

Digital Game–Based Learning in Higher Education

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INTRODUCTION

Since the 1970s, computer games have become more and more a part of our culture. For the past 20-30 years, some studies have shown that certain aspects of computer games may have potential benefits in a learning environment. For example, games may increase motivation, collaboration and competition, as well as provide an effective inquiry-based framework (Squire, 2002). With the extreme success of the gaming industry in recent years, the potential for using computer games as a teaching tool in higher education is being increasingly explored. Game-based learning has been used in the military, medicine, and physical education quite successfully. However, the rules and guidelines of incorporating digital game-based learning into education are still quite open and exploration of possibilities is greatly encouraged.

BACKGROUND

To understand the concept of a digital game, and be able to create a game, one must understand the components of a game. In other words, what are the elements that comprise a game?

Definition of a Game

Salen and Zimmerman's Rule of Play: Game Design Fundamental (2004) provides a comprehensive discussion of the definition of a game. The book reviews and compares eight different models of game definition by David Parlett, a game historian; Clark Abt, also a game historian; Johann Huizinga, an Anthropologist; Roger Caillois, a Sociologist; Bernard Suits, a Philosopher; Chris Crawford, a computer game designer; Greg Costikyan, a game designer and writer; and Elliot Avedon and Brian Sutton-Smith, both scholars of play and games. Each of these scholars/professionals provides his own framework of the elements that comprise a game. These elements can be defined and grouped into 15 categories: (1) proceeds according to rules that limit players; (2) conflict or contest; (3) goal/outcome-oriented; (4) an activity, process or event; (5) involves decision-making; (6) not serious and absorbing; (7) not associated with material gain; (8) outside ordinary life; (9) creates special

social groups; (10) voluntary based; (11) uncertain quality; (12) make-believe or representational; (13) inefficient; (14) resources and tokens; and (15) a form of art.

Based on their analysis, Salen and Zimmerman provide their own definition of a game: "A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome. The key elements of this definition are the fact that a game is a system, players interact with the system; a game is an instance of conflict, the conflict in games is artificial, rules limit player behavior and define the game, and every game has a quantifiable outcome or goal" (Salen & Zimmerman, 2004, p. 83). Therefore, one can assume that digital games should include these components, and that digital games are like every other kind of game.

Definition of Digital Game

The major characteristic of a digital game that differs from other games is that the game itself is composed of computer hardware and software. According to Salen and Zimmerman (2004), there are four characteristics that summarize the qualities and capabilities of digital games: immediate but narrow interactivity, manipulation of information, automated complex system, and networked communication.

1. **Immediate but Narrow Interactivity:** One of the common elements of a digital game is that it can offer immediate and interactive feedback. However, the interaction that the player can have with a computer is quite narrow. For instance, one's interaction with a home computer is usually restricted by using a mouse, keyboard, screen, and speakers.
2. **Manipulation of Information:** Digital games are usually filled with various kinds of visual information such as text, images, video, audio, as well as 2D and 3D animations. Besides this visual information, digital games are also capable of handling internal logic, player interactivity, or even hiding the information and only revealing it under certain circumstances.
3. **Automated complex system:** Digital games can automate complicated procedures that are created to facilitate the play process. In most nondigital game environments, a player's direct input is necessary in

order to move the game forward. In a digital game, however, the program can automate these procedures without direct input from a player.

4. **Networked Communication:** Digital games can facilitate communication between players. For example, players can use e-mail, text chat, and audio communication that are digitally mediated. The major advantage of this form of communication is that it offers (the players) the ability to communicate over long distances, and to share a complex social space with many other participants.

The Relationship of Digital Game and Learning

Learning is powerful when it is personally meaningful, experiential, social, and epistemological (Shaffer, Squire, Halverson, & Gee, 2005). The focus of learning is the interconnection between tools, resources, activities, and works that are composed in a particular learning environment. From a constructivist perspective of learning, knowledge is constructed when learners play an active role in the learning process by exploring, manipulating, and interacting within the learning environment. This reflects that learners have more control in the learning process, and that the environment must provide the structure to foster learners (Dickey, 2006).

The virtual worlds that are created by digital games are what make video games a powerful learning environment. In a virtual world, words and symbols are grounded in contexts; things and objects co-exist and correlate to each other. Through the experience of playing or the process of problem solving, learners can understand complex concepts by connecting abstract ideas with real problems. Games then integrate knowing and doing (Shaffer et al., 2005). In addition, games provide a goal-oriented environment that encourages the player to understand and solve problems through the provided tools. Therefore, the focus of gaming is reaching goals and solving problems, rather than simply learning facts and information.

Gee (2005) stated that the domain of knowledge is composed of ways of doing, being and seeing. Pivec, Dziabenko, and Schinnerl (2004) suggested that computer games can support and facilitate the learning process by providing a variety of presentations, and creating opportunities to apply knowledge within a virtual world. Playing games requires deep thought and complex problem solving skills (Gee, 2004). In the game environment, learners are encouraged to combine knowledge from different areas, and choose a solution. Learners are required to make decisions at certain points in a game in order to proceed, and they can experiment with how the outcome of a game may change based on their decisions. Games are simulations with a goal-oriented structure in which the learner has a definite objective and

desired outcome. Salen and Zimmerman (2004) suggested that what makes games so appealing is that they give users meaningful choices.

Stoney and Oliver (1998) suggested eight attributes of an interactive multimedia learning environment that affect the motivation and engagement for adult learners: immersion, reflection, play and flow, collaboration, learner control, curiosity, fantasy, and challenge. There seems to be a close relationship between playing and learning. Rieber (1996) indicated that play is an important part of a child's psychological, social, and intellectual development because play is motivating, and it involves make-believe thinking. Digital games allow players to think, talk, and act in new ways in which they take on representational or make-believe roles that are otherwise unattainable to them (Shaffer et al., 2005). In addition, computer games enhance learning through visualization and experimentation. Visualization has tremendous value in computer games because it is the main cognitive strategy for discovery and problem solving.

COMPUTER GAMES IN HIGHER EDUCATION

The Roles of Digital Game in Education

"Games and education, education and games, learning, play, theory, whatever the permutation, whatever the words, this is a deeply popular topic, almost a movement if some hierophants are to be believed" (Sefton-Green, 2005, p.441). The current learning generation is the key influence on this game movement. Microsoft's investment in MIT for the project, the education arcade, demonstrates a commitment to developing and researching games and education.

Digital game-based learning has been introduced in various educational settings for the purpose of creating a more engaging environment for the learners or so called "computer natives." The learning generation today is extremely game literate (Dekanter, 2004). David (1997) found an increasing demand from learners for greater interactivity in learning materials. A complex level of interactivity is required to stimulate learners' engagement. Squire (2005) stated that e-learning educators, in particular, spend a significant amount of time building learning environments from games. The question is not whether educators should use games to support learning, but how educators can use games more effectively as educational tools.

The integration of technology into the classroom allows educators to explore new technology-mediated spaces and environments for teaching and learning. The challenge in education is how to form a learning environment that can take advantage of the power and potential of the virtual world. Most educational games are not grounded in learning theory

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