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ORIGINAL ARTICLES

Learning Spaces of Higher Education for Postdigital Citizens

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Abstract

Citizen science research is often interdisciplinary, responsive to public concerns and inclusive of community knowledge. It can also involve multiple voices coming together to address 'wicked' problems. In this paper, we introduce CmyView, a visual and creative methodology that is suitable for research projects in citizen science, particularly those focusing on learning spaces. CmyView's conceptual framing is informed by research in embodied cognition, digital heritage, networked learning, and the postdigital. The paper discusses the CmyView methodology, as grounded on five core actions: walking, capturing, sharing, connecting, and documenting via public participation. We argue that the CmyView methodology and its accompanying app can offer an innovative way to understand, manage, document, engage with, and study the social and educational significance of learning spaces through community participation.

Keywords Postdigital · Learning spaces · Citizen science · Visual methods · Walking methods

Introduction

Human experiences are influenced and shaped by the qualities of the spaces people inhabit, whether online, offline, or hybrid. Similarly, in the context of higher education, students' experiences and their emergent learning activities are likely to be affected by the qualities and experience they have of their spaces for learning. Massey (2005) pointed out that spatial experiences are connected to existing social relations and practices, involving humans and things. There is also an

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important distinction to be made between the notions of 'place' and 'space', and we take on Cresswell's (2005) perspective to consider *places* as evoking relations between humans and spatial configurations, implying attachments to something concrete, something that is experienced. This gives *spaces* a more abstract and detached meaning, for instance in an impersonal description of a hybrid, physical, or digital situation. These ideas have informed our research, which lies at the intersection of learning, design, architecture, and digital technologies. We are interested in relations between humans, things, and settings, in how the digital and material intersect, and in how multiple elements come together to influence learning activity (Carvalho et al. 2017). Drawing on a postdigital perspective, we probe places and spaces while considering that boundaries are blurred, for instance as we walk through streets or shops with our actions being captured on surveillance cameras, or when we drive into a carpark and have to reach for a smartphone to process a QR code before we can park. A postdigital lens brings about connections between data and humans, as well as human interactions with data that connect to people's experiences of places and spaces. We use a postdigital lens to explore these relations, where digital technologies and practices are woven into our everyday and educational surroundings, with human and non-human bodies entangled (Lamb et al. 2022; Carvalho and Lamb 2024).

Through our CmyView projects, we have developed a research methodology that harnesses walking, photography, technology, and learning (Carvalho and Garduño Freeman 2018, 2023). This methodology has been used in research projects with university students at two institutions. The methods involve taking photographs and recording audio messages along a spatial trajectory. Together these form a collection of digital artefacts representing personally meaningful places. Each collection is captured while participants are walking outdoors in the natural or built environment, or indoors within a university campus. The collections participants created then become traceable artefacts to be shared with a community of fellow walkers, something that can be experienced by others, something that documents existing social values attached to places, as something that evolves and can be extended by others. This in turn generates data to be studied and analysed by educators, researchers, policymakers, and other stakeholders, including the students who participate in the studies.

This paper discusses foundational ideas in the CmyView methodology and argues that CmyView offers a way to understand, manage, document, engage with, and study the social and educational significance of learning spaces through community participation. The CmyView projects connect to citizen science in two ways. First, through the pursuit of new approaches that are inclusive of public participation, and where a key aspect is to contribute to science in ways that are more responsive to public concerns, and inclusive of community knowledge (Jandrić et al. 2023). Second, citizen science connects to our interest in interdisciplinary projects that aim at 'addressing "wicked" problems of human behavior and agency' (Tauginienė et al. 2020: 1). Wicked problems are problems that are ill-defined, complex and to which many solutions exist. In education, these types of 'problems' are often connected to wider issues in society such as poverty, colonisation, trauma, racism, and issues that often carry over into the school or university learning environments. One single

solution will not be able to create an environment for inclusive education. Instead, this involves a holistic approach and the coming together of multiple elements, so that learners can engage with opportunities that foster a learning culture of respect and belonging.

The next section discusses the use of visual methods in learning spaces research to then introduce the CmyView methodology and app, including its underlying assumptions and how it has been used. The first case study concerns research involving architecture students at an Australian university and the second case focuses on students' connections to learning spaces in a New Zealand university. The findings and discussion include the entanglement of technologies to emergent learning activity, which enable various layers of individual, social, and community learning.

Visual Methods in Learning Spaces Research

Visual research methodology includes a range of approaches such as the creation, collection and analysis of photographs, drawings, maps, video, and other image-based material (see Rose 2022). Because of the visual nature of those settings where educational activity is performed (irrespective of whether we are mostly concerned with physical or online environments), visual methods have become firmly established within inquiry that seeks to understand the complexity of contemporary learning spaces.

Even limiting our scope to higher education contexts, the value of visual approaches is clear, as researchers have used images to support a range of learning spaces inquiry. This includes the use of maps to explore student's digital and physical sites of study (Gourlay and Oliver 2017), the elicitation of postcards to explore how distance students engage with their university (Bayne et al. 2014), and the use of photovoice to explore spaces and places of connection (Gravett et al. 2023). Images have also enriched ethnographic accounts of learning spaces, offering a valuable visual element to the recounting of research stories (e.g. Lamb 2024; Yeoman 2024).

When a single photograph of a design studio or science lab can expose the assemblage of human and non-human bodies through which these and other learning spaces are performed, visual methods have been used to explore the sociomateriality of educational environments. Bringing a sociomaterial sensibility to the study of images can, among other things, help us to understand the learning spaces that students value and that might nurture belonging (Carvalho and Garduño Freeman 2023), the ways that digital resources contribute towards the negotiation of spaces for learning across and beyond the campus (Gourlay and Oliver 2017), and the ways that technologies affect classroom power dynamics (Lamb 2019). Visual methods have also become productive within postdigital studies of learning spaces, for instance in depicting the blurring of traditional spatial boundaries (Wardak et al. 2022), conveying the evolving character of teaching spaces and practices (Gravett et al. 2023), and illuminating how digital technologies are woven into the writing spaces of academic researchers (Carvalho and Lamb 2024).

These and other visual approaches are particularly helpful as we seek to critically explore learning spaces beyond the campus, bearing in mind the practical and ethical issues that can prevent the researcher visiting these domestic, social, and transitory sites in-person. Instead, we can gain meaningful insights into these settings by asking participants to visually document their surroundings. The potential for doing this work is helped considerably by the widespread ownership of smartphones, which have evolved into devices that allow for the easy generation and sharing of photographs and other visual material (Mirzoeff 2015). Despite the proliferation of devices, it is still important to acknowledge that smartphones are not necessarily available to all, either due to a lack of skills, economic means to afford the costs, or simply by choosing not to have one. Finding alternative ways of capturing those voices is also important.

The convenience of generating visual data does not mean, though, that working with this material is straightforward. Photographs, video, and maps are no different to any other form of data in needing to be approached with a critical eye. In everyday conversation, we might describe how a photograph 'captures' an event or setting, with the implication that it is possible to extricate and then elsewhere reproduce what was witnessed in the moment. In reality, a photograph is a subjective part-representation of that reality, shaped at the site of production by the particularities of the camera, and the interests and personal history of its authors (Rose 2022).

When we invite participants to photograph their educational surroundings, we need to accept that a degree of 'staging' can take place, as they potentially arrange the elements within their setting to project themselves in a particular light, or perhaps to match what they anticipate the researcher is looking for. A subtler subjectivity might be found among research participants with a particular aesthetic sensibility or prior visual training (architecture students, for instance). Images can be cropped, filtered, and enhanced in other ways that create distance between the learning space as it was seen in the moment, and when it is later viewed on screen. We also need to recognise our subjectivities at the site of audiencing (Rose 2022). In common with the learning spaces they depict, images do not have a fixed meaning, and the researcher's interpretation may differ from what the author intended to convey.

Having noted that learning spaces are always visual, they are never only about what can be seen. As we enter the architecture design studio or the seminar room, we make sense of our surroundings through sight, but combined also with sound and smell. Our response to that learning environment is additionally shaped by the relative comfort of our chosen seat, the tactile quality of the desk, by temperature and by air quality (Lamb 2024). A photograph might be suggestive of these qualities, while video can document the visual and auditory, but they are unable to adequately reveal the wider sensory dynamics of a learning space.

For these reasons, visual methods are almost always combined with other approaches within learning spaces research, as is the case in our CmyView methodology. Students can be invited to map their educational surroundings, and later explain their meaning through conversation (Gourlay and Oliver 2017). We can combine walking methods with visual approaches to explore the learning that happens in urban settings (Lamb et al. 2018), or when traversing the campus (Carvalho and Garduño Freeman 2023). Audio field recordings can be generated alongside photographs and written

notes, providing a more complete account than can be achieved through images alone, while also allowing for thematic or multimodal analysis (e.g. Bayne et al. 2014). Visual methods are also suited to citizen science research, as we will come on to discuss.

CmyView Project

CmyView is a creative participatory methodology that draws on visual and walking methods where participants produce digital artefacts based on a walking trajectory around a particular area or neighbourhood. The methodology combines the use of mobile technologies with principles of networked learning and digital heritage practices. Networked learning focuses on inter-personal relationships that involve the use of digital technologies, and where people are engaging in collaborative valued activity through joint inquiry (Networked Learning Editorial Collective et al. 2021). Digital heritage includes the use of digital media to understand and preserve cultural heritage sites (Giaccardi 2012). The methodology also draws on research on the effects of walking and other conceptual ideas that connect people and things (and we discuss these in the next section). The methodology relies on the CmyView app, which brings together the affordances of existing mobile apps that support mapping walks (e.g. Map my Walk, Trails), with other apps that encourage posting and sharing photographs (e.g. Instagram, Flickr). These elements are extended within CmyView through the ability to create an audio recording linked to GPS points, which show the location where each photo and audio file were created.

The app is used in two modes. In the *collecting mode*, participants engage with their surroundings to collect *views*, a process that involves taking photographs and creating audio recordings related to these photographs, each representing a personally meaningful site they encountered during their walk. Participants might collect these digital artefacts (photograph + audio + GPS location) while walking outdoors in the natural environment or indoors within a built environment. In the two projects described below, the *collecting mode* involved participants gathering a range of 5–10 digital artefacts, curated as a portfolio of digital artefacts within a *walking trajectory* with a collection of individual *views*. Each *view* is composed of photo, audio, and geolocation files. This becomes a traceable artefact plotted on a map which can then be shared with a community in the *sharing mode* (Fig. 1).

In the *sharing mode*, participants choose a *walking trajectory* created by someone else. They then walk that trajectory following the geolocation to discover a *view* and listen to the accompanying audio created by another participant, and exploring their curated photos, audios, and geolocations—while situated around the spot where each image/audio were created.

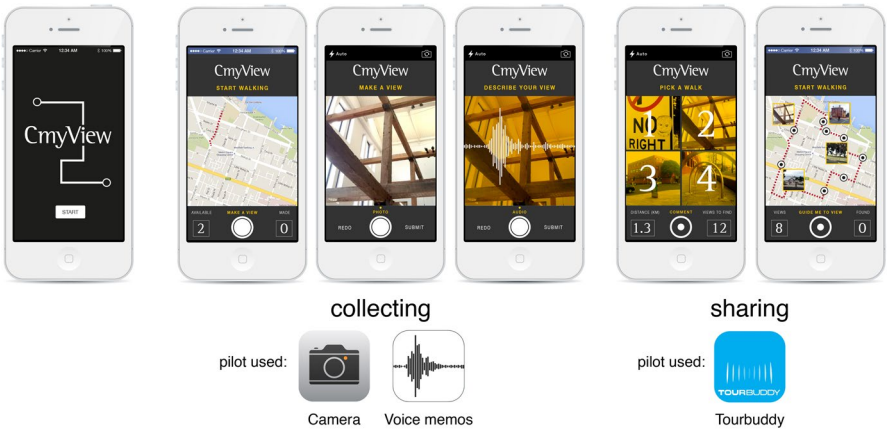


Fig. 1 CmyView app prototype

Walking, Capturing, Sharing, Connecting, and Documenting via Public Participation

The CmyView methodology was informed by research in embodied cognition, digital heritage, networked learning, and the postdigital. Its conceptual framing focuses on broad core actions namely walking, capturing, sharing, connecting, and documenting via public participation.

Walking

Walking is a central part of the everyday experience of most (able-bodied) humans (Hall et al. 2018) as well as embedded within cultural traditions (the pilgrimage), spirituality (walking mediation), and within our spatial environs from formally designed landscape forms such as the labyrinth, to unplanned paths that emerge through repetition and erosion such as 'desire lines' (Solnit 2000). Walking is more than simply ambulation or transportation from one point to another; it is founded on our proprioceptive systems and kinaesthetic senses and increases creativity (Oppezzo and Schwartz 2014). Walking is also deeply connected to people's experiences of time and space (Zundel 2013), opening up opportunities for observation, seeing, feeling, moving, and knowing our spatial world framed by our individual perspectives (Horowitz 2013). For Ingold (2010: S135), walking along 'is not the behavioural output of a mind encased within a pedestrian body. It is rather, in itself, a way of thinking and knowing… Like the dancer, the walker is thinking in movement.' Our projects have not included students with disabilities, but the methodology could be easily adapted to include people with low mobility.

In the CmyView methodology, the notion of 'walking around' involves being on the move, as well as being open to what can be sensed, seen and through kinaesthetic experience. Scalar relationships and proportions, light, colour and texture, familiar and new forms emerge as we move through space and experience place

through the opportunities that the act of walking freely generates. When a person is walking, objects are not just sitting opposite to them, but instead people and objects are enmeshed in the terrain and their surroundings. As Zundel (2013: 119) explains:

> When walking we sense these experiences not only through the rarefied features of our intellect but through our whole body which is not so much a way of believing *about* the world, but a condition of being *in* it. (Zundel 2013: 119)

Being in our learning environment, be it a formal classroom or an urban walk, is an important methodological stance because it privileges in situ experiences, rather than relying on the reporting of past memories. People might have their feet on the ground, the wind in their faces, their muscles flexing in action, and their blood circulating through their bodies. And as people walk, think and rethink their relationship to the surroundings, they do so, not only through their brains and cognitive function, but also through their bodies and the way environs can make us feel cosy and comfortable or uneasy and unwelcome. However, the CmyView method is not only about walking and thinking, but walking with a goal of noticing subtleties in our surroundings: it involves creating a digital artefact while reflecting-in-action (Schön 1983). The experience of walking and thinking about our relations to the environment is also mediated by people's interactions with a piece of mobile technology and an app, and with the goal of creating *views*. It involves the positionality of the person (Hayes 2021), what they experience as they contemplate their environs, and also their interaction with data.

Capturing

Embodied cognition is a field of study that supports the theorising of connections between human bodies, minds, and technologies (Clark 2008; Kirsh 2013) with a focus on how people's understandings of the world relate to their perceptual-action experiences with things. In making each *view* within the CmyView methodology, participants are engaging in an iterative and reflective process where they are carefully pondering, selecting, and collecting images whose meaning is interpreted or 'pinned down' (Chaplin 2006) by the audio recording. The coupling of selecting a *view* in situ and describing its meaning for the participant means that they are engaging in reflection-in-action (Schön 1983). This is a process that involves considering meanings and significance, before capturing a photograph and audio recording their impressions (Gauntlett 2007, 2011). Their final productions become representations of places where participants explain their own values, feelings, thoughts, and reasons associated with choosing to represent those places (Fig. 2).

Sharing and Connecting

CmyView was also inspired by networked learning practices, or in other words, practices that encourage collaboration, participation, and connections between people, promoting their engagement in knowledge creation and knowledge building activities (Networked Learning Editorial Collective et al. 2021). Networked learning invites

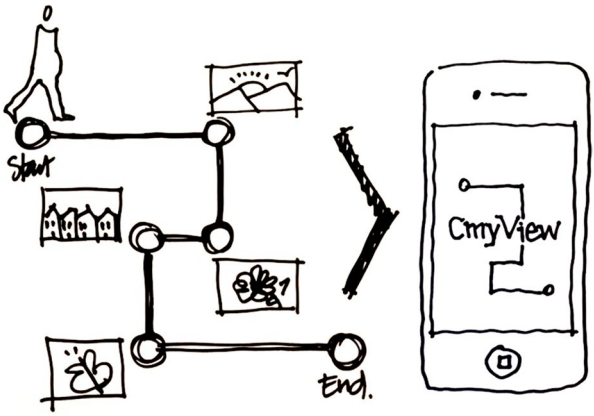


Fig. 2 CmyView: collecting mode

learners to explore themes that deeply matter to them, through (asynchronous) interactions, which support co-construction of knowledge and identity formation. Traditionally, such activity involved relational dialogues mediated through computing technology via online resources and discussion forums. A key aspect of networked learning has been its focus 'on how knowledge is applied to make sense of the world' which might include learners 'making sense of their own position in it, of unclear situations, solving issues or problems and creating value' (Hodgson and McConnell 2019: 46).

Similarly, the CmyView methodology involves creating opportunities for co-construction of knowledge and identity. There is the opportunity to literally 'walk in someone else's shoes'—that is, to follow their trajectory through the same space traversed and re-locate the images captured, thereby releasing them from their photographic stasis and sterility into in situ experiences, narrated through the first participant's audio recording. This experience expands knowledge of what might be significant in the places explored as well as creating a connected experience between the two participants—who can now see 'eye to eye' and go on to share notes and reflect on their commonalities and differences. In this s*haring mode*, participants are engaging in (indirect or asynchronous) dialogues, creating informal embodied and digital networks where connections are opportunities for learning. In addition, the collection of various *views* added into the app by multiple participants becomes a repository for documenting the social values connected to the natural and built environment Fig. 3.

Documenting via Public Participation

The notion of participatory culture (Burgess and Green 2009; Delwiche and Jacobs Henderson 2013; Jenkins 2006) involves the use of social media in ways that enable a 'complex set of social practices that interweave memories, material traces and performative enactments to give meaning and significance in the present to the lived realities of our past' (Giaccardi 2012: 1). It involves links between everyday practices and forms of heritage, which are manifested through online participation. This intersection between participatory culture and participatory media lends itself to new

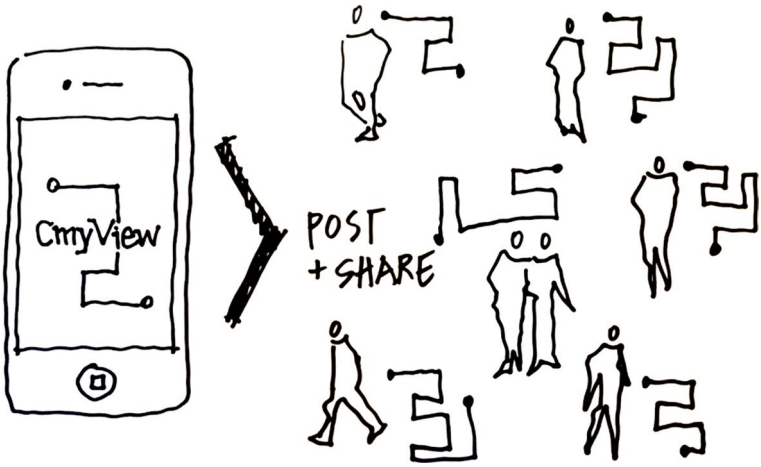


Fig. 3 CmyView: sharing mode

ways of describing the value of, and learning about, heritage. Digital engagements, like taking photographs and recording audio, or walking and looking, are embodied practices that rely on analysis and on understanding the production of artefacts, and the reception processes that surround online representations (Garduño Freeman 2013, 2010; Rose 2022). Understood as part of a postdigital entanglement, digital artefacts are examples of how visual and material culture can be used to explore and evidence people's relationships to places—they evidence social value by offering new ways of framing people's emotional attachment to buildings. One such example, discussed by Garduño Freeman (2017), involves expressions of these attachments through representations of the Sydney Opera House, where socio-visual value is demonstrated through posting representations and textual contributions in online environments, where new audience engagements, creative outputs, metaphors, and communities unfold through digital engagements with heritage. These types of manifestations are not only reflecting practices in participatory digital culture but signal the presence of dispersed communities and audiences at a global level, which can all come together to enact online forms of public engagement.

For Giaccardi (2012), there are three areas of critical interest for digital heritage: social practice, public formation, and sense of place. Social practice focuses on participatory media and emerging forms of social and visual practices. An example would be opportunities for collecting images and for creating representations that are then used to mediate (digital) communication, or as expressions of personal stories that can then be shared and legitimised within communities. Public formation emphasises opportunities for blurring of boundaries between community and audiences, which are afforded with the use of social media, and therefore enable new types of group formations and their concomitant fluid identities. And the last theme, a sense of place, is centred around experiences of social media that go beyond the online 'realm', embracing the hybridity of our postdigital times, to engender and extend 'real' experiences with places of heritage.

Going beyond places of heritage and social practices, our research focuses on the many ways we can learn about people's experiences. Such learning might be personal, for example when we learn about a new perspective, perhaps a new way of interpreting something in the built environment. But there is also potential for collective learning, for instance when we all learn through the gathering of places that are valuable to a community. As a community we might explore and understand why these places are valuable, and going further, we might take action and inform decisions about what happens with a certain community place. In what follows, we offer a brief context for two case studies where we used the CmyView methodology as a way of probing people's connections to places they value.

Two Case Studies of CmyView in Action

Case Study 1: Architecture Students and the Social Value of the Built Environment

This involved a group of four architecture undergraduates at an Australian university. Architectural education is uniquely founded on the pedagogy of the 'studio'—an educational approach that invites creative exploration and risk-taking, coupled with analytical testing and validation—what might be described as an inductive approach to learning. The students volunteered for the task, which aligned with the exploratory nature of the studio setting and provided their consent to the researcher who had ethics approval. Data was de-identified to protect participants and maintain anonymity. Taking photographs and analysing buildings and spaces are core skills in architectural practice, so being asked to individually walk around the surrounding campus neighbourhood, and to document their own responses was not foreign to them. There was no specific agenda to 'what' should be captured, except that they should generate a *walking trajectory* that visited places that felt interesting or significant. The resulting digital artefacts in the CmyView app became traceable trajectories that altogether represented the experiences of these participants: the places they stopped, the reflections they narrated, and the photographs representing what they were seeing at those points.

Two weeks later, the same group of students were asked to walk again around the same neighbourhood, but this time each student chose a trajectory other than their own: that is, they 'walked the walk' created by another participant, while looking at the places where those images were created and hearing the audio recordings that explained other people's connections to those places. As they did so, they engaged and reflected on the experiences of other students, reviewing and reframing their own understandings of the built environment. At the end of their first and second walks, students completed short anonymous surveys with three open-ended questions that asked them to describe how making *views* while walking impacted their capacity to observe and understand the places they visited. These questions explored how the task worked to extend their ability to 'see', not just with the 'good eye' of appreciation but with the 'curious eye' which is open to alternative meanings and creative possibilities (Rogoff 2002). This task then set the stage for undertaking another participant's trajectory and being open to new perspectives

I chose this second view because I feel though it incorporates sort of the new and old of what Geelong was, I suppose in the wool store days, and what has become now, in front of sort of Victoria's biggest educational institutions here, and sort of incorporating the old and new style architecture.

(Walk 3 View 2)

Fig. 4 Architecture group: walk 3 view 2

This view I was attracted to I think largely because of the straight lines that the trees have been planted in, which sort of seems to me contradicts the very sort of fluid and also maybe sharped angled nature of the branches and the leaves that are partially alive but mainly dead and crumbling.

(Walk 2 View 2)

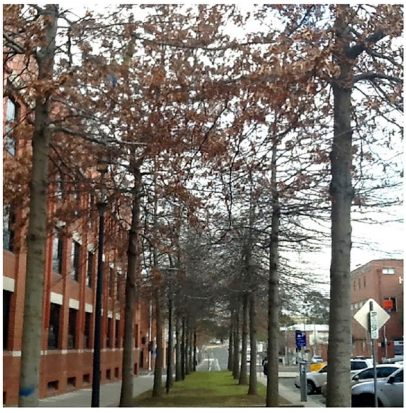


Fig. 5 Architecture group: walk 2 view 2

(literally), forming connections with others and what was learnt about their social values associated with the built environment.

Figures 4 and 5 show types of *views* created by the architecture students, alongside the transcription of their audio file narrating why this was a significant place for them.

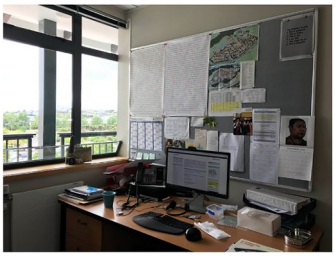
Case Study 2: Doctoral Students and Their Places for Learning

Case study 2 involved five doctoral students at a New Zealand university who were asked to reflect on the learning spaces they valued. The students were invited via email after ethical consent had been obtained at the university. These students were not in a direct relationship with the researcher. Pseudonyms were used in the reporting of data to maintain the anonymity of participants. The methodology replicated the one described in case study 1, when each of these students were

Another place I think is very important on the campus is the small forest, with a little creek just next to Gate 1. So it's just a very calm place for you to walk through, to sit for a while, to clear your mind and also it's totally different atmosphere from the campus, it's very easy to make you come down, when you have some, you know, very, when you are very nervous or stressed or something, and sometimes I'm doing jogging here in this area, because it makes you feel very fresh, and [there are] a lot of birds singing, a lot of greenness, so I really think it's very important for the campus to have something like this, it's very nature, it's very, you know, you feel you, make you feel very good.

(on campus 1, Participant 9)

Fig. 6 Doctoral group: on campus 1, participant 9



This is my office, and this is where I spend most of my time here. I absolutely love having a window and a view, and my notice board where I've got messages, that some of its information, some of it is motivational.

(on campus 1, Participant 4)

Fig. 7 Doctoral group: on campus 1, participant 4

instructed to capture images of places around the campus and to record a short audio narrating why those places were of significance to them. Two weeks after the first walk, the same students were invited to complete a second walk, this time choosing a trajectory curated by another student. After each walk, students completed an anonymous survey that also used the questions in case study 1.

Figures 6 and 7 are examples of *views* created by the doctoral students, alongside the transcription of their audio files.

Findings and Discussion of the CmyView Methodology

The types of *views* created by participants in the two case studies show opportunities for zooming in, for understanding people's connections to places through their own accounts. But as we will come on to discuss, the methodology also foregrounds opportunities for zooming out. An important consideration is that the methodology will only work if an infrastructure is in place: participants are only able to plot their trajectories in a map if they are able to connect to WiFi, for example. Our studies were conducted at universities and other settings in affluent and predominantly English-speaking countries, and we are aware that these findings might be expressing particular voices. Nevertheless, the focus of our discussion here is on layers of learning (e.g. individual, social, community, policymakers), how the CmyView

methodology and app offer useful tools for enquiry on the value of the qualities of spaces, how places affect human experiences, and how these experiences unfold and connect to postdigital research on learning spaces in higher education.

If we agree that it is important to understand spaces that are meaningful for our learners—that is, why they are meaningful from the perspective of those who inhabit these spaces—then we must provide opportunities for those voices to be heard. Going further, it is also important to capture, share, and connect, in addition to document these findings through public participation. This data can then be used by various stakeholders (including learners themselves). Understanding relations between people and things are important to learners, so that they can recognise what places are better suited for their own work, what is better done where, and why. In addition, such understanding can contribute to broader practical decisions about the development of better and varied places for learning.

In the following discussion, we draw on findings from surveys conducted after each of the walks described in the above case studies.

Opportunities for Individual Learning

Even though the two case studies were set at universities, neither proposed structured learning tasks in a curriculum. Nevertheless, one could argue that the act of noticing the qualities and subtleties of spaces and things would be particularly important for architecture students, who are being trained to consider the influence of the built environment on human experiences. Survey responses from the architecture students reflected their individual experiences, which could be associated with developing competencies to notice the qualities of the built environment. As the excerpts below illustrate, these students noted the value of the experience in allowing them to identify subtleties in their surroundings:

> I think the idea of having to explain why something stood out to you is a good [one] because it makes you actually stop and realise all of the beautiful things around you.
>
> I found myself stopping and noticing objects and 'views' that I would pass by everyday, but in the business of everything forget to think about outside of face value.
>
> I was much more conscious of the environment that I was walking through. What was I seeing, what was happening and most importantly for me why was this happening, why was this here?

One of the architecture students reflected on their experiences of the built environment when accompanied by the act of creating a digital artefact, commenting on the effects of the act of creating *views*:

> The action of taking the photograph made me consider the idea of a view more critically. Whilst when you observe with your eyes you take in the area around the view, the photo makes you be more concise with what you would like to show. Recording a memo reinforces this point of why the photo came about.

For the architecture students, individual learning seemed to include a realisation that there are different qualities in the surrounding built environment, and that being prompted to reflect upon their experiences helped them to engage more deeply with the social value of the built environment and what it meant for them.

For the doctoral students (with a background in humanities and social sciences, e.g. political sciences, sociology, linguistics) in our second case study, the experience was perhaps more personal and less conceptual. These students considered what they did in their daily lives and how they felt in the spaces they visited and worked on campus. Understanding the nuances and subtleties of the qualities of places and materials also seemed important for this group, albeit with a focus on their personal needs. For example, students may require at times a quiet space to reflect, or at other times may search for a busy space where they can connect with others. Their *views* revealed associations with certain places that contributed to their identity (as future scholars), for example when they photographed areas of the staff room, or their desks and offices. Other spaces, including a small forest near the campus (Fig. 6), were perceived as contributing to their well-being (Carvalho and Garduño Freeman 2023). In their survey responses, these students reflected on how the spaces they visited influenced their daily lives, noticing elements such as time spent in different locations:

> I feel like I spend all the time in either my office or the staff room - I took more photos than I thought after realising I do go to other places, even if I don't spend long in them.
> A very interesting walk that makes me rethink about the spaces on campus that matters to me in my daily life… and my previous experiences interacting with those places.

Opportunities for Learning Through Social Connections

All our participants completed both walk 1 and walk 2 individually, but many of them verbalised a sense of connection to others after walk 2. The idea of learning through sharing and connecting to other people's perspectives were also associated with a sense of intimacy. This emerged in the following reflection of an architecture student:

> Seeing someone else's 'views' (or journey) was almost an intimate experience. These journeys are personal and walking on someone else's journey is just a glimpse [of] their personal take on things. It allowed me to enter into someone else's headspace and see things the way they do.

The doctoral students expressed similar feelings of connection, seeing similarities in the ways other students described spaces, and photographed them. The following excerpts illustrate these experiences of indirect connection with other students:

> Felt a connection, however small, with the other post-graduate students after I realised how similar our experiences were.

> It definitely helped see what was special e.g. it wasn't just the staff room as a whole, but seeing Pippa's spot by the heater made it much more personal and real.
> Could see the [university] icons for belonging. I hadn't thought about how I feel about [university] driving by until I saw Pippa's front gate. It's not the same spot for me (mine is seeing the orange roofed white buildings from a distance) but I didn't realise there was a sense of belonging (and pride?) in seeing [the university] from outside. I could also see from Pippa's special places that while the PhD work is why we are here, it is our rest and social places that give us connections to one another and belonging with [the university].

Importantly, connections are also made when we learn about different ways of seeing the world. An interesting point raised by one of the architecture students was that (social) learning is also about challenging our own views and perceptions, for instance when someone provides a fresh perspective. This is highlighted in reference to their experience of a 'view' curated by another student (see Fig. 5).

> It challenged my thought process as to what was and was not worth documenting. Something that was interesting with the other person's walk that I completed was that a lot of what was captured was not specifically buildings. It broadened my understanding of [the] built environment towards how we shape our natural environment also.

Opportunities for Community Learning and Postdigital Citizen Science

The third layer of learning relates to insights that can be derived from the use of such methodology, when participants themselves can contribute to the shaping of spaces around a specific area. There is relevance in such methods for studies of spaces within university contexts, such as those described in our case studies. Recent research on university spaces has been calling for reimagining university spaces, for a better understanding of what is valued in the physical campus or for the creation of new campus spaces, which relates to the value of on-campus experiences and the reasons why students should be attending lessons in person (Broadbent et al. 2023). Indeed, scholars have been urging for a deeper understanding of how learning spaces can be more convivial, equitable, and sustainable (Lamb and Carvalho 2024).

While citizen science is often portrayed and praised for ideals oriented towards democratising science and encouraging lay people participation in science, some scholars have raised questions about the nature of such participatory practices (Jandrić et al. 2023). Participants are collecting data for researchers and academics, and often have little input into the design of studies or little say on further developments. Potential inequalities might emerge, when only particular voices are likely to contribute to such studies as '[t]hose who participate in citizen science are, by and large, from higher socio-economic backgrounds and are more likely to have completed tertiary or graduate level education' (Jandrić et al. 2023: 2) an aspect reflected in our case studies which conform to this characterisation. The postdigital

asks us to be wary of creating yet another form of surveillance and datafication, and to work towards making sure not only we have diverse representation of participants, but that participants are real partners in discussions involving citizen science. In taking a postdigital stance, it is important to support individuals to engage in social action and understand the challenges associated with the use of digital technologies in such projects, for example those involving data accessibility, information-related power imbalances, and biodigital sustainability (Rapanta 2023). In our view, the methodology of the kind used in the CmyView project is especially suited to nurturing these conditions.

The widespread ownership of smartphones, combined with their portability and ease-of-use, is significant for citizen science, and especially so in the case of learning spaces research. Even the most basic smartphone allows for the generation of photo and video, while also enabling the storing, editing, and sharing of this material. In the hands of the citizen scientist, the smartphone is a way of documenting the settings, rituals, people, and objects that are personally meaningful. Rather than relying on the academic researcher to decide what merits being recorded, the citizen scientist often has the means and flexibility to choose where, when, and how often to photograph or video their environment.

This sense of freedom is significant in the case of learning spaces inquiry, when it is widely accepted that educational activity increasingly takes place in settings beyond the physical campus, and that digital pedagogies and technologies have increased opportunities for impromptu learning (Carvalho and Garduño Freeman 2023; Lamb et al. 2022). At the swipe of a screen the citizen scientist can generate a visual recording of activities happening in private settings and during anti-social hours, something that would be ethically and practically difficult for the traditional researcher. This represents a shift away from more conventional ethnographic approaches where the researcher visits to observe and document the classroom, laboratory, or other learning space. Even within a research exercise with a predefined purpose and parameters, the citizen scientist has a good degree of agency and autonomy in determining those persons, places, and practices that should be recorded. It is also worth adding that, in an increasingly visually mediated postdigital world where we frequently communicate and interpret meaning through images (Mirzoeff 2015), the citizen scientist who chooses or is invited to visually document their environment is very often working in a medium in which they have a good degree of literacy: they have a smartphone to hand, and for many, the taking of photographs has become second-nature. In this sense, citizen scientists might include people from different age groups and from different walks of life: from primary school children to retired volunteers, from business people to academic researchers.

The empowerment of the citizen scientist can also be found within walking methods, and especially so when this is performed without the presence of the academic researcher. If it takes place within a formal research exercise, the performance of the walk might be shaped by timing and duration, the overarching purpose of the project, and more subtly by the citizen scientist's awareness of being involved in some form of educational inquiry. But at the same time, the citizen scientist might have the scope to set the direction, pace, and rhythm of their walk,

all of which will inform their meaning-making practices. They can choose where to look, where to pause and reflect, and whether they wish to interact with other human or non-human bodies. Put simply, walking methods can enable the citizen scientist to follow a critical and literal path that is personally meaningful, rather than being asked to follow a route that the academic researcher has determined in advance to be worthy of exploration.

It is important to recognise, though, that while visual and walking methods nurture conditions that are conducive to citizen science, they do not provide the citizen scientist with absolute agency. We have already highlighted the need for nuance when working with images, and a postdigital sensibility further prompts us to consider the assemblage of non-human actors that shape the photograph that we eventually come to view on-screen. While the citizen scientist might influence the setting, timing, and composition of a photograph, the resulting image is contingent also on the aperture, lens, processing power, and wider sophistication of the smartphone camera and its software. Even without the use of filters, there is a good chance that the photograph will have been auto-corrected in ways that are likely to be beyond the citizen scientist's understanding or influence. This reiterates our earlier point that the photograph is a representation of what the citizen scientist observed in-the-moment, shaped as it is by an entanglement of the human and non-human elements.

We also need to exercise caution when considering the autonomy of the citizen scientist undertaking a walk as a form of inquiry. As the citizen scientist cuts a path across the city, they might be directed or constrained by crowds, traffic, construction work, temperature, and other conditions beyond their control (Lamb et al. 2018). In addition, the term 'citizen scientist' does not describe a single type of human body, and we therefore need to recognise how the campus, city, or any other setting is differently experienced. Topography might exclude on the basis of physical mobility, health, and age, while some corners of the city might be more or less safe depending on the citizen scientist's gender or ethnicity. Therefore, while walking methods are particularly suited to citizen science, they do not entirely empower the citizen scientist and are not accessed or experienced equally.

Conclusion

A central assumption of the postdigital is that digital technologies, and the practices they enable, are enmeshed within society, the economy, and everyday living (Jandrić et al. 2018). From this viewpoint, social interactions are often seen to involve people engaging with a multitude of tangible and intangible elements, while navigating blurred boundaries between social and spatial, material, and virtual spaces. Inevitably, the postdigital is also associated with settings for university education, which is evidenced through a growing body of research around postdigital learning spaces (Lamb et al. 2022; Gravett et al. 2023) and settings beyond the traditional classroom and campus (Lamb and Carvalho 2024). Through the postdigital, researchers can interrogate the presence and influence of the different human, natural, material, and digital elements that shape our learning spaces. This arguably enables critical

exploration of deeper connections between multiple elements and layers, where researchers can draw inferences from the overview and the detail: zooming out to understand how educational infrastructure and social innovation can come together to help us realise the kind of university that we desire (Goodyear 2022), as well as zooming in to better understand people's connections to the places they inhabit and value (Carvalho and Garduño Freeman 2023). Along the way, it is also important to be mindful of whose voices are included, and that as we invite and encourage participation, we ensure that diversity is present.

This paper has introduced a methodology that combined visual and walking methods called CmyView, discussing the conceptual ideas that informed the development of this approach. We have outlined the value of visual methods in studies of learning spaces and have argued that both visual and walking methods are suited to citizen science. CmyView allows for learning that is individual and social, but also community oriented. In gathering and sharing *views*, public participation is encouraged, with opportunities for a wide range of voices to be heard. In bringing together different voices, these types of creative methodologies can also potentially impact upon policy development. The ability to do so is vital, particularly in the context of physical university settings, as we seek to understand what the campus is for, why students and teachers should assemble in these spaces, and how we might create spaces for learning that are convivial, equitable, and sustainable.

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