Teacher Perceptions of the Practicality and Effectiveness of Immersive Ecological Simulations as Classroom Curricula

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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.

Keywords: Feasibility, Interactive Learning Environment, Multi-User Virtual Environments (MUVEs), Simulation, Teacher Perceptions, Virtual Reality

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OBJECTIVES AND THEORETICAL FRAMEWORK

Multi-user virtual environments (MUVEs) are 3-D graphical worlds used to construct simulated immersive experiences. MUVEs provide rich environments in which participants interact with digital objects and tools, with each other, and with computer-based agents. Immersion in virtual environments can transform the learning experience by superimposing perceptual overlays on phenomena to support student understanding. (Dede, 2009). MUVEs are considered a promising platform for educational applications, in part because they can simulate environments and experiences otherwise impossible in school settings. Recent research with MUVEs for science education (e.g., Barab et al., 2005; Dede, 2009; Clark et al., 2009; Ketelhut et al., 2010; Schaller et al., 2009) has shown that these platforms can be effective in engaging students and fostering deeper learning.

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 recent study on the perspectives of educators and administrators considering the use of MUVEs in the classroom (Jones & Warren, 2011), found that the 14 teachers and administrators considering the use of MUVEs for learning mostly chose not to do so based on concerns about instructional effectiveness, technology, and time.

For this study we look at one particular MUVE-based learning environment, EcoMUVE (ecomuve.gse.harvard.edu), a middle school science curriculum developed through a research grant from the Institute of Education Sciences (IES). EcoMUVE aims to harness the affordances of virtual worlds – e.g., zooming in to the microscopic level, traveling to different points in time, and seeing effects emerge across time and distance – to accomplish understanding goals about causal patterns in ecosystems that are otherwise difficult to achieve (Metcalf et al., 2011). Pilot data from EcoMUVE has shown promising results on gains in student learning and motivation (Grotzer, 2011; Metcalf et al., 2011).

We examine the perceptions of teachers who implemented the EcoMUVE curriculum in their classrooms about the curriculum’s practicality and effectiveness. We look at surveys and interviews with teachers during and after the use of EcoMUVE in their classrooms, in order to determine their perceptions of its value, effectiveness, and feasibility based on their experiences. Some teachers additionally participated in a comparison study of EcoMUVE with a non-MUVE curriculum – using the EcoMUVE Pond module with half their classes and a similar, non-MUVE-based curriculum with the other half. Data collected from teachers included post-surveys, post-interviews, and daily self-reports of teacher experiences using the curriculum in the classroom.

METHODS

Nature of the Intervention

The EcoMUVE curriculum consists of two MUVE-based modules, Pond and Forest. Each module consists of ten 45-minute lessons. Teachers can choose to use either or both modules, so the unit takes either two or four weeks. Each module represents an ecological scenario involving complex causality. The curriculum is inquiry-based; students investigate research questions by exploring the virtual ecosystem and collecting data from a variety of sources over time. The curriculum uses a jigsaw pedagogy; students work in teams of four and are given “roles” – areas of expertise (e.g., botanist, microscopic specialist). Students use interactive learning quests to learn more about the content specific to their module, (e.g., what is pH). Each student performs data collection specific to their roles, and then shares their data with their teammates within the software,
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