

Video Games in the Classroom? What the Research is Telling Us

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Did you hear about the teacher who wanted to involve students in a sophisticated history simulation? He took the popular social studies video game, *Civilization III*, and used it to help students learn about geopolitical struggles, global economic clout, geographic details contributing to regional power, and tons of other socio-historical concepts. Teachers across the country have been inspired to sneak the *Civilization* series into their classrooms, a phenomenon not lost on the game's corporate parent when designing the newest version, *Civilization IV*.

The teacher in question is Kurt Squire, whose doctoral dissertation involved case study research in using the game within a classroom setting, an after school setting, and a day camp (2004). His work shed some interesting light on the process of taking commercially successful complex video games that are widely acknowledged to be useful for informal learning, and applying them to formal educational settings. One thing he discovered was a need to craft his own curriculum for using the program. Another issue was the brevity of typical class periods. A complex game like *Civilization III* can last hours, making it perhaps more suitable to after school and summer programs.

Squire observed some interesting phenomena once students got into playing the game. First, students were intrigued with "what if" questions they were able to pose through the simulation. What if historically weak civilizations were to become global superpowers? What would it take to get them there? Another interesting item Squire noted was students engaging in the game often referenced traditional materials for help. Rather than replace textbooks and other

paper-based learning materials, the game encouraged students to consult them, and use them to gain knowledge for the sake of the game.

A Hot Topic

Observations such as those Squire uncovered in his dissertation are at the vanguard of a popular new area of research in educational technology: video games. The biggest education conferences, such as those provided by the American Educational Research Association (AERA), Association for Educational Communications and Technology (AECT), and National Educational Computing Conference (NECC), offer multiple presentations on video gaming. Professors at universities such as Harvard, MIT, Indiana, North Texas, and others, have poured countless research hours into video games for instructional purposes. Editors at several academic journals have devoted special issues to the topic or regularly accept articles on gaming. Important books have been published, including James Paul Gee's *What Video Games Have to Teach Us About Learning and Literacy* (2003) and Marc Prensky's *Digital Game-Based Learning* (2001). Blogs, such as IGFORUM and Academic-Gamers.org along with websites such as the Education Arcade comprise the tip of the iceberg of online media devoted to the subject as well.

Of most interest to many educators is the question, What does the research say? We are interested in how research at the university level applies to work in the classroom. The question is critical in light of the fact video games have a reputation as mindless pursuits used strictly for entertainment. Like other instructional media, a genre that started out serving as entertainment can also be used for educational purposes, provided appropriate programs are used along with careful approaches to integration (Rice, 2005).

Research is ongoing, and several high profile efforts are underway. This article only scratches the surface of what we are learning about the instructional benefits of good, complex instructional video games. Below is a brief summary of some of the more interesting findings in the field.

Video Game Research

As far as rote practice goes, researchers are discovering a higher level of engagement using video game environments as opposed to traditional worksheets. A team of researchers from the University of Michigan and the University of North Texas set up an experiment around a Game Boy cartridge they programmed with math problems. Using second graders as an experimental group with the math game, and observing a control group using traditional paper worksheets, the team found a threefold increase in the number of practice problems solved by the experimental group (Lee, Luchini, Michael, Norris, & Soloway, 2004).

More research has been invested in higher-end skills within video games, such as Squire's work with *Civilization III*. Using grant funds from the National Science Foundation, researchers have created educational settings for students to explore in the Active Worlds environment. Active Worlds is a three dimensional website using avatars (digital puppets in the virtual world) that allow users to explore, communicate, and learn with one another. Sasha Barab at Indiana University led teams creating and researching *Quest Atlantis*, a game based on the Active Worlds environment. Borrowing an idea from popular role-playing titles, students embark on quests in the game, leading them down paths strewn with learning objectives. Different virtual towns the students explore hold different learning quests (Barab, Thomas, Dodge, Goodrich, Carteaux, & Tuzun, 2002). Research on interactive design within educationally-purposed video

games such as *Quest Atlantis* continues to be promising, as would be expected within such an interactive media.

The concept of borrowing popular video game features such as quests, and using them for educational pursuits, has opened a rich vein for researchers to mine. A group led by Harvard University's Chris Dede created an educational simulation called *River City*, where students work in teams to explore historical artifacts, ecological issues, and the scientific method. Guided inquiry, student motivation, and educational interactions are all areas of interest to Dede and his colleagues. Students in their experimental group showed higher motivation and post-test scores than those in the control group (Dede, Ketelhut, & Ruess, 2003).

Creating a game from the ground up for educational purposes is difficult. A team led by Amy Bruckman at Georgia Tech designed *AquaMOOSE*, a program exploring complex mathematics in a graphical environment. Students in their study complained the graphics were not up to the same standards as the video games they were used to playing (Elliott, Adams, & Bruckman, 2002). To get around the issue of designing professional graphics from scratch, researchers have discovered they can modify existing games to create their own educational environments. These products have the same look and feel as the professionally-made games students are used to playing, since they are built on the same code. One of the most heralded examples in the literature is *Revolution*, created by a team from MIT led by Henry Jenkins (Squire & Jenkins, 2003). *Revolution* promotes student learning through role-play as they take the parts of town folk in colonial America. Students are able to experience the American Revolution firsthand through this complex simulation.

Video games have provided a springboard for educational research taking a variety of approaches. For instance, interest surrounding Attention Deficit Hyperactivity Disorder (ADHD)

has led to attempts in determining if video games provide a strong focusing element for students with short attention spans. One study, measuring the squirming of students in a control group and those identified as having ADHD while playing a video game, found little difference. The authors' conclusion: video games are good in holding the attention of ADHD students, reducing extraneous body movements at similar rates as non-ADHD students, and may provide a viable resource for instructing hyperactive students (Farrace-Di Zinno, Douglas, Houghton, Lawrence, West, & Whiting, 2001).

Outside the field of education, other studies of video gaming likewise show surprisingly positive results. John Beck and Mitchell Wade (2004) surveyed close to 2000 people in business, and discovered positive links toward work attitudes, willingness to take risks, and problem solving among professionals who grew up playing video games versus those who did not. Finally, science writer Steven Johnson (2005) argues children who play video games score higher on IQ tests than their non-playing parents did at the same ages.

Conclusion

Perhaps the notion of mindlessness within video games holds back their acceptance as a viable instructional medium in the classroom. Many adults remember *Pong*, *Tetris*, and *Windows Solitaire*. These venerable titles are arcade games. They are mostly thoughtless and require little cognitive effort from users. Modern complex video games are much more interactive in nature. Traditional learning techniques such as role-play and problem-based learning can be simulated and practiced within these artificial environments. Players are forced to synthesize new data, learn new ways to do things, solve difficult puzzles, and engage in meaningful interactions

within the games and with one another. They have to think and engage in the games in order to succeed.

In Texas, we are most concerned with how any software for the classroom will improve TAKS scores. Of course, there is no easy solution found in any particular product, and video games are no exception. What modern, complex, educational video games *can* do for our students is engage them in learning situations and teamwork, expose them to literacy events (there is usually a lot of reading and writing going on in these games), and encourage them to practice higher order thinking skills. Good games are engaging and time consuming, and may be best suited in after school or summer programs where the bell schedule is less of an issue, depending on how much time the games demand to accomplish their learning objectives.

Regardless of any particular title's immediate application toward the TAKS, the cognitive and pedagogical benefits of complex video games are a reality. Researchers continue to probe into features that contribute to the educational benefits found in commercial and university-sponsored titles. Meanwhile, we should not be surprised when the day comes that our students spend time in the school's computer lab on a "pedagogically appropriate, TAKS-aligned, educational simulation." In other words: a video game.

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