

GAMING IMPACTS STUDENT LEARNING

by

Katie McCauley

An Abstract

of a research paper submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Library Science and Information Services
in the Department of Educational Leadership and Human Development
University of Central Missouri

July 2011

ABSTRACT

by

Katie McCauley

As gaming becomes more prevalent in students' lives, educators are striving to incorporate video games into literacy, math, science, and social studies curriculum to positively impact student learning. The characteristics of video games that appeal to gamers are some of the same components that make these games useful in the educational setting. Through reviewing peer-reviewed and other professional literature, the following chapters define games, focusing primarily on video games, and provide statistics on gaming. Furthermore, this study explains how video games can positively impact learning and offers examples of video games that can be implemented into the regular curriculum to enhance instruction.

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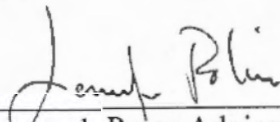
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CHAPTER 1: INTRODUCTION

Statement of the Problem

Playing video games is prevalent in children's lives today. Web, computer, portable, or console games are played by 97% of twelve to seventeen-year-old teens (Lenhart et al., "Summary of Findings"). In addition, video games exhibit many characteristics that can positively impact learning. Games can help students establish a sense of self and present a compelling learning experience. Also, games incorporate problem solving, encourage participation in learning communities, and develop cognitive skills. Since games are being played by a majority of children and can positively impact learning, educators are exploring how they can incorporate gaming into the educational setting to enhance the curriculum.

Purpose of the Study

The purpose of this research was to further understand how gaming can positively impact student learning. Literature on different types of games and gaming statistics were reviewed. Particular attention was paid to the characteristics of video games and how they can be implemented into core subject areas in grades K through 12. The results of this study demonstrate that incorporating video games into the educational setting can positively impact learning.

Questions Guiding the Study

This study explores the impact video games can have on student learning. The research provides answers to the following questions:

1. What are characteristics of video games?

2. How do video games have a positive impact on learning?
3. How can video games be incorporated into the curriculum?

Limitations of the Study

There were several limitations to this research study. First, the research was collected within a given timeframe to meet the requirements of the graduate course. Also, this study is based on existing literature and research from peer-reviewed journals and texts from individuals with expertise in the field of gaming. The scope of data collection includes journals, books, and online resources. This study focuses on the positive impacts of gaming; however, there are also negative consequences of playing video games that were not discussed. With constant technological advances, the possibilities video games can play in the educational setting will continue to change.

Definition of Terms

The following terms are found within the chapters of this study. The definitions to these terms are provided below.

Authentic learning—Learning that engages students with real-world problems

Digital—Electronic information

Flow—A motivating characteristic of video games, where the gamer is completely immersed in the game and the difficulty of the game matches the skills of the player (Gee 60; Martin and Ewing 213-4; Miller and Robertson 244; Park 105)

Game console—An electronic device used to play video games

Learning communities—A group of people who communicate, interact, and learn from one another

Massive multiplayer online games (MMOGs)—A role-playing video game played on the Internet with a large group of people

Simulation—Imitates a situation

Video game—An electronic game that is maneuvered by watching the visual images on the screen

Virtual world—A three-dimensional computer environment where players can interact with others

Walkthroughs—Provides detailed information to help players progress through a video game

Design of the Study

This research study began by searching for a variety of sources on how gaming can positively impact learning. Online resources were gathered by using the databases provided by the University of Central Missouri's James C. Kirkpatrick Library. Articles were retrieved from the following databases: *Academic OneFile*, *Academic Search Complete*, and *Education Research Complete*. Search terms included "video games," "electronic games," "virtual worlds," and "massive multiplayer online games." Additional sources were found through Internet searches. Print materials were borrowed from the Mid-Continent Public Library. Information was taken from the collection of published sources to answer the three guiding questions related to gaming in schools. No research was conducted. Rather, existing literature relating to the topic was reviewed for the purpose of this study. At no time was there an effort to create new research or to

examine existing data, privately or publicly held that would necessitate any type of permission.

Conclusion

This study includes three chapters that discuss how video games can positively impact student learning. This chapter introduced the purpose of utilizing video games in the educational setting. In addition, chapter one presented the design of the study as well as the three questions that guided the research. The next chapter is a review of the literature. Information on video games was taken from peer-reviewed and other professional literature, like journals, books, and online sources. Chapter three consists of the answers to the research questions posed in chapter one and an overall conclusion. Through these three chapters, the study describes how video games can positively impact learning and gives examples of video games that can be incorporated into core subject areas to enhance the curriculum.

CHAPTER 2: REVIEW OF THE LITERATURE

Introduction

“Tell me, and I will forget. Show me, and I may remember. Involve me, and I will understand” (Park 105). Marc Prensky suggests in his book *“Don’t Bother Me Mom—I’m Learning!”* that “learning via digital games is one good way to reach Digital Natives in their ‘native tongue’” (32). In other words, video games provide an opportunity to communicate with students in a language they choose to use with their own peers. This literature review explores how playing games can impact student learning. To begin, the research will define different types of games: physical games, board games, and video games. Next, statistics will be provided to emphasize the importance of implementing gaming in schools. The research will present many ways that gaming can positively impact student learning. Games can help students establish a sense of self and present a compelling learning experience. Also, games incorporate problem solving, encourage participation in learning communities, and develop cognitive skills. Examples of how gaming is implemented in core subject areas and special events are also provided.

Games for Education

Playing games has been and continues to be a means of entertainment among children. Centuries before radios, televisions, cell phones, computers, and game consoles, children played hide-and-go-seek and tag. With the emerging technology, children are playing handheld games on airplanes and playing games on their cell phones at restaurants. When educational games are played, students can expand their knowledge of a subject, broaden their understanding of a historical event or culture, or become stronger

at a particular skill (“Applying Educational Games” 694). Different types of games can be chosen depending on the learning goal and the students’ strengths, weaknesses, and areas of interests.

This section defines games as well as explores the different types of games. Before taking a closer look at how playing games can impact student learning, a clear definition of games is needed. This section also provides statistics on game use. The percentages show the number of teens who own a computer, game console, or portable gaming device. One final statistic shows how many teens play games outside of school.

Games Defined

A game is a competitive activity which often includes a set of rules or guidelines. There are a variety of types of games that can be played by an individual or between two or more people. Most games are governed by a set of rules, and gamers progress to a final goal. The rules are set to provide structure so the playing field is level for all participants. Although rules might provide structure to the game, a gamer’s individual creativity and imagination dictate his or her level of success and proficiency. There are physical games, like tag and hopscotch; board games, such as Monopoly; and many types of video games. Regardless of the type of game, most are chosen for the level of enjoyment or the opportunity to learn new skills.

Physical games.

A physical game incorporates body movements with strategy or mental skills. Physical games range from one person shooting baskets to two football teams with twenty-two players competing on the field at one time. A physical game is an organized

individual or team activity. Hide-and-go-seek, hopscotch, four square, tetherball, and kickball are common physical games that can be observed on a school playground or in physical education class. Physical games provide an opportunity for physical conditioning as well as competitiveness.

Board games.

According to the online Merriam-Webster Dictionary, board games are played by moving pieces on a board with strategy. Chess, checkers, Monopoly, and Candy Land are all examples of board games. However, modern board games have different components than these classic games. Newer board games do not focus on player elimination and alleviate much “down time,” or time where players are not engaged. Also, modern board games pose more interesting, open-ended decisions and provide multiple paths to success (“Broadening Our Definition of Gaming” 9; Mayer and Harris 5-6). Games of strategy instead of pure chance provide an opportunity for players to study and excel at the game (Mayer and Harris 4). Several of these modern board games include: No Thanks!, Incan Gold, Blokus, 10 Days in the U.S.A., and Zooloretto (“Board Game Recommendations” 38). The changes in current board games reflect the interests of children who have grown up in the technology age and desire multiple options and decisions.

Video games.

Unlike most board games, video games consist of handheld games powered by batteries, computer or online games, and games played on a console linked to a television. Video games often involve simulated real-world exploration (Gee and Shaffer 3). Video games are electronic games. Sound and graphics are components of video

games. Players hear sound effects, speaking characters, and background music through game play (King, Delfabbro, and Griffiths 91). The high-quality graphics can be realistic or cartoon-style. Video games have winning and losing features. Winning features include gaining points, finding bonuses, and being able to save gaming progress frequently. On the other hand, losing features consist of losing points and having to start levels again. Gamers advance through games at different rates depending on the game and the player's ability (King, Delfabbro, and Griffiths 91-2). Video games fall into a variety of genres. These genres include: racing, puzzles, sports, action, adventure, rhythm, or strategy. These games all utilize some level of simulation. Many include role-playing or virtual worlds to explore. They can be played by an individual or by groups of people through massive multiplayer online games (Lenhart et al., "Summary of Findings").

In addition to a variety of genres, video games give the player a number of options to explore within the same game. This would be in contrast to most board games that do not have the flexibility of change once they are produced. Video gamers take on different roles and perspectives, which can lead to applying these experiences to the real world (Park 104). With a variety of educational video games available, an educator can target specific areas of learning for individual students, small groups, or an entire class. Although physical games and board games also provide learning opportunities to students, the remaining portion of this research paper will focus more on video games, which are becoming more evident in classrooms.

Gaming Use among Teens

A large percentage of teens own a computer or game console and an even greater percentage play video games. According to a 2010 Pew Report, 69% of twelve to seventeen- year-old teens have a computer. The same study notes that 80% of twelve to seventeen-year-olds own a game console, like a Wii, Xbox, or PlayStation (Lenhart et al., “Part 2: Gadget Ownership”). Also, the 2010 Pew Report found 51% of twelve to seventeen-year-olds have a portable gaming device, like a Gameboy (Lenhart et al., “Part 2: Gadget Ownership”). Another Pew Report shares gaming statistics. Web, computer, portable, or console games are played by 97% of twelve to seventeen-year-old teens, which helps explain why students can often pick up on gaming concepts when teachers implement games at school (Lenhart et al., “Summary of Findings”). Teens take advantage of the wide-variety of games available. For instance, 80% play five or more different genres of games, such as puzzles, sports, action, or adventure games. Another statistic shows that 76% of teens play games with others at least some of the time, which suggests that gaming is a social activity (Lenhart et al., “Summary of Findings”). If gaming is predominant in so many student lives, incorporating gaming into the school will provide students with a learning activity comparable to what they choose themselves outside of the classroom.

Games Have a Positive Impact on Learning

“When people participate in playful activities, such as digital games, they are more likely to enjoy the learning process resulting in more time, effort, and concentration put into an activity” (Martin and Ewing 213). This section explores how video games

have a positive impact on learning. Games are fun for the participants, helping to create a motivating and positive learning environment. However, the fun and entertainment value is not the primary reason for using games as a learning tool. Video games help students establish a sense of self. In addition, video games are compelling, incorporate problem solving, encourage participation in learning communities, and develop cognitive skills.

Help Establish a Sense of Self

Video games can help players establish a sense of self. Players might enter worlds where they experience different reactions, feelings, emotions, thoughts, and even identities (Squire 9). The authors of the study “Children’s Sense of Self: Learning and Meaning in the Digital Age” examined how children can find a sense of self through interaction with media. The study looked closely at four children. Over a year’s time, the children participated in the computer game, Quest Atlantis. Quest Atlantis was designed based on findings from educational research and includes data collection tools for observing students’ game play. It utilizes “strategies from the gaming industry to immerse children ages 9-12 in educational tasks embedded within a 3-D multi-user environment” (Stein et al. 230). To collect data, the students were observed several dozen times and interviewed. They created personal documentaries and filled out questionnaires. Also, students’ computer records were viewed by the researchers. Results showed this multi-user environment appealed to the students’ personal interests, which impacted the child’s sense of self (Stein et al. 225-49). Gamers experience different thoughts and emotions through game play that influence this sense of self. Students’ learning, individualism, and sense of self are established by the choices they make. The

paths they decide to take while participating in gaming situations, such as those seen in Quest Atlantis, help them develop their decision-making skills.

In addition to appealing to personal interests, players might experience multiple identities through game play. Gee describes three different identities gamers encounter in role-playing games. A player takes on a virtual identity, or the identity of a virtual character in a virtual world. The second identity apparent in a role-playing game is a real-world identity. This identity is the real-world person playing the game. The last identity Gee refers to as the projective identity, which focuses on the interactions between the virtual character and the real-world person. These three different identities are relevant beyond video games. For example, in a science classroom, students are encouraged to take on the virtual identity of a scientist as well as their real-world identity of a learner (48-57). This can lead to the third identity, a vision of themselves as scientists when they grow up.

Games Are Compelling

One might wonder why motivation is crucial in a learning environment. Prensky's quote sums it up, "...all learning requires effort, and, like crime, people rarely do it without a motive" (84). Flow, goal orientation, and self-regulation are motivating characteristics of video games. If a game exhibits flow, the gamer is completely immersed in the game and loses track of the time and his or her surroundings (Martin and Ewing 213-4; Miller and Robertson 244). When the skills of the player match the difficulty of the game, the flow characteristic has been accomplished (Gee 60; Park 105). Goal orientation is evident in games where gamers have the desire to learn new material

and develop skills. These are learning goals. Games that have clear goals motivate players (Martin and Ewing 214). A compelling game shows evidence of self-regulation when the gamer chooses to play the game (Miller and Robertson 244). Unlike in the traditional educational setting where knowledge is presented to the students, players uncover knowledge as they play games (Squire 20). The experience and discovery of new information compels the student forward in the learning process and creates a desire to return to the gaming frontier.

Engages a child in a virtual world.

Video games provide the players with a learning opportunity that simulates a real-world setting. Playing video games “engages the child in a vivid, three-dimensional world filled with moving images and musical soundscapes, navigated and controlled with complex muscular movements” (Johnson 19). Students solve real-world problems in virtual world simulations (Gee and Shaffer 3). The more realistic the graphics are within a game, the more attracting and engrossing the game is to players. Games that most challenge players add suspense, uncertainty, and competitiveness (Martin and Ewing 215). Players are motivated to spend a significant amount of time staying on task while playing a game, because the challenges gradually increase in difficulty. The increasing difficulty level excites gamers and keeps them focused (Gee and Shaffer 4; Prensky 59). As each level is conquered, a sense of achievement drives the gamer to move onto the next level. Gamers are attracted to games that exhibit a combination of enjoyment and challenge (Martin and Ewing 212). Virtual world gaming provides situations the player may encounter in everyday life. Players experience “active content” through game play

(Aldrich 52). For example, the game Digital Zoo gives players the opportunity to operate a virtual world through the perspective of an engineer, urban planner, journalist, lawyer, or other professionals (Park 106). Games are engaging because the player is *doing* something (Squire 15).

Builds social relationships.

Through video games, students build social relationships with their peers (Levine, “Why Gaming?” 10). Gamers can interact with other gamers in several ways. First, players may hook up multiple controllers to one video-game console. Players can connect with others in different locations by using a computer network. Another way to play with other gamers around the world is to log on to Internet sites (Gee 179-180). In group environments, students learn to work with others so they can achieve a common goal. During a game, a gamer might take on the role of a leader or team member. At other times, the gamer may address a situation on an individual basis. The opportunity to make a positive contribution to a team excites and motivates the gamer to get thoroughly involved and return for more gaming time. Gamers must learn to interact with others in a gaming environment, which may create relationships in other social settings. Through these social relationships, players also gain feedback from their peers.

Feedback.

Feedback is received for every action in a video game as a result of the gamer’s choices. Did Mario make the jump over the hole? A positive result: Mario clears the hole. A negative result: Mario lands in the hole. The advantage of gaming: both result in a learning experience. When a task is successfully completed, games reward players in

various ways (Levine, “The Gaming Generation” 22). Gamers may receive experience, items, or information related to the plot as they play the game and overcome obstacles (Schrader and McCreery 560). Several different software features provide feedback. In some gaming situations, players are given direct feedback. Direct feedback might be given using visual or audio cues after a specific action is taken or might be provided at the end of the entire process. In other instances, games may give tips on how to conquer the next obstacle (Tavella et al. 9). “As a result of their formative experiences with digital objects, though, Digital Natives do crave *interactivity*—they expect an immediate response to their each and every action” (Prensky 36).

Incorporates Problem Solving

Students can learn the lifelong skill of problem solving through playing video games. Animal Class is a game where students take on the role of teachers. The students have a virtual pet that they teach the basics of language, math, science, and art. However, since the students have the freedom to teach their pet whatever they want, they could incorrectly teach their pet. Watching the game’s brain icon, students know how to adjust their teaching (“Applying Educational Games” 695). Gamers must multitask; take in the information, compile the data, and make a decision quickly (Prensky 8-9). In Animal Class, players are forced to make decisions and measure their results immediately based on the actions of their pet (“Applying Educational Games” 695).

Decision-making.

Decision-making is a component of problem solving. Gamers are presented with a problem to overcome in video games. They must make decisions to solve the problems

that come their way. Quick decisions are made one after another (Prensky 61). Steven Johnson drives home his belief about the strong tie between playing games and making decisions:

Start with the basics: far more than books or movies or music, games force you to make *decisions*. Novels may activate our imagination, and music may conjure up powerful emotions, but games force you to decide, to choose, to prioritize. All the intellectual benefits of gaming derive from this fundamental virtue, because learning how to think is ultimately about learning to make the right decisions: weighing evidence, analyzing situations, consulting your long-term goals, and then deciding. No other pop cultural form directly engages the brain's decision-making apparatus in the same way (41).

Students figure out the rules of the game by playing the game. This is especially true for video games which do not always provide a written set of rules to read before beginning the game as one finds with board games. Through playing the game, players unveil the rules. Video games provide different paths the gamer may choose to proceed in the game. Gamers decide what missions to undertake, what skills they desire, and how their characters look (Przybylski, Rigby, and Ryan 156). Being given multiple options, players take responsibility for their learning. (Levine, "The Gaming Generation" 22). Students learn that there is not always one way to approach and solve a problem within a game (Mayer and Harris 26). Being able to make decisions gives the gamer a sense of

control, which motivates the gamer and results in a positive attitude (Martin and Ewing 215).

Four-step process.

Gamers experience a similar process to that of the scientific method while playing a video game. Players go through a “probe, hypothesize, reprobe, and rethink cycle” (Gee 87). First, the player must look around the virtual world and take in his or her surroundings (probe). Then, the gamer must hypothesize about what to do next or what something might mean on the screen. After testing the hypothesis, the player reprobes the virtual world to see the effects of the hypothesis. If the feedback or result of the action is positive, the player can accept the hypothesis and continue moving forward, starting the cycle again. However, the player might need to rethink the original hypothesis if the desired results are not obtained (Gee 88). This four-step process is a learning tool that applies to multiple real-world problems outside of gaming.

Trial and error.

As players are moving through a video game and are faced with challenges, they must make decisions on how to overcome these problems. Gamers must experiment through trial and error and create strategies to conquer obstacles (Prensky 8). Students make and act upon decisions. A gamer might have to tackle the same obstacle multiple times before finding the correct solution. Since players want to excel in the game, they are not bored or discouraged by repeating tasks to overcome challenges (Gee 68; Martin and Ewing 217). Gamers are constantly reflecting on their every move (Prensky 37). Learning comes from the failures and poor decisions as well as making the right choices

and winning the game. Gamers take risks, knowing that if they fail they can try again. In the same way, educators could give students room to fail and learn from their mistakes in their studies like students are used to in game settings (Levine, “The Gaming Generation” 22).

Encourages Participation in Learning Communities

Gaming provides students with an opportunity to participate in learning communities (Gee and Shaffer 4). Learning communities promote communication and interaction among gamers and establish a sense of teamwork by working together in the virtual world. Games are made for everyone to enjoy regardless of socio-economic status or gender (Gee and Shaffer 11). Since games are created for everyone to enjoy, learning communities are made up of diverse groups of people. Players in learning communities are not often concerned with the age, gender, class, race, or ethnicity of others in the learning community (Squire and Steinkuehler).

Massive multiplayer online games (MMOGs) are social virtual environments that attract a large variety of individuals. Gamers interact with competitors. On the other hand, players might work together to accomplish a common task (Park 106; Przybylski, Rigby, and Ryan 156; Rigby and Przybylski 218-20). Players can interact with thousands of other gamers who are working towards the same goals from various locations. Gamers collaborate and work together to solve problems (Schrader and McCreery 558-9). Through MMOGs, such as World of Warcraft, gamers establish a support system by communicating with other players (Schrader and McCreery 570). Players may communicate in person, in chat rooms, through blogs, and by instant messaging (Martin

and Ewing 216). Gamers can also stay socially connected through Web forums, guild chat channels, and voiceover Internet protocol communication (Przybylski, Rigby, and Ryan 156). Technology allows players to have ongoing communication from multiple sites.

Develops Cognitive Skills

Through game play, gamers can develop cognitive skills. For example, players must learn how to manipulate digital information and technology devices, which involves multi-tasking. Also, playing video games helps gamers with hand-eye coordination. These are both skills that are useful in other areas of life.

Teaches how to manipulate digital information.

In the twenty-first century, students must learn how to maneuver and manipulate technology. Gamers learn how to manage digital information through playing video games. For example, gamers have to absorb and react to an abundance of information to play Mario Kart: Double Dash (Levine, “Why Gaming?” 14). Players must process print, graphical, audio, and visual information on the screen as well as manipulate the controller. Gamers must be able to recognize and focus on the most important things and ignore the rest (Prensky 8). They must instantly interpret, process, and react to digital data provided by the game.

Works on hand-eye coordination.

Playing video games also helps develop hand-eye coordination (Annetta et al. 1093; Levine, “Why Gaming?” 15; Martin and Ewing 216). Marc Prensky quotes Dr. James Rosser comparing the hand-eye coordination used to play video games as the same

coordination needed during laparoscopic surgery. Rosser says that surgeons who played video games earlier in their lives make 40% fewer mistakes in surgery (Prensky 7). The gamer is forced to absorb graphics and respond with physical hand motions, reacting instantly to what he or she is viewing on the screen.

Gaming in School

“When children play, they learn. This concept may seem straightforward and oversimplified, but it is a reality. From peek-a-boo to video games, people have learned from play for eons” (Annetta et al. 1091-2). It is a misconception that playing and learning are separate and do not go hand-in-hand. With the heavy emphasis placed on standardized testing, educators already struggle to cover the entire curriculum let alone trying to find time for game play. A solution to this challenge is to incorporate educational games as part of the regular instruction. Educators can integrate games that enhance the curriculum (Mayer and Harris 11). Video games can be chosen based on content standards to teach abstract concepts, encourage deeper thinking, improve student participation, increase student motivation, and promote collaboration (Annetta et al. 1093).

Gaming can be implemented in schools as part of the curriculum or for extracurricular activities. Games can be used in any subject to introduce a skill or strengthen a skill that has already been taught. Students are immersed in an authentic learning experience, since the learning skills are integrated into the video game (Mayer and Harris 13). Authentic learning takes place when students think beyond the classroom walls to the outside world (Abrams 338). Through the authentic experience provided by

video games, players development schema about information they may learn at school (Abrams 345). This section describes how playing video games can positively impact student learning in all core subject areas: literacy, math, science, and social studies. Also, a portion of this section discusses how special events at school can center around or incorporate video games to extend the learning community.

Literacy

Gaming can impact literacy, particularly reading and researching. Games can assist players in learning how to read and motivate individuals to want to learn to read. Books and games have several common characteristics; consequently, video games can lead to book selection ideas. Research comes into play with video games. Gamers must gather and analyze research throughout their gaming experience to move forward in the game. This research can be gained through the video game itself or by referring to outside sources.

Assists in learning to read.

Young children can learn to read through playing video games. By playing games, children are more self-motivated and display a stronger desire to learn how to read (Levine, “Why Gaming” 13). The Accelerated Learning program, developed by Scientific Learning Company, is an example of an educational game that is designed for children who struggle with reading skills. A study was conducted at thirty-five locations throughout the United States and Canada. The results showed that across the thirty-five sites, 90% of the children demonstrated efficiency by achieving a significant improvement in one or more tested areas (“Applying Educational Games” 694).

Words are everywhere, not just in books (Aldrich 49). Gamers can encounter text in a virtual gaming world. For example, in the game Deus Ex, players find notes, e-mail, diaries, and messages to help them uncover the storyline and decide what actions to take (Gee 96-7). However, video games are also connected to written texts. Students can read written reviews of games in magazines and on Internet sites as well as read gaming manuals, booklets, and strategy guides (Aldrich 49; Gee 97).

Use games to assist in book selection.

Video games can play a role in book selection. Story elements create a readable book, and they are present in games too. Games often consist of characters, setting, plot, and theme. Since some games' storylines are similar to history, fantasy, or science fiction book genres, making book recommendations can stem from learning what genre of video games students like to play (Galloway 24). Sometimes players want to read more about the topics in their video games and go to a book for more information. For example, students check out books that are related to topics found in Age of Empires, Civilization, and Rome: Total War (Levine, "Case Studies" 36).

Encourages research.

Gamers are researchers; research is a component of game play. Players collect and analyze data throughout the game. Some gamers conduct their research by using the information gained through playing the game while others refer to other sources, like game guides, the Internet, or learning communities that have evolved around the game. Gamers research information, study maps, design strategies, debate facts and theories, search websites for strategies, and write extensive "walkthroughs" (Levine, "The Gaming

Generation” 20; Squire and Steinkuehler). Walkthroughs provide specific information to help players each step of the way to complete the game (Johnson 28). With the abundance of information published and shared on gaming, players must learn to evaluate the information for quality (Squire and Steinkuehler).

Math

Math games can positively impact student learning across many concepts. Playing math games can show students how numbers are used in real-life situations, that geometric shapes are common in our everyday environment, and how probability and statistics help form our decisions. Math games also help with computation and memorization skills. Games that are geared towards the math curriculum can benefit other subject areas too. For example, Lightspan Partnership created a mathematical PlayStation game that was tested in over four hundred schools. The data shows a 25% improvement in vocabulary and language skills, and a 51% increase in solving mathematical problems with students who played the game (“Applying Educational Games” 694; Prensky 38).

In addition, math computer programs can also help students succeed on standardized tests. Cognitive Tutors and the ASSISTments system are used with regular classroom mathematics instruction. Students utilize Cognitive Tutors or the ASSISTments system once or twice a week and then participate in classroom lecture or group work the other days (Koedinger et al. 191). Results have shown a positive impact on student learning from both of these systems. For example, Cognitive Tutor has led to better scores on the math SAT standardized test than traditional curriculum and

encouraged more students to take an upper-level mathematics course (Koedinger et al. 191). These games provide an engaging way to learn math concepts.

Math games can also be used to measure a student's current ability to solve basic math problems. A study was conducted in three sixth-grade classes in three similar socio-economic schools in Scotland over a ten-week period. Seventy-one children participated in one of three groups to investigate the rate and accuracy of their mental math computation. The first group played Dr. Kawashima's Brain Training game using a game console for twenty minutes each day. This game focuses on mental calculations and memorizations through puzzles. The remaining two classes were comparison groups. One comparison group participated in Brain Gym, or a set of physical movements, each day for twenty minutes. The other class continued to receive regular instruction as the non-treatment control group. The results of the study show that the students in the group playing Dr. Kawashima's Brain Training over the ten-week period depicted a greater improvement on accuracy and speed on math computations than the two comparison groups (Miller and Robertson 245-51).

Science

Science concepts can be taught through games. As mentioned earlier, gamers go through a process similar to the scientific process while playing video games. Will Wright, the creator of The Sims, describes how gamers use trial and error as they progress through the game, becoming part of the hypothesis, experiment, and analysis cycle (Martin and Ewing 211).

Many science lessons involve inquiry-based learning, where students are in control of their own learning. Inquiry-based learning and gaming both allow the participants to make their own decisions to reach the end result. NASA created a multiplayer game called Moonbase Alpha. Within this game, players take on the role of a member on a moon exploration team living in a lunar settlement. The gamer has to figure out what action to take after a meteorite impact (“Applying Educational Games” 695). Zoo Tycoon and Spore are other video games that meet science standards. In Zoo Tycoon, players design and maintain a zoo as well as take care of the animals living at the zoo (Angelone 46). Players do a variety of tasks throughout the game Spore from creating an organism, building a civilization, and exploring space (Angelone 46). There are many video games like Moonbase Alpha, Zoo Tycoon, and Spore where players are taken to a virtual setting outside of the classroom to learn the science material through inquiry.

Social Studies

Many video games can be implemented into social studies classes. SimCity can be used in conjunction with social studies content to teach the basics of economics and urban planning (Levine, “The Gaming Generation” 21). Age of Empires can be utilized in an ancient history course. Making History, created by Muzzy Lane Software, is a historical simulation teaching students about the political and economic causes of World War II. According to a press release in May 2006, a social studies teacher at Oak Hill High School in Converse, Indiana had sixty-four sophomore students play Making History. To judge the outcome of utilizing this historical simulation, test scores of the

students who played Making History were compared to students who used the standard history textbook, listened to lectures, and completed the traditional assignments. The results showed that after a week of game play, the students who played Making History learned more facts and wrote more complex essays. For example, 67% of game players could define the reasons for the start of World War II compared to 35% of non-game players (Levine, “Case Studies” 35-6).

Special Events Using Games

Games can also be used for special activities during the school day or before or after school. One high school executed a day-long gaming event during the school day to celebrate National Library Week. Another high school held gaming events after school in the evening. Both of these events as well as other gaming activities can have an impact on learning as described below.

Gaming event for National Library Week.

Downers Grove South High School in Downers Grove, Illinois implemented a day-long gaming event in the library for National Library Week. The high school’s gaming event consisted of video and board games. Many staff members participated in the event. The technology staff removed game blocks from the library’s computers, and organizers made snack bags for each player and played game show themed music. Some teachers brought in their classes to play games during their class period, and other staff members played games with the students. Those who participated in the gaming event were entered into a drawing for prizes. Another area was set up for taking pictures of

students and faculty in front of a Twister backdrop throughout the day (Levine, “Case Studies” 31-3).

This day-long gaming event impacted learning in multiple ways. First, holding the gaming event in the library brought staff members as well as students into the library. Students were given the opportunity to participate in compelling activities, which encouraged problem solving and developed cognitive skills. Also, students were given the chance to take part in a social event, which required them to collaborate with staff members as well as their peers. Students who had never stepped foot in the library might be more apt to return after the day-long gaming event. These same students might also have established a relationship with a staff member or another student that will continue beyond the gaming day in the library.

Gaming night led by teens.

North Hunterdon Regional High School in New Jersey holds game nights in the library to encourage learning. Holding a gaming night is a learning experience for these New Jersey high school students. The students learn what it takes to prepare and organize an event. Students are in charge of every aspect of the program from setting up all video, sound, and controller connections to asking for discounted food from businesses. Their roles also include preparing tournament sign-up sheets and cleaning up afterwards (Levine, “Case Studies” 35). Gaming nights display student interests in gaming when they gather outside of school hours. Over one hundred students from different social groups attend game night at the high school (Levine, “Case Studies” 35). These students are participants in a learning community as they gather for game night, to plan, socialize,

and offer one another advice. Not only does game night welcome students into the library, but the students are also given the opportunity to work together and experience the positive impact games have on learning.

Conclusion

In conclusion, there are a variety of types of video games available that can be utilized to impact student learning. With the high percentage of teens playing games on electronic devices, educators are exploring how video games can be incorporated in schools to motivate students and contribute to learning. The characteristics of video games that appeal to gamers are some of the same components that make these games useful in the educational setting. Games can impact learning by helping participants establish a sense of self. Also, video games are compelling, incorporate problem solving, encourage group participation, and develop cognitive skills. Games can play a role in student learning in the areas of literacy, math, science, and social studies as well as building a learning community through special gaming events. Based on the research presented in this paper, gaming provides a learning tool for teachers to utilize in their classrooms today.

CHAPTER 3: CONCLUSION

Introduction

Video games and learning are words that are becoming more commonly heard in the same sentence. One might wonder how video games are related to learning or how learning is associated with video games. Playing video games is prevalent among teenagers; 97% of twelve to seventeen-year-old teens play games on a computer, the Web, a portable device, or a console (Lenhart et al., “Summary of Findings”). The characteristics of games that appeal to gamers are some of the same components that make these games useful in the educational setting. This chapter explores how video games have a positive impact on learning. Students are learning skills that educators strive to teach in the classroom through game play. This section is going to answer the following questions: 1) What are characteristics of video games? 2) How do video games have a positive impact on learning? and 3) How can video games be incorporated into the curriculum? The answers to these questions are summarized in the conclusion.

Characteristics of Video Games

A game is a competitive activity that is often governed by a set of rules or guidelines. There are different types of games: physical games, board games, and video games. Video games are electronic games that can be played on a portable device, a computer, the Internet, or a game console. Video games exhibit both sound and graphics, which are features that also distinguish them from other games. There are a variety of physical and board games from tag and hopscotch to checkers and Monopoly. Similarly, there is a wide selection of video games. The many genres of video games include:

racing, puzzles, sports, action, adventure, rhythm, and strategy. These games may employ simulation, role-playing, and virtual worlds. Regardless of the game genre, players progress through all games at their own pace. They make decisions on how to advance through the game. Gamers take on different roles and perspectives during game play, which helps them apply gaming experiences to the real world.

Many games can be played by an individual or in groups, including video games. Gamers can work to achieve tasks on their own. On the other hand, there are several ways that gamers can play with other gamers. One way is for players to hook up multiple controllers to one video-game console. In this instance, all the gamers are physically at one location. Players can play games with or against others in different locations by using a computer network or logging onto Internet sites. For example, World of Warcraft is a massive multiplayer online game, where people from across the globe can communicate and play the game in a social virtual environment.

Games Have a Positive Impact on Learning

Games positively impact learning in many ways. The components of games that appeal to gamers are characteristics that can be useful in a school setting. Games are fun and entertaining, which can lead to a positive learning environment. However, games can have an impact on learning beyond the fun factor. Video games help students establish a sense of self, where players enter worlds where they experience different reactions, feelings, emotions, thoughts, and even identities. Gamers can take on a virtual identity as well as a real-world identity. Taking on various identities and experiencing situations through different perspectives is evident in an educational setting too. For example,

students might be encouraged to take on the identity of a scientist and a learner in the science classroom.

Video games have other traits that can play a positive role in the educational setting. Games are compelling, incorporate problem solving, encourage participation in learning communities, and develop cognitive skills. Flow, goal orientation, and self-regulation are motivating characteristics of video games. Flow is accomplished when a gamer is completely engrossed in the game. A gamer reveals goal orientation when he or she has the desire to learn new skills. When a player chooses to play a game, self-regulation is achieved. Games are also compelling because they engage the participant in a virtual world, where the player is challenged and solves simulated real-world problems. Many video games incorporate problem solving. Players make decisions and use trial and error to conquer obstacles and move to the next level. Playing video games provides gamers with an opportunity to participate in learning communities, where gamers communicate and interact with one another. Cognitive skills are developed through games. Gamers learn how to process and react to a multitude of digital information. In addition, playing video games helps develop hand-eye coordination. These are ways video games can positively impact learning.

Incorporating Games into the Curriculum

Video games can be incorporated into any of the core subject areas of literacy, math, science, and social studies. With limited time to cover the entire curriculum, video games can be implemented as part of the regular instruction to enhance the curriculum. Video games can be used to introduce a new skill or to improve a skill that has already

been taught. Games can be chosen based on content standards or with a goal in mind, such as encouraging deeper thinking or promoting collaboration.

Video games can impact reading and researching. Playing games assists individuals in learning how to read. Gamers encounter text throughout the game and can read other written texts related to the video game they are playing, like magazine reviews and strategy guides. Video games might also have a role in book selection. Players may be interested in reading the same genres as or learning more about the topics in the video games they play. Using the abundance of information gained through game play and from other sources, such as game guides and learning communities, players learn how to evaluate the information for quality.

Games can also be incorporated into the math, science, and social studies curriculum. With the wide variety of video games available, multiple math concepts can be taught through gaming, such as geometry, probability and statistics, and basic computations. Through playing video games, students can see how numbers are used in real-life situations. Science and social studies standards can also be taught through the use of video games. A process similar to the scientific method is used to make decisions and advance in video games. Inquiry-based learning is evident in both video games and science classrooms. A number of video games exist that address a wide range of social studies concepts from urban planning to ancient history to the political and economic causes of the war. Video games allow students to move beyond the classroom to discover places, accomplish tasks, and travel in time; things that are not possible without the virtual world of video games. For example, students can be a member of a moon

exploration team in the game Moonbase Alpha or travel back in time in the game Age of Empires.

Conclusion

In conclusion, video games exhibit many characteristics that appeal to gamers, hence the high percentage of teenagers who play video games. These characteristics that attract gamers are the same components of video games that positively impact learning. Through video games, players can establish a sense of self by exploring their emotions and taking on various identities. Educators strive to engage students, incorporate problem solving into lessons, promote collaboration and teamwork, and help students develop cognitive skills. Video games accomplish all of these tasks. With the wide variety of video games available, gaming can be incorporated into any core subject area. Based on these findings, gaming can positively impact student learning in the educational setting.

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