

Freedom From the Known

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Can the inspirational qualities of research be brought to the experience of undergraduate learning?



The typical formula for an introductory general education science course is known. First, there is the search for a popular textbook that exposes students to the history, principles, and accepted knowledge in the field. Second, tell the students exactly what you want them to know. Finally, because many of these courses have large enrollments, examinations must be easy to grade, tricky questions that bring a flood of students in to argue about their grade are avoided, and low grades might result in poor class evaluations. It's obvious why most students expect teachers to follow the formula, they know the game well. It's no wonder that many university faculties prefer research to teaching. Research is an exciting

and discovery. Can the inspirational qualities of research be brought to the experience of undergraduate learning?

The ESSE I (1991-1995) program inspired me to step outside the standard formula expected of an introductory, general education class in earth science. My class in Global Environmental Change at the University of New Hampshire had reached an enrollment of approximately 200 students. The lectures were treated as “edutainment” in the hope that treating science as a very exciting and fun profession might surprise students and deserve their attention. Lectures included stories about leading scientists and their discoveries to provide insights into the scientific method, an exploration of stocks and flows of water and major biogeochemical cycles to expose students to systems thinking, and case studies that illustrated the importance of insuring that science inform environmental policy. My own ongoing research in the Amazon produced good examples of the connected nature of the earth system. Spectacular images of research sites deep in the rainforest, captured by professional NASA photographers, and satellite imagery of human encroachment into Amazonia were used to explore how scientists observe and model earth and human processes. Carefully selected and integrated visual imagery captured the attention of even the most restless students. I found myself slowly setting aside the many transparencies of taken from the text or journal articles endured by previous classes. The notion of bridging from the known to the unknown seemed to resonate in a manner that recitations limited to known and accepted knowledge might miss.



Undergraduate college students are a wealth of tacit knowledge about local places. Educational and serious games can be especially useful for stimulating small group discussion and problem solving. Dennis Meadows, a faculty colleague at UNH, introduced me to his highly regarded role playing simulation game titled *Fishbanks*. In this two hour activity students working in small teams experienced the “tragedy of the commons” phenomena and the benefits of collaborative problem solving in ways that seemed both memorable and fun. The *Fishbanks* session received top marks on class evaluations. Gaming and simulations offer interesting and fun ways experience the power collaborative problem solving, learn negotiation skills, and to appreciate and anticipate the underlying complexities of natural resource management issues.

Fifteen years after my participation in ESSE I, the design and facilitation of educational gaming and simulation exercises for audiences ranging from high school students to professionals continues to be one of my primary interests. Disaster dynamics is the focus of a current game design project. The emphasis is on the blend of scientific, engineering, and social issues that often conflict with planning for disaster resistant and resilient coastal communities.



The increasing digital sophistication of students opens a cornucopia of possibilities for the communication and representation of earth system science to audiences of all ages. The impressive variety of information and communication technologies and new media that are integral to youth lifestyles offer diverse venues for collaborative, lifelong experiential learning. Interaction with avatars in shared virtual worlds will be characteristic features of imagining and exploring alternative earth system futures sooner than we might think.

Earth System Science at UNH

http://esse21.usra.edu/ESSE21/esse1_UNH1.html

FishBanks by Dennis Meadows

http://www.sustainer.org/tools_resources/games.html

Bill Prothero's implementation of FishBanks

<http://earthednet.org/Support/materials/FishBanks/fishbanks1.htm>

Disaster Dynamics

<http://www.dd.ucar.edu/>

The Houston Advanced Research Center

<http://www.harc.edu/>