Innovative Learning Environments through New Visual Methodologies

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The embodied pedagogic voice[1]: exploring methodological approaches to investigating spatialised pedagogical practices in innovative learning environments

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Executive summary

This paper marks out new methodological territories with regard to how to explore pedagogical practices undertaken in flexible learning spaces and innovative learning environments. The project DEECD /OECD Innovative Learning Environments was designed to examine the conditions, processes and possible outcomes of innovative teaching and organisational cultures in 12 primary and secondary public schools across Victoria. Each school submitted a proposal as to why and how they met the criteria for being an Innovative Learning Environment as characterized by the OECD CERE project. The Deakin research team spent 5 days in each school to develop case studies that considered the nature and effectiveness of these self-identified ILE.

The methodological issue that emerged for the researchers was how to better understand the relationships and embodied practices enabled by ILE and flexible learning spaces in terms of both teacher pedagogies and student cognitive, emotional, physical and social learning. A focus on practice required the researchers to develop a range of visual methods to extend conventional case study data collection approaches in order to produce both comprehensive and nuanced data as to the quality of the pedagogical interactions and how this informs teacher and student learning.

A number of visual methodologies that pay particular attention to student voice are developed and described in the report, taking into account their potential for future research. These included:-

- Interview-infused participatory photographic observation
- Drawing/Mapping/Photography: Foregrounding student perspectives
- Vidi
- Pencasting
- Motioncapture
- Nearmap
- Papershow Photostories

The 12 case studies, analytical reports, and visual artefacts from each school are displayed on a Portal, a shared website that informs teachers and researchers.

This exploratory methodological work suggests a number of possibilities around how to explore the associations between spatiality, temporality and the embodied and lived experiences of teaching and learning.

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[1] See Arnot and Reay 2007.

The embodied pedagogic voice[2]: exploring methodological approaches to investigating spatialised pedagogical practices in innovative learning environments

Introduction

Exploring the nature and quality of learning that can be characterized as innovative learning environments and often enabled by flexible learning spaces means that traditional data collection techniques no longer provide the rich data necessary to investigate the social and relational practices of teaching and learning. Most case study approaches require researchers to interview adults, usually the principal, the teachers and often parents, sometimes students, to elicit understandings, validated by documentary evidence, as to what happened and with what effects (Stake 1995). For that reason the focus is on organizational structures, cultures and discourses, and on teachers and their pedagogic practice. While these are important in terms of understanding how curriculum and pedagogy is framed and practised, few case studies of reform elicit student voice. And when students are included in research, these are largely premised upon text-based renditions of interviews which often position the student as a passive object of teaching and research (Rudduck and Flutter 2004). This report argues that such approaches do not fully capture teachers' and students' 'lived experiences of space', the multiplicity of ways of seeing and feeling, and how students in particular are active participants in their learning (Coook-Sather 2006, Burke 2008, Prosser 1998).

This report maps out a number of exploratory investigations of student experiences of ILE and flexible learning spaces using visual methodologies. Visual methodologies provide ways in which children and young people provide 'expert testimony about their experiences, associations and lifestyles', and some would argue that they have a right to do so (Thomson 2008, p.2; Gallagher and Kim 2008). The researchers view children as beings able to express opinions and make judgments about particular reforms, and in so doing offering unique insights into the everyday life of schools. Given the focus on the pedagogic voice - how students experience their schooling - the methodological issue becomes how to represent this voice while realizing it is not necessarily authentic or pure. It also raises issues about what constitutes 'experience' as there is always a high level of inference that is involved in analyzing student's responses and representations to spatiality (Mathison 2008, Morrow 20003, Mirzoeff 2006, Holloway and Valentine 2000).

This approach also raises ethical issue as to the relationship between students and researchers. This research was undertaken, as much as was possible within the time frame, with and not on students and teachers. This comes from the perspective that students can be co-producers of knowledge following on from the tradition of students-as-researchers (Atweh and Burton 1995, Fielding 2001). Pedagogy is seen to be a relational endeavour and practice, and the methodological issue is how to see pedagogy 'at work' (Dixon 2008). Thus researchers consider student perspectives and representations provide a valid form of data that can inform practice and policy at the school and system level.

Background

Significant investment in flexible learning spaces and innovation at the time of the new millennium has aroused interest in how flexible learning spaces and different learning environments can improve student learning and assist in the formation of active self- directed citizens and workers. The literature on ILE (Dumont et al 2010, Blackmore et al 2011) and flexible learning spaces (Fisher

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[2] See Arnot and Reay 2007.

2010, Blackmore et al 2011) indicate that they have in both instances, been premised upon sound educational and/or architectural principles informed by a depth of research and theory in their respective fields.

There is an emerging body of research on innovation in schools with the OECD ILE/CERE program that focuses on case studies across a number of countries. These case studies have undertaken conventional case study approaches of unstructured interviews, observations, documentaries and policy analysis within a context specific framework. ILE as depicted in an OECD project, are identified post-hoc as indicating a set of desirable characteristics that have been displayed. But there is less empirical evidence as to how an ILE develops, the conditions conducive to its initiation, evolution and sustainability, or what happens in the ILE that impacts on teacher and student learning.

Most research on flexible learning spaces has concentrated on the design phase of flexible learning spaces and not on what happens when teachers and students occupy new flexible learning spaces over time. There has been considerable research on the quality of the built environment in terms of air, light, space, sound, furnishings and aesthetics (See Blackmore et al 2011 a), much of this quantitative, measuring the impact of specific elements of the built environment on student learning outcomes, and in particular their health and wellbeing. Other research on the built environment has focused on how sound 'green' environmental principles embodied in buildings have impacted on, and been influenced by, the curriculum. This usually focuses on how environmental education have been integrated into the design of the built space as well as the curriculum and pedagogies, for example, in the creation of indoor/outdoor flows, recognition of formal and informal learning spaces, or measuring and mapping low energy and resource usage including water tanks, natural light and ventilation. The focus of the methodological tools and research on the built environment to this point has been on the quality of the conditions of teaching and learning and less on the practices or how people use the built environment (e.g. Smart Green 2010, Maxwell and Chmielewski 2008).

For the purposes of assessing the quality of the built environment, there are a number of possible research tools. These include the *BREAMM Building Evaluation Assessment Method* –a computer generated post-occupancy evaluation tool which requires specialist training and analysis but adaptable to include use by students. BREAMM looks at management, health and wellbeing, energy, transport, water, materials, land use, ecology and pollution. Such tools could be adapted to develop projects associated with environmental sustainability and health and could be used for regular re-assessment as to the changing conditions of the built environment. *Fisher's Matrix Linking Pedagogy and Space* (Fisher 2005) links pedagogical activity and attributes to both spatial constructs and layouts, behavioural and processual steps. While developed to inform design it could be used to reflect on and evaluate space and track student - teacher interaction in different spaces, displaying the power of the affective in learning (See Manchester Case study, Blackmore et al 2011b). But many of these measures assume the built environment is 'finished' on occupancy. Yet the flexible learning spaces literature review indicated that occupancy is usually merely the beginning of ongoing 'serial re-design' of the space (Blackmore et al 2011).

The temporal dimension of innovative practice and spatiality was also significant as schools usually reorganized time as well as space to develop conditions conducive and integral to innovative learning environments. Possible methodologies that could explore how space and technologies are used over time include time-lapse photography. Time-lapse photography, for example, could map the social relations of gender, groupings and interactions, differential use of space and resources, and quantify interactions with teachers. While time-lapse photography was not possible given the time constraints of this project, the notion of tracking and mapping the use of space over time remains an issue to explore. In particular, student voices focused on the external changing spatiality of their school arising from new built environments. Nearmaps (see below for description) offers a

possible ways of mapping the external transformation of school playgrounds, building and facilities over time.

Furthermore, the rapid advance of mobile and integrated communication technologies has new potentials with respect to both pedagogy as well as use of space and implications of place. Much of the research on ICT and student learning has focused on the portability, convergence and connectedness that mobile technologies provide as a pedagogical tool connecting the classroom and individual to networks, inside and outside the classroom, with the home, other schools and indeed globally. Considerable research has focused on such networks and technologically driven activities produce student identities. The rise of social media has also highlighted the knowledge students bring to school and the significance of social relationships to learning (Beavis et. al. 2010). These methodological approaches focus on the production of student identities through networks of connectivity, how students use ICT differently, and the use of games and technologies to encourage students to provide representations of their learning. This provides possibilities for gathering data by getting students to imagine and draw their ideal learning space, for example, using software such as VectorWorks and SketchUp.

The Smart Green schools investigation in Australia (2010) argued that the drivers of spatial change are

- Close relationships between designers, educators and student-users during planning and occupation
- Educators implementing new pedagogies that require a variety of spaces (e.g. inquiry learning, problem-based learning, personalised learning plans)
- The curriculum being planned and taught by multi-disciplinary teams of teachers who require new learning spaces
- Ubiquitous learning, i.e. learners becoming self-directed, collaborative, resilient, learners who require a variety of spaces.
- Teachers and students who are technologically literate.

  http://www.abp.unimelb.edu.au/research/funded/smart-green-schools/

These characteristics align closely with those of the ILE outlined by OECD, again suggesting a range of desirable teaching and design practices and environmental conditions conducive to learning. The OECD Centre for Educational Research and Innovation 'Innovative Learning Environments Project' (2010) characterises an ILE as:

- *Learner-centred:* focus of all activities
- *Structured and well-designed:* role of teachers in supporting inquiry and autonomous learning
- *Profoundly personalised:* sensitive to individual and group differences in terms of background, prior knowledge, motivation and abilities
- *Inclusive:* sensitive to individual and group differences in terms of learning needs
- *Social:* learning most effective when cooperative and in group settings.

  http://www.oecd.org/dataoecd/31/16/41276828.pdf

Blackmore et al (2011a & b) have likewise argued from the literature on learning spaces and Victorian case studies that the focus of research has to be on the social practices of teaching and learning, on spatial and temporal behaviours. To do so raises different research questions and methodological issues. What actually happens in these learning spaces and ILE and why, what are the practices of teaching and learning? How and what do students learn? How do we know? Often it

is the invisible not the visible, the intangibles that matter. And how do we capture the embodiment of pedagogy as well as the pedagogic voice (Dixon 2008)

Case study approach

The ILE study of 12 self-selected Victorian schools indicated that new built environments and/or the integration of ICT and/or flexible learning spaces did not necessarily lead to changes in pedagogical practice. All the above research points to foregrounding changing teacher mindsets and practices and developing organizational structures and cultures conducive to innovation, prior to, and while transitioning into, new flexible learning spaces and as central to the production of an ILE. This priority sought to avoid default pedagogies or no-risk cultures becoming institutionalized into practice. It indicates that if an ILE is to be developed utilising new learning technologies and flexible learning spaces, one that will make a difference in the learning of <u>all</u> students, then teachers not only have to develop a wider repertoire of pedagogical practices but also gain systematic support from their school leaders and systems.

A literature review on flexible learning spaces and the analysis of 12 Victorian ILE case studies concluded that future research needs to focus on

- student and teacher practices, and how they are informed and constituted by flexible learning spaces
- the processes of becoming ILE
- the pedagogical relationships between students and teachers, students and students
- the professional relationships between teachers, and
- how these are supported and or impeded by the wider contexts of whole school cultures and philosophies, community and systemic supports

Finally, a key finding in the DEECD and OECD reports was that teacher and student participation in the design of space and place should be supported as an ongoing process as serial redesign. Teacher and increasingly student ownership of educational change is now seen to be critical for innovating and sustaining successful practices.

In undertaking the case studies, the research team found that there was a high degree of particularity in terms of the articulation between flexible learning spaces and innovation. Particular research methods were more appropriate to specific schools, age cohorts, teachers, physical environment, as well as the nature of the ILE and organizational culture. Researchers also had to be sensitive to the scheduling and concerns of each school. Each researcher therefore was given the opportunity to explore different ways of eliciting student perspectives on learning spaces and how they experienced the ILE.

What is it we are trying to find out here?

The case studies identified the need for more nuanced qualitative data that will capture the complexity of the social practices of how teachers and students interact with each other, and therefore to gain a sense of not just what is taught but also what is learnt. The methodological issue became how can we investigate teacher practices, the pedagogical interactions between teachers and students, between students and students and between teachers and teachers, that make a difference and how these are enabled, if at all, by flexible learning spaces and ICT to produce a sustainable innovative learning environment. Given the focus on embodied social practices, the methodological tools needed to have strong explanatory power and provide rich visual data.

The following data gathering techniques using visual methods including:
- Student photographs

- Student maps and cartographic annotations
- Design blueprints
- Visual symbols and spatial organisation
- Structural semiotic symbolism
- Researcher photographs

There are also clear ethical issues with regard to which methodologies were utilized in which school (Farrell 2005, Fusco 2008). Mapping the use of flexible learning spaces over time, for example, may involve the placement of fixed cameras in the flexible learning spaces to monitor space and time usage. Principals, teachers, students and parents are wary about what was felt to be unnecessary surveillance and its possible downsides regarding privacy. Practically, such an approach is difficult for the researcher as it requires consent from all students and teachers that use the space and a regular presence to monitor the equipment.

The privacy issue led to the question as to what type of data would be gained from long term tracking of students' and teachers' use of a particular space? It would tell us when and how often students were undertaking group work, group composition, how individual teachers and students moved around the room, and when students interacted with teachers. But it would not tell us much about the focus or quality of the interactions or the relationships between students, teachers and each other. For example, how would we know whether the interaction was about discipline, pedagogy or organization, about teachers raising or answering questions in a transmission more than an inquiry mode? We therefore explored a number of possible techniques that could provide time-lapse data in different and less intrusive ways (See below Motioncapture).

Alternative approaches that would produce similar if not richer data on the nature of the interaction could be observation for a day a week over the same period or purposeful videoing of particular activities, groups or teachers followed up by a discussion. Video recall allows teachers and or students to be videoed and then particular slices or events to be used as 'provocations' and replayed to them while discussing with the researcher what they think happened here, why and to what effect (Punch 2002). Again, these discussions can be done in 'real' or 'virtual' time through the Portal (See description below)

And while we may be able to map how teachers and students moved in and out and utilised the space as a resource (group work, team teaching, lectures, individual work etc…), what does this tell us about student learning? Participatory redesign was a major theme arising from of the literature on flexible learning spaces. Generative or serial redesign requires participation of all stakeholders- students as well as teachers. Recent methodological debates have focused on the notion of teachers and students as researchers of their own practices (Fraser et al 2004, Freeman and Mathison 2009). The focus on teachers has been on the type of professional learning that can be gained from researching their individual and collective practices through systematic collaborative inquiry and how this can contribute to school improvement. Others such as Rudduck and Flutter (2004) have long argued as to the need to listen to students as agents in their own education and how this contributes to school improvement (See Fielding 2001). Teachers and students are from this perspective viewed as co-participants in the production of knowledge and therefore in research on their practice (Fraser et al 2004).

In adopting this approach we found that the following methods have both methodological and pedagogical possibilities. That is, these tools are ways for both researchers and teachers to do research in and on practice.

Innovative methods for exploring space, time, pedagogy

The following section therefore provides accounts as to the different methodological visual approaches developed, their rationale and the nature of the findings that emerged.

My house is in your window: Interview-infused participatory photographic observation

Anne Cloonan

In a regional Victorian primary school attempting to engage in whole school cultural change through personalised learning, our team of researchers were involved in undertaking classroom observations – including photographic observations – of student investigations in a Prep class. As part of a larger investigation into the impact of innovative learning environments, the Principal of a selected school had identified the Prep teacher's implementation of personalized learning pedagogies as exemplary, and we were interested in gaining insight into the nature of teaching and learning interactions within this learning environment.

The classroom, which is entered through an interior corridor, had formerly been divided into two classrooms separated by folding doors. These had been removed to create a large rectangular space edged by numerous resource areas dedicated to writing, computers, construction, art and craft, reading, speaking and listening, make believe, playing 'home' and electronic communication – to name but a few. The school planned to remove the walls that adjoined an interior corridor – as well as the wall along the other side of the corridor – to make a large Prep Inquiry Unit. In preparation, the two Prep teachers had begun collaborative planning, pedagogical dialogue and some team teaching.

We researchers were interested in investigating the changed pedagogies that preceded the planned physical changes in the learning environment. Teacher and parent interviews, student focus groups and intensive student and teacher observations were to be undertaken. The observations were also to be documented visually: the learning spaces, visual vignettes of students and teachers at work in the space and classroom artefacts including student work samples were to be photographed.

Three researchers were introduced to the group of 18 Prep students (students aged 5 and 6 years of age and in their first year of schooling) and our role of observing (taking notes and photographs to find out more about how they learn in their classroom) was explained.

The students were undertaking ongoing investigations into the functioning of constructions and were at different stages in researching and representing their investigations. The teacher negotiated work to be undertaken during the session including a group who was writing up an investigation into the making of mailboxes; a group documenting the building of a skyscraper made from lego; a group investigating the making of a stage for a play. Two students who had already completed the documentation of their construction of a cardboard house were asked to use a small dictionary to check their writing for 'unusual spellings' of words such as shower (shuw), light (lit) and icecream (iscrems).

Immersed in this rich pedagogical environment, those of us with cameras set about capturing the rich resource centres framing the room, while the students gathered materials for their work. I began photographing the 'Construction Area' where a variety of materials were housed as well as completed student constructions.

I viewed the classroom through the lens of the camera, bending down to avoid high angle shots, working to ensure that my photographs were lit, framed and focused to a quality high enough to be included in research reports. As I worked I was approached by one of the pair of girls who had

'unusual spelling' who pulled at my skirt and said, 'My house is in your window'. She explained that she was referring to her construction of a house which I had photographed in the 'Construction Area' and which she could see through my large viewfinder. 'You should take some photos of my house photo book', she continued.

She picked up the house and led me over to the 'Writing Area' where she was working with another girl to revise the spelling in their documentary-style photobooks which illustrated various aspect of their house constructions. A photographic interview/tour ensued as she recounted the process of constructing the various aspects of a house and read me her documentary photobook (See Figure1). We subsequently shared the camera to photograph the photobook which displayed more fully the elements of her construction.

My house is in your window.

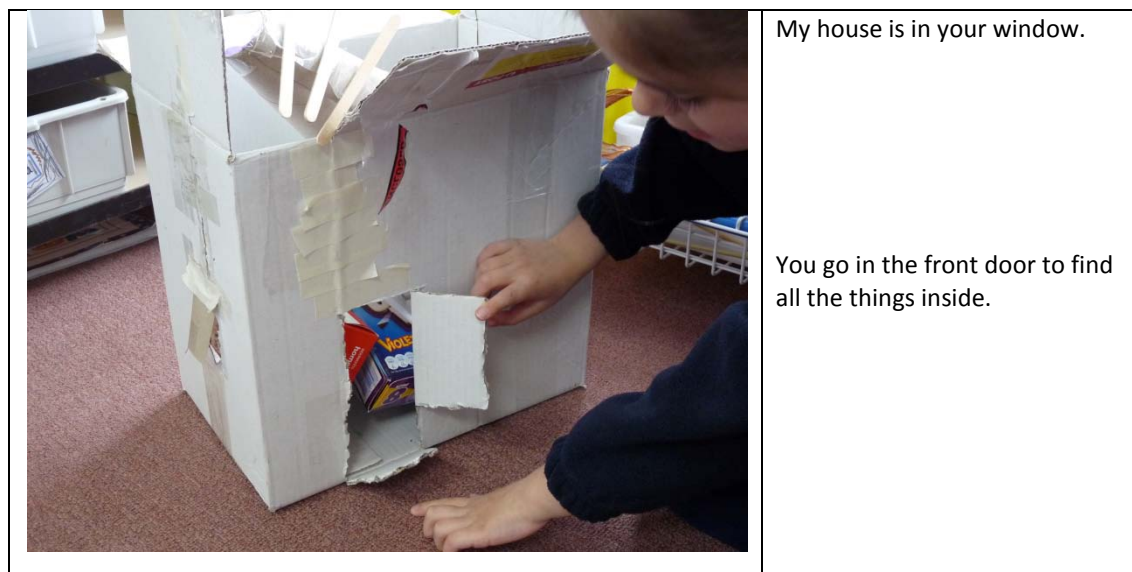You go in the front door to find all the things inside.

Figure 1 Student recounting the construction of her house

The student – or research participant - had observed the researcher photographing the classroom artefacts and seen that the data being collected showed only a partial picture of the work being undertaken as part of the students' investigations into constructions. The student intervened in the data collection process to ensure that the researcher's observations and collection of photographic data samples more fully reflected the ongoing work being undertaken by the students. The observations became infused with interviews as the student guided the researcher through the elements of the classroom artefacts and made recommendations about samples to be collected.

This classroom research interaction highlights the need for researchers to be keenly aware of the partiality and socially constructed nature of images collected as data. It shows that active participation of students in construction of photographic data collection through infusing photographic observations with interview can address the issue of *selection* of images as data (what's included and excluded in the frame) (Thomson; 2008).

In our role as temporary visitors to classrooms collection of visual observations and recordings can only be partial. This example demonstrate the value of working with students as participatory photographers and guides in the process of data collection. The process builds on the notion of 'member checks' (Guba, 1981), the sharing of data and findings with research participants for comment, a process that is deployed as a means for ensuring the trustworthiness and authenticity of interpretations of data (Stake, 1995). However, it differs in terms of the level of agency of the research participant, with data being co-constructed, rather than shared, in the example described.

In the observation and documentation of student work samples within innovative learning environments students acting as co-participants in the production of knowledge through photography and annotation enrich understanding of the research data.

Drawing/Mapping/Photography: Foregrounding student perspectives

Mary Dixon and Kim Senior

Figures 1, 2 and 3: Students drawing where like to be and where they learn at school

Methodological Positioning

The 'voice' of children and young people is an integral component in considering the connection between teaching and learning. No longer seen in the research community as merely representational in nature, the irrepressible insights of young people are central to understandings of pedagogy and pedagogical relationships (Cook-Sather 2006a, 2006b; Cook-Sather & Youens 2007; Senior 2008). Embedded and contextualised with/in teaching and learning the entangled and multifaceted nature of pedagogy requires creative approaches to classroom-based research (Dixon et al 2009). Creative approaches that position children or young people as experts or gatekeepers of particular bodies of knowledge contribute to methodological integrity through collaborative generation and collection of data.

In this project we engaged arts-based and visual approaches to present the perspectives and experiences of students in innovative learning environments. Kress (1997) details how children's meaning making occurs through and across a range of representational, communicative and multimodal expressions. Visual data produced by young people (drawing, mapping and photography) is knowledge that foregrounds their experience and engagement with/in the ILE beyond the bounded spaces of the classroom, the usual hierarchical structures of instructional discourse and beyond the limited understandings of embodied learning (Senior & Dixon, 2009). Leitch (2006) clearly reminds educators that "Embodied knowledge is a way of knowing that goes beyond the intellectual, logical and rational mode of thinking that has traditionally been defined as knowledge to include emotions, culture, physical sensation and life experiences" (p.552). Our approach amalgamates participation, observation and meaning-making as a way of capturing the relational giveness of pedagogy: we generate and assemble data as a method and a means of

analysis recognising that pedagogy is "cemented deep in the nature of the relationship between" (van Manen, 1991, p.31).

Lysaght, Brown and Westbrook (2009) suggest that "…images have the ability to capture one moment in time that would, under other circumstances, require a story of a thousand words" (p.2). Schirato and Webb (2004) note that visual texts offer great narrative possibility and expressive power; our experience as visual researchers tells us that this is not just limited to the data itself but is present in the process of creating visual data. Other researchers have illustrated that drawing provides opportunity for children to construct, represent, as well as speak to their understandings of various phenomena and topics (Piscitelli and Anderson 2001, Pink 2007, Leitch 2008, Vicars & Senior *in press*).

Method

Data Production

A small group of students are invited to **draw** where they where they like to be and where they learn at school. They use crayons and pastel and work together upon a large scroll of drawing paper. The researchers also participate in this process that generally takes 45 minutes. On this occasion, the students were photographed during this session. Researchers take note of conversations that arise during the session (see figures 1 to 3).

Later, students are given an A3 sheet of paper and pencils (water colour and lead) and asked to draw a **map** of their school (see figures 4 and 5). Upon completion students are asked to overlay their map with a transparency (figure 6) and using an OHP pen they are asked to draw themselves on the map in as many places as they like to be. In Figure 7 below, Anna Maria drew herself in purple on the transparency. Students are asked to overlay their map for a second time this time drawing in their teacher/s (see figure 7) using a different colour OHP. Each layer of the students' map is scanned onto the computer.

Each student in the group is given a digital camera for a period of approximately one week and asked to **photograph** 'learning' over that period. Their classroom teacher is also given a digital camera for the same period and asked to do the same. The photographs ar
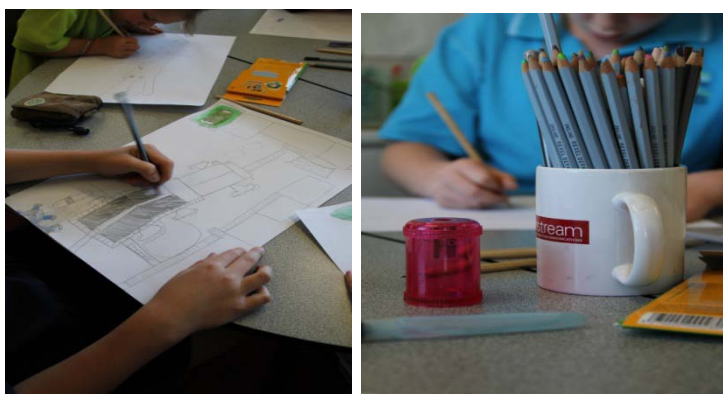
Figures 4 (left) and 5 (right): students drawing maps of their school

Figure 6 (left): overlaying the map with transparency. Figure 7 (right): Drawing the teachers on the map – the second transparency layer

Analysis

All visual data is laid out. Researcher field notes, significant quotes from interview transcriptions (if available) are also included alongside the generated data (drawings, maps and photographs). Story lines of learning are traced through the data (Dixon 2008). Intersections between data are grouped together (see figures 8 and 9) identifying the main story lines in the 'conversations or dialogue' of the data, discursive narratives, and the positionings of the actors relative to each story line (Harré and Slocum 2003).

Figure 8: Visual data being laid out

Evaluating the process

This layered process was nuanced and generative of student perspectives not previously accessibly through researcher observation, photograph or interview. It provided the opportunity for reflective work by individual students, collaborative work as students worked alongside each other and multiple avenues of expression working across various learning styles.

The insights from the students' perspectives provided, particularly in regard to student and to teacher positioning in learning, would have been enhanced through the use of this same processes with the teachers of these children.

PaperShow Photostories

Jill Loughlin

Drawing on another made for business technology we explored the use of PaperShow in the research process. This product allows for a powerpoint presentation to be edited or labeled using a digital pen technology. The technology was used during interviews using the students own photographs of the school as provocations.

Weber (2008) gives the researcher many good reasons to use visual images in research including the ability to capture that which is 'hard-to-put-into-words' (p44). The use of photography with students permits them to capture the world through their personal lens allowing them to 'show' their ideas and thoughts to the researcher. However, a photograph without any discussion will not necessarily convey the same meaning to the audience that the photographer intended to capture so there needs to be some discussion around the composition and subject of the photographs.

Five students (Years 5 & 6) were sent out with a digital camera to take photos of the places that they liked to 'hang out' in within the school grounds. This was not a question of learning spaces but a question of physical appeal during their leisure or working time. The researcher did not go with them but allowed them to work together in teams to produce a set of photos that they felt showed their favourite spaces within the school grounds.

These photographs were then combined into a powerpoint slideshow and printed on PaperShow paper products. The students then sat with the researcher to review and talk about the photos. They were asked to describe where the space was, why they had chosen that particular space and what were the physical aspects of the space that appealed to them. They were also asked to describe what sorts of activities were pursued in the space and with whom.

As students discussed the photographs the researcher recorded using the PaperShow digital pen technology, some keywords and phrases that the students were using. The students were able to ask for edits to these phrases as the interview progressed, they were also able to choose aspects of the photo to be highlighted or framed and to select colours for the writing that they felt best indicated what they wanted to say. This process became a co-construction of the visual data to tell a more explicit story about how students experienced spaces and constructed their 'spatial identities'.

The data in this process is being analysed by both the researcher and the participants as it is being produced with an agreed upon story and themes. The process takes the coercive power away from the researcher and gives it to the participants. The resulting data is immediately available as viewable text within the project.

Pencasting

Jill Loughlin

Smartpens (digital pens) have been the province of business users for many years with their ability to capture handwritten notes and drawings for use in digital formats. The variety of smartpens, their ease of use and portability, their low cost and their applications has extended their use beyond business to students and academic research. LiveScribe, a company that was created by the inventor of the LeapPad Learning System, have developed the Pulse and the Echo (smartpen brandnames) which perform a dual function of not only recording the written component but also synchronising with an audio recording. The immediate application of the pen allows the user to write words, draw pictures or take extensive notes that then act as markers to the audio recording. However, beyond this, LiveScribe has developed the Pencast, which creates a file format that allows for the written drawing/notes to be viewed and accompanying audio to be heard in 'live time'.

The attraction of this technology as a research tool is that the research interview can be reviewed as it happened with either the researcher or the participant taking control of the written component of the interview. The pencast can then be created and analysed by the research team without sacrificing the integrity of the interview through transcription. Since the pencast also has a live synchronization element the research analysis can be accessed at particular points in the research interview with ease.

Method

Before introducing the student participants to the smartpen technology, we spent time talking about the learning spaces in the school and drawing the spaces on paper using coloured pens. The process of drawing served to relax the students as they talked and this discussion was recorded in an audio format only. The students were asked to draw school maps and to eliminate any feeling of inadequacy the researcher drew rough maps during the interview as well, often including deliberate mistakes that the participants could then correct for her. Eventually the research group settled on an agreed map of the Year 5 & 6 Learning Suite.

Using this agreed map, the researcher then drew this on to special paper using the digital pen. The process of performing this with the participants watching allowed her to demonstrate the technology and pique their interest as to how the synchronization worked. Once she had done this she handed the pen to each of the participants and asked them to draw themselves in their favourite parts of the space for learning, working and being. The students were encouraged to draw in features of the space, for example, furniture and its placement. They were also asked to draw in not only themselves but any friends who might be with them and finally where the teachers usually were in the space. As they drew they described to the researcher what activities they might be doing in these spaces.

Five students were recorded talking and drawing individually but the maps were shared in pairs or threes with students able to add to the previous participants drawing.

Analysis

The creation of the pencast itself is relatively easy using the LiveScribe software. The audio component was transcribed although this is not completely necessary since the pencast allows the viewer to access any part of the pencast at any point by merely tapping on a particular part of the drawing. The pencast data was compared across each of the participants to look for commonalities and differences in their attitudes and activities within the learning spaces. The ease with which this could be done was heightened by the pencast format since the data had been able to be combined into two maps which contained the data for the five participants.

The ability to review the entire interview through the pencast allowed for the researcher to explore elements of the research interview that are often lost post-interview unless the interview is being captured in video. Moments where particular voice inflections, choice of words and the accompanying drawing activity reveal a disjuncture between what younger students might want to say and feel able to say. This was most revealing when the students were describing the type of work they were doing relative to the ambient features (noise, light, air, furniture) of the spaces they described and their sense of safety and security.

The pencast also permits the researcher to analyse their own presence within the interview which often serves to lead younger participants particularly in ways that are unintended. It serves to highlight data that has been inadvertently coerced in the interview process that a researcher may not realize they are doing using more traditional methods.

When the security and integrity of the data storage can be maintained (at present the storage and access is only available in the LiveScribe online community) and data edited to remove identifiers then this will also permit a wider audience to share in the raw data.

Vidi

Jo O'Mara

Vidi is an in-house built software package that enables video to be "marked up" or annotated directly to the video. The video is played through the program and can be stopped at any point and a note can be added to the video. These notes can then be viewed with the video and sorted by time, who made the note or keywords. The annotations can also be used as a way of tagging a specific point in time, and enabling particular sections of the video to be quickly found. The program is very simple to run and use, and has a wide variety of applications.

In the first stage of development, the program was run on a secure server. Passwords had to be created to use the program and video had to be uploaded to the server. While the potential of the tagging was clear, this process was cumbersome and took some time, so we rethought how it might best run.

The second phase of development means that a teacher or researcher (or both) can have the *Vidi* as a complete system. The program can be loaded onto a single laptop computer and then that computer acts as a server to a set of Ipads or other laptop computers. Video taken in a classroom context (of students working, for instance) can be immediately downloaded from the capture device onto the computer. The ipads then connect into the server computer and can run the video on each device (this can be started at different times). The video can be stopped at any point in time and annotations can be added. Using an in-house computer as a server (via Bluetooth) means that the data is not transmitted beyond the immediate area of the classroom. The tags can be made by students to do things such as describe what they are doing, pose questions or to mark points in time where they were most engaged. This data can then be viewed in various ways such as by the time point on the video, by the person who added the tag or these annotations can be searched by keywords.

In the ILE schools, there was a wide range of technology being used innovatively. The *Vidi* system would work very well in conjunction with existing practices as the software can be loaded onto existing hardware. V*idi* can also be used to facilitate reflection by students, or as a basis for them to check the aesthetics of their performance work. It can be used for research purposes to both ask students to comment directly on moments of the classroom work, or for teachers and researchers to tag the video for their own purposes after class. There is great potential for this type of system to be used as a meta-cognition tool. Because the tags can be searched, students could compile video logs over time. In terms of qualitative research, it can be used instead of working from transcripts of videotape. The advantage of this is that it provides a manageable way for the researcher to stay in contact with the original data.

MotionLab: Tracking the spatial behaviour of teachers and students in learning spaces[3]

Jill Blackmore

Understanding how teachers and students move around and through open-plan classrooms is critical to understanding the specific kinds of learning behaviour these spaces facilitate, and therefore to evaluating their use and value in schools. Evaluating how space is used in a learning space involves a consideration of a range of factors such as proximity to others, degrees of stillness and locomotion, and patterns of congregation and disaggregation which, collectively, comprise what might be termed 'spatial behaviours'.

Tracking the two-dimensional movement patterns of students and teachers in a classroom setting is a means of quantifying elements of spatial behaviour so that they can be analysed in a learning context. Motion capture, which normally takes place in a custom designed studio, can be adapted and simplified to track the movement of students and teachers in situ, in a real classroom. For example, a single high definition colour video camera placed in a birds-eye view position, looking directly down at the floor area of the test environment, provides similar capacities to track individual and group movement while protecting privacy. It would provide a two dimensional view of the participants for the duration of the experiment. Participants would wear brightly coloured markers or caps to enable motion tracking from the video feed. A custom computer application using interactive software such as Max/MSP/Jitter could be developed to track the movement in the 'x/z' plane (tabletop plane) around the room. The theory behind such analysis has been successfully implemented in, for instance, most video editing suits - where *chroma key* channels are frequently extracted from the source footage, and colour tracking is a relatively common application in interactive performance, although not usually used in these artistic contexts to extract quantitative data.

Using this technique, it would be possible to track the movement of discrete groups of participants, although probably not of individual students. For example, the movement of male students, female students and teachers could be used to compare the spatial behaviour of groups in terms of amount of mobility, amount of stillness, usage patterns across the space, e.g. 'hot spots', which are frequently used and 'cold spots', which are rarely used, speed/slowness, degree of proximity to others. These measures could be used to analyse the ways in which the different groups use the space, and to compare the use of different spaces. It would also provide data about patterns of interaction between teachers and students, and composition of groups, while protecting individual privacy.

This technique would require in the order of 3 weeks software/hardware development and testing. Set up and data collection on location would require a team of three research assistants, with set up time in the order of 1 – 3 hours, depending on the infrastructure in the space. Data analysis requirements would depend on the scope and numbers of measures needed, and the type of documentation developed (e.g. QuickTime movie, graphical representation, etc.).

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[3] The team at the Deakin Motion.Lab is experienced in developing custom interactive applications for creative and analytical contexts. Clients and industry partners include Australian Defence Apparel Pty. Ltd., the Hawthorn Football Club and the Melbourne Ballet Company. More information can be found on our website http://www.deakin.edu.au/motionlab/.

Nearmap

George Aranda

Nearmap (www.nearmap.com) is a web mapping service application similar to Google Maps. It is capable of displaying aerial images of Australian locations specified in its web browser. Nearmap has mapped approximately 2% of Australia with particular emphasis on its capital cities. What differentiates it from Google Maps is that it is capable of displaying images of the same location taken over a period of time. It currently updates its images of Australian capitals every month or quarter.

Nearmap was tested as a tool for this project where researchers would be able to examine changes in the school visible from aerial photographs. It was thought that student's use of space could be examined in terms of spatial dynamics (e.g. how students use the space throughout the day) or social dynamics (e.g. where boys or girls played), or how students responded to structural change (e.g. buildings being constructed or renovated).

Method

Screenshots were made from Nearmap aerial images for three of the schools involved with the Innovative Learning Environment (ILE) Project. Nearmap had multiple images of each school, typically taken over the course of the previous year. See below for examples of the screenshots made for John Monash Science School

Analysis

The screenshots of the aerial images were very clear and useful in examining gross structural changes such as construction of buildings or repairing school ovals. This would make Nearmap useful in determining a relationship between student area use of outside space and how this might be related to student morale. It could be useful in examining how students are affected by construction when their recreational areas are impinged upon or when they are unable to access these spaces. This would require surveys or interviews being conducted before, during and after construction in conjunction with Nearmap data of the same timeframes.

However, as we had no control over when the aerial images were taken, they were often taken outside of the school year, on weekends, outside of school hours or while the students were in class. This made it difficult to obtain screenshots of when the children were using the outside areas. If it were possible, to a priori arrange for aerial images to be taken during recess, lunch or afterschool hours, this might be a useful tool in examining student use of school grounds.
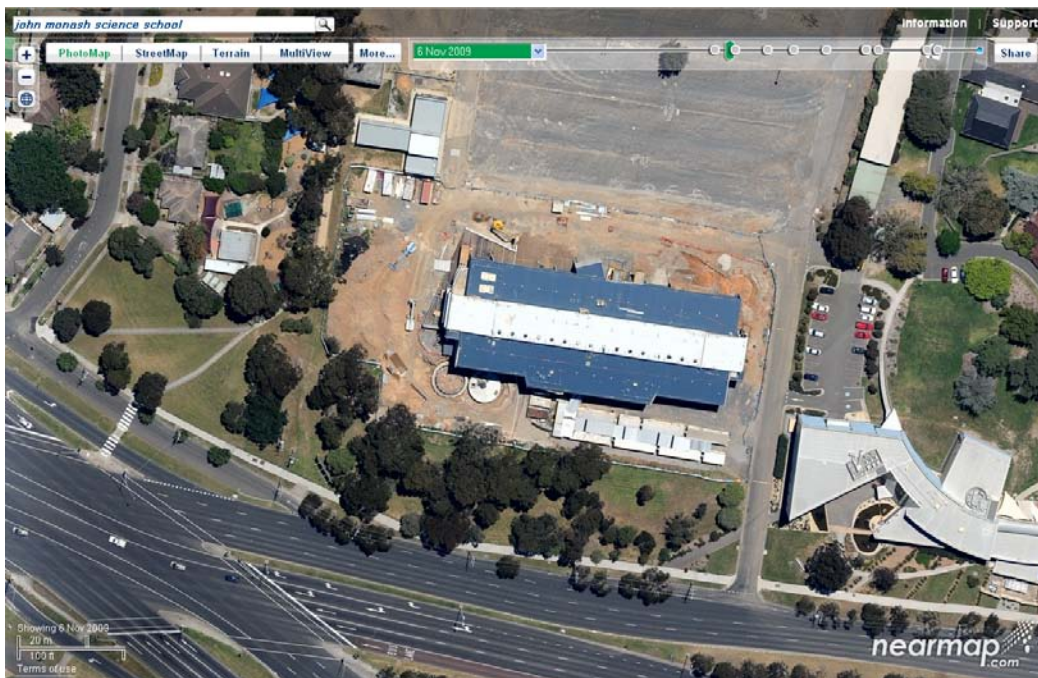
Nearmap Example: John Monash Science School

The following is a series of images taken from www.nearmap.com which illustrate changes made to the school between the 12th of October, 2009 and 20th of July, 2010.
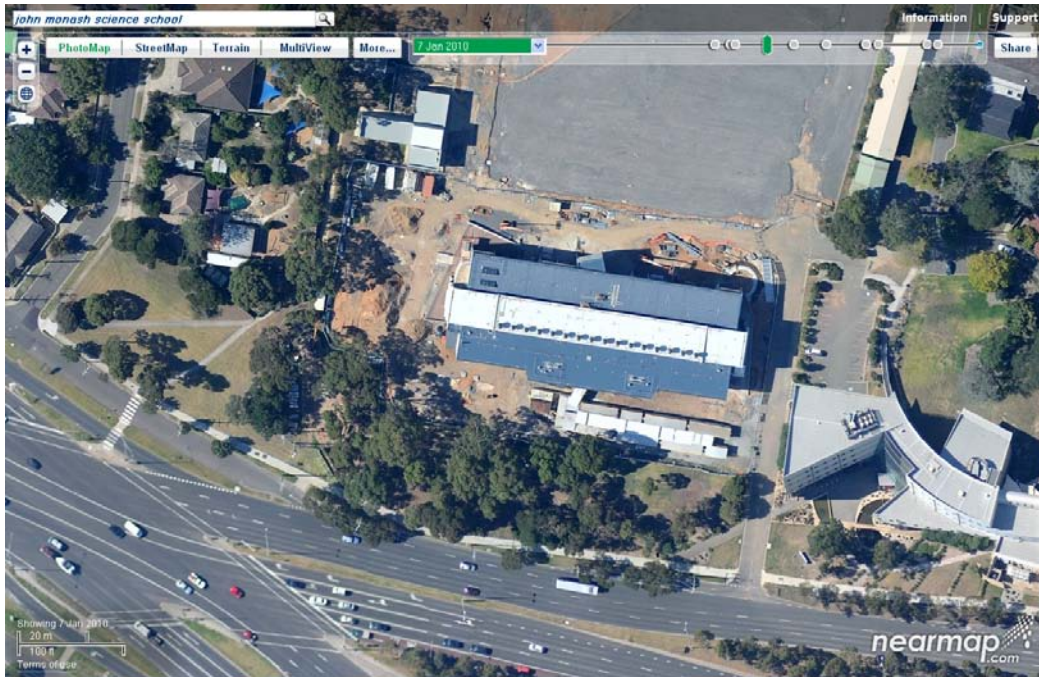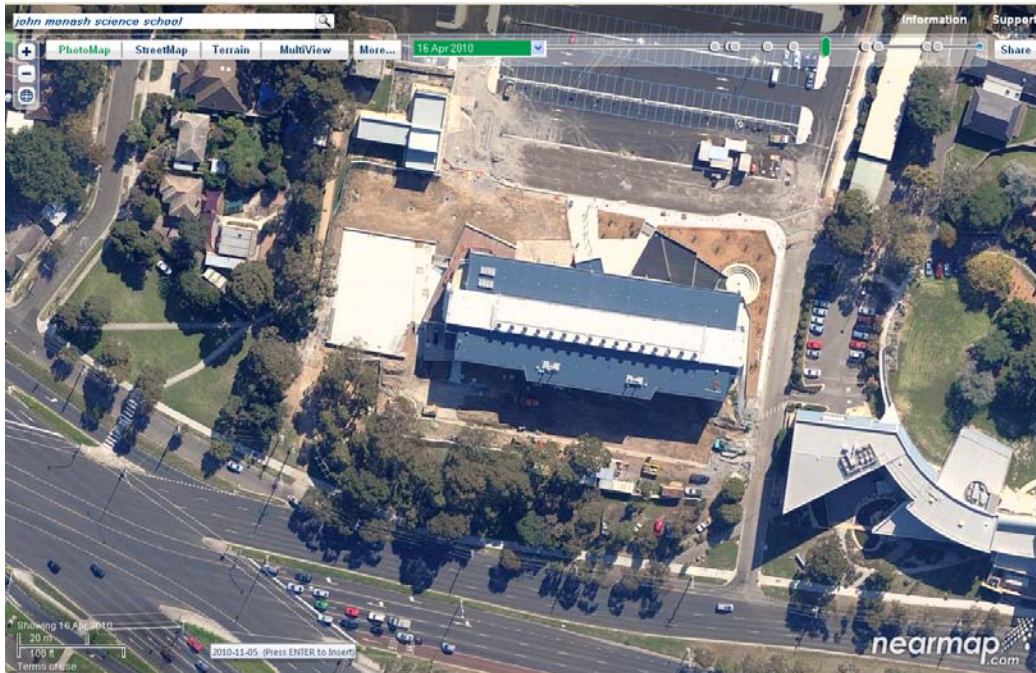
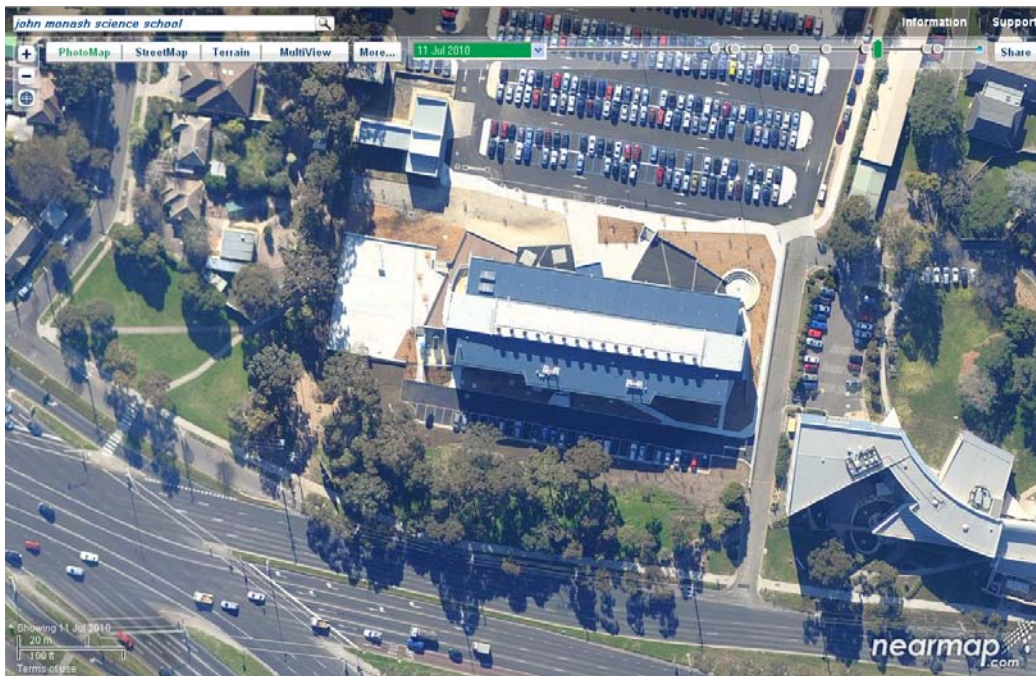12 October, 2009
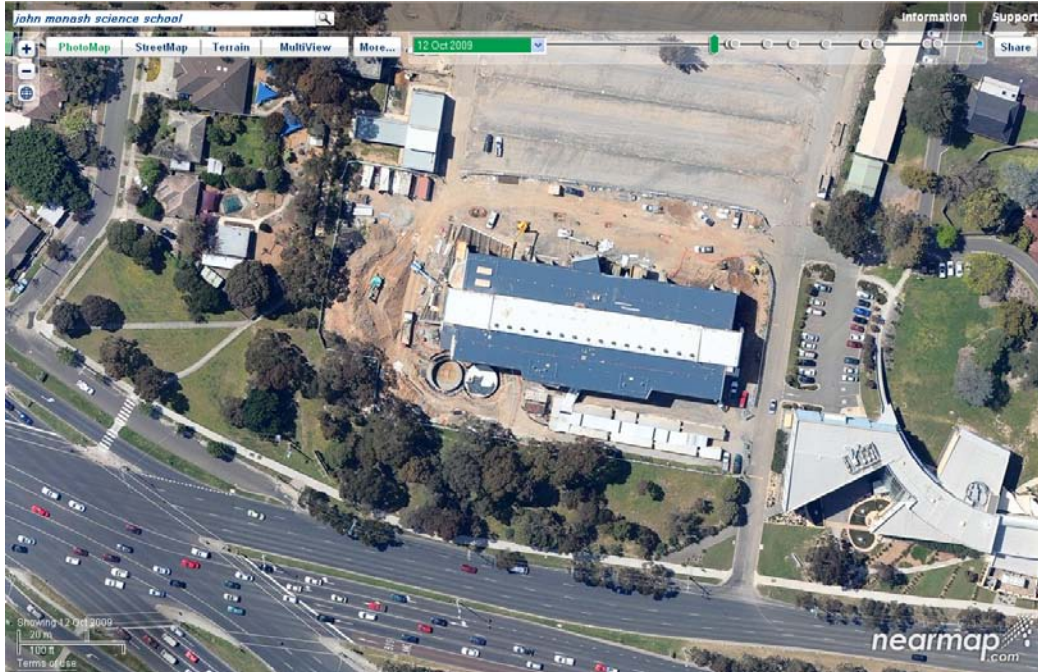
6 November, 2009

7 January, 2010

20 February, 2010

16 April 2010

11 July, 2010

The Learning Spaces Portal

Debra Bateman

As demonstrated through a recent literature review undertaken by Blackmore et al (2010), there has been much published through print media, which describes various aspects of learning space design, and the ways in which space can be conceptualised. In our more recent project focusing on Innovative Learning Environments (ILE), the complexity of investigating what occurs within a space or ILE has been highlighted. Often, the discussion about space does not adequately capture the ways in which people use space, or the various elements of space that enable the richness of teaching and learning that is now expected in innovative classrooms and that focus on personalized learning. The Learning Spaces Portal attempts to represent some of these elements, and to annotate the ways in which of these elements are significant.

The Learning Spaces Portal is a website (www.learningspaces.edu.au) that represents a learning common, between Deakin University's Centre for Research in Educational Futures and Innovation (CREFI) and the Department of Education and Early Childhood Development (DEECD). A learning common has been described as a knowledge community when information is organised in collaboration with learning initiatives defined through cooperative processes (Beagle, Bailey, & Tierney, 2006). The richness of these collaborative representations of data and interpretations of that data indicates the success of a learning common.

The aim in this instance is to interrogate and define the essence of an Innovative Learning Environment. What has been clear through this research is that there is not a one size fits all model, and that it is what occurs within the space, not what the space is, that leads to productive learning. Thus, the Learning Spaces Portal showcases the multiple ways in which Innovative Learning Environments were evident in 12 schools across Victoria.

The technology of the website provides the affordance of multimodal engagement with texts (New London Group, 1996), with multiple layers and links between the twelve case studies, the reports analyzing the case studies, and the methodology discussion paper. The 12 case studies, each undertaken over five days as one-off snapshots of the Innovative Learning Environments, provided us opportunity to examine the ways that innovative practices were initiated, evolved and evaluated. There were multiple examples of how this occurred – in a school's philosophical stance, organisational structure and culture, the use of classroom space, school design, the integration of learning technologies, multi modal pedagogies and professional learning. In order to represent this data, we have technologies which enable some interactions with the different aspects of the Innovative Learning Environment's context. It is possible to download the full report, with text and photos for each case study.

The artefacts include video tours through the built environment guided by a school leader and a selection of annotated photos that capture the nature of the ILE, thus enabling the visitor to the site to gain a sense of the spatial characteristics of the ILE. The suite of artefacts vary for each school and highlight the differing approaches to teaching and learning, with a focus in some instances on student learning and others on teacher professional learning. This site will continue to be a repository as research is ongoing in these schools, thus tracking how innovative practice transforms over time.

The Learning Spaces portal offers great potential in showcasing innovative practices and is a valuable professional learning tool by making the practices and spatial dimensions of learning visible to others (Project Zero & Reggio Children, 2001). It is original in both reporting on research, and creating a learning commons for teachers and researchers.

Discussion: exploring the lived environments of learning communities

This paper identifies a range of possibilities around how to investigate associations between pedagogical practice, spatiality, and student learning. A number of emerging themes arose.

Student's perspectives often offer a very different perspective on pedagogy, space and time. In particular, the spaces they identified as most pleasurable or conducive to learning were not necessarily those considered learning spaces by teachers. The students also come to the research endeavour with fewer pre-conceptions than teachers as to what is expected and therefore provide fresh, often naïve, representations on teaching and learning.

Furthermore, students were active participants, in terms of providing direction and indeed intervening in some instances to point the researcher to what they found to be interesting, with some taking control over the interview.

A major theme in the data gathered through these approaches was the significance of place as distinct from space. Space has a more abstract connotation, whereas the students often identified with a particular space as 'my place', 'my desk', 'my drawing' in that space. This again goes back to the notion of spatial identity and the sense of belonging that students seek and relationships that nurture their learning.

These methods of data collection were context and cohort responsive. A dimension not explored here due to lack of time, was how particular methods were age-appropriate.

The portal also enables discussions between teachers around how to expand their pedagogical repertoires but also 'provocations' to reflect on what is going on here. The portal has the capacity to disseminate ideas and provoke imaginaries about the potential of flexible learning spaces and ICT in terms of creating ILE.

The focus of most of these explorations was on student voice and representations. We found that teachers, particularly those with multiple visitors to the school to view the ILE, provided a more scripted account of what was going on when interviewed. This led us to conclude that it would be valuable, given the focus of these methods on pedagogical practice, to undertake longitudinal research in which teachers with researchers mobilized these visual research technologies as pedagogical tools to inform their own practice. This would make visible many of the intangibles and silences that are evident in more conventional research approaches, and facilitate teachers to get beyond the dominant script of what is successful and hopefully continue to innovate.

These methods together provide numerous potentials as to how teachers can reflect on practice. For example, capturing the workings of a group of students and/or team of teachers through video and motion capture, and then using video recall techniques to have teachers and students respond through Vidi onto video, would provide a reflective talking script of the activity. Such 'learning events' can be used as a 'provocation' for teachers to explore.

Working with students as co-participants in producing data about their learning also indicates the potential for teachers to use these research tools as pedagogical tools. Various teachers expressed interest in considering how they could readily adopt many of these techniques into their everyday practices. The potential of these methods described here indicate that valuable data could be derived through the extension of these methods across time. Visual methodologies provide a way of doing research on, as well as in, educational practice.

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