EcoMUVE: Promoting Ecosystems Science Learning via Multi-User Virtual Environments

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MUVE: Multi-User Virtual Environment

• Immersive simulated world
• Virtual representation called an avatar
• Move through virtual environment
• Interact with digital objects and tools
• Interact with other users and with computer-based agents
Rationale

- Ecosystems have complex causal dynamics that are hard for students to understand.
- We have seen that Multi-User Virtual Environments (MUVEs) can help students engage in authentic science inquiry and gain a deeper understanding through immersion in virtual worlds.
- Our goal is to develop EcoMUVE as a MUVE-based curriculum that will enable a richer understanding of ecosystems and complex causality.
EcoMUVE project specifics

• Research project funded by the Institute of Education Sciences, U.S. Department of Education.
• Timeline: July, 2008 - July 2011 (extended to June 2012)
• Targets middle school science (ages 11-14).
• Two MUVE-based modules: Pond and Forest
• Each module is a two-week unit to teach about ecosystems and complex causal patterns, using an inquiry-based approach.
EcoMUVE Demo
Why MUVEs for Science Education?

- Increased engagement in learning.
- Simulated experiences otherwise impossible in school settings.
- Exploration over time, place, size, and scale – supports for accessing and visualizing complex phenomena.
- Opportunities to take on roles, work in teams, jigsaw pedagogy – problem-based, open-ended environment.

MUVEs create a shared immersive experience that contextualizes learning and supports inquiry.
Immersion engagement, and learning

- Species scavenger hunt – opportunities for self-directed exploration, discovery.
- Links to food web.
Food Web tool
Effects at a distance and over time

Effects in ecosystems are often at a distance and over a long period of time. Students discover that fertilizer runoff from a distant development causes the eventual eutrophication of a local pond.
Non-obvious causes
A submarine tool explores the microscopic organisms in the pond, helping students understand that organisms that they cannot see play a critical role in the pond ecosystem.
Module 2: Forest
Recent research

- Over 20 teachers and 1200 students used EcoMUVE during Spring, 2011.
- Each classroom used either Pond, Forest, or both modules.
- Broad range of classrooms: 4\textsuperscript{th}/5\textsuperscript{th} – 9\textsuperscript{th} grade, diverse populations of students.
- Many teachers participated in a comparison study of the Pond module and a similar non-MUVE curriculum.
- We collected lots of data…
Goals for Fall 2011

• Data collected last year includes pre-post surveys, student artifacts, video, interviews, and logfiles.

• We have funding this year to:
  – score, enter, and analyze the data
  – finalize the curriculum materials
  – and possibly run further classroom implementations
Research projects – do you have background or skills in:

- Assessment, statistical methods
- Ecology and ecosystem science
- Middle school science teaching
- Curriculum development
- Flash or other web programming
- Gaming and virtual environments
- Graphic design
EcoMUVE project tasks

1. Help with scoring and analysis of both qualitative and quantitative assessment data, including:
   a. Pre-post surveys
   b. Student interviews
   c. Teacher interviews
   d. Student artifacts
   e. Logfiles
   f. Videos
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EcoMUVE project tasks

2. Final editing of project materials, including:
   a. Project website
   b. Curriculum materials
   c. Teacher training materials
   d. Assessments
   e. Flash-based tools (food web, learning quests)
   f. On-line surveys
EcoMUVE project tasks

3. Working with schools and collecting additional classroom data is also a possibility this fall.
   – Useful to have flexible daytime schedule for classroom visits, videography or interview background, teaching experience.