

# Exploring Chinese student's perceptions of learning management systems: a community of inquiry approach

## Abstract

Learning Management Systems (LMS) have become essential platforms for online teaching in higher education, providing spaces for synchronous and asynchronous communication, online interaction, and collaboration. This study investigates the perceptions of Chinese international students regarding their learning experiences in a university course, via an LMS designed based on the Community of Inquiry (CoI) theoretical framework. Twenty Chinese students participated in narrative interviews. The findings indicate overwhelmingly positive perceptions among Chinese students. They expressed satisfaction with the CoI LMS course design, which incorporated techno-pedagogical perspectives and a seamless learning approach. This approach facilitated collaborative, constructive, and meaningful learning in an environment that provided spaces for collaboration, interconnectivity, communication, and learning support. It is recommended to integrate a techno-pedagogical approach in designing LMS course content, structure, organization, communication, and assessment to meet students' diverse learning expectations.

**Keywords:** learning management systems (LMS), community of inquiry (CoI), design, collaborative inquiry, seamless learning, techno-pedagogy

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## Introduction

The COVID-19 pandemic interrupted normal education activities, leading to a transition to online instruction and impacting the pedagogy, course design and delivery, and learning experience of students in higher education worldwide. As a result of the pandemic, all courses transitioned to online instruction. The sudden changes required both teachers and students to be adaptable and acquire new attitudes, knowledge, skills, and understanding in response to the new demands.<sup>1</sup>

This study investigates the learning experiences and perceptions of third-year Chinese undergraduate students enrolled in the Organizational Communication course at a university in New Zealand, taught through the learning management systems (LMS) designed based on the CoI framework. The students had been using Stream, the university's learning management system, during their first two years of study as a form of blended learning. The increased severity of the COVID-19 pandemic and severe movement restrictions imposed by the pandemic forced the course to shift online. Due to border lockdowns in both China and New Zealand, many Chinese students enrolled in the course were unable to travel and were therefore stranded in China. They were classified as 'offshore students.' Through LMS, the course could still be managed, organized, and facilitated. Their voices and reflections will shed light on the LMS course design and online pedagogical practices.

## Background

Information technology has changed the way universities organize and facilitate teaching and learning. Learning management systems (LMS) have now become essential tools for blended and online learning in higher education. One of the most popular LMS is Moodle, which offers an extensive range of features that meet the needs and expectations of online teaching and learning.<sup>2</sup> Moodle enables teachers to create professionally structured course content

by incorporating slides, images, videos, files, text, links, and text formatting. Additionally, it provides communication tools to engage all or individual students enrolled in the class, tracks student progress through data analytics of attendance and assignments, and facilitates the organization of group activities.

The design philosophy and development of Moodle are guided by a particular philosophy of learning and teaching called "social constructionist pedagogy". This pedagogy involves creating a dynamic and collaborative learning environment where learners construct knowledge through interaction with teachers, fellow students, the environment, technology, and learning resources across formal, semi-formal, and informal levels.<sup>3</sup> LMS has the capacity to meet varied learning needs of students who demand flexible, personalized, and unconstrained ways of learning, enabling them to learn at their own time, place, and pace within a community of inquiry.<sup>4</sup>

The university has adopted Moodle LMS since 2013 with a rebranded name Stream. Moodle LMS, based on the principle of social constructionism, assumes that learners can achieve desirable learning outcomes in a true collaborative environment that needs to be open, flexible, and adaptive to respond to the needs of each individual participant.<sup>5,6</sup> This principle of social constructionism is consistent with the community of inquiry (CoI) theoretical framework formulated for blended and online learning design.<sup>7-9</sup> LMS tools incorporate constructive-collaborative approaches to learning, serving as catalysts for self-reflection, facilitating interaction, engagement, and active learning, offering pedagogical flexibility, and supporting effective course design practices. These core features are grounded in the CoI principles of collaborative constructionism and learner-centeredness.<sup>7,10,11</sup>

There is a large body of quantitative research literature on the application and practices of the CoI framework. However, qualitative research on the application of the framework, on the design of LMS courses, and on the learning experiences of international students

engaging in online learning while studying offshore has not been empirically explored. In addition, much of the literature on the application of the CoI framework has focused on asynchronous online communication, with limited attention to the use of synchronous communication tools, such as the effective use of social media. Synchronous communication learning environments created through Zoom conferencing and WeChat 24/7 connectivity have removed many barriers and problems identified in past online course design and further increased the popularity and application of the CoI framework. This study, adopting a qualitative interview approach, intends to fill this gap by examining Chinese students' perceptions of their learning experiences through LMS. The proposed research questions are:

*RQ 1: How did Chinese international students perceive their online learning experience through the learning management systems and associated social media?*

*RQ2: How satisfied were they with their online educational experiences?*

Students serve as constituents in the process of teaching and learning. Students' unique perceptions and feedback are important components in evaluating the Community of Inquiry (CoI) aspects of LMS course design and delivery. By sharing their experiences and perspectives on navigating the LMS interface and engaging with CoI elements and pedagogical practices, students provide valuable insights for instructors to reflect on their teaching methods and course design. Through their voices, students demonstrate their understanding of effective teaching, online class management, engagement strategies, and creating a conducive learning environment.<sup>12</sup>

## Literature review

The CoI framework provides a roadmap, principles, rationality for the selection of strategies and guidelines, templates, and rubrics for blended and online learning approaches and course designs.<sup>13</sup> The framework consists of three key elements of an educational experience: social presence, cognitive presence, and teaching presence. Social presence refers to identification with and participation in the community, purposeful communication in a trusting environment, and development of interpersonal relationships. Cognitive presence is defined as 'the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry'.<sup>9</sup> Teaching presence involves design and organization, discourse facilitation, and direct instruction.

Most studies have shown that the Community of Inquiry (CoI) framework and the associated constructs of teaching, social, and cognitive presence can serve as a benchmark for LMS design.<sup>14-18</sup> Shea and Bidjerano<sup>19</sup> called for consideration of the connection of the CoI framework with technological innovations that can support the three constructs for instructional designers from different disciplines. To understand this connection in online course design for LMS, it is important to take a sociomaterial approach to uncover the interlocking connection of the social and the material.<sup>20</sup> This approach is concerned with the relationship between technologies as material tools and social frames, establishing the materiality of situations that include networks, and co-constitutive interactions between humans and non-humans,<sup>20-24</sup> in this case, between all those involved in teaching and learning and other nonhuman elements, such as course materials, technology, and LMS.

Sociomaterial configuration is a constitutive entanglement, and all elements (social or technological, human, and material) are inseparable.<sup>21,25</sup> Leonardi and Rodriguez-Lluesma<sup>26</sup> used the term

'imbrication' to refer to sociomateriality as a space where different communities engage in conversations between people, technologies, and materials, negotiating relationships to achieve collective goals. As a result, the possibility for course design depends largely on the understanding of the significance of sociomaterial practices and the designer's ability to navigate the interconnected elements to achieve pedagogical goals.<sup>26</sup> Designers can benefit from taking a sociomaterial approach to design, balancing the social and technological aspects in CoI design for learning management systems.<sup>27</sup> Johri<sup>25</sup> emphasized that as learning and technology are inseparable, 'any effort to theorize learning practices must encompass technology in learning environments'.

The sociomaterial configuration takes a techno-pedagogical perspective to incorporate technology in designing a course curriculum to ensure that technology is adopted to support pedagogical practices, including teaching and learning processes, strategies, procedures, and methods, and to help students master the course content through active-collaborative seamless learning.<sup>28</sup> Seamless learning refers to a learning style where one can learn in a variety of contexts (formal and informal, online or offline, synchronous or asynchronous), and can switch from one scenario to another, with technology as a mediator.<sup>29</sup> Wong<sup>30</sup> defines seamless learning as 'when a person experiences a continuity of learning and consciously bridges the multi-faceted learning efforts, across a combination of locations, times, technologies, or social settings'.

The concept of seamless learning, which emphasizes the impact of learning contexts on students' learning experience, habits, and perceptions, can influence how learning experiences are designed to better support learner goals. This concept is consistent with the principles of the Community of Inquiry (CoI) framework, which emphasize a deep approach to learning, a collaborative constructive learning environment, and supportive and critical communication of inquiry.<sup>10</sup> The seamless learning approach encourages social interaction, engagement, and active and collaborative learning, enables learning effectiveness, flexibility across time and space, and provides the possibility of improving learning experiences.<sup>31</sup> The cross-temporal and cross-spatial nature of seamless learning challenges curriculum rigidity.<sup>28</sup> Seamless learning requires lecturers and course designers to develop flexible pedagogies, curriculum design, and learning resources to better support learning trends.<sup>32</sup> The seamless learning approach plays a significant role in facilitating the CoI presences, removing 'seams' that disrupt learning inquiry, and creating an environment of sociomateriality of learning – balancing human and nonhuman (technological) aspects of learning to provide maximal learning support.<sup>30</sup> Seamless learning is a learner-centered approach that enables designers to cater to the anticipated needs and expectations of students and to create a learning environment through LMS and technologies that allows students to access course content anytime and anywhere without any technological, temporal, and situational constraints.<sup>33</sup>

Taking a seamless approach from a sociomaterial perspective, LMS course designers make decisions about various dimensions of learning theories, design principles, the educational goals and strategies, the learning process, the stages of the teaching process, educational and technical possibilities and constraints,<sup>34,35</sup> and course design, such as the content, structure, pedagogy, learning activities, assessment procedures, and use of technology to support and facilitate learning.<sup>25</sup> The study by Garrison and Cleveland-Innes<sup>11</sup> shows that design plays a critical role in influencing student approaches to learning and learning outcomes. It is important to consider structure and leadership, and the three categories of teaching presence (design,

facilitation, and direction) to create an online environment to sustain cognitive presence consistent with deep and higher-order learning and learning goals.<sup>10,36</sup> The sociomaterial approach offers a lens for CoI designers to integrate the three CoI constructs through a deep understanding of the relationships between the material aspects of technologies and the social aspects of teachers and learners. Garrison and his colleagues have developed seven instructional design principles stemming from the CoI framework to guide the design of blended and online courses and programs.<sup>10,13,35</sup> Teaching presence of the CoI framework is central to the formulation of these principles. Designing a course lies at the heart of teaching presence.<sup>10</sup> It is a planning process involving systems thinking,<sup>21-23</sup> a process that systematically considers the involvement of human and non-human, social and material/technological, pedagogical, and contextual aspects of course design. Garrison<sup>10</sup> stressed that these principles should not be rigidly implemented without considering the contextual factors. As the process of design is dynamic, flexible, open, context-dependent, and adaptable to the particular needs of the changing environment, the designed learning activities should be congruent with the intended learning outcomes, environmental, and technological demands.<sup>35</sup> Garrison<sup>10</sup> maintained that there are no one-size-fits-all

rules in designing effective student learning experiences grounded in constructive-collaborative ideas and the CoI framework that require designers' experience, knowledge, insight, reflection, adaptability, and thorough understanding of theoretical underpinnings.

## Methods

The aim of the study is to investigate Chinese international students' perceptions and levels of satisfaction of their online learning experiences through LMS.

## Participants

Two cohorts of twenty Chinese international students were recruited for the 30-40 minutes narrative interviews. They studied online the third-year course Organizational Communication through Stream during the COVID-19 pandemic. They were stranded in China because of the border closures. Eight (8) participants were enrolled in the course in Semester One, February-June 2020. Twelve (12) participants were enrolled in the course in Semester One, 2021 (Table 1).

**Table 1** Chinese international student profile. Names are pseudonyms

	2020 Cohort				2021 cohort				
	Given name	Surname	Sex	Location	Given name	Surname	Sex	Location	
1	Zheng	Fu	M	Hubei	9	Hua	Tang	F	Jilin
2	Amy	Xue	F	Sichuan	10	Danling	Ren	F	Sichuan
3	Jie	Wang	F	Anhui	11	Qiling	Zhang	M	Yunnan
4	Xu	Kou	F	Shanghai	12	Xiaomei	Liao	F	Shenzhen
5	Jing	Li	M	Guangdong	13	Zhiming	Tian	M	Chongqing
6	Xiaochun	Lin	M	Shenzhen	14	Yang	Liu	F	Zhejiang
7	Bozheng	Tao	M	Shenzhen	15	Yuan	Hao	F	Guizhou
8	Xiaoning	Zheng	F	Jiangsu	16	Longyu	Ren	M	Guangdong
					17	Ying	Wang	F	Henan
					18	Shiliang	Wang	M	Shenzhen
					19	Zuguo	Lin	M	Sichuan
					20	Lisa	Wu	F	Liaoning

## Research method and dimensions

A narrative interview approach was used to conduct primary qualitative research in educational settings. Narrative inquiry is an approach involving inquiry directed at a collection of narratives of the individual experiences, stories, and oral histories of research participants.<sup>37</sup> This effective and feasible approach enabled the researcher to collect open-ended data and to examine participants' perceptions, beliefs, attitudes, and feelings about various aspects related to LMS usage, including: LMS affordances, course design involving the course guide, the LMS Stream dashboard, the course content, learning activities, assessment, seamless learning, learning support through social media, and self-regulated learning through LMS.

## The process

Kvale<sup>38</sup> explained that qualitative interviews are "attempts to understand the world from the subjects' point of view, to unfold the meaning of people's experiences, to uncover their lived world prior to scientific explanations". The qualitative approach allowed the researcher to listen to the participants' narratives in the process of inquiry to have a deeper understanding of the dynamics of their

perceptions of their online learning experiences. Narrative interviews collect, analyze, and unpack stories that enable the researcher to understand the discursively constructed meanings, meaning-making device, experiences, and insight in life in storytelling<sup>39</sup> and ensure an 'intrinsic study' to "investigate and report the complex dynamic and unfolding interactions of events, human relationships, and other factors in a unique instance".<sup>40</sup>

All interviews were conducted in Mandarin Chinese through Wechat, a popular social media platform in China that allows video and audio calls. The audio and video interviews were digitally recorded and transcribed verbatim for analysis. The transcripts of this study were thematically categorized, coded, and assigned meaning for data analysis, then put into logical categories based on the CoI framework and relevant literature to identify significant thematic structures and patterns. The transcripts were coded according to the major themes and repeated key words. Coding provided a framework for further data analysis to make sense of all the words.<sup>41</sup>

The data analysis involved both inductive and deductive approaches to have a complete understanding of the research issues. The inductive approach examined the interviews in a holistic fashion,<sup>42</sup> allowed critical themes to emerge, and sought patterns. The deductive approach

began with the CoI theoretical framework to form hypotheses, collect, and analyze the data from the theoretical perspective. The names of the participants are pseudonymous to protect confidentiality.

## Results

This study, employing the COI theoretical model, examines the perceptions and satisfaction levels of Chinese international students regarding their experiences with LMS online learning. The three constructs of COI—teaching presence, cognitive presence, and social presence—are interdependent. Teaching presence is central in fostering a community of inquiry by integrating cognitive and social aspects to facilitate knowledge creation and new learning. It involves designing an online learning environment guided by principles that provide spaces for active, dynamic, and collaborative inquiry. In this study, teaching presence is reflected in the design of the course guide, the dashboard, the structuring of the course content, learning activities, assessment, and the provision of learning support. This Stream design and structure encourage student self-regulated learning with a seamless approach.

### The course guide

The course guide is an essential part of the LMS course design. It contains learning outcomes, learning activities, and assessment. It is both a standalone document and a guide embedded into the LMS course portal. It serves as both a standalone document and a guide embedded within the LMS course portal. All participants provided highly favorable feedback regarding the course guide's clarity, organization, and helpfulness in navigating the course materials.

Ying expressed her high level of satisfaction with the course, stating that the guide facilitated student navigation through the course, saved time by consolidating information from various locations, and reduced workload and anxieties associated with potentially missing important information. Xu appreciated the lecturer's welcome message, which was accompanied by the course guide sent to all students via email three weeks prior to the beginning of the course. This initiative fostered a sense of belonging within the community, established a climate of trust and support, and motivated students to eagerly anticipate the start of the course.

Shiliang found the guide extremely helpful as it contained all the critical course information, allowing students to be fully prepared and make practical learning plans. Hua expressed appreciation for the guide, which helped her understand the course expectations and learning outcomes. It also allowed her to utilize the LMS portal fully, accessing all learning resources and preparing for any challenges.

### The Stream dashboard

The dashboard serves as the default homepage in the LMS, featuring active links to other course components. It provides viewers with an overview of the course.

Jie commented that the dashboard offered a comprehensive view of the course, incorporating learning content, course information, communication tools, assessment portals, the course calendar, and student support, all easily accessible with a click. He remarked that the professionally displayed beautiful design, layouts, and structure instilled a sense of pride in students due to its professionalism. Based on his experience with Stream, Xiaochun noted that the Stream dashboard's utilities took into account students' technological knowledge, learning goals, needs, and expectations. It also ensured easy access to learning content while providing a space for student interactivity and engagement. Xiaochun appreciated the dashboard's design, which offered an overview of the course, learning activities,

and communication channels, facilitating connections with fellow students studying the same course.

### The course content

The course contents block is a plugin within LMS Stream that displays all visible sections of the course, including readings, topics, and multimedia resources.

Zheng found the course content on Stream—including weekly study topics, assigned readings, video recordings, and assessments—to be expertly organized and structured. This organization facilitated students' understanding of the course, disciplinary theories, knowledge, and practices, as well as their participation and collaboration within the learning community.

Zhiming also expressed satisfaction with his learning experience using Stream. He appreciated the recommended readings, typically 2 to 3 each week, available on Stream. These readings facilitated his understanding of the topics and subject matter covered in the course. The video clips were very helpful to his visual learning, enabling him to better understand the course concepts and theories through visualization.

Shiliang found the assignment samples uploaded on Stream extremely helpful as guides for completing his assignments. These samples aided his comprehension of assignment requirements, structure, layout, organization, presentation, as well as the use of citations and references.

### Learning activities

Online learning activities related to the course content focus on interaction and aim to create an online learning environment that facilitates the CoI presences consistent with the learning goals. These activities include forum discussions, group activities, assignments, case studies, workshops, and guest lectures.

Zuguo expressed great excitement about engaging in conversation with a guest speaker who authored one of the recommended books during a Zoom meeting. This interaction further fueled his enthusiasm and interest in studying the subject. Yang shared a similar experience, expressing appreciation for the opportunity to engage with internationally renowned scholars and researchers in the field of organizational communication. These scholars, hailing from various countries including the United States, the UK, Norway, Finland, and others, were invited to deliver Zoom presentations on selected topics.

Lisa felt socially and academically supported on the discussion forums, which provided her with opportunities to make friends with other team members. Danling expressed great interest in the course activities, which taught students practical problem-solving and critical thinking skills. For example, she learned how to identify ethical issues, communication issues, tensions, and conflicts in the case studies, and understood how to address these issues in real-life organizational communication. Xiaoning highly praised the discussion forums for their focus on learning interaction, engagement, and collaborative learning. She said,

Seeing others taking part in discussions motivates me to get involved and engaged. I can see how other students understood and responded to the questions and learn from the threaded discussions.

Longyu had a similar experience. He lacked confidence in speaking English, but he enjoyed participating in online forum discussions where he could carefully craft his thoughts and express himself in well-written English.

## Assessment

Assessment is an essential part of LMS CoI course design, identifying the knowledge, skills, and attitudes students should acquire and develop during the learning process.

Hua describe her learning experiences with assignments that emphasize the learning process, participation, and collaboration.

There are four assignments in the Organizational Communication course, all contributing to learning and skill development. These assignments focus on reflection, analytical skills, critical thinking, research skills, and collaboration, enabling me to gain a good grasp of the subject.

Xiaomei expressed her positive experiences in doing assignments. She said each assignment gave a variety of options and so she could choose the one she felt most confident with and achieve the best learning outcomes. Ying commented that having opportunities to choose an option created a supportive learning environment, allowing her to take control of her learning, reduce anxiety, and enhance the learning experience. In addition, Xiaoning stated,

I have learned a lot from doing assignments, and my confidence grew each time I completed one. With the social media platform WeChat always available, I could consistently receive feedback on my questions from my ever-present professor.

Jing said he had learned a lot from his peers in workshops, group assignments, and online forum discussions. They became friends through their learning activities. Similarly, reflecting on the team performance during a group assignment via WeChat video conferencing, Yang said, there is no doubt that my team's collaboration on the project was fruitful. Prior to this project, I had never participated in any group assignments. Now, through this experience, I understand the significance of teamwork, collaborative problem-solving, and collective contributions, which can lead to better outcomes and innovation. Additionally, this teamwork taught me how to address practical organizational problems.

## The seamless learning approach

Most students gave a thumb up to seamless learning. Ying narrated her learning experience with satisfaction with seamless learning:

In China, many foreign social media platforms are banned. Our New Zealand teachers often provided links to webpages for students to watch videos on platforms like YouTube or Facebook. However, we were unable to access these links due to the restrictions. Understanding our difficulties, our teachers uploaded the downloaded videos to Stream, the university-owned website, which was accessible in China and not subject to bans.

Bozheng told a similar story. He mentioned that when the University discovered that many foreign websites and apps, including the Google search browser, were banned in China, they provided students with a VPN app to safeguard their security and privacy. Most importantly, this VPN app helped students 'jump over the Great Firewall' to access banned webpages and foreign social media platforms such as YouTube, Facebook, and Instagram.

Yuan was very pleased with her learning experience using Stream, which was purposefully designed to meet students' needs and expectations. She highlighted her over-met expectations in this way:

When I studied in New Zealand before the outbreak of the COVID-19 pandemic, I often completed my assignments, using the

PC in the library. All our assignments were required to be submitted in a MS Word format. While in China, we could not afford Microsoft Office. The University seemed to understand our needs and provided a link for us to use the software from its Intranet. That was a huge help.

## Learning support through social media

The LMS Stream platform enables asynchronous but not synchronous video communications. This gap is bridged through links in the LMS to external social media platforms such as Zoom and WeChat apps, facilitating students' learning.

Amy reported that she preferred Zoom meetings over physical classrooms. As a second language student, she experienced apprehension when attending in-person classes. Zoom meetings—lectures, tutorials, workshops, and group activities—helped alleviate her fears. Amy found that she learned more from online classes than she had expected. In New Zealand, attending in-person classes left her feeling helpless due to difficulties understanding the language, concepts, and teachers' accents, and she struggled to take useful notes. In the virtual class, she attended Zoom meetings and tutorials. She benefited from watching Zoom recordings, which automatically displayed audio transcripts. While not always accurate, these transcripts enhanced her learning, increased her confidence as a second language speaker, and improved her linguistic competence.

Most Chinese students used WeChat as their primary communication tool and generally did not frequently check their emails. Qiling enjoyed New Zealand lecturers' use of Wechat to support learning.

When I had any questions or queries, I sent a text message to my teacher. Within a few minutes, I received her reply. She was very kind and helpful. For difficult questions, she would initiate video conferencing to provide detailed explanations. That was cool.

Danling described her learning experience as 'very positive.' She stated:

Communicating with the teacher via WeChat was really beneficial. WeChat made the student-teacher social relationships closer. I feel like our teacher is always on my side, ready to offer help when necessary. In the past, we had to make an appointment to meet the teacher, but now it's different. Her presence is always visible.

Xiaoning loved the WeChat group, which provided a social platform and a learning environment for students to engage in collaborative learning and mutual support. She said, "When I have questions, I ask my classmates in the WeChat group first." The WeChat group has become a learning community.

## Self-regulated learning

Stream, as an online learning platform, enables seamless learning and empowers students to develop self-regulated learning skills through LMS CoI designs for learning activities within the community of inquiry. All participants agreed that the Stream design, structure, course content, learning activities, and approaches provide a student-centered (i.e., individualized) self-regulatory learning experience that optimizes intellectual growth and fosters self-directed active learning and independent dispositions.

Hua reported that with textbooks, required and recommended readings, and assignments all uploaded on Stream, she could download them and complete the readings before Zoom meetings. This allowed teachers to focus on providing learning support during tutorials. Independent learning improved her understanding of the subject,

leading her to change her learning habits from the past: 'Listening to lectures in face-to-face classes and never doing any readings before class.' Jing found that online learning enabled him to manage his time, space, and progress effectively. He said,

With an abundance of learning resources available on Stream, such as assignment samples, guides for writing essays, reports, case studies, and reflections, I found self-regulated learning enjoyable and rewarding. I could learn in my own way and at my own pace.

Similarly, Qiling enjoyed his learning through Stream, designed in such a way that empowered students to regulate their learning activities and take control of their own learning process. He could determine the learning style that suited him best.

Lisa was certain that online learning through Stream had developed her self-regulated learning skills by adapting her learning approaches to the online environment. Such skills motivated her academically, encouraged her to reflect, and set benchmarks for her success. Yang explained that being a self-regulated learner was attributed to learning support, scaffolding, teacher direction and facilitation, explicit teaching, and effective technological support. Ying felt liberated through self-regulated learning: "I have become the master of my own learning process. I can understand and control my learning environment through self-planning, self-monitoring, and self-instruction."

## Discussion

The findings show that, in general, Stream, as a web-based technology, is an effective platform for assisting learners in achieving their goals in a collaborative environment, catering to the needs of participants. The CoI theoretical framework proves useful in designing and delivering courses through Stream, providing a design philosophy to guide pedagogical practices and structure content based on CoI principles.<sup>17</sup> Stream lays out clear learning objectives, carefully structures course content, learning activities, and assessments, and adopts a sociomaterial seamless approach to assist students in achieving desired learning outcomes with seamless and thoughtful technological integration in both synchronous and asynchronous online learning.

The study has identified several advantages of deploying technology in Stream. The platform provides a space for lecturers to harness technological potentials to enhance social, cognitive, and teaching presence in building a community of inquiry that emphasizes constructive-collaborative approaches to learning, self-reflection, and the development of metacognition.<sup>10,43</sup> It enables multi-dimensional interactions in both active online and offline learning environments: student-to-instructor and student-to-student interactions, as well as interactions with course content and technology. Stream enhances students' engagement and active involvement in the learning process, while also fostering their self-regulated learning skills and autonomy.

In designing the Community of Inquiry (CoI) in the Learning Management System (LMS), the course guide, as a defining document, plays a critical role in determining the success or failure of LMS pedagogical practices. Embedded within the course guide are the CoI principles of design and organization, which stipulate clear communication of the course philosophy, topics, goals, learning outcomes, assessments, and learning tasks and activities. The guide reflects the instructor's leadership and a strong teaching presence in terms of course design and instructional management.

This study demonstrates that course content was one of the most important organizational issues concerning student satisfaction. It is

crucial to carefully consider the selection of content for the curriculum and to design pedagogical strategies and procedures guided by learning theories and principles. Interactions with content, teachers, and peers play a vital role in building learners' cognitive structures during the knowledge acquisition process.<sup>44,45</sup> Content, serving as a central focus for course structure, communication, and assessments, enables teachers to organize learning materials and activities along specific learning pathways.

When planning pedagogical content for Stream, it is essential to consider creating an effective learning environment that integrates social, cognitive, and teaching presence.<sup>17</sup> This involves aligning teaching activities with course expectations and learning outcomes, balancing content with skills development, technological affordances and constraints, and considering the value that specific content can contribute to achieving learning goals and meeting course outcomes.

Furthermore, offering a variety of materials and multiple communication channels is important to enhance the student learning experience. As online learning primarily relies on asynchronous text communication, simply uploading learning content on Stream may not suffice. It is crucial to design communication strategies to support student learning, such as providing office hours, lectures, tutorials, and discussions through synchronous communication tools like Zoom or social media.

Students learning online via LMS mediate content with multiple technological devices in various contexts. The findings suggest that students felt satisfied when their learning needs were considered from both techno-pedagogical and sociomaterial perspectives. The techno-pedagogical perspective involves integrating technology into course curriculum design to ensure that it supports pedagogical practices, including teaching and learning processes, strategies, procedures, and methods, thereby aiding students in mastering course content through active, collaborative, seamless learning.<sup>28</sup>

The sociomateriality perspective examines the interactions between humans and technologies and how humans utilize technologies to achieve their desired goals. The findings indicate that the seamless learning approach greatly facilitated student learning. This approach considers how physical, intentional, social, and technological contexts influence student learning with multiple mobile devices.

Online learning via Stream primarily relies on asynchronous communication through discussion forums and emails. It is crucial to design communication strategies that support student learning by enabling synchronous communication and engagement with teachers and peers, removing temporal, spatial, and technological barriers.

This study has revealed that students benefit most from both synchronous and asynchronous engagement and interactions, utilizing a combination of Stream and social media platforms. Popular platforms such as Zoom and WeChat offer features that facilitate the building of a community of inquiry, problem-solving, collaborative thinking, reflection, and other academic activities in an online environment similar to that of a physical classroom.<sup>46</sup>

Zoom provides collaborative tools that meet pedagogical needs, seamlessly integrating social, cognitive, and teaching presence within the learning community. Live synchronous meetings facilitate real-time interaction, engagement, teaching and learning activities, foster a sense of belonging, and motivate and support students in achieving their learning goals through self-regulated learning.

## Recommendations

The study has revealed some important insights into designing for a CoI in LMS. Here are some proposed recommendations:

1. The course guide is the defining document that determines the course content, structure, pedagogy, learning processes, resources, activities, communication, assessments, engagement, and interaction through the LMS. It should be given priority in designing a CoI in the LMS for both synchronous and asynchronous online learning.
2. Students benefit most from a combination of synchronous and asynchronous online learning. In designing a CoI in the LMS, designers should balance these two modes of learning and communication. Social media platforms, such as Zoom and WeChat, play a complementary role in the success of online learning.
3. The integration of a techno-pedagogical approach in teaching and learning should be considered when designing online course content, communication, and assessment. There is a need for LMS course designers to have mastery in both technological knowledge and pedagogical knowledge to meet various expectations for meaningful learning.
4. When designing for a CoI in the LMS, it is recommended that lecturers consider the sociomaterial perspective and the seamless learning approach to facilitate learning.
5. Domestic and international students may have different learning habits and processes. When designing an online course, it is important to align the learning objectives and teaching pedagogies with student profiles, cultural backgrounds, contextual factors, and technological considerations.

## Conclusion

This study investigated Chinese students' perceptions of their online learning experiences through the Community of Inquiry (CoI) design in Stream. Most students expressed satisfaction with their educational experiences, including the course guide, content, learning tasks and activities, assessments, and communication. The findings support the CoI framework and principles in designing an LMS online learning environment, providing spaces for active, dynamic, and constructive-collaborative inquiry, and enhancing and balancing social, cognitive, and teaching presence. The adoption of a techno-pedagogical approach integrates technologies with teaching pedagogies, encompassing both synchronous and asynchronous learning methods, and leveraging Stream functionalities and social media to support students' seamless learning and develop their self-regulated learning skills.

The weakness of the study is that the sample size was small, and the research subjects were limited to Chinese students only. Future research should compare the perceptions of LMS learning between domestic students and international or offshore students to identify key factors influencing their perceptions, learning behaviors, and performance. This will help design a Community of Inquiry (CoI) for LMS to better support students' learning needs and experiences.

The concepts of sociomateriality of learning and seamless learning align with the CoI framework, aiming to provide enhanced learning support and increase CoI presences. Future research can investigate how various dimensions of learning contexts and settings influence students' learning and how to support them in realizing sociomateriality of learning through the seamless learning approach.

Social media serve as key complementary components for LMS online learning, playing an important role in collaborative learning, the transfer of learning resources, and interaction with peers and teachers. Future research will explore how social media impact students' learning behavior and academic performance within the LMS learning environment.

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## Conflicts of interest

The authors declare that there is no conflict of interest.

## References

1. Wood R, Shirazi S. A systematic review of audience response systems for teaching and learning in higher education: the student experience. *Comput Educ.* 2020;153:103896.
2. Moodle. Features. Moodle. Published 2020.
3. Williams BC. *Moodle Manual for Teachers, Trainers and Administrators*. Rev ed. Version 1.4.3; 2005.
4. Coates H, James R, Baldwin G. A critical examination of the effects of learning management systems on university teaching and learning. *Tert Educ Manag.* 2005;11:19–36.
5. Behnagh RF, Yasrebi S. An examination of constructivist educational technologies: Key affordances and conditions. *Br J Educ Technol.* 2020;51(6):1907–1919.
6. Herrera-Pavo MÁ. Collaborative learning for virtual higher education. *Learn Cult Soc Interact.* 2021;28:100437.
7. Anderson T, Rourke L, Garrison DR, et al. Assessing teaching presence in a computer conferencing context. *J Asynchronous Learn Netw.* 2001;5(2):1–17.
8. Garrison DR, Anderson T, Archer W. Critical inquiry in a text-based environment: computer conferencing in higher education. *Internet High Educ.* 1999;2(2-3):87–105.
9. Garrison DR, Anderson T, Archer W. Critical thinking and computer conferencing: A model and tool to assess cognitive presence. *Am J Distance Educ.* 2001;15(1):7–23.
10. Garrison DR. *E-Learning in the 21st Century: A Framework for Research and Practice*. 3rd ed. Routledge; 2017.
11. Garrison DR, Cleveland-Innes M. Facilitating cognitive presence in online learning: Interaction is not enough. *Am J Distance Educ.* 2005;19(3):133–148.
12. Archambault L, Leary H, Rice K. Pillars of online pedagogy: A framework for teaching in online learning environments. *Educ Psychol.* 2022;1–14.
13. Garrison DR, Vaughan N. *Blended Learning in Higher Education*. Jossey-Bass; 2008.
14. Şahin M, Yurdugül H. Learners' needs in online learning environments and third generation learning management systems (LMS 3.0). *Technol Knowl Learn.* 2020:1–16.
15. Salah S, Thabet M. E-learning management systems: A feature-based comparative analysis. *J Inf Syst Technol Manag.* 2021;18:1–15.
16. Tello SF, Motiwalla L. Using a learning management system to facilitate learning outcomes assessment. In: Kats Y, ed. *Learning Management System Technologies and Software Solutions for Online Teaching: Tools and Applications*. IGI Global; 2012:138–156.
17. Tseng H. An exploratory study of students' perceptions of learning management system utilisation and learning community. *Res Learn Technol.* 2020;28:2423.

18. Van Wingerden C. Designing for inclusion within the learning management system: social justice, identities, and online design for digital spaces in higher education. *Int J Educ Pedagog Sci*. 2021;15(8):684–692.
19. Shea P, Bidjerano T. Community of inquiry as a theoretical framework to foster “epistemic engagement” and “cognitive presence” in online education. *Comput Educ*. 2009;52(3):543–553.
20. Johannesen M, Mifsud L, Øgrim L. Identifying social presence in student discussions on Facebook and Canvas. *Technol Knowl Learn*. 2019;24:641–657.
21. Fenwick T. Sociomateriality and learning: a critical approach. In: Scott D, Hargreaves E, eds. *The Sage Handbook of Learning*. Sage; 2015:83–93.
22. Fenwick T, Edwards R, Sawchuk P. *Emerging Approaches to Educational Research: Tracing the Sociomaterial*. Routledge; 2011.
23. Hattinger M. Sociomateriality and design – How do we un-pack technology for knowing in practice? Presented at: 24th European Conference on Information Systems (ECIS); June 12–15, 2016; İstanbul, Turkey.
24. Sørensen E. *The Materiality of Learning: Technology and Knowledge in Educational Practice*. Cambridge University Press; 2009.
25. Johri A. The socio-materiality of learning practices and implications for the field of learning technology. *Res Learn Technol*. 2011;19(3):207–217.
26. Leonardi PM, Rodriguez-Lluesma C. Sociomateriality as a lens for design: imbrication and the constitution of technology and organization. *Scand J Inf Syst*. 2012;24(2):79–88.
27. Li Y. *University Teachers' Pedagogical Work with Canvas: An Exploration of Teachers' Conceptions, Design Work and Experiences with an LMS* [dissertation]. University of Oslo; 2019.
28. Wong LH, Looi CK. The conceptual niche of seamless learning: an invitation to dialogue. In: Looi CK, Wong LH, Glahn C, Cai S, eds. *Seamless Learning: Perspectives, Challenges and Opportunities*. Springer; 2019:3–38.
29. Wong LH. A learner-centric view of mobile seamless learning. *Br J Educ Technol*. 2012;43(1):E19–E23.
30. Wong LH. A brief history of mobile seamless learning. In: Wong LH, Milrad M, Specht M, eds. *Seamless Learning in the Age of Mobile Connectivity*. Springer; 2015:2–40.
31. Krull G, Duarte JM. Moving to seamless learning. In: Power R, Ally M, Cristol D, Palalas A, eds. *LA Learning: Mobilizing and Supporting Educator Practice*. International Association for Mobile Learning; 2017:150–183.
32. Zhu ZT, Yu MH, Riezebos P. A research framework of smart education. *Smart Learn Environ*. 2016;3(1):1–17.
33. Nussli N, Oh K. Culturally responsive pedagogy, universal design for learning, ubiquitous learning, and seamless learning: how these paradigms inform the intentional design of learner-centered online learning environments. In: Panconesi G, Guida M, eds. *Handbook of Research on Teaching with Virtual Environments and AI*. IGI Global; 2022:163–188.
34. Göksu I, Özcan KV, Çakir R, et al. Content analysis of research trends in instructional design models: 1999–2014. *J Learn Des*. 2017;10(2):85–109.
35. Vaughan ND, Cleveland-Innes M, Garrison DR. *Teaching in Blended Learning Environments: Creating and Sustaining Communities of Inquiry*. Athabasca University Press; 2013.
36. Vaughan N, Garrison DR. How blended learning can support a faculty development community of inquiry. *J Asynchronous Learn Netw*. 2006;10(4):139–152.
37. Butina M. A narrative approach to qualitative inquiry. *Clin Lab Sci*. 2015;28(3):190–196.
38. Kvale S. *InterViews: An Introduction to Qualitative Research Interviewing*. Thousand Oaks, CA: Sage Publications; 1996.
39. Karch F. Narrative interviewing. In: Allen M, ed. *The Sage Encyclopedia of Communication Research Methods*. Vol 3. Sage; 2017:1072–1075.
40. Stake R. *The Art of Case Research*. Sage; 1995.
41. Gibbs G. *Analyzing Qualitative Data*. Sage; 2007.
42. Berg BL, Lune H. *Qualitative Research Methods for the Social Sciences*. 9th ed. Pearson; 2017.
43. Garrison DR. Design principles. *The Community of Inquiry*. 2019.
44. Garcia C, Badia A. Posting messages and acquiring knowledge in collaborative online tasks. *Technol Pedagog Educ*. 2020;29(3):377–388.
45. Moore MG. Three types of interaction. In: Harry K, John M, Keegan D, eds. *Distance Education: New Perspectives*. Routledge; 1989:19–24.
46. Serembus JF, Kemery D. Creating dynamic learning with Zoom. *Nurse Educ*. 2020;45(6):291–293.