At issue:
A Conversation about Immersive Education within a 3D Environment

Wayne F. Pricer
Librarian & Associate Professor
Schoolcraft College

The conversation examines the growing use of virtual simulations and their impact in higher education. Recently, I sat down with three Schoolcraft College administrators to gather their insights in using the technology. I spoke with Monica Sullivan, Dean of Instruction; Susan Lupo, Executive Director of Planning and Research; and Richard Weinkauf, Assistant Dean of Sciences.

What are virtual simulations?

Susan Lupo: Virtual simulations are high-fidelity simulations which use high performance computer modeling programs to simulate selected aspects of the real world for the purpose of improved understanding. These simulations can be used for analyzing the interdependencies of systems, predicting human behavior, and for training people.

Is a virtual cave a theater for learning?

Richard Weinkauf: The virtual cave uses 3D technology. To some extent there may be high performance computing that has to be leveraged. Virtual cave applications allow you to
model situations using computing power. There are ways to visualize things that you couldn’t easily visualize necessarily. There are applications out there for 3D anatomy. You can either project a 3D image on a screen—this is a two dimensional image, but it looks three dimensional and allows you to turn it on all of its axes, or it’s an actual 3D image that’s projected on the screen and you use polarized glasses to view it three dimensionally. Or there is a method of projection where it almost appears that the projection is in the center of the room floating away from the walls. That uses some combination of projectors, and there is a particular height it has to be at. You view the projection also with 3D glasses.

There are already some applications out there using 3D—anatomy and physiology especially. There are some forensic applications where you can project the body in the middle of the room, and wearing these glasses or headsets you can view a virtual autopsy. Somebody goes through and peels back layers of the physiology or the anatomy, and there is a narration associated with it. I don’t even know all the virtual cave applications. There are a bunch of them in aerospace, materials and engineering, manufacturing—there are a lot of them out there. It’s up to your imagination to what you can do in a 3D cave.

How do you envision the use of virtual simulation in higher education in general?

Monica Sullivan: We started to think about simulations and how nursing is already using simulating mannequins in some of their skill lab preparation for students. We have some mannequins that talk, and cough, and sneeze, and do other things—and die and live and all of that. So we have some experience on campus with using simulations and that kind of an environment. We also have the firearms (FATS) training at Radcliff campus for our criminal justice students, which is also a simulated learn-
ing environment. Then, we thought we really use simulations a lot on our campus—above and beyond just in the nursing and public safety disciplines. We discovered that we had some low fidelity simulations going on; for example role-playing could be considered a low-fidelity simulation. We also have some high fidelity simulations occurring. Examples of those would be the simulated firearms (FATS) training or the computerized training in the nursing skills lab or simulations that are based on gaming technology.

**Lupo:**

The use of virtual simulation technology in teaching and learning creates a safe and forgiving environment for students to explore. For us, simulation technology became the notion of a tool: an environment where the notion of programmatic or isolated instruction could not exist because it is as the real world is. It is about the complexity and the systems and the interaction through the devices that allow you to immerse yourself in a world that you couldn’t physically create.

**Sullivan:**

The technology includes a wide range of tools and applications for learning including the use of simulated mannequins in the nursing and health care fields, the design and construction of buildings and tools, the creation of manufactured products, the simulated repair of machinery, analysis of communication systems, police and fire training simulations, the analysis of materials, physical properties, and the use of gaming technologies. The technology also allows students to enter “virtual worlds” where they can experience a variety of simulations in a 3D environment that would be economically impossible to achieve in real world conditions. There is also a website at [http://www.immersiveeducation.org/](http://www.immersiveeducation.org/) where they are building standards for this kind of work.”
How do you feel that the use of this type of technology will transform higher education and in what ways?

**Sullivan:** This technology enables a local and a remote means of delivering an immersive learning experience. It will change the way that faculty design and deliver curriculum content. The use of virtual simulation technology can provide a powerful platform for the integration and interdisciplinary knowledge transfer to meet the needs of our learners. We live in a collaborative, interdisciplinary world, so we’ve got to find a way to make our education more that way; and I think that this technology can help us do that. I think that as faculty become more involved with these resources and their possibilities, opportunities for collaboration and interdisciplinary work will become second nature.

**Lupo:** We think it can transform teaching as well. We think teachers and instructors and faculty if they are allowed to play with simulation technology will discover all sorts of ways they can integrate it into instruction. I honestly believe that at some point along the way, the educational world that we experience now—the brick and mortar, coming to school, being in the classroom—probably will eventually be very altered. Because of technology—as you talked about with the Kindle™ e-book reader—the book itself will take on different properties. With web 3D books, the book will take on different metaphysical elements. I might be able to imagine that I am actually jumping in the book and running with the dinosaurs or flying with a flock of birds, or I may actually think that I am listening to a concert being given by Bach or Beethoven. I think that what it will do is completely change how human beings learn and how they experience the world around them.

A lot of folk, particularly people who are digital immigrants like me, get real scared of that because they think that human beings will lose touch with reality. I think
that eventually my grandchildren will understand learning very differently. The thing that I am excited about is that simulation technology really has the potential to help teaching and learning articulate itself as the brain actually works and functions. To know that learning doesn’t happen in a moment, it happens in an environment and in a setting and that it is a group process as well as an individual process. Left brain and right brain thinkers experience the world very differently, yet we create environments that are all left brained and mechanical. I think all of this will help instructors. If you are a left brain person and all you can do is the linear stuff—which is appropriate in some environments but if you can put on goggles and suddenly understand what it is like to experience the world as a right brainer, you’ll think differently about what you will create in the classroom.

The use of simulations in education is not new and has a wide variety of applications. What are your thoughts on how it can be best used?

Sullivan: The technology can help encourage more opportunities for interdisciplinary collaboration rather than a single disciplinary or siloed means of thinking. The technology can help us address capacity issues and provide equal opportunities for all of our students to experience the same learning situations and scenarios. In the health and medical fields, more opportunities for standardized training and the analysis of currently used systems will help to reduce medical mistakes. Partnerships with regional hospitals will be fostered through the mutual benefit of using this type of technology.

Lupo: The technology extends applied learning. Through simulation you can acquire a skill and do it over and over again. The thing about this environment is that you can create 15 different ways for someone to learn that same skill. The process requires that they think about it afterwards and reflect on it. Become conscious of it.
In a manufacturing environment workers can be more quickly retrained, manufacturing systems can be analyzed and product prototypes can be developed and analyzed. The technology can be used to help enhance manufacturing productivity, saving money and time and also as a tool to help re-educate the workforce in the process.

Weinkauf: What is really important with just about every simulation—whether it is a nursing simulation or a communication, an emergency, Homeland Security, any of these—the debriefing period is critical. It has to happen right after the simulation too. You just can't wait a couple of days to do it. That is something that a lot of people think—we will put in our lab—but then they don't put any thought into the debriefing process or the debriefing area. They don't really get everything out of the simulation if they don't pay attention to the debriefing process.

Where I sit I am trying to make sure that the Health Profession Simulation Lab reflects the needs of the students and the faculty and the conversations that we have had in terms of the planning. Also trying to make sure that whatever virtual cave environment we might put in place here addresses the needs of our science students. Can we do physics simulations in the cave? That is something we want to do. We do things with biology. We also want to look at environmental studies. We should be able to do simulations with ground percolation. We should also be able to do weather simulations and augment those classes that we already teach here in the sciences. If we can—leverage the 3D cave environment to make those a little richer in terms of classroom experience.

A really important part of the whole simulation process is not just going through it. A lot of learning happens during the reflection period, so it is really important to have a debriefing after every simulation. And the debrief-
ing needs to occur because that is when people relive and replay what happened in the simulation. Find what they did right and critically examine what they did wrong.

There is a whole philosophy that has grown up around debriefing areas. They have to be comfortable environments. Usually you want it to be group oriented, so you don’t want everyone front-facing in a classroom. People have to be objective and to some extent almost egoless because they are going to be making comments about whether somebody else on their team made a mistake. So they relive and replay and debrief the actual experience, and they do this while they are reviewing the video. So every one of the simulations is going to have video and audio recording. The debriefing part is really important to the learning process—to review the video and audio in the group that did the simulations and to be able to talk about it. The Learning Theater is going to be able to provide that environment.

What are the implications for teaching and learning?

Weinkauf: I think that is when most of the real learning can occur—when you get people from different disciplines together that point out different aspects of their own discipline and how they interconnect to another discipline that a lot of time people don’t think is related. They really are. I’m hoping that in the 3D cave some of that learning can occur, not only for students but for our faculty too.”

A variety of available sources commonly cite advantages of using virtual simulation technology:

- The technology allows students to receive training and learn a variety of tasks in a safe working environment.
- It provides students with the opportunity to learn and receive training within a structured environment that would not be economically feasible in real world conditions.
• It fosters teamwork, communication, collaboration and critical thinking skills.

• The technology can be used to help entrepreneurs and start-ups with product design and development.

• The technology can also be used to design a variety of new systems within multiple disciplines and also analyze existing systems.

What are the downsides, if any, in using this technology?

Sullivan: The use of virtual simulation technology is not a panacea, but an investment in the technology as a teaching and learning tool.

The following resources explore the use of virtual reality simulations in higher education:


The report contains a definition of virtual worlds and a comparison of several. Among the virtual worlds discussed are the following: a) Second Life, b) OpenSim, c) Active Worlds, d) Active Worlds Europe, e) Blue Mars, f) Croquet and OpenCroquet, g) Google Lively, h) Metaplace, i) Neverwinter Nights, j) OLIVE, k) Playstation Home, l) Twinity, m) Wonderland, n) World Beside, and o) World of Warcraft.

EDUCAUSE, Virtual Community Resources: http://www.educause.edu/Resources/Browse/VirtualCommunity/30398

The site lists 158 virtual community resources including publications, presentations, podcasts, and blogs.

EDUCAUSE, Virtual Worlds Resources: http://www.educause.edu/Resources/Browse/VirtualWorlds/17791

The site lists 127 virtual worlds resources including publications, presentations, podcasts and blogs.
Electronic Visualization Laboratory (University of Chicago): http://www.ice.eecs.uic.edu/index2.php

The electronic visualization laboratory focuses on advanced computing research, developing tools, techniques, and computer hardware in support of real-time interactive collaborative visualization.


The initiative focuses on ten main identified areas of immersive education which include: a) developing and refining a platform ecosystem and an education grid, b) the design and development of interactive web3D books, c) defining, developing and publishing best practices relating to pedagogy, learning assessment and learning outcomes, d) defining, developing and publishing best practices relating to constructing immersive education learning environments, e) designing, developing and promoting interoperable learning environments, f) developing curricula, g) developing artificial intelligence and game based learning tools, h) defining best practices to assist and identify at-risk users, i) providing hands-on professional development training opportunities, and j) developing and promoting communities of technical support.

Open Cobalt Alpha: http://www.opencobalt.org/
An open source virtual world browser and toolkit.

Open Wonderland: http://openwonderland.org/
An open source toolkit for creating virtual worlds.


The article focuses on the main concepts of immersive education: a) immersive environments, b) computer simulations, c) virtual reality, d) augmented reality material that adds to or augments reality such as video, photos, interviews, and data that can be generated by GPS or other mobile technology e) authentic learning, by doing through the use of simulation.

The article discusses the many advantages of using high performance computing. It also stresses the importance of creating collaborative partnerships to allow access to high cost supercomputing technology.

UM3D Virtual Reality Cave: http://um3d.dc.umich.edu/resources/hardware/res_hardware_cave.html

The site discusses the technology used in the immersive 3D virtual reality lab at the University of Michigan and the many applications for its use. The applications listed on the website include: a) architectural walk-throughs, b) virtual prototyping, c) driving simulations, d) training for dangerous situations and scenarios, e) molecular modeling, f) virtual reconstruction of archaeological sites, g) medical and biological visualizations, and h) the artistic expression of ideas.

USC Institute for Creative Technologies: http://ict.usc.edu/

The institute develops interactive digital media for a variety of training simulations. The site contains related projects, news and publications.

USC Institute for Creative Technologies, YouTube Channel: http://www.youtube.com/uscict

The YouTube site contains a video collection of interactive digital media projects and demonstrations from the USC Institute for Creative Technologies.

Virtual Human Interaction Lab, projects (Stanford): http://vhil.stanford.edu/projects/

The virtual human research lab focuses on several projects including the study of a) virtual reality and social interaction, b) virtual reality and behavior, c) learning in an immersive environment, and d) social interaction within virtual environments.

VRoot.Org: http://vroot.org/

A website for virtual reality news and related resources.
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