

Chapter 12

Designing Engaging Educational Games and Assessing Engagement in Game-Based Learning

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ABSTRACT

The focus of this chapter is on designing engaging educational games for cognitive, motivational, and emotional benefits. The concept of engagement is defined and its relationship with motivation and cognition are discussed. Design issues with many educational games are examined in terms of factors influencing sustained motivation and engagement. A theoretical framework to design engaging digital games is presented, including three dimensions of engagement (i.e., behavioral, cognitive, and emotional). Later, the chapter considers how to harness the appealing power of engaging games for designing engaging educational games. Various motivational features of game design and learner experiences are considered. In conclusion, the chapter also discusses various methods to assess engagement in order to inform the design of educational games that motivate learners.

INTRODUCTION

Over the past two decades game-based learning has grown increasingly into a popular instructional approach due to its power to motivate and engage students in complex learning, such as problem solving, decision making, and metacognitive thinking (Kim, Park, & Baek, 2009). There has been a lot of effort to design and develop educational digital games or to use existing commercial entertaining games to create a game-based learning environment (Susi, Johansson, & Backlund, 2007). Despite some ongoing debates over positive or negative impact of digital games, there is sufficient empirical evidence

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to support the benefits of digital games (including video and computer games) for learners in several aspects, such as cognitive aspect (Amory et al., 1999; Eseryel, Ge, Ifenthaler, & Law, 2011; Navarrete, 2013; Shaffer, 2006), motivational aspect (Navarrete, 2013; Johnson, 2010), emotional aspect (Virvou, Katsionis, & Manos, 2005), and social aspect (Granic, Lobel, & Engels, 2014). Researchers studying the impact of games, including the impact of massive multiple player online games (MMOG), have observed that if designed well, games could afford rich opportunities for, communication, collaboration, fantasy engagement, problem solving, hypothesis generation, identity development, and reflective thinking (Barab, Ingram-Goble, & Warren, 2008; Squire, 2008). Games also help to understand complex systems, create expressions with digital tools, and enhance social interactions (Oksanen & Hämäläinen, 2014; Squire, 2008).

Why are digital games becoming one of the popular instructional tools? The answer is simple: Games are fun and engaging. Since games have such capability and power to motivate and benefit learners' cognitive thinking, educational researchers have attempted to capture the fun, challenges and engagement of game playing experience and apply it to support learning and instruction (e.g., Amory et al., 1999). However, evidence shows that not all games are interesting or motivating, especially when it comes to educational games, which do not necessarily engage students or sustain their engagement over a period of time (Eseryel, Ifenthaler, & Ge, 2011). Educational games are also categorized as "serious games", which are defined as electronic/computer-access games that are not designed primarily for commercial or entertainment purposes but rather for training users on a specific skill set for educational or training purpose (Annetta, 2010; Djaouti, Alvarez and Jessel, 2011; Michael & Chen, 2006; Susi, Johansson, & Backlund, 2007). This type of games merges a non-entertaining purpose with a game structure (Djaouti, Alvarez, & Jessel, 2011).

Yet, there are concerns about educational games. Some researchers noticed that as soon as educational components are embedded in a game, the fun is taken out (Bruckman, 1999). To express their frustrations, some use the metaphor "chocolate-covered broccoli" to describe educational games (Granic, Lobel, & Engels, 2014). This metaphor speaks of some truth about the current state of educational games. In a recent study, Eseryel et al. (2014) found that students' interest and engagement dropped after their initial excitement in playing a Massively Multiplayer Online Game (MMOG). The decrease of motivation was partly because students had expected that the educational MMOG they were going to play would be like a typical commercial MMOG; but they found out later that it was not quite the same. This discrepancy might have attributed to the decrease of students' motivation. Instead of finding themselves solving problems in a complex system, students were given tasks which were didactic and discrete in order to be aligned with the standards. Although there were some other reasons leading to the decrease of the students' motivation, the game design issue alone drove the authors to explore the motivation features associated with the digital game design. We hope that educational games could engage learners in meaningful problem solving tasks and complex learning experience to foster their 21st century skills.

The goal of this chapter is to provide a conceptual and design framework for designing educational digital games, based on a critical review of literature on several bodies of literature, including human learning and motivation theories, game design principles, and assessment in game-based learning. We first provide a review of human learning and motivation theories. Then we use the theoretical framework of motivation and engagement to analyze game features associated with motivation. This framework is intended to help us understand why some games are perceived as engaging while others are not. Different dimensions of engagement (behavioral, cognitive, and emotional) are examined to help us understand learners' motivation and frame the design model for engaging games. Later, we focus on designing

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