INTERACTIVE TECHNOLOGIES FOR TEACHER TRAINING: COMPARING PERFORMANCE AND ASSESSMENT IN SECOND LIFE AND SIMSCHOOL

Julia Meritt[1], David Gibson[2], Rhonda Christensen[3] and Gerald Knezek[4]
[1]*Texas State University, San Marcos, Texas USA*
[2]*Curtin University, Australia*
[3]*Institute for the Integration of Technology into Teaching and Learning, Denton, Texas USA*
[4]*University of North Texas, USA*

ABSTRACT

Two alternative technologies forming the basis of computer-mediated teacher preparation systems are compared and contrasted regarding implementation, operation, and assessment considerations. The role-playing system in Second Life is shown to have the unique characteristic of developing a co-constructed pedagogical identity, while the flight simulator metaphor of simSchool encourages rapid, stepwise refinement of pedagogical expertise. Each has cost and traveling distance advantages over face-to face traditional meetings, as well as some shortcomings. Ultimately, the largest assessment issue for both is how to measure learning inside a simulator or a social media space. Further research is needed in this area.

KEYWORDS

Virtual performance assessment, digital simulation, student teaching, virtual pedagogical practice

1. INTRODUCTION

In spite of efforts to better prepare teachers and support their induction into the profession, the high attrition rate of teachers in their first five years suggests persistent problems. Bright young teachers are leaving at an unsustainable rate (National Commission on Teaching and America's Future, 2007). Many of these problems concern self-efficacy in terms of classroom management skills (Greiner, 2009). This article introduces two highly interactive technologies aimed at giving pre-service and new teachers improved classroom management preparation. Both technologies involve simulations that address the challenge of providing pre-service teachers with experiences interacting with the wide variety of student behaviors they will encounter in the real world of teaching. One approach involves a Second Life environment in which pre-service teachers play either the role of a classroom teacher or a student in a classroom. Afterwards, the class de-briefs and discusses the behaviors and teacher responses, and makes suggestions for alternative actions. The second approach involves simSchool, a flight simulator for teaching that uses a computational model of teaching and learning. simSchool supports practice and reflection on a variety of teaching challenges, including classroom management, classroom activity design, and the psychology of learning. Each technology – role playing and computational modeling - will be introduced in its own section, followed by comparisons and contrasts between the two. The discussion section will first summarize implementation considerations and then focus on assessment issues arising when comparing the two.

2. CONCEPTUAL RATIONALE

Digital simulations offer a promising new way to provide a practice environment for student teachers (Grossman, 2010); they provide low-risk, high-touch, scalable and efficient method for microteaching and pedagogical experimentation by integrating the elements of fantasy and play with realistic dynamics and authentic actions into the pre-service classroom. The two methods presented here, a virtual world for role-playing and a computational model of learning embedded in a game-like interface, each have different affordances for virtual professional practice, introduced below.

Among the new affordances of simulation-based professional practice, new assessment opportunities stand out. As seen in the pilot study of the virtual role-playing environment, students negotiate their pedagogical identities revealing some evidence that while microteaching and observing other students experimentations, they construct, deconstruct and reconstruct their conceptions of the dynamics at play in the classroom. Of interest is to what degree the simulations and co-constructed understanding of those translate into the actions of an efficacious beginning teacher. Further study, perhaps following a group of students from early fieldwork, through student teaching and into the classroom might reveal positive effects of virtual play combined with co-construction of identity work.

In the case of interacting with simSchool, the assessment challenge includes how to make sense of what a user knows and can do based on an analysis of interaction log files, providing a view of the user's performance over time. Today, a person responding to assessment prompts embedded in a digital game or simulation, can perform a wide range of actions continuously over extended periods of time leaving behind high-resolution traces of decision-making, intentions, and even emotions in a new kind of digital performance space (Dede, Nelson, Ketelhut, Clarke, & Bowman, 2004; Gibson, 2011). Large files often comprising thousands of records for a single virtual performance interaction are generated. Interpretation of issues of time, sequence, action relevancy, big-data pattern recognition, overlapping patterns, and levels of meaning is required (Ifenthaler, Eseryel, & Ge, 2012). There is a need for new psychometric considerations for methods of data capture, analysis and display.

3. CLASSROOM MANAGEMENT IN SECOND LIFE

Actual experiences and the informal relationships within the school classroom settings can lead to a sense of belonging to a community of practice thus building the aforementioned and requisite self-efficacy (McNally, Blake, & Reid, 2009). As part of a course embedded in a field-based internship students examine personal beliefs in relation to various methods of classroom management. Student teaching follows where students are expected to enact those beliefs in a real classroom. Initial data reflects students' genuine investment in becoming effective classroom managers with many references made to wishes that pupils learn, enjoy the experience of learning and feel safe. Virtual practice in virtual classrooms should increase students' efficaciousness paving the way for successful early teaching efforts because they are coming very close to having authentic teaching and collegiality building.

3.1 Process

Several colleagues at a large southwestern university launched a virtual third grade classroom; a prototype to ascertain whether the virtual reality tool, Second Life, would be a viable means to help pre-service teachers practice classroom management skills in a relatively risk-free environment. Over the course of nine months a team created an inviting virtual classroom in which instructor-created scenarios were translated into a virtual classroom. Students described and analyzed their learning after participating as either a student or a teacher and co-constructing new points of view collectively.

3.2 Student Intern Responses

After each scenario enactment debriefings were held. Everyone simply chatted about the virtual experience.

In turn, students made personal connections, outlined new understandings, analyzed, questioned, and critiqued themselves in formal written papers. Analysis of this data gave evidence that students' integrated knowledge of teaching from the perspective of either the actors (student and teacher) or the audience. Actors, as avatars, were able to be the role they were playing and also retain a distance from that role (Ackermann, 2004).

Analysis of transcripts of the debriefings and student reflections revealed themes related to the goals of the course including: ways a mentor manages a classroom, attention to positive behaviors, organization, teacher control, proactive teacher behaviors, consequences for misbehavior, chaos, choice, humiliation, respect for students, hearing students, attention to non-demanding students, student engagement, humiliation of students, and knowing ones' students.

4. VIRTUAL PEDAGOGICAL PRACTICE IN SIMSCHOOL

A major challenge facing beginning teachers is how to juggle teaching and learning parameters in an often-overwhelming context of a new classroom. The classroom simulator, simSchool, has been developed, improved and researched for its role in contributing to teacher development to help address this challenge. In this brief overview, we provide the rationale for using a computational model as the engine for a teaching simulation, describe in broad terms how the model works, and share the results of research on simSchool.

The use of digital games and simulations to help prepare teachers is inspired by the dramatic rise and growing appreciation of the potential for games and simulation-based learning in professional training (Aldrich, 2004). Research and development of teacher education games and simulations is just beginning. The new field has the twin goals of producing better teachers and building operational models of physical, emotional, cognitive, social and organizational theories involved in teaching and learning (Gibson, 2009).

4.1 Computational Representations of Teaching and Learning

SimSchool promotes pedagogical expertise by re-creating the complexities of classroom decisions through mathematical representations of how people learn and what teachers do when teaching. The model includes research-based psychological, sensory and cognitive domains similar to Bloom's Taxonomy of Educational Objectives (Bloom, Mesia, & Krathwohl, 1964). However, in simSchool these domains are defined with underlying subcategory factors that reflect modern psychological, cognitive science and neuroscience concepts. For example, the Five-Factor Model of psychology (McCrae & Costa, 1996) serves as the foundation of the student personality spectrum. This model includes the following characteristics: extroversion, agreeableness, persistence, emotional stability, and intellectual openness to new experiences.

Aspiring teachers interact with this cognitive model over several sessions spanning several weeks, with micro-teaching interactions lasting from 10 to 30 minutes; and attempt to negotiate the simulated classroom environment while adapting their teaching to the diversity of students they face. Additional details concerning how simSchool works - how the simulated students respond to tasks and teacher talk – can be found in (Christensen, Tyler-Wood, Knezek, & Gibson, 2011).

4.2 Indications from simSchool Research

Results spanning several years of study (Knezek, Fisser, Gibson, Christensen, & Tyler-Wood, 2012) suggest that simulations such as simSchool can play an important role in preparing tomorrow's teachers. Use of simSchool has been shown to increase Instructional Self-Efficacy (confidence in one's competence), Learner Locus of Control (the teacher's sense of responsibility for learning results), and Self-Estimates of Teaching Skills, Experience and Confidence.

Research on SimSchool indicates that it provides pre-service teachers with a safe environment for experimenting and practicing techniques, especially methods of addressing different learning characteristics, and wide variations in academic and behavioral performance of students. Findings reported to date illustrate that simulations are capable of modeling a wide range of student learning, and can be envisioned as having significant impacts on improvements in teaching.

5. SIMILARITIES AND DIFFERENCES

simSchool and Second Life enactments of the teaching act have some similarities. In both models, students play the role of teacher interacting with virtual students. Both technologies support the acquisition of confidence in one's expertise as an actor who can practice making effective instructional decisions without risk of harm to real children. simSchool students work with virtual students in a virtual classroom with performance and social characteristic student profiles, and during "run time" make instructional decisions.

The primary difference between the two models lies in how knowledge is constructed while students are in situ. In the Second Life students are both the actors and the acted upon in concert with an audience of their peers. Students construct their understanding of effective teaching socially before, during and after the experience. In simSchool a replay capability allows students to experiment to find better moves to assist virtual pupils by adjusting tasks, task sequences, and personal interactions. Thus, knowledge of teaching practice is socially constructed in Second Life; whereas, this knowledge is privately constructed through experimentation with a computational model of teaching and learning in simSchool.

In simSchool the progression of the scenarios are repeatable within close but flexible bounds, allowing for single player experimentation and private asynchronous practice. In Second Life, the scenarios are socially constructed and are experienced in a live, real-time, group setting.

simSchool allows pre-service students to create virtual students with particular psychological and cognitive characteristics, build a virtual classroom with targeted performance and social characteristic student profiles, and during "run time" make instructional decisions. In Second Life, however, students inhabit pre-constructed avatars ascribing personal character during the act of role-play, much like improvisational theatre.

6. DISCUSSION

The delivery environments for Second Life versus simSchool differ somewhat. Second Life is a very large system serving multiple functions and numerous islands, while simSchool is a single-purpose environment. Instructors need the support of an Instructional Technology team to create a virtual environment in Second Life. In simSchool, the complexity of the modeling framework and its openness for flexible purposes entails building up experience in applied educational psychology and cognitive science as well as teaching methods, which provide benefits for effectively creating scenarios and making sense of the data produced by the simulation.

New assessment challenges and opportunities abound in both the role-playing virtual worlds and digital simulations contexts. While many of the ensuing questions are common (e.g. to what extent these experience have an impact on one's preparation to teach, cause valuable conceptual changes, and improve one's knowledge, skills and attitudes as a teacher) the approaches differ for addressing them, leading to new methods of inquiry and analysis.

Role-playing as a teacher in Second Life when combined with face-to-face instruction invites the researcher to consider the long-term behavior effects on pre-service teachers' future teaching practice. Virtual reality allows the learner to be immersed in the environment with a high degree of authenticity. By combining real-life problems of great intrinsic value to the learner with a dedicated space designed for the learner to solve those problems with cooperative support of their peers and instructor, learners are required to analyze their choices and those of others. The question becomes whether any of this results in deepened conceptual understanding and behavior change leading to effective teaching practices.

As indicated earlier, digital games and simulations based in computational models provide learning experiences in a dynamic new performance space that have implications for assessment. *Data mining* and *machine learning* in a context of *data science* applied to educational measurement are approaches and theory needed to address the new challenges of assessment (Gibson & Knezek, 2011).

7. SUMMARY AND CONCLUSIONS

Two alternative technologies forming the basis of computer-mediated teacher preparation systems have been compared and contrasted regarding implementation, operation, and assessment considerations. The role playing system in Second Life is shown to have the unique characteristic of developing shared, constructed pedagogical knowledge, while the flight simulator metaphor of simSchool encourages rapid, stepwise refinement of pedagogical expertise. Each has cost and traveling distance advantages over face-to-face traditional meetings, as well as shortcomings. Ultimately, the largest assessment issue for both is how to measure learning inside a simulator or a social media space. Further research is needed in this area.

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