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Citation:

6. Video Games in Education

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Key Points:

- Game-based learning and gamification have been around for years.

- Gamification, unlike game-based learning, has shown an increase in implementation within the educational community.

- The educational community understands that game-based learning has many benefits but requires more support for better utilization in the classroom.

- Diffusion of innovations with game-based learning rarely reaches past early adopters.

Abstract

Since around the mid 1900s, the video game industry has flourished with new devices and styles of games. Video gaming is a popular hobby amongst the population. Despite the popularity in the general public, video games included in classrooms as a method to learn is still not fully utilized to its full potential. Using educational games in a lesson has many social, creative, and engaging benefits. An increase in gamification has been more prominent in public education as a way to assess and engage students. Comparatively to game-based learning, gamification has shown more success with
innovations. Game-based learning tends to not make it past the innovators and early adopters. Introducing more popular video games into the curriculum and providing more technical support to educators would help break the barrier that prevents full adoption and diffusion.

Introduction

Do you consider yourself a “gamer?” When you think of the word gamer, your mind probably pictures an individual that devotes hours a day to a new PC or Playstation game. Do you find comfort in passing time with a game of Solitaire or Candy Crush? Have you recently posted your successful Wordle session on a favorite social media platform? Is it just me, or do you also look forward to your yearly visit to the dentist so that you have a chance to play Pacman on the arcade machine in the waiting room? If you answered “yes” to any of these, technically you are also a gamer.

One technological innovation that has exponentially increased in both users and revenue over the years is video games. A video game is played on an audio-visual device with input and output functions that can sometimes be based on a story (Esposito, 2005). Games are commonly played on computers, smartphones, consoles, and portable devices. Video gaming is a popular hobby that brings joy to many people regardless of age and ability (ESA, 2022).

At the beginning of my career as an educator, I felt well prepared and confident to provide engaging lessons. My education did not prepare me for the little technology support and an outdated curriculum that commonly plagues many public school districts. The realization set in that a more creative approach was needed to maintain the focus of twenty 6-year-olds with bland and monotonous content. Simple connections with students proved that video games were a hot topic. Conversations of newly released games and favorite streamers engaged commentary, whereas addition and subtraction did not. Ensuring the success of every student ended up requiring my start in game-based learning.

Introducing video games into education and gamification is not a new innovation. Gamification is the addition of game elements such as points, leaderboards, and badges, into non-game activities. Unlike gamification, game-based learning introduces, reinforces, or enriches through play itself (Walter, 2022). The game-based learning rate of
adoption in the education community only recently is slowly beginning to climb. If you were to walk into a classroom today, you would notice that many teachers still resort to traditional teaching methods or lack the means to bring video games into their lessons. Teaching with digital games is not a common practice even though the educational benefits are known (Rüth et al., 2022). In this chapter, we are going to take a deeper dive into the history, current adoption practices, reasoning behind the success and failure of the innovation, and how to possibly move forward.

History of Gaming in Education

Games and consoles have developed and soared in popularity over the last half-century. Starting with the release of William Higinbotham’s 1958 Tennis for Two for an analog computer to the release of Sony’s Playstation 5 in 2020, it is evident that the popularity of gaming continues to be present. Development of the systems adapted to mainstream adoption of the innovations with noticeable changes in accessibility. The 1972 release of the Magnavox Odyssey to be sold to the public was the first console and start of gaming at home. The Nintendo Gameboy in 1989 allowed for further accessibility with gaming on the go.

Today, we see games being played on smartphones, tablets, computers, consoles, and portable devices. With approximately 215.5 million Americans and 71% of American kids under the age of 18 playing video games for at least an hour a week (ESA, 2022), video games are a popular source of entertainment.

The benefits of gaming in education are not a new concept and date back to before video games became mainstream. In 1958, B.F. Skinner identified the importance of engagement and recognized the passive learning role students began taking in the classroom. To solve the perceived problem, Skinner developed and studied the use of teaching machines in educational environments. Skinner’s teaching machines allowed individual students to move at their own pace, get immediate feedback, increase the challenge level, compare results, and essentially keep and try to beat their own score (Skinner, 1958).

As the video game industry exploded during the early to mid-1980s, early innovators began introducing gameplay into learning environments. Classic educational video games include the historical
context in the Oregon Trail, Microsoft’s Flight Simulator, and Mario Paint introduced digital art to a generation of young learners (Tremaine, 2022). Modern examples include the programming and game development in Minecraft, the introduction to physics in Angry Birds, and the problem solving and critical thinking in Civilization and Animal Crossing.

Advantages and Disadvantages

Introducing and utilizing video games in an educational setting has its advantages and disadvantages.

Once set up and introduced, it requires less management from the teacher as students engage in an educational game. One example of this is during center groups. Groups allow teachers to meet with small groups of students to target differentiated instruction for literacy or math. Group sessions are one of the most important times in a school day as they can be tremendously impactful to student success. While the teacher works with a small group, the rest of the class is engaged in other educational independent activities. It can be difficult to manage the rest of the class during this time while the focus is primarily on the students with the teacher.

Educational video games can be used to keep students engaged. *Prodigy*, a popularly used math game for primary students, can provide feedback on student learning rates and allow teachers to target specific skills for each student. For example, when the teacher begins a unit on telling time, they could go into the dashboard of the website and set it so the students would receive questions about how to tell time.

Video games are a supplement that engages the students with the material and allows them to learn difficult concepts in a space they feel comfortable (Lee & Templeton, 2008). Video games allow students to virtually practice real-world experiences like taking actions for desired outcomes, managing their attention effectively to complete goals, and safely taking risks to discover that failure is a way to learn (Seelow, 2022). Teaching with video games also speaks to young learners with a medium and context that they are used to. Playing video games can impact and improve how students learn, communicate, and solve problems (Prensky, 2006).
Despite the advantages, there are also several disadvantages to utilizing video games in an educational setting. Teachers are often provided with several tools and websites to use without little training. Unsuccessful adoption can occur when teachers need to provide additional time to research and create a lesson outside of the classroom. With already so much on the teacher’s plate, this can lead to burnout or lack of enthusiasm in setting up the resource.

Occasionally certain programs require training or professional development to allow for set up and implementation in the classroom. Unless the teacher is adequate and efficient with account creation and usability, additional time is required to implement fully. Without the necessary training, a program could not be utilized correctly in the classroom. The educational value of the content could be misused by the student. Some games could require more teacher intervention in order to be successful. Not correctly utilizing a program could negatively impact student success and engagement.

Many games can be time-consuming to set up and maintain. For example, though advantageous for student-centered learning, Prodigy requires consistent effort to assign the new skill to students; however, once it is set up for the skill, you do not need to assign a new skill until the previous skill is generally mastered. This additional time could contribute to teacher burnout.

One problem for students that can and have been faced with is the age requirement on several popular video games. Many games have a rating attached which prevents schools from allowing students to play in the classroom. The age rating is due to the content in the video game, whether it is violence, language, or other negative influences.

An unanticipated result that has been recognized with the increase in video game usage is the toll on students' mental and physical health. In a study involving 1,178 American youth aged 8-18, it was found that about 8% were exhibiting symptoms of Internet Gaming Disorder (Gentile, 2009). Internet Gaming Disorder (IGD) is classified as a mental disorder related to addiction, and is now included in recent editions of the American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Disorders. A person is diagnosed with IGD when they experience five or more symptoms within a year (American Psychiatric Association, 2013).
Symptoms include:
- preoccupation with games
- withdrawal symptoms when gaming is taken away
- tolerance, resulting in the need to spend increasing amounts of time engaged in games
- unsuccessful attempts to control participation in games
- loss of interest in previous hobbies and entertainment as a result of and with the exception of games
- continued excessive use of games despite knowledge of psychosocial problems
- deceptive information provided for the amount of gaming
- game usage to escape/relieve moods
- jeopardizing or losing a significant relationship, job, or education/career opportunity because game participation

Adolescents experiencing problems associated with IGD could lead to serious health-related consequences (Pontes et al., 2016). The impact on students' health can prevent some potential adopters of game-based learning.

These unintended consequences of gaming can also contribute to classroom management issues for student interactions with the game. When familiar with a particular commercial game, redirection is necessary to keep students in a learning mindset (Marklund & Taylor, 2016).

Adopters of Video Game-Based Learning

Despite the major advancements in recent releases of new games and the knowledge of its benefits, many school systems, and teachers are considered late adopters of this innovation. The rate of adoption has not dropped completely, but rather continues to slowly incline.

A more recent increase in technology usage in the classroom was a result of the COVID pandemic. School systems were in sudden need of devices for each student to provide that access to an online classroom. Some schools that initially lacked the funds for additional devices suddenly had access to a vast variety of options. Teachers who relied on worksheets in their lesson plans needed to adapt to the
drastic changes. Teachers turned to game-based learning as a tool for the digital environment (Torchia, 2022).

The increase in online learning environments called for different strategies to maintain student engagement. Blooket, Gimkit, Kahoot, and Quizizz quickly became preferred methods to successfully engage many students. Often mislabeled as “game-based” learning, these types of websites actually are considered “gamification,” which is presenting traditional multiple choice questions in a gamified environment (Litman, 2022). Teachers have used basic recall educational games for decades, but new adaptations have been using mainstream games, like Minecraft, for higher-level academic learning (Jones, 2018).

Adopters

Rogers (2003) categorizes adopters based on their innovativeness compared to others within a system; innovators, early adopters, early majority, late majority, and laggards. When assessing game-based learning’s rate of adoption, or the speed with which an innovation is adopted, it is helpful to consider these categories to understand human behavior (Rogers, 2003).

Innovators, those first to adopt an innovation, are considered venturesome and launch the new idea into the system (Rogers, 2003). This small category of innovators typically would be a very select few teachers or technology leaders that initially test out the new game.

Early adopters are considered the role model for other adopters in a system and often are a key factor in the success of the rate of adoption (Rogers, 2003). Many early adopters are quick to jump on new technology innovations and enjoy technological advancements. This may be a teacher who enjoys gaming and wishes to engage their students further, knowing that the newer generations of students play video games outside the classroom.

If the innovation is communicated positively, early majority adopters begin to implement the idea. This group of individuals tends to be hesitant and less willing to take a risk. Early majority adopters tend to adopt the innovation before the average individual; however, only after the new innovation has proved itself to be generally reliable and effective. Individuals in this group may rely on the change agents and early adopters to communicate the benefits and provide guidance for successful individual implementation.
Individuals adopting after the average individual are considered to be in the late majority group. Teachers have to overcome obstacles and reservations about game-based learning but are convinced of the results (Groff et al., 2010). These challenges can be through missing support systems from administrators, colleagues, and professional development as well as missing needed resources within the classroom.

The term “laggard” is applied to the group last to adopt an innovation (Rogers, 2003). There could be several reasons behind their delay in implementation. Teachers that lack contemporary skills in technology and those in need of increased technical support find themselves dragging their feet regarding newer innovations. The scarcity of resources in many school districts puts a constraint on many technology innovations, including video gaming in education. Without professional development support, teachers may be required to spend their time researching the innovation and eventually choose to stay in their comfort zone of more traditional teaching methods.

Despite the difficulties of full implementation, many early adopters have successfully used video games in lessons. Gameplay experiences allow students to learn specific content, practice problem solving, work on collaborative skills, tap into creativity, and even learn important social-emotional skills.

**Assassin’s Creed in History**

Video games often can be presented in a format that hides the educational content with impressive narration and theatrical gameplay. One game that does this well is the action role-playing game (RPG) Assassin’s Creed series created by Ubisoft. Each game references historical characters and events hidden within a game that has soared in popularity across many devices. Ubisoft invests in the general authenticity of the game’s environment and historical context, the result is players learning history during gameplay. While there are some creative deviations from historical events, often shown from the perspective of the fictional protagonist, the game developers try to keep environment design as true as possible to the historical context of the game. For instance, revolution era urban Paris, the frontier, New York, and Boston during the American Revolution, or ancient Greece and Egypt are based on historical references and scholarship.
In a 2018 Canadian study, researchers observed the educational impact on 329 high school students from three different Assassin’s Creed games (Karsenti & Parent, 2020). The majority of the students had experience with the game; however, 44.9% stated they had never played it. With a game rating of Mature for an audience of 17+, the teachers did not use the actual video game but rather clips of gameplay, cinematics, and screenshots from the game itself. It was used as visual support for learning content. The result of the study provided strong evidence to show success in sparking student interest. It was also noted that the educator’s teaching style played a large role in the student’s successful understanding of the content.

A more recent addition to the series, Assassin’s Creed: Origins, took its game a step further and included an educational spin through the Discovery Tour. In this add-on, combat and quests are replaced with a guided tour of Ancient Egypt. Players are able to interact with artifacts to learn about various aspects of the civilization, including important historical figures. Changes in-game content to reach younger audiences could have a profound impact on the rate of adoption.

Adoption Success and Reasons for Rejection

When analyzing the rate of adoption and development of video games, it is safe to assume that that innovation was successful and continues to grow. The pandemic additionally brought new players into the gaming world.

Despite the rapid success of video games in the mainstream, it is noticeable that video games in education have been slower to be fully adopted in the classroom. The intentions from teachers are there due to the beneficial results of student engagement; however, compared to the video gaming industry, it is not as well utilized in the classroom.

Comparing the advantages and disadvantages of implementation in the classroom shows that the advantages have the potential to outweigh the disadvantages. This makes instructional designers question what causes are involved that are preventing the adoption of this innovation. Why is it that designers and curriculum writers have known for decades that the impact could positively affect students, yet teachers and the current curriculum in areas continue to
support passive learning? With the increase in expectations on test performance, it does not make sense to me that the education system is so outdated.

One cause of this is the lack of provided materials in the curriculum and professional development to support game-based learning. Support through professional development is essential to promoting teachers’ readiness to change (Chee et al., 2015). This lack of support leaves teachers needing to create or locate lesson plans on their own time, which is always after school hours due to the planning period almost always being compromised. Principals admitted that they seek teachers that are technology-fluent and able to create authentic learning opportunities when hiring, but believe that teacher training has been the biggest barrier to success with integrating digital content (Project Tomorrow, 2016). To be effective, teachers need to use technology, but there is often no time to train teachers on how to use technology.

Additionally, public schools often require teachers to follow the provided curriculum. Regardless of career experience, a hindrance to implementing video games in lessons is the need to follow the district curriculum (Hayak & Avidov-Ungar, 2020). This, in turn, tends to hinder creativity and freedom to implement new innovations. State and district testing put pressure on both teachers and students to perform. This also adds strain to the desire to take more creative risks, especially if the evidence is not apparent to support the risk.

An additional unanticipated result that has been encountered is the game content being too mature for audiences. Popular games, which would be ideally used, often are not appropriate for a school setting. Through my own personal experience, as a teacher who has occasionally played movies for my class for a reward or break, I needed to be extremely mindful of the rating. The movie always needed to be rated G and cultural or religious conflicts kept in mind. This made even searching for a movie difficult. How would I play movies with those restrictions? Simply, I wouldn’t play them. This can come into play with video game ratings as well.

As seen with the Assassin’s Creed scenario (Karsenti & Parent, 2020), the rating of the game impacted how it was delivered. This was adapted and instead of using the actual game, the narrative elements were used. Video games ideally will continue to release student-friendlier versions for school districts to use, like Assassin’s Creed Discovery Tour and Minecraft Education. Using video games
as objects of reflection in a teacher-guided lesson is a promising approach for fostering specific skills, like media literacy skills (Rüth & Kasper, 2021). Once popular name games continue to develop and advertise to the educational community, adoption of video games into more lesson plans would likely be easier.

**Conclusion**

In studies using video games as a theme or incorporating them directly into the lesson, students have shown to be more engaged with the material and resulting in higher testing results. Given the significant gaming population, changes should be made to support teachers with more video games in the classroom.

Teachers often use various gaming mechanisms currently to enhance learning. Gamification websites (Quizizz, Blooket, etc.) have shown successful adoption and a large interest in implementation. However, there is a noticeable difference in the educational community adoption rate compared to video games and console development and adoption.

The implementation and adoption rate of the innovation could benefit when teachers are provided the materials and support. Bringing video games into the curriculum with more professional development options will allow for more teachers to experiment with implementation.
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