551	222	236
Altmetrics Score	3	1	2

Figure 3 and Figure 4 summarise the first episodes' recordings web page statistics from a total of 155 webpage views throughout March to July2022.

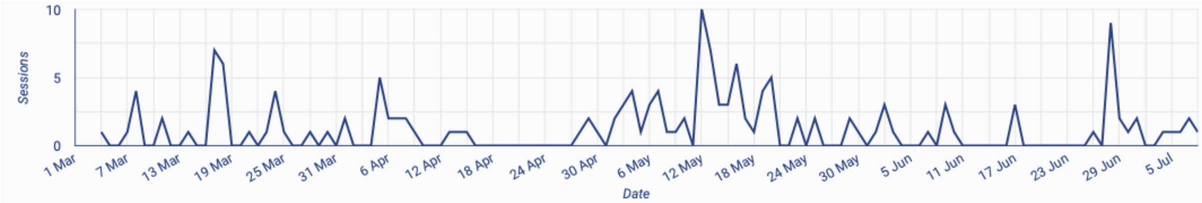

Figure 3: Webinar Vimeo recordings webpage views – March to July 2022

Webpage views show peaks associated with email newsletter and social media mentions of each episode followed by smaller numbers of views in between episodes via web searches.

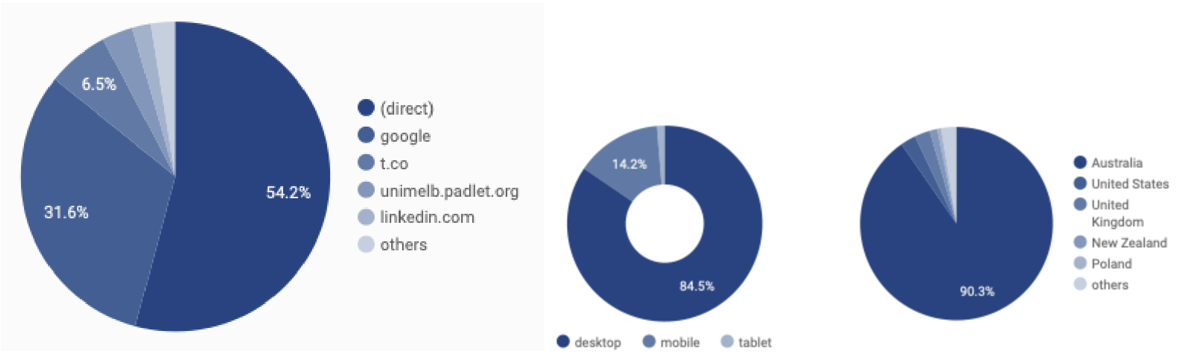

Figure 4: Webinar Vimeo recordings webpage statistics – March to July 2022

Webpage referrals, device and country pie graphs indicate the 'traditional' webpage hosted recordings attract predominantly a local audience, as does Yammer – an institutional social network, whereas Twitter and LinkedIn analysis indicates wider global reach beyond our institutional target audience to a wider global network of ECRs and MCRs.

While we had hoped that the webinar series would be effective in supporting the development of the Teaching-Research-Nexus (TRN) we had envisioned greater live participation in the episodes beyond the core panel group, leading to a responsive interaction with the audience/target group. What we have found so far is more impact through the asynchronous viewing of the episode recordings. An emergent point for analysis, therefore, whether if covid19 'burn-out' has impacted synchronous participation in events that are perceived to be of a business-as-usual professional development activity. An emergent possibility for future research is to explore hosting (while simultaneously live-streaming and recording) episodes face-to-face on campus to explore if social dimensions would influence live participation numbers.

The project has facilitated collaboration between the associate Deans Teaching and Learning and the team of educational specialists, with the intention of leading to further collaborative activities around enhancing understanding and explorations of teaching and research connectivity. The series has also provided a pathway for the associate Deans Teaching and Learning (and the wider participants) to gain critical understandings of the differences in the TRN across discipline silos. We anticipate that this will lead to more transdisciplinary collaboration across the university faculties in the future (Burnett, 2011).

A core suite of social networks (Twitter, LinkedIn, Yammer) that link altmetrics to the DOI of the recorded episodes hosted on Figshare were utilized. These provide both wider impact and facilitates a feedback loop into the university research elements database. This effectively adds to the research output profiles of the panel. Ongoing analysis has already suggested, however that maximising altmetrics impact necessitates a cultural shift. This includes accepting and integrating engagement with 'effective' social networks (Haustein, 2018; Lamba, 2020) as part of academics' workflow. To date, this proven a robust but challenging process, particularly Associate Deans Teaching and Learning who were new to the concept of using altmetrics via Twitter, LinkedIn, and Blogging for amplifying impact. This represents a tension with and movement away from the traditional approaches of relying upon email newsletters to broadcast and advertise events, which have demonstrated decreasing effectiveness since COVID-19, due in part to online burn-out over increased email inbox bloat. The targeted use of social networks have potential to create a more conversational and participatory approach to sharing event details and feedback and represents a ‘pull’ model rather than the ‘push’ model of centralized email.

Next Stages

Three further episodes are scheduled for the rest of 2022. Ethics consent will be submitted for qualitative evaluation and impact analysis through participant focus groups and feedback surveys at the end of the series. We will also explore creating more awareness around the institution of the link between Figshare and Altmetrics for amplifying the impact of non-traditional research contributions, and scaffolding the adoption of Twitter and LinkedIn for academics not already utilizing these platforms effectively.

Conclusions

Initial analysis of basic episode metrics indicates impact through the wider participation from the target audience for the series beyond the live synchronous webinar sessions, with significantly higher views and downloads of the recordings through Figshare and advertised through three social networks – Twitter, LinkedIn, and Yammer. The impact of the series on actual development of the teaching research nexus (TRN) for ECRs and MCRs will need deeper exploration through qualitative analysis of subsequent focus groups and participant surveys. Anecdotal feedback from the participating Associate Deans Teaching and Learning is that the series has become a valuable addition to their strategies for supporting the TRN development in their faculties.

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reconnect
Reconnecting relationships through technology

Challenges in deploying educational technologies for tertiary education in the carceral setting: Reconnecting or connecting?

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With the COVID-19 pandemic, educators across the globe pivoted to using educational technologies such as lecture capture, video conferencing and discussion boards to reconnect with learners. For incarcerated learners, this was not an option due to the dearth of technologies and internet access in most correctional jurisdictions. As many tertiary education institutions leverage the affordances of digital technologies to increase access to learning and reconnect with learners, they are inadvertently excluding a large cohort, incarcerated learners. Prisons are typically technology poor and prohibit access, at least to some degree, to the internet. This paper examines some of the common challenges to the deployment of educational technology in prisons to reconnect with incarcerated learners. They are classified as physical challenges, operational challenges, attitudinal challenges, and human challenges.

Keywords: Prison education; carceral education; eLearning; dynamic security

Introduction

Prisons across Australasia deploy tertiary education for people in prison. This usually takes the form of vocational education, pre-tertiary programs and higher education (Barrow et al., 2019). Prisoner engagement with education serves many purposes. Among them, it keeps prisoners occupied and out of trouble (Rochealeau, 2013); it can help create vocational pathways that lead to employment on release (Rosmilawati & Darmawan, 2020); promotes prosocial behaviour among participants (Farley & Pike, 2016); and in and of itself it reduces recidivism rates (Davis et al., 2013). During the prison lockdowns precipitated by the COVID-19 pandemic, prisoners were only able to leave their cells for an hour or two at a time, and education providers and volunteers were prohibited from visiting prison sites. This happened in Aotearoa New Zealand and most, if not all, Australian jurisdictions. At the time of writing, educators are still not allowed on prison sites and educational programming has not resumed in many places. While educators 'outside the wire' pivoted to use educational technologies to connect with learners, these options were not available for incarcerated learners (Bradley & Davies, 2021). In Aotearoa New Zealand, Ara Poutama Aotearoa Department of Corrections did consider the rapid deployment of tablet technologies for prisoners, but ultimately it was decided it would be detrimental to rush such an initiative without due consideration to content strategies and a rigorous hardware options analysis. Instead, they opted for the delivery of hard copy activity booklets and a database of resources that could be readily printed off by corrections officers. This strategy has been maintained over the two and a half years of the pandemic.

Especially in the wake of the pandemic, the tertiary landscape is moving away from hard copy materials and face-to-face delivery, to one that is leveraging the affordances of educational technologies (Bradley & Davies, 2021). Even face-to-face programs usually incorporate some online and digitally enabled aspects in a blended learning model, usually requiring access to a learning management system and the internet. Broadly speaking, prisons do not provide access to the internet for learners or access to contemporary digital technologies making it very difficult for prisoners to meaningfully participate in digital tertiary education (Willems, Farley & Garner, 2018), particularly during prison lockdowns precipitated by the COVID-19 pandemic. Video conferencing technologies were introduced to facilitate virtual visits from whānau/family members (Dallaire, et al., 2021), and it was initially envisaged that these could be leveraged for educational purposes, but the heightened demand for family contact, staff availability and site logistics made this option untenable.

Educational technology in the carceral setting

Despite the many challenges, educational technologies have been unevenly deployed across many jurisdictions. The Making the Connection project led by the University of Southern Queensland (UniSQ) provided access to digital higher education through providing servers networked into existing computer labs and laptops that could be used in-cell, preloaded with course materials, and requiring no access to the internet (Farley et al., 2015). The processes and technologies have since been incorporated into standard operating procedures for UniSQ. The Otago Corrections facility in Aotearoa New Zealand has been using virtual reality to teach literacy and numeracy to people in prison. Again, this system required no internet (McLauchlan & Farley, 2019). Across the US and Europe, and more recently in New South Wales, digital tablets have been supplied to prisoners to provide access to entertainment, administrative functions such as appointment booking, and education. These technologies are often supplied free of charge to prisons with the technology companies charging prisoners for access to materials and resources (McKay, 2022). Every prison in Aotearoa New Zealand has Secure Online Learning suites that offer learners access to a limited range of whitelisted websites focused on drivers licensing and literacy and numeracy (McLauclan & Farley, 2019).

Challenges to the deployment of educational technologies in the carceral space

There is wide agreement that education is beneficial to prisoners and that educational technologies could enhance the delivery of that education. It is also acknowledged that the biggest impacts come with the delivery of tertiary education (Davis, et al, 2013). Given the impacts of COVID-19, it has become necessary to use technologies to connect with learners who have often been restricted to learning from home (Christopoulos & Sprangers, 2021). Ideally, these same technologies would also be deployed with incarcerated learners, however, several challenges remain. Education in prisons is almost always facilitated by face-to-face delivery by external providers or by educators directly employed by correctional jurisdictions. The options for reconnection to learners via educational technologies for prison educators simply do not exist.

Physical challenges

Prisons are designed to be impenetrable fortresses made of concrete and cinder blocks. Many prisons across Australia and New Zealand date back to Victorian times when less thought was given to prison design and the movement of prisoners around a facility. Physical barriers to the outside are made obvious (Engstrom & Van Ginneken, 2022). Though this serves the security demands of a prison well, it is less amenable to the post-build installation of wi-fi to accommodate learner needs. Most modern builds are installing the capacity for either wired or wireless internet, even if the purpose of that has not been determined. Even where attempts have been made to create connectivity, in the wake of the COVID-19 pandemic, access to prisons by outside contractors has been prohibited. This leaves prisons unable to become ‘connected’ in a timely or efficient manner to facilitate learning.

Operational challenges

The first purpose of a prison is to keep the community safe and to contain those who are perceived to threaten that safety. People are imprisoned and allocated to a security classification and an individual may move up and down through those classifications, dependent on their behaviour and participation in rehabilitative programs (Tahamont & Frisch, 2019). People from different security classifications are not allowed to meet. In Aotearoa New Zealand, this is further complicated by the necessity to keep members of different gangs apart (Breetzke, et al., 2021). This results in a prison with numerous cohorts. For example, Christchurch Men’s Prison has 28 different cohorts that can never meet. This makes movement around the facility difficult; these people cannot meet, even in a walkway or classroom. Moving learner cohorts to classrooms and computer labs becomes a significant challenge, resulting in no or little time in those spaces (Farley & Doyle, 2014). Isolation requirements exacerbate these issues with prisoners being shuffled around to accommodate new prisoners or those exhibiting symptoms suggestive of COVID-19 (Ayhan, et al., 2022).

Corrections officers are needed to accompany learners to computer labs, supervise the use of technologies by prisoners, and sometimes to act as the intermediary between learners and prison education staff. The COVID-19 pandemic has taken a significant toll on frontline corrections officers (Smith, 2022). They often have to wear full PPE all day, they have to deal with prisoners frustrated at not being able to see visitors or engage with programs, and they have to cover for colleagues who have COVID-19 or are too immunocompromised to work in the prison during the pandemic. This has resulted in a large number of corrections officers leaving due to workload and conditions or leaving because they are close to retirement. Across the world, prisons are reporting being understaffed. In these situations, activities are prioritised and education is usually not near the list of those priorities (Bradley & Davies, 2021).

Attitudinal challenges

'Security' is often bandied about as the reason that educational technologies and internet cannot be introduced (Farley & Doyle, 2014). Unrestricted access to the internet is seen as posing too great a risk to the community and, to victims of crime. Prisoners would be able to monitor victims or potential victims through social media channels, view prohibited content related to their crime, or run illegal businesses. Though there are ways to mitigate risk, for example through whitelisting websites, a blanket ban often persists. Though the public is kept safe by this prohibition, it also excludes access to the websites and learning management systems of tertiary education institutions. Most of these sites are not suitable for whitelisting as they often incorporate third party links and resources, such as journals and rely on dynamic IP addresses (Taugerbeck, 2019). Even when viable solutions are offered, these are often disregarded by those with an incomplete understanding of the technologies and 'security' is usually the excuse proffered.

In most jurisdictions, the relationship between prison education teams and correctional officers is fraught. Education teams are seen to be 'soft' on prisoners. Corrections officers perceive that prisoners receive concessions and opportunities that they, or people on the outside are not entitled to (Novek, 2019). This is frequently a misconception. Prisoners bear the costs of tertiary education and are subject to the same rules as learners outside of prison. Some of this resentment stems from corrections officers, outside of Scandinavian jurisdictions, needing very little education for their role. They become uncomfortable if a prisoner is studying for a higher qualification than the one they hold. This is particularly an issue with higher education incarcerated learners. In addition, corrections officers may poorly understand educational technologies and perceive them as a risk to security (Kerr & Willis, 2018). A personal example illustrates this; I visited an Australian prison to meet with corrections officers about a technology project I was leading in their prison. One of the main concerns I had to address was their perception that phone calls could be made from a scientific calculator. Obviously, this is not true but was a widely held belief in that prison at that time.

Human challenges

Access to technology is not enough to ensure access to learning. Both education tutors and learners in the carceral settings need to understand how the technologies can be used and why they would be used. The lack of digital literacies of both staff and learners have slowed down my own technology projects in the carceral space. People in prison are frequently from disadvantaged communities and have already experienced the digital divide, even before their incarceration. They come to prison without the skills and knowledge they need to fully participate in the digital world (Smith, Willems & Farley, 2021). This is exacerbated by the dearth of contemporary technologies in prison. These people are not given the opportunity to build their digital literacies while incarcerated. This undermines the rehabilitative potential of education; digital literacies are necessary for higher level employment. A lack of digital literacies restricts an ex-prisoner to low paying and often physical jobs that have little impact on recidivism (Bhuller, et al., 2020). When technologies are provided, both staff and learners are unsure how to use them and they may be put aside in favour of hard copy materials (Farley, Murphy & Bedford, 2014).

Conclusion

Incarcerated learners lack the access to the educational technologies that learners 'outside the wire' enjoy. In pre-COVID-19 times, tertiary education was normally delivered face-to-face or supported by education tutors or education officers. During the lockdowns that have resulted from the COVID-19 pandemic, these educators have been prohibited from visiting prisons, forcing them to rely on the delivery of hard copy materials to prisoners by corrections officers. In most cases, the delivery of regular educational programing has ceased, and technological solutions have not been in place. The range of challenges to the implementation of educational technologies that could overcome these barriers have been listed and are broadly categorized into physical, operational, attitudinal, and human challenges. Educators have not been able to reconnect with their incarcerated learners and those learners have been languishing in their cells without the opportunity to learn. If they are to reap the benefits of reduced recidivism rates and dynamic security afforded by educating prisoners, correctional jurisdictions need to address the challenges of implementing educational technologies and recognise the very human foibles that often prevent progress.

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reconnect
Reconnecting relationships through technology

Language learning and virtual reality: A scoping review

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This paper describes the rationale, process and results of a scoping review of journal articles researching aspects of language learning and the use of Virtual Reality (VR) from 2020 onwards. Twenty-four articles were chosen for data extraction, including five previous systematic reviews. The analysis confirmed that VR has a positive effect on the motivation of language learners to study but there is less clear-cut support for specific language gains. The most frequently mentioned language target is vocabulary acquisition, and although VR certainly facilitates initial vocabulary learning there is less evidence of long-term retention of new lexis. This scoping review has helped to focus the next stage of this VR project on working with students in the long term on improving specific speaking skills and to clarify the most appropriate pedagogical strategies for the use of VR for language learning.

Keywords: virtual reality, scoping review, language learning, higher education, K-12

Introduction

Virtual Reality (VR) has been used in a variety of forms in education for a number of years. Examples include game-based learning in the virtual worlds of Minecraft, storytelling and empathy education through immersive documentaries such as Anne Frank House, and collaborative learning using social platforms such as Spatial. These different forms of VR vary in how immersive they are but all attempt to transport learners to another world in which to explore, discover and learn. As a result of the COVID-19 pandemic, VR was a ready alternative to face-to-face lessons and could even be used to replace study abroad as travel was so limited (Liu & Shirley, 2021). Within this context, from April 2021 until February 2022, the two presenters undertook a small longitudinal pilot study with five students to investigate how different types of VR could be used for self-directed learning and what language teachers needed to know in order to use VR successfully in their practice (Cowie & Alizadeh, 2022). The pilot study revealed the positive impact of VR on engaging students in self-directed learning and enhancing their communication and collaboration in group activities as found through focus group interviews. Despite the benefits, full immersion VR using Meta Quest 2 head mounted displays caused certain degrees of cybersickness in the participants. As a result, the pilot study was continued with WebVR, first using Mozilla Hubs and Spoke to create and co-explore VR and later using Thinglink to create 360 degree tours. The next stage is to transfer these lessons to a larger group of students and try to establish what exact teaching practices are most effective for language learning using VR. As preparation for this it was decided to carry out a scoping review of previous research involving VR and language learning to gather evidence from the literature and identify research gaps.

Although education for the most part is back to face-to-face in many parts of the world, VR and other immersive technologies can play a significant part in connecting to peers and teachers beyond classroom borders, for example in hybrid settings. In addition, such technologies are still relevant in the post-pandemic world as they transform the learning experience beyond merely connecting remote learners and teachers. VR, for instance, can create authentic contexts that help learners establish improved awareness and understanding of the target language community and culture and takes them a step further to negotiate their identity and maintain their motivation, thus facilitating self-regulation and goal achievement in the learning process (Oyserman et al., 2017). Given this background, it is essential to keep exploring the potential of new technologies such as VR.

Previous systematic reviews of VR and language learning (8, 13, 14, 15, 16 in Appendix A) have included research from 2008 until 2021. Not surprisingly, in view of the rapid changes during that period in VR, there are wide variations in results. Perhaps the most obvious is the changing nature of VR from early virtual worlds such as Second Life (13) and various games (15) to virtual tours such as Google Earth (8). One omission appears to be the lack of reference to recent collaborative applications such as Engage or Mozilla Hubs. On the other hand, there are a number of consistent trends: research participants tended to be university students in an English as a Foreign Language (EFL) context and the most common language target is specific vocabulary acquisition. The various reviews cited the immersion and multimodal context that VR provides as reasons for facilitating vocabulary learning and retention; however, there were few longitudinal studies that assessed more permanent language gains. Finally, research findings focused on the affective domain provide some evidence that VR is enjoyable and motivating and can be a tool to stimulate interest in language learners. It was suggested that future research needs to focus on larger sample sizes (15), longer term treatments and more attention paid to pedagogy (8, 16); that is, what kind of approaches will be most effective in teaching languages using VR. With these lessons as background, a scoping review was undertaken to answer the two following research questions:

1. What are the findings of previous studies regarding the impact of VR on language learners' psychological and emotional states (for example, engagement, motivation and anxiety)?
2. What are the findings of previous studies regarding the impact of VR on language learning outcomes?

Procedure

Research papers on VR and language learning from 2020 onwards were searched for on Web of Science, Scopus and ERIC. The search string included terms related to VR, WebVR and their variations as well as language learning and its variations in both K-12 and higher education, yielding an initial pool of 37 articles (See Appendix B). Those articles were then screened for language of writing, duplication, topic relevance and quality, which left a final pool of 24 articles for full text review (see Appendix A). Five of the 24 journal papers (8, 13, 14, 15, 16) were systematic reviews. The remaining 19 participant studies were conducted in various countries including *Taiwan* (2, 4, 9, 10, 19, 20, 24), *China* (5, 12, 18, 23), *United States* (1, 7), *Australia* (22), *Cyprus* (11), *Hong Kong* (3), *Iran* (6), *Italy* (17), and *Japan* (21). As the frequency counts show, researchers in Asian countries were found to have the highest number of publications on VR and language learning which probably reflects the growing VR market in the region (Report Ocean, 2022). Six out of 19 papers were published in *Computer Assisted Language Learning* (Q1 journal). Most of the studies used a mixed methods approach to research collecting both quantitative and qualitative data from participants. All the studies reviewed except for one (3) were conducted in a foreign language setting as opposed to a second language setting, with the former referring to a learning context where the target language is not spoken in the learners' out-of-class environment. On the contrary, study 3 took place in a Chinese-as-a-first-language context with secondary school students. In addition, all studies but two (7, 21) were focused on developing learners' language skills for general purposes. Studies 7 and 21, however, were conducted in English-medium instruction settings focusing on technical vocabulary and content knowledge acquisition combined with general linguistic skills.

Results

Research Question 1: Psychological and emotional states

The reviewed studies focused on differing affective factors including engagement, motivation, enjoyment, satisfaction, confidence, and enthusiasm. The collective findings almost unanimously confirm students' general positive views toward VR assessed through self-report questionnaires and/or interviews. The one exception (24) reported that students felt anxious using VR, although that could be explained by the fact that the specific VR application used was not interactive and communicative activities, which students said caused anxiety, were not carried out within the application itself. One consistent result, echoing the previous systematic reviews, is that VR is enjoyable and motivating for students (2, 5, 6, 7, 10, 18, 20, 21, 22, 23) especially for students who may initially not be that interested in language learning or confident in their linguistic skills (5, 6), although some researchers warned of the influence of the novelty effect of learning with a new fun tool (20, 23). In addition, two studies also found evidence supporting the positive impact of VR on willingness to communicate (6, 24) and learner autonomy (24). The impact of VR on fostering cultural awareness and intercultural competence was the focus of three of the research papers reviewed (6, 9, 18), all of which provided evidence in support of VR to deepen cultural understanding. This observation corroborates previous findings regarding the power of VR as the 'ultimate empathy machine' (Barbot & Kaufman, 2020). In addition, as with previous studies, there was evidence of the potential that VR has to decrease anxiety, particularly for public speaking (4, 23), to facilitate critical thinking (10), and that students are less distracted (24). However, one study comparing VR and mobile apps (11) found that although VR scored highly for engagement it was not significantly different to mobile apps.

Research Question 2: Language learning outcomes

The scoping studies examined a number of different language learning outcomes such as grammar (24), writing structure (23), writing skills (3, 9, 10), pronunciation (24), listening comprehension (5, 19) and speaking (4, 5, 6, 7, 9, 10). In addition to these areas, two studies also looked at the impact of VR on willingness to communicate (6, 24), one at learner autonomy (24), and one on improved knowledge sharing as part of intercultural competence (18). The most common target areas, echoing the findings of the previous five systematic reviews, were those of vocabulary acquisition (2, 5, 7, 11, 17, 20, 24) and speaking (4, 5, 6, 7, 9, 10). Overall, there was relatively little evidence that the use of VR promoted language gains with the exception of short-term vocabulary retention. Instead there was more support for students finding VR fun, enjoyable and motivating but these positive feelings were not consistently linked with successful language learning outcomes.

Other findings

In addition to providing data to answer the two research questions, the scoping review also revealed a number of other relevant results that we would like to briefly mention. One striking, and somewhat worrying, finding was the low quality of a number of papers (six out of 37). The writing in these papers was disorganized, unclear and very difficult to understand. As a result, these were excluded from the final list. Although this finding is not directly related to our research agenda, we think that it is worth noting that although a number of papers had significant language issues that made them difficult to understand they were still published in Q1 journals. A second trend was the continuation of frequently changing definitions and terms connected to VR. This is partly the result of VR being an ever-widening field with new applications appearing all the time, but also appears to reflect the lack of consistency in research terms. Thirdly, some studies claimed to have adopted a mixed-methods research approach evaluating learning outcomes by comparing pre- and post-test scores and students' learning experience using questionnaires; whereas in reality their evaluations were entirely subjective and based on learner self-reports for both affective aspects of the learning experience and language gains. In addition, when assessed according to the SAMR Model (Puentedura, 2013), a significant number of the studies did not go beyond augmentation and failed to create transformative learning experiences. Finally, the review was extremely useful in identifying a future research agenda for the use of VR and language learning. Areas to focus on include the lack of studies on the long-term effects of VR with large groups of learners; the need to widen the target language outcomes and to identify what teaching approaches work best with those targets. Some of these areas, including the lack of longitudinal studies on VR and language learning and an overemphasis on vocabulary learning gains, have been highlighted in previous systematic reviews (8, 13, 14, 15, 16) but there is still a research gap as shown by our review which covers recent articles published from 2020 to 2022.

Conclusion

The two presenters carried out a scoping review of 24 journal papers published since 2020 on VR and language learning. An analysis of these papers confirms that VR is clearly engaging and motivating to language students and can decrease language learning anxiety. This is an important aspect in such a performative subject: as well as knowledge of a language, students need to practice various skills in order to become proficient and being relaxed and motivated should help this process. Regarding language knowledge, it is also clear that, because of its multimodal and immersive nature, VR can be extremely helpful in aiding short-term vocabulary acquisition. However, the papers have less evidence regarding other longer-term language outcomes achieved in regular classroom contexts. It is concluded that future research needs to examine what specific teaching approaches for the use of VR are most suitable for long term language skill development, and in what ways VR can be used for language teaching in genuinely transformative ways rather than substituting or augmenting existing pedagogy.

As future work, the researchers plan to run an experimental study to assess the impact of VR on learners' general business English skills. As the scoping review results indicate, most studies involve short-term interventions and some fail to objectively measure language learning gains based on pre- and post-test scores. To avoid these pitfalls, a longitudinal study with control and experimental groups will be planned to evaluate the effect of VR on learners' affective states such as motivation and engagement and their business English learning gains. The study is planned to last over ten weeks with approximately 30 participants in each group. As shown in the literature (Cowie & Alizadeh, 2022; Rebenitsch & Owen, 2016), VR headsets are not comfortable to wear over long stretches of time and can cause cybersickness and other health issues. To avoid these problems that can negatively affect research findings, the researchers will use a 3D VR environment that works on PC browsers.

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Appendix A

Articles reviewed:

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Appendix B

Search terms:

(WebVR OR Web-based VR OR Web-powered VR OR Web VR OR Desktop VR OR 2D VR OR Web-based virtual reality OR Web-powered virtual reality OR Web virtual reality OR Desktop virtual reality OR 2D virtual reality OR Immersive web OR Metaverse OR Metaverse-based OR Metaverse-powered OR Immersive learning) AND (Language learning OR Second language OR Foreign language OR Language learner OR Language education OR Language teaching)

Alizadeh, M., & Cowie, N. (2022). Language learning and virtual reality: A scoping review. In S. Wilson, N. Arthars, D. Wardak, P. Yeoman, E. Kalman, & D.Y.T. Liu (Eds.), *Reconnecting relationships through technology. Proceedings of the 39th International Conference on Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education, ASCILITE 2022 in Sydney*: e22258. https://doi.org/10.14742/apubs.2022.258