

## Issues Involved in the Development of Educational Videogames

In 2006 the Federation of American Scientists hosted a *Summit on Educational Games: Harnessing the Power of Video Games for Learning* in Washington D.C. The final *Summit* report addressed the issues involved in developing videogames for educational use.

The exploratory nature and uncertain returns of research on educational games, and the uncertain sales market of schools inhibit the investment of the private sector in developing educational videogames. The reasons for the reluctance include:

- High development costs in an uncertain market makes investment in educational gaming innovations too risky for the commercial video game producers and even the educational materials industries.
- Change in schools comes slowly in terms of adopting any new innovations and as do making the necessary organization and instructions changes that allow use of new learning technologies.
- There is a reluctance on the part of schools to give up textbooks in order to purchase educational gaming products.
- The specific educational values that are tied to state standards have not been proven through in-depth research, which is a requirement of the No Child Left Behind Act.
- Some parents and teachers have very negative attitudes about the use of videogames in the classroom.
- Games are especially good at teaching higher order skills, which are not typically assessed in standards examinations.
- Access to computers in many schools is so low that they can't play a mainstream role in student learning.

While education is one of the most knowledge and information-intensive organizations in the country, a study by the U.S. Commerce Department of 55 industries, found education had the lowest use of information technology. Most schools adopted technology to fit with existing organizational and instructional systems, automating existing work. Susan Patric, the former Director of Education Technology at the U.S. Department of Education, observed at the 2006 *Summit on Educational Games*, that schools need to be transformed by technology, rather than merely having technology integrated into what they already do. She felt that new technologies will not have a significant effect on learner outcomes unless they are accompanied by systematic changes in how teachers approach instruction and organization. Schools have been designed as systems and are organized to maintain the status quo. Fundamental change is so challenging and disruptive that schools resist it.

Schools are generally unwilling to abandon textbooks in favor of technology-based materials. They have budget limitations that prevent them from purchasing both textbooks and new technologies. A large percentage of K-12 educational materials budget goes to purchase basal textbooks, leaving little for supplemental materials. Educational games would add more costs for schools. K-12 schools are also reluctant to purchase educational technologies that are unproven in terms of assuring students will master required educational standards. In fact, many schools are required to purchase only materials that have been proven to be effective. The K-12 market in general is big, fragmented, conservative, slow to adopt technology, and resistant to major change. For these reasons, K-12 education in general is not part of the IT revolution.

There are other barriers to the development of educational games. Students have limited access to computers and other technology during a typical school day. The effective use of

educational games requires easy access by all students in a classroom at the same time. The access must include students who speak English as a second language and students with disabilities who may require adaptations.

Another issue is that most games are not designed to be played in a specific time period. Some types of games can't be played in the typical 45 minute class period of most middle and high schools. Effective use of educational games requires significant changes in pedagogy, content, and a re-thinking of the role of teachers. Game design must eliminate the many hours it currently takes to learn to play a game.

A third barrier is that some teachers and parents have negative attitudes about videogames and are often unfamiliar with the games or are ill-informed. Teachers who perceive gaming in a negative way or who use technology in limited ways in their teaching and personal lives, need training if they are to attempt game-based learning.

Software producers need to explore the possibility of developing "downloadable" educational games. These are often simpler to develop, cost less, and require less time to play. Commercial game companies should look at education as a secondary market for their technology and identify technologies that will help lower the overall costs. Open source initiatives in which components of learning games are interchangeable and available at low or no cost should be developed.

One of the most important challenges to educational game development is the need for tools that make it easy to create learning games and simulations quickly and at low cost. Such tools would reduce the developmental costs. Standards and protocols have to be developed and used by game developers that would allow chunks of learning content to be interchanged from one game to another. There is probably a need for games that can be downloaded in ten minutes or so. These games are typically simpler and shorter than games developed for console systems. They also typically take less time and money to develop. It might be possible for gaming companies to license their game engines, or earlier versions, for educational applications. Open source initiatives also need to be explored so that individuals and companies could self-construct educational games or components for them. Another approach might be for educational publishers to develop classroom materials to use with off-the-shelf video and existing computer games.

Currently, game publishers finance most of the video and computer game development and research. Game development costs have risen 300% since 1999 because advanced technology and powerful new processors allow increasingly more sophisticated games with richer and more immersive user experiences. Developing and launching a new game can cost as much as \$10 million dollars, with high-end games running \$15-\$25 million. Past experience in trying to sell educational games to schools discourages gaming companies from taking the risk of developing new educational games.

Educational publishers and software companies do not tend to have staff with the skills to develop cutting edge games and simulations. The industry would have to invest additional funds to develop educational games on top of their already large investment in developing print materials. Two subject areas that are perhaps the most likely targets for technology-enabled interventions are remedial reading and math. Scholastic did have success with a reading intervention product that was modeled after a videogame. They invested \$9 million dollars in development and the game generated over \$100 million in revenues. So it is possible for educational publishers and software companies to be successful.

Because of the development costs of gaming and uncertain educational market, the final report of the *Summit* asserts that there is a role for the government to play in the research and development of educational learning. Videogaming companies focus on new products for the entertainment market. Publishers of educational materials have not identified a market opportunity large enough to justify the investment in educational game research. The U.S. government spends \$780 billion on elementary, secondary, and post-secondary education and workforce training, but not specifically on the development of educational technologies and games.

There is a need to focus government attention and funding on applying features of games and simulations to the learning environment. Educational game design must target the desired learning outcome and the game must achieve specific learning goals. Educational games must be built on a foundation of learning science. Research is needed on the nature of challenges, competition, and how they affect motivation. Motivation is also a factor in terms of acquiring new information. New learning can be integrated more easily into existing knowledge and models. More research needs to be done in this area. Research can help build scaffolding into educational games and appropriate feedback

Research is also needed to determine the amount of learning that is taking place in a given amount of time, which is referred to as “educational density.” Research may identify ways to balance the entertainment or “fun factor” of games, how long games hold the interest of learners, and the impact on learning. Research may lead to a way to assess immersion and engagement and to identify game features that foster these characteristics. Another aspect of games that needs to be researched is the score-keeping. There is a need to better understand the relationship between score-keeping and goal orientation. One requirement for educational games is that teachers need easy access to game feedback to be able to monitor student progress with the game.

Research could help make games more attractive to different types of users, and address the differences in the types of games that appeal to either sex. Females tend to be more attracted to games that involve relationship building than do males, who tend to prefer action games. Educational games also need to be culturally sensitive.

At the *Summit* Jan Cannon Bowers, of the University of Central Florida, called for rigorous, systematic research on the features of games and simulations that lead to effective learning. Lorne Lanning of OddWorld felt that knowledge convergence is needed in which the challenge and reward delivery system that keeps gamers engaged is melded with the delivery of critical educational information. Lanning explained that educators understand the principles of learning which game designers do not. Educators and game developers need to collaborate to create appropriate educational games. There is also a need to know more about the appropriate transitions between gaming and traditional instruction. Education requires shifting between game scenarios, web-based resources, on-line discussion groups, in-class discussion, and classroom activities.

The American Library Association announced in July 2008 that it will use a \$1 million grant from the Verizon Foundation to document the use of gaming as a literacy tool and to monitor literacy activities at 12 libraries nationally, including the Todd Wehr Library at St. Norbert College in DePere, Wisconsin. The project will measure the impact of gaming has on the acquisition of literacy skills.

**Source:**

*Summit on Educational Games: Harnessing the Power of Video Games for Learning.* Federation of American Scientists. 2006. Washington DC. [www.fas.org/gamesummit/](http://www.fas.org/gamesummit/)