

Simulations, Games, and Learning

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Where We Begin

Exploring games and education is inherently controversial. Games can seem uneducational; they are typically associated with play and childhood. Even the name implies that games are the opposite of work. Assertions that games must be used to make learning “fun” ignore the fact that students who are deeply engaged in learning consider it both fun and hard work.

Most of us begin a discussion of games with some discomfort and with an incomplete experience base. For many educators, the term “game” conjures up a mental image of playing cards or a game like Jeopardy. These “casual games” are brief (five minutes to two hours) and simplistic. Today’s games are complex, take up to 100 hours, require collaboration with others, and involve developing values, insights, and new knowledge. They are immersive virtual worlds that are augmented by a more complex external environment that involves communities of practice, the buying and selling of game items, blogs, and developer communities. In many ways, games have become complex learning systems.¹

It is hard to understand something without direct experience. Yet that is how many approach games in education. Most educators are neither game players nor game developers. How much of our skepticism about the educational value of games is tied to experience (or lack of experience)? If we had the same experience base as a 15-year-old game enthusiast, might we view games differently? If we were discussing “virtual worlds,” “synthetic worlds,” or “immersive multiuser environments,” would our mind set be different? Our own biases and experiences can influence the exploration of games in education.

Although definitions vary, digital games provide visual information to one or more players, accept input from the player(s), and use a set of programmed rules.² Unlike more traditional games, the rules are not described in an instruction manual; they are programmed into the code. The sensory interface and story adds emotional appeal, as well.

Games should be thought of as a family of related items; they are not all alike—they are not designed for the same audiences, nor do they incorporate the same features of game play. Among the common categories of games are

- **adventure games**, where the player moves through a virtual world,
- **puzzle games**, such as Tetris,
- **role-playing games**, where the player assumes the role of a person or creature, such as Dungeons and Dragons,
- **strategy games**, such as The Sims, where a player’s strategy drives the game,
- **sports games**, such as golf or football, and
- **first-person shooter games**.³

Games are now part of modern culture. Not only are scholars beginning to study gaming as part of contemporary society, but an increasing number of degree programs have emerged.⁴ Preschool

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children play educational games to learn colors, numbers, and names. Virtually all children will have played video games by the time they graduate from high school.

Game play is common in college, as well. In a U.S. survey, 65 percent of respondents were regular or occasional game players. Games are part of their multitasking environment; students play games while visiting with friends, listening to music, or doing assignments (in observations, male students were frequently seen to have online games open alongside their assignments).⁵ Thirty percent of college students admit playing games in class.⁶

However, games aren't just for youth; the average age of a game player is 30. In the United States, 50 percent of adults play games; one in five adults over 50 is a video gamer. Males and females play games about equally (55 percent are male; 43 percent are female). Perhaps the prevalence of games is why 63 percent of parents believe games are a positive part of children's lives; nearly 60 percent of teachers in the United Kingdom are willing to use games in the classroom.⁷

Not to be forgotten is the gaming industry; it is sizable. Digital gaming is a \$10 billion per year industry, projected to reach \$29 billion by 2007.⁸ In 2004, nearly 250 million games were sold.⁹ Whether or not we play games, gaming has become part of our culture.

But games are still evolving. Rather than their simpler predecessors, today's games are coming to represent "distributed authentic professionalism," meaning that players are learning how to be a professional—a soldier, an astronaut, an entrepreneur, and so on. Knowledge and skills are built into the virtual characters, objects, and environments; the players must master the skills they don't have as well as integrate their skills with those of the virtual characters and other players. These types of games distribute expertise among the virtual characters and the real-world players. More than just a game, they are networked communication systems with interactive chat, internal e-mail, and messaging.¹⁰ They also require the player to adopt a certain set of values and a particular world view which is connected to performing activities within a specific domain of knowledge. By the end of the game, the player has essentially experienced a profession.¹¹

Effective Learning Environments

Other papers (Shaffer et al. and NESTA Futurelab) describe how games can facilitate learning. It is important to emphasize that games and play may be effective learning environments, not because they are "fun"¹² but because they are immersive, require the player to make frequent, important decisions, have clear goals, adapt to each player individually, and involve a social network.¹³ Games have many attributes detailed below that are associated with how people learn.

- **Social.** Games are often social environments, sometimes involving large distributed communities. "It is not the game play per se but the social life around the edge of the game that carries much of the richness in terms of the game's meaning, its value, and its social and cultural impact."¹⁴
- **Research.** When a new player enters a game, he or she must immediately recall prior learning, decide what new information is needed, and apply it to the new situation. Those who play digital games are often required to read and seek out new information to master the game.
- **Problem solving.** Knowing what information or techniques to apply in which situations enables greater success, specifically, problem solving. This often involves collective action through communities of practice.
- **Transfer.** Games require transfer of learning from other venues—life, school, and other games. Being able to see the connection and transfer existing learning to a unique situation is part of game play.

- **Experiential.** Games are inherently experiential. Those who play games engage multiple senses. For each action, there is a reaction. Feedback is swift. Hypotheses are tested, and users learn from the results.¹⁵

Most educators are familiar with the world-to-the-desktop interface that computers provide, enabling users to access resources, distant experts, collaborations, and communities of practice. The user “sits outside” the virtual world, but can access resources through it. An increasingly common interface—a critical one for games and immersive environments—might be called an Alice-in-Wonderland, multiuser virtual environment. Whether the technology involved is a computer or a hand-held ubiquitous device, participants can interact with computer-based agents and artifacts, virtually. A key distinction is that the world-to-the-desktop interface is not psychologically immersive. Virtual environments and augmented realities cause a psychological sense of sensory and physical immersion resulting in one feeling “inside” an environment.¹⁶

Experience and reflection are important parts of learning; an ideal learning environment allows the learner to alternate between being “inside” an environment (fostering situated learning) and being an outsider looking in (fostering insights gained from perspective).¹⁷ Active learning based on immersive experience (real or simulated) that includes frequent opportunities for reflection is both engaging and effective for a broad spectrum of students.¹⁸ Most multiplayer virtual environments used today are games.

These immersive environments use authentic contexts, activities, and assessment; they also involve mentoring and apprenticeships in communities of practice. The result is a powerful pedagogy that allows for immersion and intense, extended experiences with problems and contexts similar to the real world.¹⁹ It may not be the “game” that is effective for learning but the immersive multiplayer virtual environment in which it is set.

Immersive multiplayer virtual environments let players participate in new worlds, inhabiting roles that would otherwise be inaccessible to them. They allow people to think, act, and talk in new ways. Rather than relying on words and symbols, learners experience the virtual world. Players can experience the ways a particular discipline thinks about and solves problems, as a physicist, an astronaut, or a physician. By requiring one to become a member of the community (or guild) and to develop knowledge, skills, and values, novices are exposed to the ways professionals deal with problems, mirroring the practice of becoming an expert. “A large body of facts that resists out-of-context memorization and rote learning comes easily if learners are immersed in activities and experiences that use these facts for plans, goals, and purposes within a coherent domain of knowledge.”²⁰

Another critical element of games is the community that develops around them. Ideas are shared in these communities, group problem-definition and problem-solving occurs, as well as a good deal of socializing. In fact, the description of a game community mirrors closely the definition of an educational community of practice. The community has a culture of learning; everyone is involved in a collective effort of understanding. The expertise of members is diverse; members are valued for their contributions and helped to develop further as the group continually advances its collective knowledge and skills. The emphasis is on learning how to learn and sharing learning. “It is not necessary that each member assimilate everything that the community knows, but each should know who within the community has relevant expertise to address any problem.”²¹ Developing this skill is important personally and professionally, not just in the game world.

Games and Schools

Although games can be effective learning environments, not all games are effective, nor are all games educational. Similarly, not all games are good for all learners or for all learning outcomes. Games may remain on the sidelines until rubrics and evaluation strategies are developed that assess a game's value. "Faculty members need training to analyze, design, develop, implement, and evaluate digital game-based learning (DGBL). Staff members need training to support faculty during this process."²²

How games are used is important as well. Simply using games may not be very effective; use is not synonymous with integration. In fact, use of one strategy is often assumed to replace another (for example, a game replacing face-to-face instructional time). What is more important is to consider how to add games to the educational tool set, blending them with other activities. Integration requires an understanding of the medium and its alignment with the subject, the instructional strategy, the student's learning style, and intended outcomes. Integration of games into curricula is much more likely to be successful than mere game use.²³

There are a range of options for integrating games into education. Strategies include allowing students to create their own games or integrating commercial games into the curriculum. If games are integrated into the curriculum, it will be important to understand what types of games promote the desired learning outcome. For example:

- **Card games** promote memorization, concept matching, pattern recognition
- **Jeopardy-style games** encourage quick mobilization of facts, labels, concrete concepts
- **Arcade-style games** are good for improving speed of response, automaticity, and visual processing
- **Adventure games** are useful for promoting hypothesis testing and problem solving.²⁴

If games are integrated into the curriculum, strategies may go beyond game play. An alternative to playing a game is to ask students to critique a game. This allows students to explore not just the subject but how the game is structured. Since most games were not designed for educational purposes, it is not surprising that details may be missing or facts incorrect. Another strategy is to have students discover what is missing or incorrect in a game.²⁵

Beyond selection of a game, educators must consider when and how to integrate a game into the curriculum or the class. Options include use as a

- preinstructional strategy,
- coinstructional strategy (augmenting, illustrating, discussing), and
- postinstructional strategy (for assessment and synthesis).²⁶

Games may also be considered a part of the informal educational environment.

Implementation Issues

Among the most staggering game figures are their development costs, commonly reported in the tens of millions of dollars. It would be easy to assume that educators need to spend millions to develop educational games. Cost is often used to argue against the use of games in education. However, game engines are increasingly available, reducing the cost of game development. MIT, for example, has made its augmented reality game engines available to other developers. Rather than developing the software for the game, the developer simply overlays his or her scenario on a generic shell. In the

last year, even developers of military simulations have seen their development costs drop as game development tool sets become more widely available.

Institutions must consider a host of implementation issues. For example:

- Are computer laboratories available where students can play games? Are they appropriately configured? Are they available for the extended hours that game play involves?
- Is the right equipment available, such as headphones, speakers, special consoles?
- Is support available for the game, both technically and in terms of game play?
- Are there instructional designers who can develop games?
- Is gaming integrated into the curriculum or just added on?²⁷

Professional development and support is a significant implementation issue. “Everyone involved in the design, development, or implementation of digital game-based learning needs training on what DGBL is and how it is supported and implemented, institution-wide.” Students will need support for games, implying help desk personnel must be prepared for common questions, procedures, and technical issues. And, instructional or IT units may need assistance with licensing agreements and negotiating discounts.²⁸

Using games or multiuser immersive virtual environments in education will require “unlearning” many unconscious beliefs, assumptions, and values about teaching and learning, as well as the structure of education. Unlearning requires higher levels of emotional and social support than traditional forms of staff development. Ideally, it should take place in distributed learning communities so learning occurs in context.²⁹

Today and Tomorrow

Most games that have been developed to date were not designed for educational purposes. Although they may educate, that is not their primary goal or their most important design feature. Moving forward, educators must hope for games based on learning theory and research. These future tools may not be games but rather massively multiplayer immersive worlds where learners develop epistemic frames and social networks.

Games are in an early stage of evolution. As we gain more experience, our adoption and adaptation of games will become increasingly sophisticated; we may find that the ultimate value of games does not mirror today’s uses.

Endnotes

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