New Media Resistance: Barriers to Implementation of Computer Video Games in the Classroom

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Abstract

Computer video games are an emerging instructional medium offering strong degrees of cognitive efficiencies for experiential learning, team building, and greater understanding of abstract concepts. As with other new media adopted for use by instructional technologists for pedagogical purposes, barriers to classroom implementation have manifested in tandem with rising interest in the medium. This presentation draws upon a broad analysis of current research dealing with the educative impact of computer video games in the classroom, with a focus on these barriers to implementation. This research study was a qualitative review of 12 scholarly papers exploring the use of computer video games in the classroom. For each paper, the barriers to implementation were identified and summarized. Such barriers include a lack of pedagogically appropriate and standards-based computer games, a lack of understanding concerning the differences between arcade-style games and more complex role-playing, graphically dense, and cognitively viable modern games, and a traditional disdain for the notion of learning as fun.

Introduction

Computer video games are an emerging instructional medium offering strong degrees of cognitive efficiencies for experiential learning, team building, and greater understanding of abstract concepts. As with other new media adopted for use by instructional technologists for pedagogical purposes, barriers to classroom implementation have manifested in tandem with rising interest in the medium. This paper draws upon a broad analysis of current research dealing with the educative impact of computer video games in the classroom, with a focus on these barriers to implementation. Several scholarly papers exploring the use of educational video games in classroom settings were subjected to qualitative review. For each paper, barriers to implementation of video games in the classroom were identified and summarized.

Subjecting the papers to qualitative review resulted in the following six areas identified as barriers to classroom implementation of educational video games: negative perceptions among stakeholders; graphics quality and other issues surrounding computer graphics; lack of adequate hardware in schools to run newer gaming software; lack of instructional time in school periods to adequately engage in rich, cognitive video games; lack of affordances within artificial environments to adequately represent desired learning objectives; and lack of alignment for objectives within commercial gaming environments to state and local standards.

Perceptions Among Educators

Perceptions hampering acceptance of even the best educational games for classroom use include a lack of understanding concerning the differences between arcade-style games, often the first exposure the general public has to video games, and more complex role-playing, graphically dense, and cognitively viable modern games. These advanced computer gaming products belong in a separately defined category. Virtual interactive environments (VIEs) are derived from

several fields, including virtual reality and cognitive science, in order to produce robust and engaging products offering users multiple opportunities for higher order thinking. However, many educators with little or no exposure to modern VIEs may, when asked to consider video games, conjure up mental impressions of lower cognitive arcade titles requiring little or no thought and simplistic gaming properties (Schrader, Zheng & Young, 2006). There also appears to be a general perception in the populace that many video games foster violence, with some research backing up this assertion (cf. Anderson & Bushman, 2001; Sherry, 2001). This may result in a reluctance on the part of school personnel to adapt anything using the term "video game" as an instructional tool for classroom use.

In addition to the negative perceptions surrounding the term itself, actual instruction through video games requires a certain degree of relinquishing control of the classroom. Dede and Ketelhut (2003) noted a strong need for extensive professional development with teachers when implementing their multi-user virtual environment (MUVE). The game-like structure of the MUVE necessitated an approach to classroom management that relies more heavily on technology and constructionist principles, facets with which some teachers may be uncomfortable.

Graphics

A team at Georgia Tech created a math game called AquaMOOSE using graduate programmers (Elliot, Adams, & Bruckman, 2002). Upon informing the school-aged experimental group they were going to play a game, the students initially expressed enthusiasm. However, graphics the students were used to from home consoles and traditional computer games proved superior to that of the team's trial program. Professionally developed games students are used to

playing have a high degree of graphical sophistication, and creating educational products from scratch is thus a high barrier.

That barrier may be overcome by modifying existing commercial products which include the advanced graphics favored by players. Such an example may be found in Massachusetts Institute of Technology's experimental game Revolution, which is a modification of the Neverwinter Nights commercial game (Squire & Jenkins, 2003). Alternatively, acceptable graphics quality may be implemented by using an existing three dimensional environment like the online Active Worlds, used by Harvard's River City (Dede, Ketelhut, Nelson, Clark, & Bowman, 2004) and Indiana University's Quest Atlantis (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2002).

Hardware

A more significant problem to widespread use of computer video gaming in the classroom may be the lack of machines available for students in many schools. Although 99% of all teachers reportedly have access to computers in schools, one-to-one ratios for students appear to be far from reality (NCES, 2000). Computers that are available for student use traditionally are older and less powerful machines. Some survey authors have suggested lower-level games from the edutainment category, such as those in the Math Blaster series, may likely be placed on school computers because of low processing power requirements (Becker, Ravitz, & Wong, 1999).

Advanced games often require newer hardware and tend to be resource hogs, thus potentially limiting their adoption for classroom use. Innovative educational products created for research purposes, such as those based on the Active Worlds environment, often use fewer resources, making them more likely to be feasible on classroom machines and networks. This

idea was a key consideration of Jones and his colleagues when creating software designed for an online three-dimensional classroom. The game-like software was designed to run on older computers, built in 1999 (the year the popular online video game EverQuest debuted) or later (Jones, 2004).

Time Divisions Within the School Day

Squire (2004) noted the time limitations of the bell schedule hampered his efforts to use Civilization III in formal classroom environments. The game is challenging and complex, and users can spend several hours a session playing and learning. Informal learning environments such as after-school and summer programs, and other situations in which the bell schedule is not as critical in dividing learning periods, may prove to be better times for engaging in rich cognitive VIEs. Otherwise, the video games will need to be specifically designed so that learning objectives can be typically achieved within 45 minutes. This is a tactic taken by some researchers when designing games for classroom use. Squire and Jenkins (2003) indicated Revolution was designed with time constraints of the typical class period in mind.

Lack of Affordances

Affordance Theory was proposed by Gibson (1977) as a way to describe the relationship between an entity and its environment. The more affordances offered by an environment, the greater opportunities for interaction become apparent to entities within the environment. Within three dimensional electronic learning environments, upon which many game-based instructional efforts are based, the current level of software sophistication is insufficient for highly advanced affordances. Dickey (2003) noted that the lack of affordances in some three dimensional environments to completely simulate real life pedagogy may hinder desired instructional processes. Particularly, she noted limited movements of avatars within the Active Worlds

environment resulted in less than realistic experiences among users in synchronous distance learning efforts. Those leading classes, for instance, could not engage in complex gesturing, drawing on a chalkboard to dynamically illustrate points, or other actions easily afforded within real world classrooms.

Lack of Alignment to Standards

Squire (2004) noted a need to develop his own curriculum and alignment of standards when implementing Civilization III within classroom environments. Widespread commercial gaming products are designed primarily for entertainment purposes rather than educational purposes, though informal learning may occur through using the products. Teachers wishing to use the products within their classrooms must often develop alignments on their own, a significant hindrance to adoption due to the added time and effort required.

Deubal (2002) indicated that a requirement for any software, including video games, to be successfully used in classrooms is to provide capabilities for dynamic teacher adjustments. Thus, products such as PowerPoint are thoroughly dynamic and find widespread use within classrooms. Products allowing few or no outside adjustments by teachers may find stiffer resistance to adoption. Therefore, if a video game is to find widespread adoption within classrooms, each teacher adopting the product must be able to adapt it to his or her specific state and local standards rather than seeking to adapt the standards to the product.

Conclusion

Wider acceptance of video games as an instructional medium in the classroom is hampered by negative perceptions held by educators. The graphics quality of educational video games needs to be sufficiently advanced to provide easy engagement by the students. While modifying existing products may be a work-around to creating graphical environments from

scratch, time and programming skill remain necessary. Creators of the more successful educational game-like environments use three dimensional software that walks a fine line between graphical sophistication and low resource requirements. This will continue to be necessary so long as older machines remain common in schools. Newer advanced gaming environments tend to maximize use of computer resources, and consequently will likely remain in entertainment venues rather than quickly finding their way to educational markets. School days remain divided into hour long or less class periods, while advanced VIEs can engage students for hundreds of hours. Finally, many of the best cognitive video games are typically created for mass market consumption, rather than purely educational purposes, resulting in the need for additional efforts by teachers wishing to align them to their curricula.

The training benefits of complex computer games in military and business efforts are well documented (see Prensky, 2001). The pedagogical benefits of educationally appropriate video games, including strong cognitive efficiencies for the grasping of abstract concepts, development of team-building skills in multi-player environments, as well as strong experiential learning, are now being researched with promising results. Facts and details, material usually best covered in dense media at lower learning levels and found in high-stakes tests, remain prime components of older media involving text, lecture, and video. Complex understandings, broad experiences, higher level thinking, and consequential decision making are all approached in many advanced computer games now offered in the marketplace and occasionally co-opted by teachers or created specifically for academic environments. As greater understanding of the pedagogical potential of VIEs increases, acceptance of this new instructional medium is poised to increase as well.

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