Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

USING VIDEO DATA TO RESEARCH PEDAGOGIC PRACTICES IN NEW GENERATION LEARNING ENVIRONMENTS IN SCHOOLS: DEVELOPMENT OF A FRAMEWORK FOR ANALYSING AND REPRESENTING TEACHER PRACTICE

Dr Benjamin Cleveland
University of Melbourne, Parkville

Dr Helen Aberton
University of Melbourne, Parkville

Abstract

This paper discusses the use of video data to research pedagogic practices in new generation learning environments (NGLEs) in primary and secondary schools. Using video footage drawn from a collaborative research project between the University of Melbourne and the Victorian Department of Education and Early Childhood Development (2013), the paper charts the development of a framework for analysing and representing teacher practice across a range of NGLEs: learning spaces that provide a greater degree of spatial variation, geographic freedom and access to resources for students and teachers than traditional classrooms.

Video of teacher practice collected in four Victorian government schools was used as the basis for developing the framework. This footage was initially coded using Studiocode, a software tool that has been employed to analyse teacher practice in classrooms across the world, including by the International Centre for Classroom Research (ICCR), but not as far as we know used to analyse teacher practice in NGLEs through a human geographic or spatial lens. The paper describes the research methodology, the data collection methods and the analysis framework that was developed to represent data about the 'intersections' between people, space, practice and time i.e. the complex spatialized pedagogic practice of teachers in NGLEs. The practical dilemmas and hurdles that were encountered during the process of developing a simple coding system and visual tool that could represent teacher practice in NGLEs are discussed, along with the final analysis framework and representational tool that arose from the empirical data.

Introduction

Emerging visions for what 'good' teaching and learning should look like in primary and secondary schools has significantly influenced school design in Australia during the past decade, as well as internationally (Loughlin, 2013; Mulcahy, Cleveland, & Aberton, 2015; OECD, 2013). During this period, the process of school design has become a dynamic setting for debate about pedagogic practice in both individual schools and across education systems. Furthermore, the subsequent inhabitation of new learning environments has become a forum for the development of 'new' pedagogies. Within this climate of change, the proliferation of new generation learning environments (NGLEs) – an umbrella term used here to refer to a variety of learning spaces that provide a greater degree of spatial variation, geographic freedom and access to resources for students and teachers than traditional classrooms – has followed progressive ideas about 'learner-centered', 'personalised', 'enquiry-based', 'technology-enabled' and 'collaborative' teaching and learning practices (Cleveland, 2015).

Interest in this dynamic setting for educational change has grown over recent years, with educators and architects becoming increasingly aware of the 'developmental space' (Derksen et al., 2011) that can be

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

created through people dialoguing about altering the physical environment in schools, and reflecting on their experiences of inhabiting new learning environments. Indeed, the significance of the debates surrounding the potential 'transformational power' of new spaces on teacher practice and learner behavior should not be underestimated amidst other debates about how to improve our education systems.

However, as is readily pointed out in the literature, there remains a lack of evidence about what influence new learning spaces have on pedagogic practice and how such influence may be realized (e.g. Blackmore et al, 2011; Boddington & Boys, 2011; Deed & Lesko, 2015). We still know little about what may or may not be occurring in new learning spaces and require more information about what teachers and students are actually doing in these socio-spatial settings to substantiate claims of what is afforded by new school designs, or not. Amidst the complexities of teachers and students trying to integrate their historically-derived practices into new environments, many people currently involved in contemporary school design remain perhaps too tightly tied to their visions of 'what is possible' and 'what should be happening' to be suitably objective about the practices and activities that are actually afforded by the variety of new learning environments now available in schools. As suggested by Saltmarsh et al. (2014):

> … [open plan] learning environments can pose considerable pedagogic challenges for teachers who must balance the ethos of spaces designed to facilitate autonomous and flexible student learning, while simultaneously managing the complexities of shared space and resources, decreased staff–student ratios, and highly variable student responses to learning in open-plan settings (p. 1).

More research-informed conversations about what is going on in new learning spaces is needed to enhance pedagogic practice in the NGLEs that have already been built in Australian schools, as well as the spaces that are likely to be built in the coming years.

Of course, gaining access to research-informed conversations about what is going on in NGLEs is problematic as research into teacher and learner practices in these spaces is rare and the research that is available is often case study-based and therefore not readily accessible to practitioners (teachers and architects) or comparable across multiple sites.

This paper takes as its lead the problem of how to analyse and represent *teacher practice* in NGLEs in ways that are (1) accessible to practitioners and (2) readily comparable across sites. Using video footage drawn from a collaborative research project between the University of Melbourne and the Victorian Department of Education and Early Childhood Development (2013), this paper charts the development of a framework for analysing and representing teacher practice across a range of NGLEs, including both primary and secondary schools. The research question that directed the project was:

What kinds of pedagogic practices do the newly designed learning spaces of Victorian government schools afford?

The aim of research reported here (one aspect of a larger project that included additional aims) was to develop a simple method that could be used to code, analyse and represent teacher practice in NGLEs. Video of teacher practice collected in four Victorian government schools was used as the basis for developing the analysis framework. This footage was initially coded using Studiocode, a software tool that has been employed to analyse teacher practice in classrooms across the world, including by the International Centre for Classroom Research (ICCR), but not as far as we know used to analyse

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

teacher practice in NGLEs through a human geographic or spatial lens. The paper describes the research methodology, the data collection methods and the analysis framework that was developed to represent data about the 'intersections' between people, space, practice and time i.e. the complex spatialized pedagogic practice of teachers in NGLEs. The practical dilemmas and hurdles that were encountered during the process of developing a simple method (coding system and visual tool) that could represent teacher practice in NGLEs are discussed, along with the final analysis framework and representational tool that arose from the empirical data.

Background

The use of video data in educational research is becoming increasingly common. Indeed, Derry et al. (2010) noted that the "widespread availability of affordable, usable, high-quality video technology is transforming the practice of learning science research" (p. 4). These authors suggested that many researchers are being drawn to the use of video technologies because they can provide "powerful ways of collecting, sharing, studying, presenting, and archiving detailed cases of practice to support teaching, learning, and intensive study of those practices" (p. 4).

However, as highlighted by Snell (2011), the richness of video data can provide researchers with an 'analytical headache' due to the potential for sensory overload. Raising an important issue, Snell asked: "how can analysts make sense of the array of verbal and visual phenomena that video represents" (p. 253). Derry et al. (2010) also highlighted this issue and commented:

> Accessible video technologies provide researchers with powerful "microscopes" that greatly increase the interactional detail that can be obtained and permanently stored for comprehensive analysis and reanalysis by multiple investigators. However, this enhanced observational power requires thoughtful attention to the problem of how to extract data and meaning from the large, complex video corpora that such research creates (p. 6).

This critique of the use of video as a research tool in education aptly sets the scene for the types of hurdles and dilemmas that were encountered in this research project. Armed with the question, *'What kinds of pedagogic practices do the newly designed learning spaces of Victorian government schools afford?'* the choice of video as a means of collecting detailed data about teacher practice in NGLEs appeared to be an obvious choice. Yet, developing a simple method that could be used to code, analyse and represent teacher practice in NGLEs proved to be a more time consuming, and at times confounding, process than anticipated – in part due to the nature of the complex socio-spatial settings in which the research was conducted (teaching and learning in NGLEs). Recognizing the image- and video-based research of others in traditional classrooms (e.g. Clarke et al's 2006 investigations into the teaching of mathematics across twelve countries and Lim et al's 2012 investigation into 'spatial pedagogy'), we feel safe in suggesting that collecting video data of teacher practice in NGLEs came with an added dimension of difficulty due to the mobility afforded to teachers (and students) in these spaces and their resultant regular movement between multiple locations. To accommodate such movement, up to three technicians were required to pursue their teacher 'subjects' around the learning spaces that were chosen for this project (further details about the data collection methods are provided below).

Martin (2002) described the 'classroom' as a system where "there is a complex relationship between the physical structure and arrangement of the room, the teacher, the students and the distribution of space" (p. 139). In many ways, NGLEs are intended to support the development of a 'new' system, whereby teachers and students can engage in practices and activities that are 'learner-centered',

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

whereby teachers and students can engage in practices and activities that are 'learner-centered', 'personalised', 'enquiry-based', 'technology-enabled' and 'collaborative' (Cleveland, 2015). The development of these new socio-spatial systems for teaching and learning has been driven by government policy (e.g. DEECD, 2009; 2011) and educational researchers across Australia have become increasingly interested in the 'system development' that has been occurring over recent years. For example, Alterator and Deed (2013) considered how modern versions of the open classroom authorised different approaches to teaching as a means to identifying teacher reaction to the affordances of open space learning environments. Saltmarsh et al (2014) identified teachers as a "significant group whose everyday spatial practices merit in-depth consideration" (p. 3) and conducted case study research into how teachers' existing understandings of pedagogy as a structured activity influenced their use of open-plan spaces and the material resources within. And Deed and Lesko (2015) examined how teachers adapt to the 'action possibilities' of new school facilities, designed and built on the concept of openness. It was their conclusion that:

> … the nature of open schools and classrooms means that it is difficult to achieve a mature system with coherent pedagogical practice, a shared culture and mutuality between teacher and student learning. Rather, there is a continual process of negotiation as teachers react and adapt to the affordances of open learning environments. Hybrid pedagogy tends to result from the friction between routine and possible practice within open space, increasing the intensity of teaching practice (p. 217).

This research project sought to extend this field of research and contribute to it a tool for coding, analyzing and representing teacher practice in open, or as we prefer to call them, new generation learning environments (NGLEs). We see the potential contribution of video-based research in this field as significant, and recognise that some standardized research approaches (Derry et al., 2010) could help advance our understandings of what is actually afforded in these spaces.

Methodology and Methods

The (overall) research project

A small-scale study (2012-3) was designed to investigate the nature of the teaching and learning afforded by the newly designed learning spaces in Victorian government schools with the potential to provide an evidence-base for better understanding relationships between teaching and learning and the physical and virtual spaces in which these practices now take place. It was conducted by the authors' university in collaboration with the Victorian Department of Education and Early Childhood Development. A stratified sampling strategy was used to select four Victorian Government schools with a reputation for innovative pedagogic practice in NGLEs. Participating schools were (i) a large, outer suburban, government secondary school in a low socio-economic area; (ii) a large, suburban, government secondary school in a high socio-economic area; (iii) a medium size, government primary school in a relatively affluent suburb of a regional Victorian city; and (iv) a medium size, government primary school in the western suburbs of Melbourne servicing a low socio-economic and immigrant community.

Methods

Video-based case studies of 'naturally' occurring interactions in primary and secondary learning units at these schools were conducted and accompanied by interviews undertaken with school Principals

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

and Assistant Principals (seven altogether), participating teachers (nine altogether) and participating students (eight altogether).The video case data were collected as: (1) video recording of classes conducted in the learning spaces for a minimum of fifty minutes, using up to three cameras to collect teacher and student data; and (2) semi-structured individual interviews conducted at completion of filming with participating teachers (nine altogether), selected students (eight altogether in pairs), and Principals and Assistant Principals of the participating schools (seven altogether).

Data collection

Video recordings (along with interviews and researcher observations) were conducted. The complexities of traditional classroom research invite a method whereby both student and teacher interactions can be recorded simultaneously by several cameras affording a more efficient overview than can be achieved by just individual observers (Clarke, Mitchell, & Bowman, 2009). In the NGLEs that were the focus of this study (as compared to contained single classrooms), additional challenges for the researchers included classes with more than two teachers and up to 100 grouped students, and the added mobility of students and teachers.

The technicians videotaped as extensively as possible with two fixed cameras, whilst each participating teacher was exclusively filmed by mobile cameras as he/she interacted with students and spaces. Sound recording equipment was 'worn' by the teachers and other microphones were set up to record as much as possible in filmed areas.

Collation of data

The video and interview data from each site were collated and made available to the research team by the technicians. At Balliang Primary School (a pseudonym) there were ten videos created in total. These included four videos of the class session, an aggregated '4–up' of these videos, two teacher interviews, one paired student interview, two GoPro videos filmed by students when taking the researchers on a walkthrough of their NGLE, and a '2–up' of the same 'tour' videos. These provided considerable scope for working with these data in different ways, such as generating different representations of the pedagogic practices in the learning spaces.

For the purposes of this paper we concentrated on the in-class videos only as a means to exploring a method to generate meaningful representations of this video data. The following figures (Figures 1 and 2) show 'still' examples of the type of footage captured of individual teachers at Balliang PS. The time elapsed during the 50 minute lesson is shown.

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

Figure 1: Teacher 1 at Balliang PS (at 11 min 45 sec)

Figure 2: Teacher 2 at Balliang PS (at 14 min)

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

Video analysis and generation of new data

From initial viewing of the classroom videos 'lesson tables' (see Table 1 below) were created so that simple descriptive analysis by frequency of pedagogic practices could be undertaken and demonstrated in each learning space. It proved difficult to represent the complexity of different pedagogical encounters in open and constantly changing spaces, where there was considerable student and teacher mobility. However, these preliminary representations helped the researchers identify patterns and levels of detail that informed the further analysis of lesson events.

Table 1: Sample lesson table – Balliang PS (partial lesson only used to represent technique)

Time code	Lesson Event	Group 2	Group 1	Teaching and learning materials	Sociomaterial practices – reassembling spaces
00.00	1. Combined class seated on floor – brief introduction			Interactive whiteboard display Title of session – 'Building ideas (Branching out)' Designated groups A-H Black lines on carpet. Teacher stools.	Teachers seated in front of students each side of whiteboard, children sitting on floor in compact group within designated black lines on carpet, with focus on teachers and whiteboard.
01.14-01.20	Transition - Division of students to two locations	Groups 1and 2 – (focus group) moved to 'back room'	'Shuffled' forward to fill gaps		Peeling off of focus group, relocation to 'back room' with teacher 2 'doesn't matter where you sit' – but facing teacher. 'Shuffling' to fill the gaps and restore compact nature (togetherness) of the group.

Representing the data

Our aim was to use the video footage to develop a method by which to represent the data as an assemblage, thus highlighting the multifaceted nature of teachers' work in NGLEs. In doing so, we hoped to develop a visual representation that could illustrate the intersections between people, space, practice and time, without oversimplifying the complex assemblages seen in the videos. With its many different applications, Studiocode software (see Clarke et al, 2009) was chosen as the preferred coding tool due to its flexibility and capacity for user-defined control over coding parameters (MacLin & MacLin, 2005).

Based on the pedagogic encounters seen in the videos we decided to focus on three elements of the learning assemblage (Dovey & Fisher, 2014): 'who', 'where' and 'what'. The category 'who' was derived from the number of students interacting with, or relating to, the teacher at particular times; the 'what' category was based on observed pedagogic practices; and the 'where' category was based on types of spaces, or physical settings, where the pedagogical encounters were taking place with each building.

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

Development of a coding strategy

Our initial use of Studiocode did not produce the types of representations we envisaged. However, not constrained by a pre-determined coding system, we used at iterative process of trial and reflection to arrive at a coding strategy that we were satisfied with and that we felt others could adopt. Indeed, the coding process was integral to the iterative process of developing (1) the coding system and (2) the graphic representation tool produced (see Figure 4 below). In order to develop a representation tool showing a continuous timeline it became necessary to refine categories in order to create mutually exclusive categories within each element. The final coding system was developed around the three distinctive elements of teachers pedagogic encounters (who, where, and what) as discussed above:

- Who (Human geography)
    - Group size: number of students the teacher is working with.
    - Direct collaborators: number of other teachers the teacher is working with directly.

- Where (Space)
    - Physical setting: type of space/physical setting where the pedagogic encounter is taking place.
    -
- What (Pedagogic practice)
    - Pedagogic mode adopted by the teacher(s) (teacher's role)

Our first attempt to code the teachers' pedagogic practices generated four categories: (1) discussion, (2) organisational instruction, (3) content instruction and (4) conferencing. However, on closer examination of the video footage it became apparent that these categories were not mutually exclusive, nor could they adequately represent all the pedagogic practices and encounters observed. Categories blurred or overlapped. The too simplistic categorization was expanded to better represent the pedagogic encounters witnessed. Subsequently, it was necessary to increase the number of categories so that they became mutually exclusive, thus ensuring the codes did not overlap on the representational timeline. Original categories were combined and/or additional ones were created, making eight categories in total (see Figure 3 below). 'Content instruction' was divided into two categories: content instruction and content instruction with dialogue. Similarly, 'organizational instruction' was divided into two: organizational instruction and organizational instruction with dialogue.

Representing all of the elements (who, where and what) for each of the teachers in one visual tool was not possible using Studiocode. Consequently, the data were charted manually using Microsoft Excel (see Figure 4 below). Upon first attempt, gaps appeared in the timeline where we had not coded certain periods of time during each lesson. Re-examination of the video footage disclosed additional pedagogic practices (what's): 'observation of students' and 'monitoring students'. The later we used to code teachers recording anecdotal notes, either in written form or on computers.

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

WHO		WHERE		WHAT	
1	■	Individual pod	■	Organizational instruction	■
2	■	Enclosed T&L	■	Org instruction with dialogue	■
3-7	■	Project/Wet	■	Content instruction	■
8-18	■	Large Group	■	Content instruction with dialogue	■
19-28	■	Open T & L	■	Discussion	■
29-56	■	Auditorium	■	Conferencing	■
57-100	■	Transition	■	Monitoring students	■
100+	■			Observation of students	■
T-T	■				
0	■				
teacher	■				
recording					

Figure 3: 'Who', 'where' and 'what' codes for pedagogic encounters in NGLEs

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
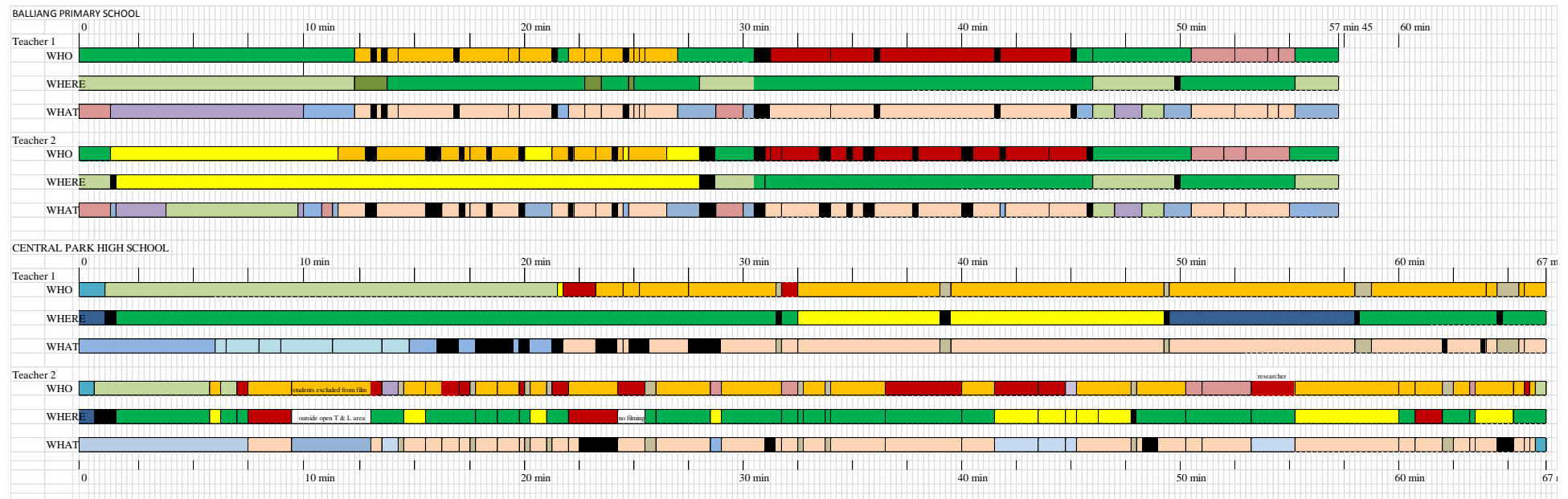Dr Helen Aberton
helen.aberton@unimelb.edu.au

Figure 4: Representing the data - teachers' practices in NGLEs (NB. each grid space represents 15 seconds)

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

The following figures (Figures 5-8) show the snapshots of the types of activities that were coded using the system outlined above. The 'who', where' and 'what' were identified from these '4–ups', that show concurrent teacher practice in shared spaces.

Figure 5: Organizational instruction at Central Park HS (at 16 minutes)

Figure 6. Conferencing at Central Park HS (at 33 minutes)

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

Figure 7. Content instruction at Balliang PS (at 6 min 40 sec.)

Figure 8. Conferencing at Balliang PS (at 25 min 45 sec)

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

Discussion and conclusion

The efficacy of using video for educational research depends on the strengths and limitations of the technology and analytical tools used, with various strategies needed in order to make sense of 'the array of verbal and visual phenomena that video represents' (Snell, 2011, p. 253). We found that a visual representation of different pedagogical practices was particularly useful when used in conjunction with the video footage from which it was derived. 'Mapping' the 'who', 'where' and 'what' contributed to our understandings of the dynamics of the pedagogical assemblages under review – and have allowed us to more readily analyse and share the data with other researchers. We believe that these representations highlight the multifaceted nature of teachers' work in NGLEs and clearly show the intersections and interrelationships between people, space, practice and time. Our experience aligns closely with that described by Derry et al (2010):

> Performing analyses with video is an iterative process that involves moving back and forth among the process of video selection; one's evolving interpretations and hypotheses; and a variety of intermediate representations for discovering, evaluating, and representing the video data for oneself and others (p. 15).

We hope that our initial foray into the use of video data for educational research will be a catalyst for further use of such technologies and investigation into the development of improved analytical methods.

We strongly believe that this type of analysis could make a positive contribution to future research and researchers, opening up the possibility to trace and overlay this type of analytic framework with other pedagogic variables/elements in order to better understand the complexities of pedagogic and learning assemblages.

The research reported here into the development of a framework for analysing and representing teacher practice across a range of NGLEs is by no means intended to be conclusive, rather it is offered to promote further enquiry into what tools could be developed and used to extract meaningful data from video footage of teacher (and student) practice in new learning spaces/NGLEs.

Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

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Dr Benjamin Cleveland
benjamin.cleveland@unimelb.edu.au
Dr Helen Aberton
helen.aberton@unimelb.edu.au

Paris: OECD.

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