Games and Education: A Revolutionary Idea

O'Neal Smitherman, Gail Ring, James Jones and Bizhan Nasseh

Abstract

The purpose of this paper is to describe the integration of the game Revolution into an eighth grade social studies lesson on the American Revolutionary War. As educators work to integrate technology into teaching, there continue to be many questions regarding the benefits of using technology in the classroom. For example, what motivates children to stay glued to a video game for hours while teachers have difficulty keeping students' attention for 40 minutes? What impact do educational role-playing games have on student learning or, for that matter, on teaching? This paper addresses these questions, presents findings concerning the efficacy of the use of games in supporting instruction, and considers the implications for the integration of games in the classroom.

Introduction

Pretend that you are Alice, the milliner in colonial Williamsburg. It is your task to sew a uniform for Peyton Randolf, the Attorney General of Virginia, and this task can only be accomplished through the collaboration and successes of other members of your community. Or maybe you are Tom, the blacksmith, who builds or repairs tools and weapons for the members of the town or Sally, the slave, who cooks and cleans for Peyton Randolf. This was the opportunity that students in a middle school social studies class had early last year. Students played the game Revolution, developed at the Massachusetts Institute of Technology (MIT), as part of their social studies lesson on the

Revolutionary War. Revolution allows players to experience the Revolutionary War period as one of eight participants in a three dimensional virtual world (see http://www.educationarcade.org/revolution)

During the last decade, significant funds have been used to integrate game technology in the classroom; yet, there are mixed reports about how this has positively impacted student learning (Dick, 1991; Klassen & Willoughby, 2003; Levine, 1998; Schwartzman, 1997). The field of computer gaming has risen to near equal status with the film and music industries in terms of revenue, customers, and employees (Kirriemuir, 2002). Jayakanthan (2002) likens the influence of the computer gaming industry on youth today to the influence of music, religion, and politics in previous decades. In fact, computer games are so popular that blockbuster films are being made about them (e.g. Laura Croft: Tomb Raider). Sawyer (2002) argues that the advantages of simulations and games are that they: (a) can foster strategic thinking and other learning benefits through repeated use; (b) utilize technology available to the general public; and (c) can intertwine both fictional and non-fictional events.

The allure of using games in classroom instruction is the opportunity it can provide teachers to increase the motivation of students and even keep them in their seats (Prensky, 2001). Seay, Jerome, Lee and Kraut (2004) surveyed over 1800 players of EverQuest, Dark Ages of Camelot, Asherton's Call, or Ultima Online and found that 90% of the players were males who played multi-user games for 15-21 hours per week. The primary reasons for playing these types of games were for:

1. Character growth (21%)
2. Fun (20%
3. Social contacts (15%).

Similarly, in Yee's (2004) study of the game Everquest, survey respondents listed mediation, leadership, and persuasion skills, as well as how to instill loyalty and how to encourage and motivate group members as characteristics they developed through game playing. Exploring fantasy worlds, enjoying social interactions, achieving goals, moving up game levels, and completing quests appealed to players while feelings of power, killing angry mobs, and crafting complex skills or learning a trade were listed as less appealing (Bonk & Dennen, 2005).

Chen, Shen, Ou, & Liu, (1998) point out that multiplayer games are filled with extrinsic motivators (e.g., competition, collaboration, recognition, and material goods). In effect, players are drawn into multi-user games by the possibility of being part of a community (Bonk & Dennen, 2005). When people are motivated intrinsically they become more engaged in the task. For example, it becomes easy to "lose one's self" in a book and read for hours or spend hours learning a piece of software or even playing a computer game. The concept of flow, developed by Csíkszenthmihályi (1990), is a state of being completely involved in an activity for its own sake. Similarly, Herz (1997) suggests that the reason people play games for hours goes beyond being good at the game or facing danger: it is more about the engagement that a great game creates. Teamwork may also

be crucial as a player's success often will be dependent on the degree to which he or she collaborates or works effectively with other players in virtual teams.

MIT's Revolution

Designed as a tool for teaching Advanced Placement American History at the high school level, Revolution is an attempt to simulate digitally the world of a colonial town in order to familiarize students (players) with the social, political, and cultural mechanisms that figured in the Revolutionary War. Each student assumes a role within the town to explore the events that led up to the war, the war itself, and its aftermath from several different perspectives. Ideally, students should take away from the experience a dynamic, yet practical, understanding of the intricate relationships between the forces that might have shaped the genesis of the United States.

Revolution combines the role playing of Everquest (see http://eqplayers.station.sony.com) with the mission-style structure of Diablo (see http://www.planetdiablo.com). Students play roles as tailors, bankers, lawyers, blacksmiths, slaves, mothers, daughters, sons, or ordinary workers in colonial Williamsburg. The game is divided into 40-minute chapters, and each chapter contains two interwoven strands surrounding a social event in the player's life and a political event leading up to the Revolution. Players begin by choosing the role they wish to play and then tailoring their character as much to their own liking as the role allows. Players will be able to choose skin-tones, facial features, hair color, etc. within the race, class, and ethnicity they choose. Once this is finished players immediately find themselves within

the world of the game where they will be free to explore and improvise their own narrative based on the resources available to them as well as their interactions with other players.

Figure 1. Screen capture of a character from the Game Revolution

Research Questions

The following questions guided our research:

1. In what ways did the students increase their knowledge of the Revolutionary War period?
2. How was the student's interest in the Revolutionary War period affected by interacting with the game?
3. In what ways did the gender of the students affect their experience?
4. In what way did playing the game affect the emphasis that participants believe should be allotted to the Revolutionary War in a social studies or history class?
5. Did playing the game by alone versus with a partner impact interest, knowledge or emphasis?

Method

Participants

The participants were 37 eighth grade students enrolled in a required social studies course and 10 high school (HS) students taking elective psychology courses. The students were predominately male (70%; n = 33) with few females (30%; n = 14), but this was reflective of the school's overall enrollment for those grades. The game sessions were part of the students' class time, and the teachers were present during the session as observers.

Procedure

All students completed a short pretest survey developed by the researchers in collaboration with the teachers. The survey asked for ratings on seven point scales concerning the students' level of interest and knowledge in the American Revolutionary War. The survey also asked how much emphasis should be allotted to the Revolutionary War in a social studies or history class. The student was asked to identify his or her gender and complete two questions concerning how often he or she played video games each week and which games were played. The students then began playing the game as the character assigned to the computer station at which they were seated. There were six computer stations, each with a different character. In some of the sessions, a single student was at each computer station, while in other sessions dyads or triads were used.

After playing the game for 30 minutes, the students were given a posttest with the same questions regarding interest, knowledge, and emphasis. In addition, the students were

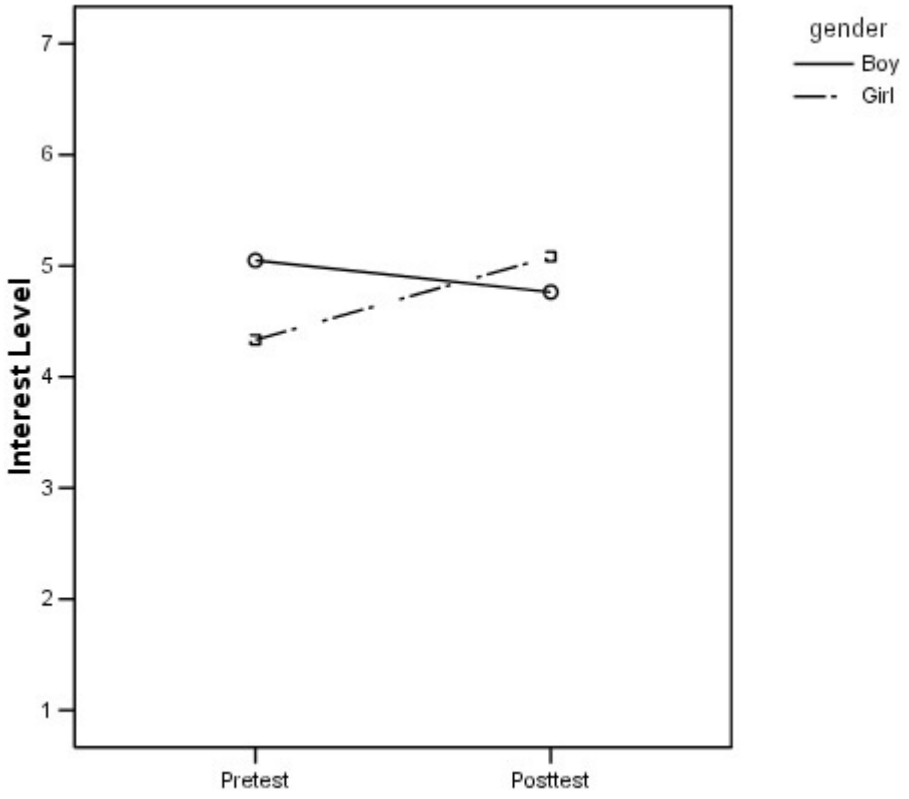
asked if they would like to play the game again, and they were presented a series of open-ended questions about why or why not they would like to play the game again, what was learned from playing the game, and the positive and negative aspects of the game. After the surveys were completed and collected, a 10 minute, unstructured discussion of the game with the researcher and teachers completed the session.

Results

In comparing the pretest and posttest responses for the eighth graders, a three-way ANOVA was run separately for interest, perceived knowledge, and emphasis with between-subjects factors for group (single versus dyad) and gender, and a within-subjects factor for pre versus posttest. No main effects or interactions were found for perceived knowledge or emphasis, but an interaction of group by time was found for level of interest ($p = .01$). As shown in Figure 2, the level of interest for females in the American Revolutionary War increased from 4.33 at pretest to 5.08 at posttest on a seven-point scale. Post hoc tests of the interaction found that only girls showed a statistically significant ($p = .03$) change from pretest to posttest. Boys and girls, however, were not found to differ from each other at pretest or posttest. With only three HS girls, a similar comparison was not run for the HS students. Comparing HS students and eighth graders overall using t-tests for the scales and chi–square (x2)for categorical variables did not find any statistically significant differences between these two groups. Both HS and eighth grade students were combined to compare the change scores for interest, perceived knowledge, and emphasis based on whether the student was playing a character that was a slave or a free person. Those who were playing one of the two slave characters had a

mean increase of .71 in level of interest of a seven-point scale, while those playing one of the four remaining free characters showed a mean decline of .15 (p = .006). No differences were found for perceived knowledge or classroom emphasis.

Figure 2 Change in interest level by gender



In looking at previous video game playing experience, 49% (n = 18) of the eighth graders and 70% (n = 7) of the HS students reported playing three or more hours of video games per week. Girls were less inclined to play video games three or more hours per week (14%) than boys ($\chi 2 = 12.12$; $p < .001$). Almost all the eighth grade (94%; n = 34) and HS students (80%; n=8) were interested in playing the Revolution game again.

Observational Data and Feedback

In addition to the data obtained from the posttest, we were encouraged by the recorded observational data as well. During this experiment, notes were recorded and collected from a social studies teacher and a curriculum specialist. The sessions were also video taped for analysis. Both teachers provided the researchers with feedback regarding their observations of their students playing the game. The social studies teacher highlights some of the value of the experience:

> *Anytime education can become more engaging, learning is enhanced. Larry Cuban (Professor of Education at Stanford University) teaches us to identify intended curriculum, taught curriculum, and learned curriculum. My intended curriculum included giving the students a chance to further understand the importance of Williamsburg in early American history. The learned curriculum turned out differently than I expected. The first thing I noticed with the interactive experience was how the students quickly assumed the roles they were assigned. They were very territorial with the jobs they were given and the locations they were protecting. The participatory learning activity was seen as a reward to the students.*

> *Perhaps, the most encouraging outcome of the project involved a student who was moderately disabled. Initially I was concerned about the student participating; however, the game seemed to eliminate the reluctance the student usually showed*

and he performed as well as if not better than his peers. In addition, he requested to play the game again for several weeks after the experiment.

Most of my students really enjoyed the process of looking at a new game and engaging in this type of interactive learning. However, the experience would be more educationally fulfilling if some well-developed supplemental materials were provided. Overall this was an enjoyable way to look at a portion of history in a new format.

In addition to observing the students playing the game, the curricular specialist analyzed video tapes of the sessions and provided the following feedback:

Three students at the eighth grade level that are identified special education demonstrated different reactions to the program than their regular education peers. Viewing the tape and discussing the outcomes with assigned special education teachers indicated an opinion that an increase of time on task took place. The three students showed a high level of engagement for longer than the 5 to 10 minutes teachers expected. Also the teachers witnessed an increased level of fine motor skill activity that resulted from the active involvement in the game and the use of the mouse to move characters across the screen. The special education teachers concluded that the multi-sensory approach to learning offered by Revolution resulted in the improved time on task and fine motor skill level.

For example, one participant is classified under special education laws as autistic. He has progressed from nonverbal and non-reading to the ability to hold a conversation and reading first grade work by his eighth year. We were astonished at his reaction to Revolution. An increased time on task was witnessed. His IEP (Individualized Education Program) requires that he spend a limit of 20 minutes on any activity followed by a time of non-school activity. After twenty minutes his aide suggested he relinquish the control of the mouse to a group member. He refused and continued playing until the end of the 55-minute period. A review of the tapes showed him becoming increasingly more adept at controlling the mouse and thus the actions of the character. He seemed to understand the goal of the game and wanted to complete the activities required of his character. Lastly, we observed that his communication level with classmates increased as he played. Normally, he does not communicate with anyone except his aide; however, while playing this game he became more verbal then usual.

Special education teachers reflected on the change in his behavior. They expressed the belief that the multi-sensory aspect of the game increased his interest. He also received immediate feedback when successfully moving his character, which increased his willingness to continue playing in an independent learning mode. His understanding of the colonial Williamsburg era also seemed to increase. He could verbally share some of the concepts taught by playing Revolution with his aide and others in the classroom. Overall, playing Revolution

gave him more avenues to demonstrate his learning and mastery of a number of skills beyond typical classroom activities.

Limitations

One possible limitation of the use of the educational video game with middle school students is that the goals of Revolution do not match the American history curriculum and the standards prescribed by the Indiana Department of Education. American Revolutionary War is taught at the eighth grade level in Indiana and the Revolution program seems to be aimed at the high school level student.

The overriding observation concerning the use of the game Revolution by different groups of students was the overuse of violence. All age levels were observed participating in violent activities on the screen. Students were observed spending most of the period engaging their characters in acts of violence against another character or bystander. In fact, observations show that the use of violence actually kept some students from completing the game.

Consideration was given to differences between boys and girls and their ability to manipulate the game to a successful conclusion. There appeared to be no difference in the ability to manipulate the game from a visual viewpoint. Additionally, girls completed the game as demonstrated by their behaviors more often then boys did.

From observations of student behaviors, the conclusion was reached that students had a difficult time identifying with the goal for each character. Some did not understand the verbiage used in the instructions. Others could not identify with the goals or the value of the goals based on their life experiences. Lastly actions of the students helped to conclude that some of the goals set for the characters or the players were not challenging. Some students were observed completing the required goal for a character rapidly and then engaged the character in violent activities, bragging to students seated next to them about their exploits. A rationale for the actions of some students would have to consider the lack of maturity on their part or the lack of opportunity to engage in computer-based role-playing as an education activity in the past.

Discussion

Due to the brief exposure students had to the game Revolution, little content knowledge was gained. However, the survey results and teacher comments did indicate that engagement by the students was enhanced, particularly for students who were identified as having special educational needs. The results of the survey also found that girls in general showed an increase in interest for the Revolutionary War period and wanted to play the game again. Further, both male and female students expressed more interest in the topic and the game after playing the role of one of the two slave characters. The engagement of the students did not appear to be affected by group or individual play.

Conclusion

Possibilities created by technology, expectations of society, parents, and employers--combined with a highly competitive job market and economy--require educational institutions to provide opportunities for students to gain practical knowledge in addition to theoretical knowledge. The 21st century model of teaching and learning embraces and supports opportunities that enable students to obtain practical knowledge through the integration of digital tools. Games like Revolution can provide these opportunities by enabling students to experience and respond to social, economic, and political issues.

Students also enjoyed the experience of playing Revolution, as indicated by the fact that many of them wanted to play the game after the lesson had been completed. Another interesting finding was that the female participants' interest in the Revolutionary War increased after playing the game. The American Association of University Women Educational Foundation Report, How Schools Shortchange Girls (1992), describes the ways in which the prevailing educational system does not adequately meet the needs of girls and presents strategies to make formal education more relevant to the lives of girls, such as emphasizing real-life situations and offering hands-on experience (Inkpen et al., 1994). Further studies might provide insight into how the integration of these types of learning experiences increases girls' interest in otherwise male-dominated content areas such as math, science, and technology.

Another interesting finding was that students who played the role of the slave demonstrated an increase in posttest scores. It is not yet clear why this is so and this

finding may warrant further study. However, student interviews suggest that these characters presented more "new information" about life in this period than other characters.

Among the most interesting data obtained were the teacher observations of students with learning disabilities. In their opinion, these students were more engaged and focused. The online and interactive activities seemed to eliminate the reluctance of the individual student who might be intimidated in face-to-face discussions and group learning activities. Standen, Brown, and Cromby (2001) suggest that virtual environments appear to be a fruitful method of teaching skills for independent living to people with intellectual disabilities. Initial studies demonstrate that learning in this way transfers to the real life environment in which the skills are required. More research is needed to confirm that this is, in fact, the case.

We believe that as more games are designed in collaboration with educators for use in the classroom the potential for dramatic results is great. The hands-on, problem-based, and cooperative digital learning environment will dominate teaching and learning methodologies in the coming years, and we are encouraged by our early findings.

About the Authors

Dr. Smitherman is the Vice President for Information Technology and is responsible for assisting and encouraging faculty to use technology to enhance teaching and learning. He supervises University Computing Services, University Libraries, and the Ball State

University Teleplex. As executive assistant to the president, Smitherman serves as ex-officio member of the Professional Affairs Council and the Governance Committee and assists the president with administrative tasks. Smitherman came to Ball State in 2001 as one of the nation's leading administrators in information technology. He received a doctorate in educational psychology in 1977 from the University of Alabama and completed additional advanced graduate study at Florida State University and the University of Tennessee. Smitherman received his master's degree in sociology from the University of Alabama in 1973 and a bachelor's degree in psychology from the University of Alabama in 1971.

Gail Ring received her Ph.D. in Instructional Technology from the School of Teaching and Learning at the University of Florida. She is the Director of the Center for Technology in Education at Ball State University. Prior to joining the faculty at Ball State she implemented and managed the electronic portfolio project and faculty development activities in the College of Education at the University of Florida. Dr. Ring has consulted with universities and school districts across the US on the implementation of electronic portfolios in teacher education. Dr. Ring's research interests involve the study of innovation diffusion in an academic setting, and has recently begun working with K-12 schools on the implementation of electronic portfolios in the K-12 curriculum. She is also interested in examining the effects of the integration of a digital learning environment into the middle school science classroom and has partnered with schools in Muncie and Indianapolis on furthering this line of inquiry.

Dr. James A. Jones is Assistant Director of Research and Design in University Computing Services at Ball State University. In this role, he provides consultation and data analysis services for academic researchers in a variety of fields. His previous publications have included the fields of gerontology, dietetics, higher education administration, nursing, counseling psychology, and psychological measurement. Dr. Jones has also served as a statistical consultant on several federal and state research grants primarily concerned with topics in gerontology and education. Currently, he is involved with development of interactive media for the teaching and learning of science and scientific principles.

Dr. Nasseh is the Special Assistant to the Vice President for Information Technology and adjunct professor of computer science. He has written over 40 papers on the utilization of computers in education and staff development. Over the years he has taught many courses and developed workshops for the university and the community. In his current position he collaborates with the Vice President of Technology on the University's technology vision and planning and is responsible for coordinating cross-functional teams from three IT units (library, teleplex and computing services). His research interests include intersection of technology and learning and artificial intelligence and the Internet. Nasseh received a doctorate in adult and community education in 1996 from Ball State University.

References

American Association of University Women (1992). How schools shortchange girls: A study of major findings on girls and education. Washington, DC: American Association of University Women Foundation. (ERIC Document Reproduction Service No. ED339674)

Bonk, C., & Dennen, V. (2005). Massive multiplayer online gaming: A research framework for military training and education. Retrieved August 15, 2006 from http://lisa.socialstudiegames.com/Galarneau_Zibit_OnlineGames.pdf

Chen, G. D., Shen, G. Y., Ou, K. L., & Liu, B. J. (1998). Promoting motivation and eliminating disorientation for Web based courses by a multi-user game. Proceedings of the Ed Media/Ed Telecom 99 World Conference on Educational Multimedia and Hypermedia and World Conference on Educational Telecommunications, Frieberg, Germany.

Csikzentmihalyi, M. (1990). Flow: The psychology of optical experience. New York: Harper Perennial.

Dick, W. (1991). An instructional designer's view of constructivism. Educational Technology, 31, 41-44.

Herz, J. (1997). Joystick nation.: How computer games ate our quarters, won our hearts and rewired our minds. Boston: Little Brown.

Inkpen, K., Upitis, R., Klawe, M., Lawry, J., Anderson, A., Ndunda, M., Sedighian, K., Leroux, S., & Hsu, D. (1994). We have never-forgetful flowers in our garden. Journal of Computers in Math and Science Teaching, 13, 383-403.

Jayakanthan, R. (2002). Application of computer games in the field of education. Electronic Library, 20, 98-102.

Kirriemuir, J. (2002, Febraury). Videogaming, education, and digital learning technologies. D-Lib Magazine, 8. Retrieved on February 4, 2007 from http://www.dlib.org/dlib/february02/kirriemuir/02kirriemuir.html

Klassen, K., & Willoughby, K. (2003). In-class simulation games: assessing student learning. Journal of Information Technology Education, 2, 1-13.

Levine, B. (1998). Leadout: An experience in leadership. Simulation & Gaming, 29, 367-369.

Prensky, M. (2001). Digital natives, digital immigrants. On the Horizon,9, 1-2.

Sawyer, B. (2002). Serious games: Improving policy through game-based learning and simulation. Retrieved May 22, 2004, from:http: wwics.si.edu/topics/docs/ACF3F.pdf

Schwartzman, R. (1997). Gaming serves as a model for improving learning. Education, 118, 9-18.

British Journal of Educational Technology, 32, 289-99.

Yee, N. (2004). The Daedalus Project. Retrieved May 22, 2004, from: http://www.nickyee.com/daedalus/