Chapter 2

Teacher Perceptions of the Practicality and Effectiveness of Immersive Ecological Simulations

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ABSTRACT

Recent research with Multi-User Virtual Environments (MUVEs) in education has shown that these platforms can be effective and engaging for students; however, educators and administrators have practical concerns about the adoption of MUVE-based curricula. This study looks at implementations of EcoMUVE, a MUVE-based curriculum designed to support middle school learning of ecosystem concepts and processes. Research questions looked at teacher perceptions of the curriculum’s implementation feasibility, alignment with curricular objectives and standards, and perceived value. Results showed that EcoMUVE was very well-received, and technical issues were manageable. Teachers felt the curriculum was effective, aligned well with standards, and compared favorably with a non-MUVE alternative. Particular technological and curriculum features that contributed to EcoMUVE’s perceived value included student-directed learning, an inquiry, role-based pedagogy, immersion in the virtual environment, and the ease of collecting and comparing data with graphs.

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INTRODUCTION

Multi-user virtual environments (MUVEs) are 3D graphical worlds used to enable simulated immersive experiences. MUVEs are considered a promising platform for educational applications, in part because they can simulate environments and experiences otherwise impossible in school settings. MUVEs provide rich environments in which participants can interact with digital objects and tools, with each other, and with computer-based agents. Immersion in virtual environments can transform the learning experience by empowering new forms of engagement, self-efficacy, mastery, and transfer (Dede, 2009). Recent research with MUVEs for science education has shown that these platforms can be effective in engaging students and fostering deeper learning (e.g., Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Dede, 2009; Clark, Nelson, Sengupta, & D’Angelo, 2009; Ketelhut, Nelson, Clarke, & Dede, 2010; Schaller, Goldman, Spickelmier, Allison-Bunnel, & Koepfler, 2009). Positive learning impacts have also been demonstrated for similar types of virtual tools, including game-based curricula and multi-agent-based computational models (Barab, Pettyjohn, Gresalfi, Volk, & Solmou, 2012; Dickes & Sengupta, 2013).

Despite the potential benefits of MUVEs, however, practical concerns remain about their inclusion in school curricula (Jones & Warren, 2011; Kenny & McDaniel, 2009; Klopfer, Osterweil & Salen, 2009; Rice, 2007). Barriers to implementation include concerns about instructional effectiveness, lack of alignment to standards, lack of sufficient technology, need for teacher training, and limitations on time and schedule. A study on the perspectives of K-12 educators on the use of MUVEs in classroom settings (Jones & Warren, 2011), found that the fourteen teachers and administrators surveyed mostly chose not to implement 3-D virtual environments in their classrooms because of concerns about instructional effectiveness, technology, and time.

These concerns mirror topics raised by studies of the adoption of new technologies more generally (Ertmer, 2005; Miranda & Russel, 2012; Venkatesh, Morris, Davis, & Davis, 2003). Factors that may influence decisions about whether to adopt emerging technologies include: facilitating conditions (i.e., a user’s perception that sufficient infrastructure exists to implement a new technology) and performance expectancy (i.e., a user’s perception that a new technology will enhance his or her job performance) (Venkatesh, et al., 2003). Researchers have shown that these factors influence teachers’ technology adoption — in a study of Massachusetts educators, teachers’ ease or difficulty integrating technology into instruction, belief that technology will help accomplish instructional goals, and perceived importance of technology for teaching were found to be strong predictors of their technology use in the classroom (Miranda & Russel, 2012).
Teacher Perceptions of the Practicality and Effectiveness of Immersive Ecological Simulations as Classroom Curricula

Digital Literacy and Cultural Mediations to the Digital Divide