The Design of an On-line Classroom Simulation to Enhance the Decision Making Skills of Beginning Teachers

Brian Ferry Faculty of Education University of Wollongong, Australia, bferry@uow.edu.au
Lisa Kervin Faculty of Education University of Wollongong, Australia, lkervin@uow.edu.au
Jan Turbill Faculty of Education University of Wollongong, Australia, jturbill@uow.edu.au
Brian Cambourne Faculty of Education University of Wollongong, Australia, bcambourne@uow.edu.au
John Hedberg Nanyang Technological University, Singapore, jhedberg@nie.edu.sg
David Jonassen University of Missouri, USA, jonassen@missouri.edu
Sarah Puglisi University of Wollongong, Australia

Abstract

This paper describes the design of a simulation designed to support pre-service teacher education. The simulation prototype allows the user to take on the role of the teacher of a virtual Kindergarten classroom (children whose ages range from 5 to 6 years). As the simulation runs, the user is required to make many decisions about structuring the literacy lessons, classroom management, and responses to individual students. The user can monitor and track the progress of three targeted students throughout the course of the simulation. An embedded tool serves as 'thinking space' that is used at decisive points to encourage the user to plan and justify new decisions, and to reflect upon the observed consequences of previous decisions.

Other supports within the simulation prototype include links to: textbooks; syllabus documents; in-service materials; sample artefacts collected from schools and classrooms; and other annotated online teaching resources. The initial prototype software of the simulation will be presented at the conference.

Introduction

Reviews of beginning teachers over the past eighty years continually identify a number of key skills that are not well developed by traditional pre-service teacher preparation programs. These include: student discipline, motivating students, dealing with individual differences, insufficient and/or inadequate resources, organisation of classwork, assessing student work, and relationships with parents. Interviews conducted with final year pre-service reachers report that they often leave university feeling under-prepared for life in classrooms and confused by what will confront them when they arrive at schools. Further, schools that employ beginning teachers, claim that a majority of recent graduates are unaware of how classroom cultures operate and find it difficult to transfer what they've studied at university into effective classroom practice (Ministerial Advisory Council on the Quality of Teaching, 1998). The Ramsey (2000) review of teacher education in NSW supported these findings and also asserted that pre-service teachers do not understand how classroom practice produces effective student learning. In the current climate of national benchmarks and teaching standards for beginning teachers (Nelson, 2002), it is crucial that these issues are addressed within pre-service teacher training.

Hoban (2002) claims that many teacher education courses present a fragmented view of learning and this can hinder pre-service teacher development into flexible, progressive practitioners. His work supports other studies that have also reported on the fragmented and decontextualised way

that knowledge is presented in schools and universities (for example, Entwhistle, Entwhistle & Tait, 1993). As a result essential knowledge is often not retrieved when it is required in real-life classroom situations because there is minimal links made to the situation in which it applies (Bransford et al, 1990). Likewise, Barth (1990:118) writes about the benefits to the teaching profession when pre-service training is linked with actual classroom experience. However, he also acknowledges, 'seldom do these two worlds converge'.

The Ramsey (2000) review of teacher education in NSW corroborated these earlier reports. It strongly recommended that pre-service teachers receive quality classroom-based experience supervised by an accredited teacher mentor. However, just providing more extensive classroom-based experience does not guarantee quality experience. Both Darling-Hammond (1999) and Ramsey (2000) conceded that school-based practical experience often consists of a series of isolated, decontextualised lessons prepared and implemented according to the requirements of the supervising teacher; or at worst it can be an unsupported and disillusioning experience.

It has become necessary to re-think school-based practice teaching programs and many universities are experimenting with context-based approaches. For example, Cambourne, Ferry and Kiggins (2003) reported on how they re-conceptualised a conventional school-based practice teaching program through an alternative approach known as the 'Knowledge Building Community' (KBC). This approach used problem-based learning, support from interactive communication technologies, and regular, sustained classroom experience coordinated by school-based teacher mentors (Ferry, Kiggins, Hoban & Lockyer, 2000). The focus was on building knowledge about how schools and classrooms work and this was done within a learning community which consisted of peers, lecturers and school-based teachers who worked in partnership to build the community's knowledge about how schools work.

Evaluations of the KBC program by Kiggins (2001) and other teacher education programs described by other researchers (such as Groundwater-Smith, Deer et al, 1996), consistently claim that pre-service teacher learning is enhanced when pre-service teachers regularly participate in the complex decision-making processes that teachers make in classroom settings. However, pre-service teachers classroom experiences are typically limited by lack of regular access to quality classroom experiences (Ramsey, 2000). This frustrates both teacher educators and beginning teachers as the initial year of a teacher education program is acknowledged as a critical time for pre-service teachers to develop primary understandings about their future work of teachers. Pre-service teachers need to begin to see the consequences of the complex decisions teachers make in constructing and managing learning environments. In particular, they need to see how decisions made about student behaviour, classroom organisation and learning decisions impact on and contribute to student learning outcomes. Further, they need to get close to the teacher's and the student's experiences of the learning environment in order to understand how teachers and students feel their way, cognitively and emotionally through a learning task (Brookfield, 1995).

Danielson (1996:2) claims that teachers make over 3000 nontrivial decisions daily. If this is considered to be true, it then poses serious implications for pre-service teacher education and how these teachers are prepared for the complexity of teaching. In an ideal world pre-service teachers would have unlimited access to quality classroom episodes that progressively develop

their classroom practice and associated decision making abilities. However, the cost of the practicum experience, school needs, school availability and university course requirements place limits on access to practicum experiences. Therefore other ways of providing the sorts of experiences provided during personal experience with classroom- based teaching episodes are needed. One such approach is to make use of a simulated classroom environment for pre-service teachers to engage with.

Limited research has been conducted on simulations for teacher development. However, advances in educational software have demonstrated that it is feasible to create a motivational simulation that supports pre-service teachers with tools that allow them to view the effects of classroom management decisions from multiple perspectives; allowing them to get close to the teacher's and student's experience of a learning episode. Furthermore, the design of the simulation can incorporate feedback and advice, through devices such as an on-line mentor teacher, and the opportunity to pause or repeat a lesson and explore alternative decisions. Usually this is not an option in a real classroom. Whilst we acknowledge that a simulation is only a representation of real-life, there are features that can enhance real-life experience. For example, a simulation can provide authentic and relevant scenarios, make use of pressure situation that tap users' emotions and force them to act, they provide a sense of unrestricted options and they can be replayed (Aldrich, 2004).

Project Aims

This research project aimed to develop a simulation prototype for pre-service teachers to use to assist them in making links between the theory of their training and what this means for subsequent classroom practice.

This paper aims to address this focus and to more explicitly describe the basic design of a computer-based simulation intended to progressively develop pre-service teachers' understanding of the complex decisions needed to plan and implement literacy-based lessons for lower primary pupils. In addition, the paper describes how this design supported a cohort of pre-service teachers who participated in a trial of this software.

Overview of the Simulation

The classroom simulation has been designed for use in initial teacher education and as such it allows the user to take on the role of the teacher within a simulated Kindergarten classroom (children whose ages range from 5 to 6 years). As the simulation runs, the user is required to make many decisions about organising the lesson, classroom management, and responses to individual students. These issues have been highlighted as areas that underlie the quality of teachers (Nelson, 2002:25-26). The user is able to monitor and track the progress of three targeted students throughout the course of the simulation. An embedded tools referred to as a 'thinking space' is used at decisive points for the user to plan and justify new decisions, and to reflect upon the observed consequences of previous decisions.

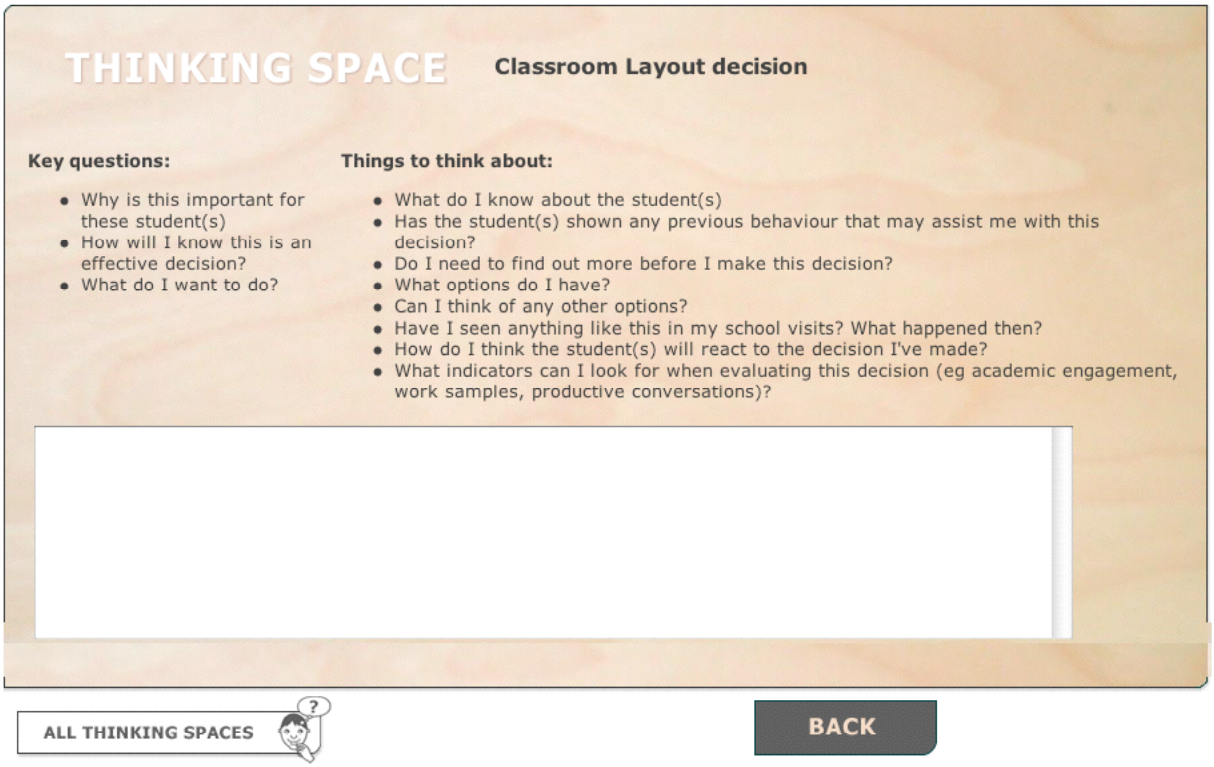

Figure 1: The Thinking Space (Screen designs by SPROUTMEDIA www.sproutmedia.com.au)

Figure 1 presents the design of the thinking space. It presents three key questions developed to promote thoughtful decision making. These key questions are supported by the help screen shown on the right hand side that offers prompts and additional things for the user to consider. The user types their reflections and thoughts into the blank space and is able to save their notes. The user is able to retrieve and review their previous decisions and thoughts throughout the running time of the simulation.

The pedagogical focus of the simulation is on the teaching of literacy skills in lower primary schools. These skills are considered one of the keys to success in schooling (Cambourne, 2000; Comber et al, 2001) thus, an important focus area for pre-service teachers. Teachers of children in the early years of primary schooling need to provide appropriate sequences of learning experiences that develop reading and writing skills (Purcell-Gates, 1995). It is also important that beginning teachers understand the impact of classroom discourse on student learning (Gee, 2000). This can be a very challenging task for beginning teachers. The simulation makes use of research data on how exemplar teachers facilitate learning and behaviour management within primary classroom settings, in particular during the teaching of reading and writing (Freebody & Luke, 1990).

The virtual Kindergarten class (5 year olds) consists of twenty-six students. The user is required to make a series of decisions about the management of the classroom, of students and of random events that typically occur during a lesson. At other times they will be required to make decisions about the sequence of teaching – specifically the 'episodes' they will include within their teaching time in the simulation. For example, when teaching the 'days of the week' do they

begin a lesson with a sequencing episode, or a modelled reading episode, or a modelled writing episode, or a retell of a familiar story episode?

Each of these decisions has the potential to impact on the behaviour and learning outcomes of three targeted students and at any time the user can focus in one of the targeted students to examine their learning outcomes. These are presented visually as bar charts structured according to the NSW model of pedagogy (DET, 2003) and comments upon 'Intellectual Quality', 'Quality Learning Environment' and 'Significance' for the targeted student at that point in the simulation from an 'expert' are able to be accessed.

Figure 2 shows part of the update for one of the targeted students. In the final version users will indicate on a scale their predictions and justify these ratings. Once this has been completed, rating and commentary will be displayed. Thus users will be able to compare their ratings and justification with those of 'experts'.

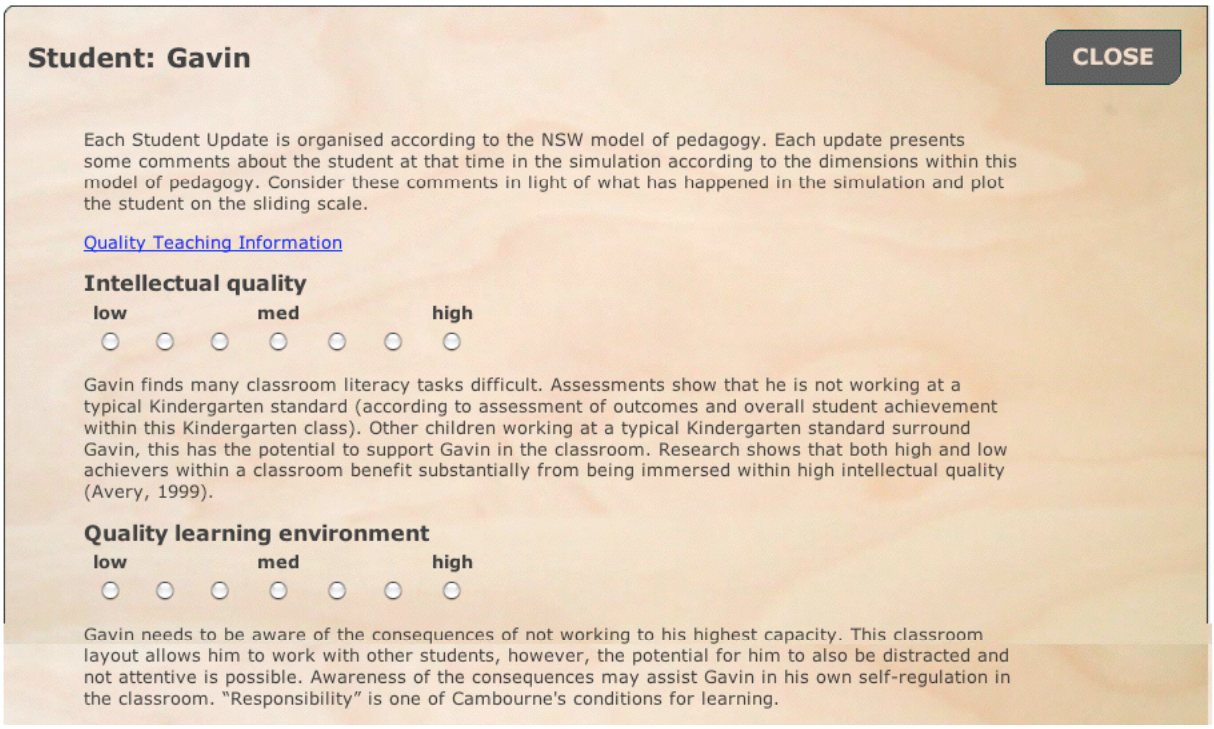

Figure 2: Student update for Gavin (Screen designs by SPROUTMEDIA www.sproutmedia.com.au)

Figure 3 shows in schematic form a simplified view of the basic plan of the simulation. It shows how the decision points are supported and some of the different branches within the simulation. It has been designed so that the targeted students can achieve acceptable outcomes through a variety of pathways within the simulation, reinforcing the view that there is not just one acceptable pedagogical approach to student learning.

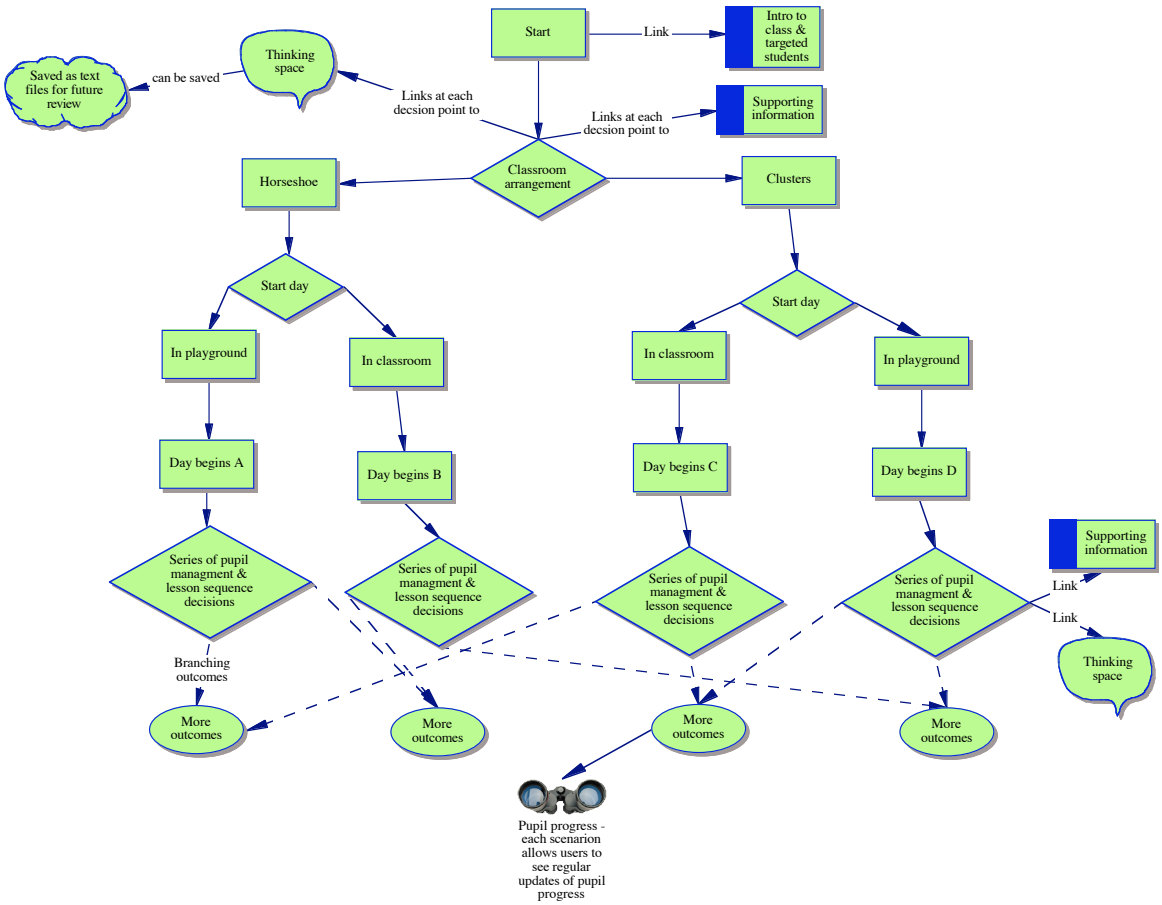

Figure 3: The basic plan of the simulation

Classroom layout: an example of a decision point

There are many points in the simulation where the user has choices. For a first version we limited these to two-three options at each point but are currently expanding these options after recent trials. Figure 4 shows a screen capture of a classroom layout choice. Each decision point is supported by links to related literature presented as brief summaries of current research about these topics. As this simulation is currently aimed at pre-service teacher education within one tertiary institution, many of these links have come from their assigned textbooks in their core subjects. In the case of the classroom layout we have links to literature about classroom arrangements and the impact they have on student learning, In addition we have provided links to summaries of information about the arrangement of resources and materials that may support the teaching of literacy to the proposed Kindergarten class.

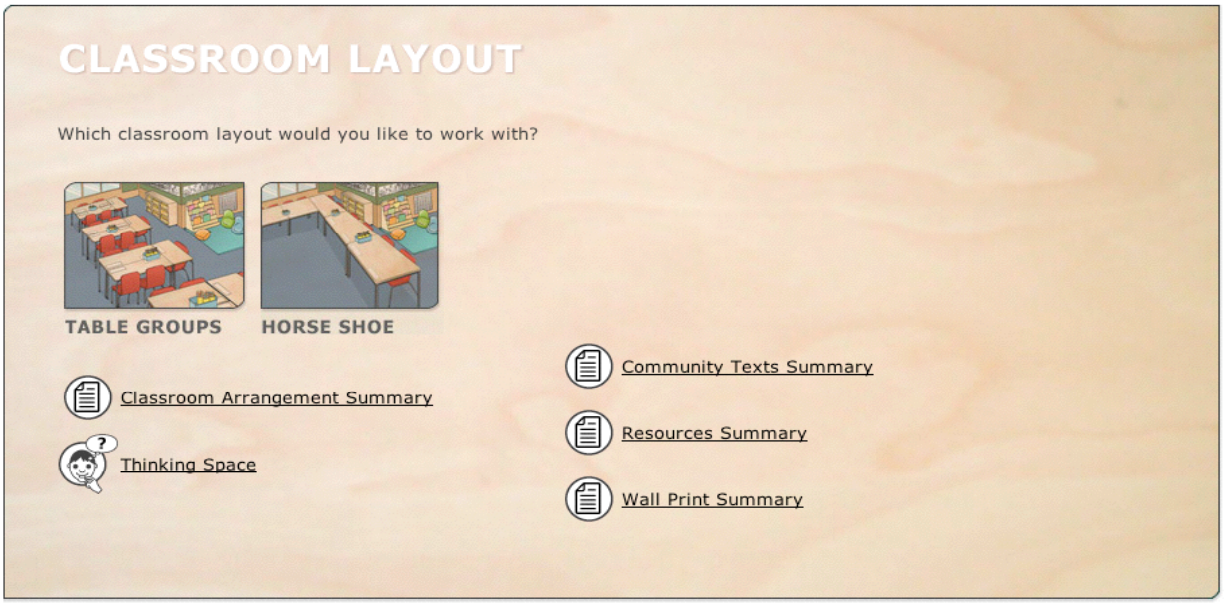

Figure 4 : The classroom layout screen (Screen designs by SPROUTMEDIA www.sproutmedia.com.au)

Figure 5 shows the class profile screen, This screen links to documents that provide information about the class, the targeted students, the teacher's aid and Gavin, a student who is on a 'behaviour contract'. Such information has been compiled from research data collected by team members throughout classroom-based research. The number of links on each screen is deliberately kept to as few as possible. This is an attempt to reduce the effect of cognitive load. We are aware that this can occur when users are presented with a large number of options and links and can result with the user becoming overwhelmed and confused by the available options. The design of this prototype is responsive to this.

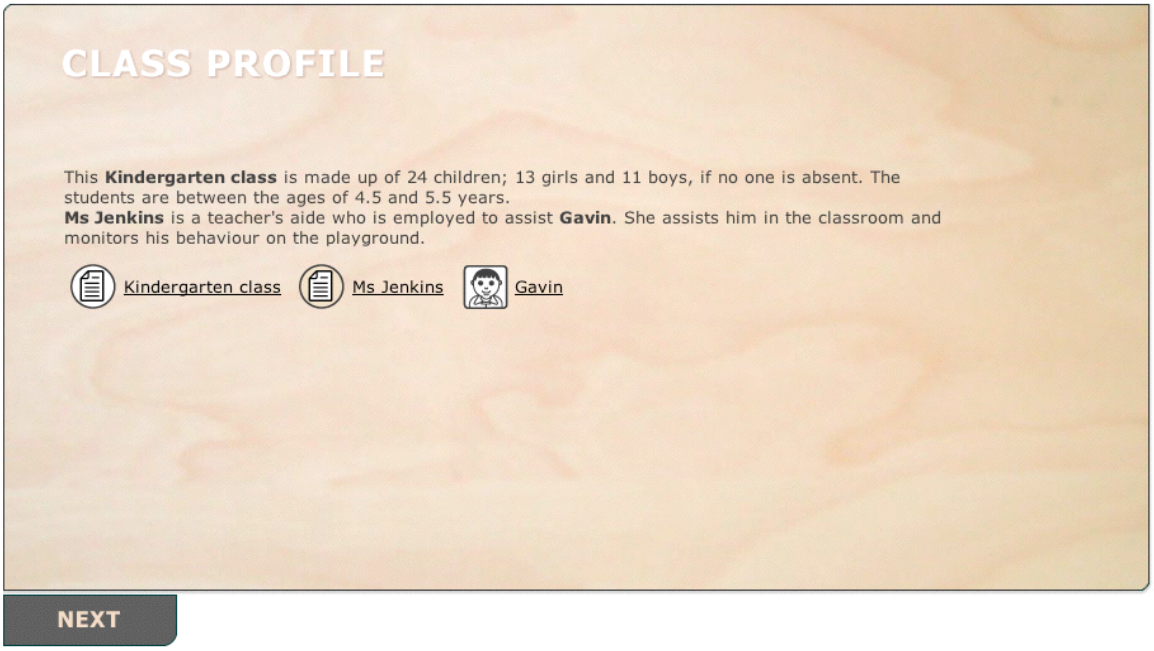

Figure 5: Class profile (Screen designs by SPROUTMEDIA www.sproutmedia.com.au)

The Targeted Students

The three target students within this virtual class have been developed to represent three examples of the wide variety of students teachers have to accommodate for within a classroom and the challenges provided by each. These three students remain constant throughout the simulation. The decisions the user makes impact upon these students and the user is able to access such information which may in turn impact upon future choices made.

'Bibi' is a refugee child from Afghanistan. She has been in Australia for two months, one month of which was spent in a detention centre. She has limited English and listens intently to the teacher. 'Bibi' has a friend, 'Mary', who she likes to be with in the classroom.

'Harley' is medicated for ADHD. He finds the classroom situation difficult and he is frequently not engaged during classroom lessons. If he is not medicated he tends to annoy other children. The teacher is aware that 'Harley' is being bullied by 'Gavin' and as such the situation is being monitored.

'Gavin' finds classroom tasks difficult and is not working at the typical Kindergarten standard presented in this simulation. 'Gavin' also has significant behavioural problems and as such a Classroom Teaching Assistant has been employed for twenty hours per week to support 'Gavin' in the classroom. The simulation presents the user with some ideas about how an extra support person such as the Classroom Teaching Assistant can be utilised and managed within a classroom. The teacher has negotiated a 'behaviour contract' with 'Gavin' and his parents. The user has access to this contract throughout the simulation. As such, 'Gavin' poses the user with many behaviour management issues.

Figure 6 shows how the profile for 'Gavin' is presented. The profile is linked to a screen entitled 'teacher notes'. These notes are based on the sorts of comments that teachers typically keep based on our own experiences as teachers and our classroom-based research. It is designed to add depth and authenticity to the simulation, providing the user with additional information to guide and support the decisions they make.

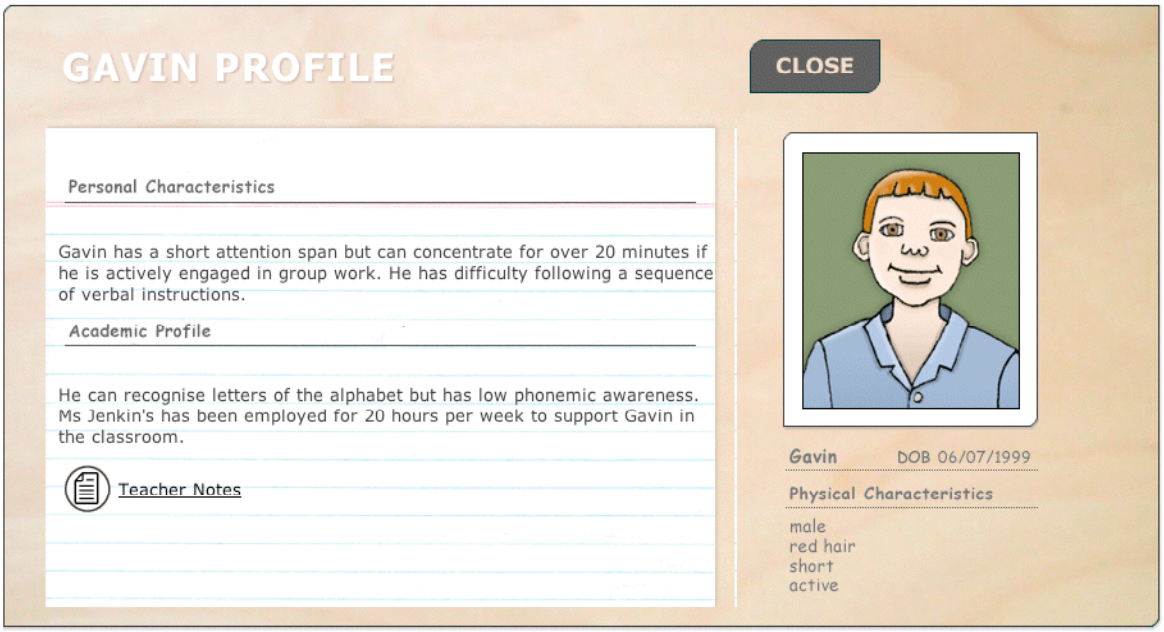

Figure 6: The profile for Gavin (Screen designs by SPROUTMEDIA www.sproutmedia.com.au)

As users make decisions about the management of the classroom and the teaching of literacy episodes they follow sequences of events that reflect their management decisions (for example, organisation of the classroom, start of the day, dealing with the late arrival of a student and random interruptions) and teaching decisions (for example, sequencing learning episodes, modelling reading, modelling writing, retell of a familiar story).

Other features of the simulation prototype will be demonstrated during the presentation of this paper. As in other simulations the user will have the option to pause, save notes and their current location in the simulation. However, users will not be able to revise decisions until they have completed a 'lesson'. This decision was taken as in real classroom teachers have to deal with the consequence of their decisions.

Pre-Service Teacher Interaction with the Simulation

The trial of the simulation prototype was conducted with twenty-four pre-service teachers enrolled in the Bachelor of Teaching program. A case study design was utilised throughout the trial of this simulation with the aim of providing a detailed, descriptive analysis (Creswell, 2003) to capture the participants' use of the software.

The findings from this trial suggested that certain characteristics of the simulated environment supported these pre-service teachers. These characteristics included the safety of the simulated environment, the support materials and the embedded thinking tools. Each of these will be explored further in connection with collected data.

Safe Learning Environment

Data collected in this trial indicated that the simulated environment provided the participants with a safe environment to work within and a sense of freedom to make decisions without serious consequences. Working within a safe, self contained setting (McMahon, 2000) seemed to support pre-service teachers in this study to develop their decision making and problem solving skills. Within the simulated environment, this cohort of beginning teachers were able to test different strategies, reflect on consequences and then return to the start of the simulation and try an alternative path (Brown, 1999).

When questioned about the value of a learning environment free of serious consequences, many participants responded favourably to this characteristic of the simulated environment. One participant identified the benefit of testing decisions on simulated children that closely resembled students encountered during classroom-based experiences, and to then observe the consequences before testing such decisions on 'real' children in a 'real' classroom. Another participant stated that it was advantageous to be able to implement strategies and observe how children responded without impacting on real children. Another participant referred to the simulation as providing the opportunity to develop her skills without using real children as "guinea pigs". These findings support the literature by Zhu and Roberts (2003) who state that an advantage of using simulation technology is the opportunities that are provided for the users to practice making 'virtual' decisions, which would otherwise have serious consequences. Just as simulated patients are becoming increasingly popular in providing medical students with practice in a 'safe' environment (Stewart, 2003; Doyle, 2002), the simulated students within this 'virtual' classroom appeared to provide opportunity for these pre-service teachers to practice their skills.

While both the participants and the researchers recognise the importance of classroom-based experiences in the development of the pedagogy of pre-service teachers, it seems reasonable to suggest that the safety of a simulated environment has the potential to assist in supporting beginning teachers' emerging pedagogy. Pre-service teachers are able to practice and gain experience in the intricacies of teaching in the simulated environment while avoiding any real consequences.

Support Material

The findings from this trial indicated that an important feature of the simulated environment was the support material. This material appeared to provide participants with avenues to develop their professional knowledge, through information sheets, web links and textbook references. The enthusiasm which the participants displayed towards the support material indicates that this is a plausible way to support pre-service teachers with sourcing and interpreting professional information.

The participants asserted the importance of this aspect of the simulated environment in supporting the development of their professional knowledge and emerging pedagogy. One participant identified the advantage of textbook references in assisting him to make connections between the theory of teaching he was expected to engage with and where it fits in classroom

reality. Another participant referred to the flexibility afforded to pre-service teachers in the simulated environment, as the web links allow beginning teachers access to relevant information which they could retrieve if and when they wanted it. The findings from the trial indicated that this material was perceived to be a highly valuable characteristic of the setting in terms of supporting the professional learning of these pre-service teachers.

Embedded Thinking Tool

Analysis of the collected data revealed that the embedded thinking tool, the 'thinking space', was an important characteristic of the simulated environment. This tool appeared to support these participants in articulating and expressing their 'virtual' experiences.

The thinking tools act as a journal, which according to Lee (2004:74) is a valuable device in pre-service teacher education in fostering connections between theory and practice.

> "Preservice teachers with no or little teaching experience are naturally preoccupied with acquiring a repertoire of survival skills in the classroom. One immediate and important need for them is how to transfer the skills and knowledge acquired in teacher education courses as students to the real classroom situation as teachers" (Lee, 2004:74).

The findings from this trial indicated that the embedded thinking tool supported these pre-service teachers to make these links between their understandings acquired in their university studies with their classroom-based and simulated experiences.

The pre-service teachers engaged in several processes while using the embedded thinking tool within the simulation. These processes included justifying decisions and beliefs, reflecting on the practice of the simulated teacher and at times critiquing this. According to Lee (2004) pre-service teachers need to be 'pushed' to think and reflect on the issues which arise in the classroom. The findings of this study indicate that the embedded thinking tool used within this prototype encouraged this thinking and reflecting.

Concluding Comments

The trial of the simulation prototype demonstrated that this was a useful and meaningful experience for these pre-service teachers. However, it also revealed some specific design elements which the research team need to consider for future iterations of this software.

Immediate feedback is indicated in the literature as a positive element of simulations, and the findings of this trial indicated that this is an area we need to explore further. Many participants felt that they required more feedback in terms of consequences to the decisions they make. In this initial prototype of the simulation, feedback existed in the form of the student updates. However many participants identified that this did not provide enough of a sense of consequence to the decisions they had made. Thus, it is necessary for us to consider how we can provide users with more obvious and tangible feedback on the effectiveness of decisions within the simulation.

The findings of this trial also proposed that extended navigational tools would support the user to make full use of the simulated environment. Brown (1999) asserts that an advantage of using

simulations compared to real life settings is the ability to make a decision and then go back and alter that choice after observing the consequences. More sophisticated navigational tools to enable the user to move back and forth through the simulation would support this software. The simulation prototype used in this study worked from a central page, with links branching from this page. This proved to be problematic for some participants in this trial.

Increased interactivity for the user would further support the simulation design. A reduction in text and increase in graphics may support users in becoming further immersed in the simulated classroom environment. Similarly, the development of some animation would enhance the authenticity of the 'virtual' classroom. The on-line simulation in this study was focused on the English key learning area. Further research is also needed into 'virtual' classrooms which focus on other Key Learning Areas.

These areas for development are being addressed in the development of the next prototype version of this simulation software. The research team aim to trial this next version of the software with a larger cohort of first year Primary Education students in 2005.

References

Aldrich, C. (2004). Simulations and the Future of Learning. San Francisco: Pfeiffer.

Barth, R. S. (1990). Improving Schools From Within. San Francisco: Jossey-Bass Publishers

Bransford, J. D., Sherwood, R. D., Hasselbring,, T.S., Kinzer, C.K., & Williams S.M. (1990). Anchored Instruction: Why we need it and how technology can help. In D. Nix & R. Spiro (Eds.) Cognition, Education Multimedia: Exploring ideas in high technology. Hillsdale:Lawrence Erlbaum, 115-141.

Brookfield, S. (1995). Becoming a Critically Reflective Teacher. San Francisco: Josey-Bass.

Brown, A.H. (1999). Simulated classrooms and articificial students: The potential effects of new technologies on teacher education. Journal of Research on Computing in Education, 32 (2), 307-318.

Cambourne, B. L. (2000) Conditions For Literacy Learning: Observing literacy learning in elementary classrooms: Nine years of classroom anthropology, The Reading Teacher, 53, 6, Mar 2000,512-517.

Cambourne, B. L., Ferry, B., & Kiggins, J. (2003). The Knowledge Building Community Odysset: Reflections on the Journey. Change: Transformations in Education. 6(2), 57-67.

Comber, B., Badger, L., Barnett, J., Nixon, H., Prince, S., & Pitt, J. (2001). Socio-economically disadvantaged students and the development of literacies in school: A longitudinal study, Three Volume Report, South Australia Department of Education, Training and Employment and University of Adelaide.

Creswell, J.W. (2003). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. California: Sage Publications.

Danielson, C. (1996). Enhancing Professional Practice: A Framework for Teaching. Alexandria, Virginia, Association for Supervision and Curriculum Development

Darling-Hammond, L. (1999). Teacher Education: Rethinking Practice and Policy. Unicorn 25(1), 31-48.

Doyle, D.J. (2002). Simulation in Medical Education: Focus on Anesthesiology. Medical Education Online, 7 (16), 1-15.

Entwhistle, N., Entwhistle A., & Tait H.(1993). Academic Understanding and the Contexts to Enhance It: A perspective from research on student learning. In T.M. Duffy, J.Lowyck & D.H. Jonassen (Eds.) Design Environments for Constructive Learning.Heidelberg: Springer-Verlag, 331-357.

Ferry, B., Kiggins, J., Hoban, G. & Lockyer, L. (2000). Using computer-mediated-communication to form a knowledge-building community with beginning teachers. Educational Technology and Society, 3(3), 496-505.

Freebody, P. & Luke, A. 1990, Literacies programs: Debates and demands in cultural context, *Prospect:* A Journal of TESOL, 5 (3), 7-16.

Gee, J. P. (2000), New people in new worlds: networks, the new capitalism and schools, In B. Cope & M. Kalantzis (Eds) Multiliteracies: Literacy Learning and the Design of Social Futures, Melbourne: Macmillan..

Groundwater-Smith, S., Deer, C. E, Sharp, H. & March, P. (1996). The Practicum as Workplace Leaning: A Multi-Modal Approach in Teacher Education. Australian Journal of Teacher Education, 22(2), 21-30.

Hoban, G. F., (2002). Teacher Learning for Educational Change.Philadelphia: Open University Press.

Kiggins, J. (2001). The Knowledge Building Community Project: A Grounded Theory of an Alternative Teacher Education Model. University of Wollongong: Unpublished PhD thesis.

Lee, I. (2004). Using Dialogue Journals as a Multi-Purpose Tool for Preservice Teacher Preparation: How Effective Is It? Teacher Education Quarterly, 31 (3), 73-97.

McMahon, M. (2000). Developing Web-based Learning Strategies: a comparison between the Web and traditional learning environments. World Conference on Educational Multimedia, Hypermedia and Telecommunications 2000(1), 693-701. [Online]. Available: http://dl.aace.org/1373 [Accessed 2004, September 15].

Ministerial Advisory Council on the Quality of Teaching (1998). Raising the stranding of teachers and teaching. Sydney: NSW Department of Education and Training.

Nelson, B. (2002). Quality Teaching – A National Priority. Report of a national meeting of professional educators. 28 (2) 23 - 29

Preston, A. P. & Biddle G. (1994). To Be or Not to Be?: Making a Professional Career Choice. International Journal of Career Management, 6(1), 28-32.

Purcell-Gates, V. (1995). Other people's words: The cycle of low literacy. Cambridge, MA: Harvard University Press.

Ramsey, G. (2000) Quality Matters Revitalising teaching: Critical times, critical choices. Report of the Review of Teacher Education in NSW. Sydney: NSW Department of Education & Training.

Stewart, D. (2003). Medical training in the UK. Archives of Disease in Childhood, 88 (8), 655-659.

Zhu, L., & Roberts, C. (2003). A Web-based Simulation Built on Constructivist Learning. World Conference on E-Learning in Corp., Govt., Health., & Higher Ed. 2003(1), 1272-1277. [Online]. Available: http://dl.aace.org/13905 [Accessed 2004, September 12].