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Pedagogical, Technical and Organisational Considerations for Using an Online Simulation with Pre-service Teachers

L. Kervin
University of Wollongong, lkervin@uow.edu.au

Brian Ferry
Univerity of Wollongong, bferry@uow.edu.au

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Lisa Kervin
Faculty of Education,
University of Wollongong,
Northfields Avenue,
Wollongong. NSW. 2522
Australia
Email: lkervin@uow.edu.au

Brian Ferry
Faculty of Education,
University of Wollongong,
Northfields Avenue,
Wollongong. NSW. 2522
Australia
Email: bferry@uow.edu.au

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Abstract

Simulations are fast becoming a popular way to use technology to engage users in learning about and critically reflecting upon workplace practices and experiences. This paper reports on our development and implementation of an online classroom simulation (ClassSim) created with the support of a large grant from the Australian Research Council entitled: *Investigating a classroom simulation designed to support pre-service teacher decision making in planning and implementing literacy teaching* (DP0344011). Our discussion is focused on pedagogical, technical and organisational considerations that have shaped the use of the software with more than 500 pre-service teachers.

Introduction

There is much in the literature describing the digital generation and their needs as learners. Descriptions of 'digital natives' (Prensky, 2001) and the 'Net Generation' (Oblinger, 2005) portray contemporary students as familiar and competent using Information and Communication Technologies (ICT) to achieve their aims. Prensky (2001) highlights the divide between 'natives' (students) and 'immigrants' (their teachers), positioning teachers as 'struggling to teach a population that speaks an entirely new language' because of the 'outdated language (that of the pre-digital age)' that they use (Prensky, 2001, p. 2). Oblinger observed that the so called net generation access more than eight hours of 'media messages,' each day; much of the time participating in multiple simultaneous activities, for example, surfing the Internet while listening to music (Roberts, Foehr & Ride-Out, 2005, in Oblinger, 2005, p. 69). Some researchers argue that this generation is intrinsically motivated to learn with ICT (for example, Leu, 2002 and McCombs, 2000), presenting the argument that as learners have changed so too must the nature of learning environments. It is therefore timely to consider the new learning environments that technology affords.

Considerable sums of money have been invested on initiatives intended to develop digital educational resources. Friesen (2004) names such projects as the Curriculum Online project for schools in the UK at a cost of $500 million and a similar project from the Australian Learning Federation at a cost of $30 million as examples. While such projects are important and worthwhile, there appears a general lack of adoption of these technologies from both practitioners and vendors (Farance, 2003) and little investigation into "…their epistemological and ideological implications" (Friesen, 2004, p. 59).

When we began to develop ClassSim we decided to focus on creating a digital resource that would support a group of users (our pre-service teachers) for a targeted purpose. We wanted the learning environment to be one that was useful and relevant to them in their immediate situation and subsequent professional lives. We wanted the resource to

respond to the research into pre-service teacher education that argues that often universities do not prepare beginning teachers effectively for their entry into the teaching profession and pre-service teacher education courses often present fragmented and decontextualised learning experiences (for example, Hoban, 2002; Ramsey, 2000; Entwhistle, Entwhistle and Tait, 1993). Herrington, Oliver and Reeves (2003) assert that many researchers and teachers now accept that well designed multimedia environments provide an alternative to real-life settings without sacrificing the authentic context. Advances in educational software have demonstrated that it is feasible to create a motivational simulation that supports pre-service teachers by providing them with tools that allow them to view the effects of their decisions within a virtual classroom context (Aldrich, 2004). A simulation can be designed to enable its users to participate in the creation of a virtual-classroom world; make decisions like a teacher would have to, and then view and reflect on the effects of a multiplicity of classroom management decisions and teaching decisions. We believe that the development and use of a classroom-based simulation is one way to support the diverse needs of learners within our teacher education programs.

The context for our research

The Faculty of Education at [name to be inserted after review] was formed in 1984 from the amalgamation of the former Department of Education of the Faculty of Arts of the [name to be inserted after review], and the nearby School of Education (Institute of Education). Since its formation, the total enrolment of undergraduate and postgraduate students in this faculty has grown to approximately fourteen hundred. The areas of pre-service teacher education include Early Childhood, Primary (Elementary), Secondary and Physical & Health Education, all of which are required to complete sixty days of practice teaching throughout the duration of their degree.

A Bachelor of Teaching degree can be completed over a three-year period (full time). Each year two semesters are offered (autumn and spring); a full time student can study up to four courses per semester. Successful completion of the three-year degree qualifies the participant to teach in primary (elementary) schools within the state. Upon completion of a Bachelor of Teaching degree, participants are eligible to apply for a fourth year of study to complete the Bachelor of Education (Primary) or apply for Bachelor of Education (Honours) degree. This qualification enables the participant to teach in most other Australian states and overseas.

'Professional Practice' is a compulsory strand within the degree structures with a course included each year of the program. These courses have been developed with the aim of assisting students to develop an understanding of learning and teaching as an interactive process within a classroom setting. Pre-service teachers are introduced to essential curriculum concepts, classroom management strategies and student welfare issues. The courses guide pre-service teachers in curriculum planning and encourage reflective practice. Throughout the courses, pre-service teachers observe a range of demonstration lessons at local demonstration schools, with opportunity to apply their knowledge and skills in microteaching and practicum situations. Our students, like many from other

institutions, report that they often graduate from the university feeling under prepared for, and overwhelmed by, the work of a teacher.

ClassSim was developed with the support of a large grant from the Australian Research Council entitled: *Investigating a classroom simulation designed to support pre-service teacher decision making in planning and implementing literacy teaching* (DP0344011). It is an online simulation that enables the user to assume the role of a Kindergarten teacher as they organise and implement literacy learning experiences within a virtual two-hour period. We have previously reported in depth on the theoretical underpinning of the software's design [References to be included after the review process]. This paper aims to report on the pedagogical, technical and organisational lessons we have learned from pre-service teacher engagement with the software.

Research methodology

Since 2004, more than 500 pre-service teachers studying within the Faculty of Education at [name to be inserted after review] have engaged with iterations of the software. An overview of research trials conducted is reported in Table 1. With each trial of the ClassSim software we used the same methodology. First, we used a survey to collect demographic data from all users, focus group interviews were held at the end of all sessions that focused on how users interacted with the embedded tools in the software, analysis of thinking space entries was conducted, and observations by a research assistant during scheduled times of interaction with the software occurred. Data collected and analysed from each trial provided the researchers with considerations to take into subsequent versions of the software; each trial resulted in further development of the software.

Table 1: Overview of pre-service teacher use of ClassSim

Year	Pre-service teacher cohort	Number of students involved	Pattern of engagement
2004	First year students enrolled in alternate teacher education program	24	2 x 90 minute lab sessions + URL access
2004	Fourth year Bachelor of Education students	20	4 x 60 minute lab sessions + URL access
2005	First year students enrolled in alternate teacher education program	24	2 x 90 minute lab sessions + URL access
2005	First year Bachelor of Teaching students	187	2 x 55 minute lab sessions + URL access
2005	Third year Bachelor of Teaching students	40	1 x 55 minute lab session + URL access
2005	Fourth year Bachelor of Education students	24	4 x 60 minute lab sessions + URL access
2006	First year Bachelor of Teaching students	180	2 x 55 minute lab sessions + URL access
2006	Third year Bachelor of Teaching students	180	1 x 55 minute lab session + URL access
2007	First year Bachelor of Teaching students	185	2 x 55 minute lab sessions + URL access

In this paper we draw upon findings from each of these trials as we explicate pedagogical, technical and organisational considerations that have shaped and informed our experiences with the ClassSim software. While our discussion is not exhaustive of our data, we do aim to respond to the questions:

- In what ways can simulation be used to support and enhance learning?
- What are the per-service teachers' experiences of using the simulation?
- What are the best methods of integrating the simulation within the broader learning and teaching context?

Pedagogical considerations

In all iterations of the software, our goal was to develop a simulated learning environment to support our students as pre-service teachers in connecting the theory of their studies to the reality of classrooms. We were acutely aware of the need for quality classroom-based experience (Ramsey, 2000) and believed that a virtual environment had the potential to facilitate such opportunity. Further, we wanted to ensure the experience was one that was contextualized within what we know about classrooms and schools and was positioned in a way where meaningful connections could be made to course materials to support understanding.

As such, it was important for there to be a deep theoretical basis embedded within the software. In the development of iterations of the software we aimed to represent the conditions for authentic learning environments as identified by Herrington, Oliver and Reeves (2003). As a research team, we drew upon our understandings of the work of a teacher from our research and our own professional experiences to aide the construction of classroom-based narratives to guide the simulation story [Ref to be inserted after the review process]. Using a narrative genre within the simulation enabled us to capture the depth of learning theory, philosophy and rationale for the virtual classroom to reveal many of the intricacies of classrooms. We were able to then dissect the 'story' to reveal decision points for the user focused on the levels of a teacher's classroom practice – the organization of the learning space, planning and implementation of learning experiences and responses to individual children. Many participants acknowledged the authenticity of the simulation, with one stating, *"The simulation indicates a very real classroom, with very real, and very different personalities amongst the children, with real activities"*. Another acknowledged, *"The experience with the simulation was very real for me as a teacher, and presented me with a vision to aspire to"*.

The identification of decision points enabled for strong connections between the simulation and the theory through the virtual scenario, references to text books, department policies and additional readings. Our data consistently reveals how surprised participants are with the number of decisions teachers make and the implications of these. During a period of observation a participant when encountering a decisive point in the software describes,

> *"This is a key decision point, because both avenues lead students in directions of further learning. However the decision needs to be made about which direction lesson will be most beneficial for students in regards to where they are in their learning".*

Such comment demonstrates awareness of the consequences for children that result from a teacher's decision.

Technical considerations

Accessibility to the software for our pre-service teachers was a key consideration in all development. We wanted to ensure that they were able to access ClassSim both on and external to the university campus. Further, developing the software so that it had minimal hardware and software requirements, in response to issues of equity and cost, were also important. Housing it as a website on the Internet where students could access it via URL and password were considered appropriate ways to respond to these considerations. Using the technology of Rich Internet Applications (RIAs) we were able to make use of a range of powerful tools including: easy access, updating capability, scheduling of tasks, and a flexible learning environment. Rich client technology (Flash player as an example) provided us with all the benefits of the Web while keeping costs to a minimum (e.g. automatic compression and loading of components on demand). In addition, features such as client scripting, high performance connectivity, and real-time server communication could be used. Our data suggests the simplicity in the design of the simulation appeared to support their navigation. One participant described,

> *"I believed the simulation to be clear, straightforward and very simple to follow. All options and features were clearly defined and very simple to navigate".*

Another acknowledged, *"I liked the layout of the program as it was very realistic and similar to a real classroom"*. However, other participants still experienced anxiety, considering the virtual environment to be complex and confusing. One participant recounted their experience,

> *"I did have some trouble using the program … I found myself getting completely lost at a couple points … Twice I wanted to backtrack to re-read something that was said earlier … instead of going back to the previous screen I ended up at a completely different screen I hadn't seen before and then on clicking forwards again couldn't get back to where I was and ended back at the "choosing episode" screen".*

The underlying storage system for the simulation consists of text files containing the 'serialised' content of each user's 'session'. This does away with need for a database and associated complexities, as well as making it possible to easily backup and restore sessions. Each 'session' consists of the data for a user's current progress through the site. This includes their notes (from the embedded reflective tool called the 'Thinking Space') and where they've been during their use of the simulation. The data for each session is stored in PHP's 'temporary' session management system, as well as being saved in a local directory. This allows users to revisit events or to study other aspects of the simulation in subsequent sessions. Such a system gives users the opportunity to slow down or accelerate classroom events, revisit and reflect on critical decision points and replay events in the light of new understandings. It also keeps an ongoing record of responses that users type into the 'thinking space'. This text file can be edited and exported to serve other user purposes. Many participants acknowledged this as a powerful tool, with one describing, *"The reflection page to write notes was a fantastic tool that allowed me to reflect on what I have been exposed to and what I wish to achieve as I progress"*.

Most of the pages within ClassSim are made up of static XHTML with a PHP 'header' that tracks the pages viewed by the user. This tracking of pages means that a 'history trail' of the major sections the user visits can be viewed. This has provided course lecturers and tutors with valuable information about the navigational pathways throughout the software for individual users, which in turn help to indicate areas for further focus in class. Many pages also contain 'triggers' for random events designed to simulate some of the random interruptions to the virtual classroom that occur during the simulation's running time. The inability of the course lecturer or tutor to control these, has helped to reinforce the often unpredictable nature of the classroom environment.

Organisational considerations

Once the software had been developed, it was incorporated into course schedules. The software has been included as a key learning experience within the 'Professional Practice' strand of the Bachelor of Teaching and Education degrees. The focus taken for each course in the separate years is different. In the first year course, the software is used to prepare the pre-service teachers for their first real school based visit. Our experience with first year students has shown that the very nature of classrooms often makes them an overwhelming environment for pre-service teachers at the beginning of their studies. Having the opportunity to 'play' with and 'explore' the virtual environment gives them scope to understand the complexity of the environment, and gives us time to begin to deconstruct key elements with them. We have found this initial experience gives students a lens through which they can view their actual classroom based experience. One participant described,

> *"It allowed me for the first time since the commencement of Uni, to really be engaged in the world of teachers … It stimulated my mind to begin to think like a teacher, and think about the many decisions that teachers face daily in their profession".*

Another acknowledged,

> *"… it was an excellent introduction of how a classroom works and what a teacher does. I would like to see a simulation done for all subjects we are undertaking".*

Alternatively, our final year students have used the software as a way to articulate what they know about the nature of classrooms and the role of a teacher, and a mechanism to identify areas for future professional learning. They have demonstrated ability to make significant connections between what they have experienced across their school-based experience (including the simulation), the role of a teacher, and where their 'gaps' in knowledge and understanding are. One participant described,

> *"The experience of the simulation agrees with my understanding of the work of a teacher. The simulation presents real scenarios which I myself have experienced when teaching in schools. I understand that the work of a teacher involves dealing with different challenges … the simulation has given me a great insight into the different scenarios I will be faced with as a future teacher".*

In both these instances, pre-service teachers are provided with scheduled periods of interaction in a university lab with continued access to the software through a URL. A participant described,

> *"The simulation was an excellent experience it gave me time to go through a classroom experience in my own time … I am a very practical hands on person … I would like to go through this process again".*

Our data shows that pre-service teachers across the year levels continue to revisit the simulation after these structured course experiences. One participant described, *"I found I needed more time exploring the simulation … I was able to log on to the simulation from home with no problem"*.

We have found that the formal inclusion of the software within course schedules has enabled our pre-service teachers to engage with the software in a lab situation where they have been able to be supported by academics as they work to decode what their role as the teacher within the virtual classroom entails and the ramifications of the decisions they make. This has provided a forum for considerable discussion and debate as users work through the scenario.

Discussion

While our research has identified the potential of simulation technology to contribute to pre-service teacher learning, it has also demonstrated the significant impact that the introduction of new technology has across many levels.

It is important that the development of software is supported by deep pedagogical rationale with the identified needs of its potential users at the forefront. If learning technologies are to be given kudos alongside more established teaching methods, they need to be established and developed within sound pedagogical frameworks to provide rich and meaningful experiences for students. In our later iterations of the software, that have built upon previous versions in connection with analysed data from our trials, we have found that the introduction of simulation technology has impacted upon the ways students view learning experiences and the organisational structures and processes within our university.

The organisational considerations demand that the developed technology is not the property of an individual research team, but is used in ways where the wider faculty can assume ownership of the place of the technology in their courses. As a research team we have had to work closely with faculty staff to articulate rationale for the use of the technology in learning experiences, examine how it can be embedded within already existing organisational structures and consider the impact of this upon our practice as tertiary educators.

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