# Games and learning

**Games and learning** is a field of education research that studies what is learned by playing video games, and how the design principles, data and communities of video game play can be used to develop new learning environments. Video games create new social and cultural worlds – worlds that help people learn by integrating thinking, social interaction, and technology, all in service of doing things they care about. Computers and other technologies have already changed the way students learn. Integrating games into education has the potential to create new and more powerful ways to learn in schools, communities and workplaces. Games and learning researcher's study how the social and collaborative aspects of video game play can create new kinds of learning communities. Researchers also study how the data generated by game play can be used to design the next generation of learning assessments.

## Research

The games and learning research world studies how new digital media tools shift the topic of education research from recalling and repeating information to being able to find it, evaluate it and use it compellingly at the right time and in the right context. Games and learning research explores how games and game communities can lead to 21st-century educational skills such as higher order thinking, the ability to solve complex problems, think independently, collaborate, communicate and apply digital tools to effectively gather information.

Research conducted by Shaffer, D., Squire, K., Halverson, R., & Gee, J. P. from the University of Wisconsin – Madison shows the educational and social benefits of digital games. Games do not need to be specifically geared towards education to be educational tools. Games can bring together ways of knowing, ways of doing, ways of being, and ways of caring. As John Dewey argued, schools are built on an obsession with facts. Students need to learn by doing, and with gaming, students can learn by doing something as a part of a larger community of people who share common goals and ways of achieving those common goals, making a game a benefit for social reasons as well. Gaming has also changed the look of content-driven curriculum in schools. In content-driven media, people learn by being told and reflecting on what they are told. In gaming, game designers create digital environments and game levels that shape, facilitate and even teach problem solving.

Another experiment investigated the effects of utilizing the iPad as a learning tool in American Preschools. The results from the experiment contrasted greatly to the common notion that the increasing use of technology by children proves harmful. In their results, the use of the iPads, specifically the completion of the application's tasks within it, yielded positive results. Peer interaction, participation, and learning were all evident since the task was administered in a classroom setting that required the children to work together.

Games also teach students that failure is inevitable, but not irrevocable. In school, failure is a big deal. In games, players can just start over from the last save. A low cost failure ensures that players will take risks, explore and try new things.

Much of the debate about digital games for education was based on whether or not games are good for education. But that question is overly simplistic. The National Research Council's report on laboratory activities and simulations makes clear that the design and not merely the medium of a physical or virtual learning activity determine its efficacy. Digital games are a medium with certain affordances and constraints, just as physical labs and virtual simulations are media with certain affordances and constraints. Simulations and digital games actually share many similarities in this regard. Although there are multiple definitions for games, the key characteristics differentiating games from simulations involve the explicit inclusion of (a) rules for engaging with the simulation, (b) goals for players to pursue, and (c) means for indicating players' progress toward those goals. Properly designed, features of games can provide powerful affordances for motivation and learning.

Individual studies have shown, for example, that well designed games can promote conceptual understanding and process skills, can foster a deeper epistemological understanding of the nature and processes through which science knowledge is developed and can produce gains in players' willingness and ability to engage in scientific practices and discourse.

In his book *What Video Games Have to Teach Us about Learning and Literacy*, James Paul Gee talks about the application and principles of digital learning. Gee has focused on the learning principles in video games and how these learning principles can be applied to the K-12 classroom. Successful video games are good at challenging players. They motivate players to persevere and teach players how to play. Gee's video game learning theory includes his identification of thirty-six learning principles, including: 1) Active Control, 2) Design Principle, 3) Semiotic Principle, 4) Semiotic Domain, 5) Meta-level Thinking, 6) Psychosocial Moratorium Principle, 7) Committed Learning Principle 8) Identity Principle, 9) Self-knowledge Principle, 10) Amplification of Input Principle, 11) Achievement Principle, 12) Practice Principle, 13) Ongoing Learning Principle, and 14) Regime of Competence Principle and more. Within these learning principles Gee shows the reader the various ways in which games and learning are linked and how each principle supports learning through gaming. One example would be Learning Principle 6: "Psychosocial Moratorium" Principle, where Gee explains that in games, learners can take risks in a space where real-world consequences are lowered. Another of Gee's principles, #8, that shows the importance of games and learning states that learning involves taking on and playing with identities in such a way that the learner has real choices (in developing the virtual identity) and ample opportunity to mediate on the relationship between new identities and old ones. There is tripartite play of identities as learners relate, and reflect on, their multiple real-world identities, a virtual identity, and a projective identity.

Scot Osterweil, a research director at the Massachusetts Institute of Technology's Comparative Media Studies program states that these standards and testing methods are not conducive to teaching methods that incorporate video games. Games alone will not make schools more efficient, cannot replace teachers or serve as an educational resource that can reach an infinite number of students. The extent of the roles games will play in learning remains to be seen. More research in this area is needed to determine impact of games and learning.

Peter Gray, who has conducted research on early childhood learning, states that gaming is purely a beneficial activity in young children. He states that children are able to choose how to most effectively use their time and that extensive use of a particular medium of learning shows they are taking something valuable from it. He goes on to state the significance of the computer in the modern age and that not utilizing it as a learning tool is simply foolish. Video gaming has shown positive levels of improvement in areas of cognitive function. In their study "Improving Multi-Tasking Ability through Action Videogames". Chiappe and colleagues determined that 50 hours of gaming significantly improved results on a performance test modeled after skills used when piloting an aircraft. Aside from this, areas of attention and vigilance, as well as basic visual processes have shown to improve with allotted video game time.

**Application**

Digital learning tools have the potential of being customized to fit the abilities of individual students and can engage them with interactive tasks and simulate real-life situations. Games can create new social and cultural worlds that may not have been available to everyone in the past. These worlds can help people learn by integrating thinking, social interaction, and technology, all in service of doing things they care about.

Video games are important because they let people participate in and experience new worlds. They let players think, talk, and act in new ways. Indeed, players inhabit roles that are otherwise inaccessible to them. One example of a game where players are learning while playing would be *The Sims*, a real-time strategy game where players need to make decisions that alter their character's life. They can manipulate the scenario to create digital lives where they can experience the struggles of single parenthood or poverty. Players in this game are not

allowed to modify a previous decision to alter the outcome, even if the outcome is unpleasant. The goal is to survive to the best of their abilities. The game is complicated and difficult, just as it would be to live a real life. Regarding a more traditional approach to education, *The Sims* has been used as a platform for students to learn a language and explore world history while developing skills such as reading, math, logic and collaboration.

While not all researchers agree, some recent studies have shown the positive effects of using games for learning. A study carried out by Professor Traci Sitzmann at the University Oregon among 6,476 student's states that "trainees in the game group had 11 percent higher factual knowledge levels, 14 percent higher skill-based knowledge levels, and 9 percent higher retention levels than trainees in the comparison group". Some other aggregated studies also show an increase in learning performance thanks to the use of videogames

Educational games are games explicitly designed with educational purposes, or which have incidental or secondary educational value. All types of games may be used in an educational environment. Also Educational games are games that are designed to help people to learn about certain subjects, expand concepts, reinforce development, understand a historical event or culture, or assist them in learning a skill as they play. Game types include board, card, and video games. An educational game is a game designed to teach humans about a specific subject and to teach them a skill. As educators, governments, and parents realize the psychological need and benefits of gaming have on learning, this educational tool has become mainstream. Games are interactive play that teach us goals, rules, adaptation, problem solving, interaction, all represented as a story. They satisfy our fundamental need to learn by providing enjoyment, passionate involvement, structure, motivation, ego gratification, adrenaline, creativity, social interaction and emotion in the game itself while the learning takes place.

**Video games**

With the increase and availability of technological devices, there has been a shift in what types of games people play. Video or electronic gaming has become more widely used than traditional board games. Barab (2009) defines conceptual play as "a state of engagement that involves

(a) Projection into the role of character who,

(b) engaged in a partly fictional problem context,

(c) Must apply conceptual understandings to make sense of, and ultimately, transform the context".

The goal of such play spaces is to have the "gamer" engage in the narrative while learning cognitive and social skills. The ability to immerse oneself in the gaming process facilitates "empathetic embodiment" which occurs when a player learns to identify with the character they have chosen for the game and the virtual environment of the game (Barab, 2009)

**Game-based learning**

Game-based learning (GBL) is a type of game play that has defined learning outcomes. Generally, game-based learning is designed to balance subject matter with gameplay and the ability of the player to retain, and apply said subject matter to the real world. Children tend to spend hours playing hide and seek, learning the steps of digital games, such as chess, and engaging in creative games. Therefore, it can be said that play and learning are synonymous, leading to cognitive and emotional development inside a social and cultural context. For instance, the game of hide and seek. Good hiders need visual and spatial perspective to define the best hiding places, while seekers must be skilled at searching for cues from the surroundings and choosing the most probable location for the hider among various possible places.

## Application

Traditionally, technology used in school operates usually to solve problems in a fun way, particularly in mathematics. They usually make up case studies designed to introduce students to certain technologies in an effort to prepare them for a future major assignment that requires the aforementioned technology. They have also been developed to work in the virtual world. More recently educational games have been developed for Higher Education students, combining real-world case studies in a virtual environment for students to have a consistent, 24/7 educational 'virtual' experience. In some public schools implementing Common Core Standards, game-based learning programs are utilized by educators to supplement their teaching programs. According to a recent case study by an tech-based nonprofit organization, teachers find some digital learning games help address issues with alignment in Common Core.

In the future, technology and games are expected to be used in simulation environments to simulate real world issues. In the professional sector, such as flight training, simulations are already used in an effort to prepare pilots for training before actually going out into planes. These training sessions are used to replicate real life stresses without the risk factor associated with flying. Simulation-games are used in other professional areas as well; a spy-themed learning game has been used to improve sales skills at Avaya and a 3D simulation game has been used to train New York City emergency responders.

Before deciding how to use game-based learning, the trainer must first determine what they would like the trainees to learn. A trainer that fails to focus training around a central idea runs the risk of using a game that fails to connect with the learners. To prevent this, tailor the material to the demographic (age group, familiarity, educational pre-text) so that the material is neither too difficult for, nor too familiar to the learner. Gathering ideas from children early in the design process has yielded useful insights into what children want in technology in general or in a specific type of application. Children's early involvement in requirements gathering has revealed clues about gender differences in preferences related to technology, children's navigation skills, ways of presenting textual information, application-specific content-related preferences, the variety of elements to be included in user interfaces and their structures, and children's desire to personalize their applications. Multiplayer role playing games (MMO's) provide opportunities for players to improve such skills as, "complex learning, thinking, and social practices". MMO`s also provide a social network which can favor collaborative gaming and learning and contribute to the formation of teams, communication within a group and help strengthen individual and communal identities.

## Compared to a classroom model

Video games have been found to be more engaging; instead of providing information over an extended class period, games provide small amounts of information at relevant stages. Playing video games helps with metacognition (which describes the ability to think about your own thinking); strong metacognitive skills have been proven to help with developing academic skills and allows students to learn about their strengths and weaknesses and increase their performance. Video games that are used as objects of study in classroom can enable students to be skilled rhetorical readers, by exposing literature and language from different discourse communities, and by encouraging students to practice reading the symbolic structure of inherently consumption-based video games.

## Educational setting

As video games spread in the 1980s, the educational potential of them was researched. Its findings showed that the visual and motor coordination of game players was better than that of non-players. Initial research also indicated the importance of electronic games for children who proved to have difficulty learning basic subjects and skill.

It also found that:

- Video games helped students to identify and attempt to correct their deficiencies.
- The adaptability of video games, and the control that players have over them, motivate and stimulate learning.
- In cases where students have difficulty concentrating, video games can be highly useful.
- Promote critical awareness of discourse communities.
- The instant feedbacks given by video games help arouse curiosity and in turn allows for greater chances of learning.
- Video games teach cooperation.

**Barriers to the use of games**

Many teachers have reservations about using video games. One study asked teachers who had some experience using games in class why they didn't do it more often. Six general categories of factors were identified as problem areas:

- **Inflexibility of curriculum**: Teachers find it difficult to integrate games with the already-set curriculum present in classrooms. It can be difficult to locate a game that is educational as well as fun. And many teachers have no experience in using games to teach. Learning with games may not be accepted by skeptical parents who personally learned with more conventional techniques. The interdisciplinary field of game studies has offered a variety of perspectives to complement traditional modes of rhetorical analysis and production, which should be adapted to address the unique affordances of video games as a medium in contrast to the traditional banking model of education.
- **Stigma:** Video games are associated with children's play or a leisurely pass time for the adolescent population, which creates tension between the realities of video games enhance a child's educational viewpoint. Video game is thought of to distract children from the seriousness of academics and is considered an unproductive activity.
- **Psychological issues**: Gaming can promote student addiction as well as physical problems. Students may also lose their desire to learn in the traditional setting. It can also remove teacher control and result in "excessive competition".
- **Students' lack of readiness**: Students have varying levels of skill and computer literacy, which may be affected by their socioeconomic status. It takes time to teach them the rules of games, and games are harder for them to understand than traditional audiovisuals.
- **Lack of supporting materials**: Teachers do not have access to supporting text or work for students to do alongside games.
- **Fixed class schedules**: Teachers have time constraints and their school may not allow them to use games. More sophisticated games, often yielding the most learning content, often take hours to learn, and more time to play. The tutorials for Civilization V take an hour to finish, and complete games can take 10s of hours.
- **Limited budgets**: Computer equipment, software, and fast Internet connections are expensive and difficult for teachers to obtain.
- **Relevance to Common Core**: The educational systems are increasingly driven by standardized testing focused on assessment of common core topics. Games exist for these topics (glasslabgames.org) but game play is generally not competitive with commercial video games.

**Gamification of learning**

**It** is an educational approach to motivate students to learn by using video game design and game elements in learning environments. The goal is to maximize enjoyment and engagement through

capturing the interest of learners and inspiring them to continue learning. Gamification, broadly defined, is the process of defining the elements which comprise games that make those games fun and motivate players to continue playing, and using those same elements in a non-game context to influence behaviour. In other words, gamification is the introduction of game elements in a non-game situation.

There are two forms of gamification, structural with no subject matter changes, and the altered content method that adds subject matter. Games applied in learning can be considered as serious games, where the learning experience is centred on serious stories. The serious story is "impressive in quality" and "part of a thoughtful process" to achieve learning goals.

- In educational contexts, examples of desired student behaviour which gamification can potentially influence include attending class, focusing on meaningful learning tasks, and taking initiative.
- The gamified music learning platform, *Rise of the Rhythm*
- Distinguishable from game-based learning, gamification of learning does not involve students in designing and creating their own games, or in playing commercially produced video games. Within game-based learning initiatives, students might use *Gamestar Mechanic* or *GameMaker* to create their own video game, or play *Minecraft*, for example, where they explore and create 3D worlds. In these examples, along with games such as *Surge* for PlayStation and *Angry Birds*, the learning agenda is encompassed within the game itself.
- Some authors contrast gamification of learning with game-based learning, claiming that gamification occurs only when learning happens in a non-game context, such as a school classroom, and when a series of game elements is arranged into a system or "game layer" which operates in coordination with the learning in that regular classroom. Others include games that are created to induce learning.
- An **educational video game** is a video game that provides learning or training value to the player. Edutainment describes an intentional merger of video games and educational software into a single product (and could therefore also comprise more serious titles sometimes described under children's learning software). In the narrower sense used here, the term describes educational software which is primarily about entertainment, but tends to educate as well and sells itself partly under the educational umbrella. Normally software of this kind is not structured towards school curricula and does not involve educational advisors.
- Educational video games play a significant role in the school curriculum for teachers who seek to deliver core lessons, reading and new skills. Gamification of education allows learners to take active roles in learning and develop technological skills that are needed for their academic and professional careers. Several recent studies have shown that video games, whether violent or not can help children in the development of intellectual and emotional skills that support their academic achievement.