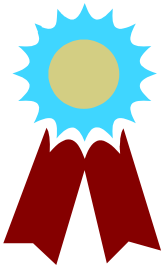
Virtual Learning Prize Application



Endangered Ecosystems – Hidden Secrets of the Salt Marsh

(Part 2 - A Case-Based Learning Scenario)

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Abstract: - 100 words

Students come into college with pre-assumptions on how things work. When faced with complex problems, students jump to conclusions based on what they can physically see and their past experience. Based on real world contexts, case-based learning has been used effectively to help students become team-oriented problem solvers. Virtual worlds offer the tools and affordances to build graphically rich, interactive learning environments. In order to better support the educational community, this proposal seeks to develop a set of tools, inspired by the popular games Myst and Nancy Drew, to allow for the development for interactive case-based learning scenarios.

Description of the Tool, Resource or Experience:

This proposal seeks to expand the **Endangered Ecosystems – *The Virtual Salt Water Marsh*** build by creating a gaming structure (through a set of scripts) that will support case-based learning. These scripts can then be layered on top of a virtual world build (such as the ecosystem) in order to support the development of advanced problem solving skills and the application of research and scientific thought. In this particular scenario, student teams will identify possible causes to explain the mysterious happenings that appear to have degraded the natural environment in the salt water marsh. Inspired by the popular case-based entertainment games like Myst and the Nancy Drew Mysteries, this resource will enable students to interact with the environment, discovering clues which may or may not be causally-related to the degradation of the marsh. Through this gaming structure, layers of complexity will be built into the case, and information will be provided across various disciplines important to environmental science. Students will perform tests to gather data about the virtual marsh while recording results in an online field journal (one of the scripts to be developed) and then compare virtual results to historical data from Sandy Hook, NJ and other relevant salt marshes to determine the significance of the data they gather.

Similar to gaming simulations, continual student assessment will be built into the environment and results collected as students interact with objects throughout the build. Once students have formed a hypothesis to explain the mysterious observations presented in the case, they will collect further data to test the validity of their hunches. They will identify possible remediation strategies and propose a plan of action to restore the area's natural processes. Student groups will present their proposed restoration plans and discuss among themselves the strengths and weaknesses of each plan to arrive at a best practice proposal together.

This proposal seeks to offer the community a gaming structure that will support the collection and analysis of data as well as important formative and summative feedback channels to students. This will also support an example of best practice for creating and using case-based learning in virtual worlds. Notes on the process of planning and implementing will be shared along with strategies used to overcome barriers. (Case-study is attached)

Why is this idea especially suitable within a virtual space?

The use of case-based learning has been widespread in the fields of medicine, law and business education for many years. Based on real-world contexts, this method provides meaning, allowing students to analyze theory in practice. Through the process of identifying the problem and recommending solutions, students are exposed to a variety of viewpoints, acquiring new perspectives and increasing their understanding of the complexity that surrounds seeking solutions to real-world

problems. What once appeared to be a simple issue, now becomes complex as decisions made impact stakeholders in different ways, both positively and negatively.

Advances in technology have opened up new forms of instructional delivery while providing unlimited access to content. Many of the popular online multiuser games have their foundation in case-based learning as players gain skills and resources to engage in quests and various challenges with other players. However, these applications are very expensive to produce and beyond the skills of most educators and designers. Virtual worlds such as Second Life, offer educators the tools to actually build graphically rich, interactive case-based learning environments, similar to those found in online gaming.

Using effective design principles, one can actually provide clues to encourage students to intelligently proceed through the case based on the layout of the material environment and the objects in it. Through this embodied experience, students discover that objects, artifacts and the way in which the environment is set up can store knowledge and power. As a result, students become practiced in the skill of "reading" a space. Because the virtual world supports a variety of media, meaning and "ways of knowing" can be built through multiple modalities such as image, action, and sound, impossible with the traditional "paper and pencil" case study. In this way, not only are a variety of learning styles supported, but also students are challenged to use observational skills related to all their senses to interpret information.

One of the affordances of using a virtual space to study endangered ecosystems is that students can study the region and conduct virtual experiments without doing any harm to the actual plants and animals that live there. Ecosystems are easily debilitated by the introduction of both toxins and benign substances. Using a virtual environment would allow educators to create situations that would normally disturb and possibly degrade a real Salt Marsh. Students can propose and test solutions without negatively impacting this special biome.

At the heart of case-based learning is group work and collaboration. Working as a team of scientists, students find their strengths and learn from each other to solve the case. Effective group work teaches them that recommendations for solutions must satisfy a number of needs and concerns. Virtual environments are especially good at encouraging social interactions, providing a space and sense of presence. In our case-study, the use of a virtual space will also provide a means for students to connect with actual experts in the field for feedback and questions.

Virtual worlds provide educators with the ability to provide experiences for students to acquire the habits of mind important in scientific inquiry, which lays a foundation for them to become critical thinkers in general. We know that humans acquire knowledge best when they think and solve problems by reflecting on their previous

experiences in the world, and testing it against new situations. When faced with new challenges, aspects or elements of this situation can remind us of situations we have had in the past. Moving from novice to expert, we notice patterns in similarity and difference. With success, we begin to take on the identity and "ways of knowing" of a confident problem-solver: observant, data-gathering, creative yet skeptical, open to teamwork and collaborative solutions.

What are the key outcomes for the participant or user of this tool or experience?

At the completion of the case-based activity in Second Life, learners will be able to …

- Gather, analyze, manage, and evaluate data from numerous sources such as historical and provided data, environmental observations, and outside resources to substantiate and support arguments.
- Apply scientific principles and concepts to real-world contexts.
- Work collaboratively to exchange ideas, information and perspectives.
- Debate, discuss and arrive at a group consensus, identifying and evaluating possible solutions.
- Create and present a plan of action to alleviate/solve present environmental impact and restore the integrity of the ecosystem.
- Demonstrate the acquisition of "ways of thinking" found in scientific and research communities.
- Share findings with outside groups of interest (i.e. New Jersey Marine Sciences Consortium) to help educate the broader community through a blog or wiki that the larger community could read and possibly contribute to. Students could publish their finding there as recommendations to the outside community.

Please describe which disciplines/and or courses this idea is applicable to and why?

Ecology, Biology, Environmental Science, and Geology

Students come into the science classroom with many pre-assumptions, based on their experience in the world. When faced with problems to solve, those students will jump quickly to conclusions based on their limited observations, such as what they can

physically see (i.e. litter, medical waste) as the cause of ecosystem decline. The complexity of chemical interactions, energy flows, food webs, etc are the hidden secrets of the saltwater marsh that are essential for understanding the cause and effect processes that govern ecosystem function. Student's solutions to environmental problems tend to be simplistic, usually lacking depth of knowledge as well as creativity in integrating multiple causes. One important objective of the virtual salt-water case study is the deconstruction of students' pre-assumptions to allow for the reconstruction of new, more complex notions on how things work.

Models of critical thinking provide a means for evaluating problem-solving maturity. Susan Wolcott applies a useful set of terms to the stages of critical thinking, pointing out that half of the students entering college are "confused fact-finders" lacking the skills to put facts together to solve problems. At the end of college, the majority have advanced to the stage of "biased jumper," which describes the behaviors outlined above. Few pass through the next stages, "perpetual analyzer" and "pragmatic performer," to master the skills of the "strategic re-visioner." Experience with team-based problem-solving, based upon real-world issues in a gaming-type virtual environment offers educators the opportunity to track and encourage the skills implicit in models for critical thinking such as this one, and to make this progress explicit in their classroom practice.

(See: http://www.nmc.org/virtual-learning-prize)