Gaming the Classroom Viewing Learning Through the Lens
Self Determination Theory

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ABSTRACT

Educators, designers and curriculum creators are interested in developing educational experiences that replicate the fun aspect of video games to increase student intrinsic motivation. This aspect, which compels players to engage with the game and persist despite failing, has the potential to increase student academic success. Researchers used mixed-methods to investigate the results of an instructional design that attempted to replicate the fun aspect of video games in a remedial algebra class. The study offered insight on the ways in which student motivation might be better developed and refined in educational settings using game-based approaches. Results indicated that some students enjoyed the freedom of choosing their own quests to complete while others felt lost in the new environment. It is important to game and instructional designers to scaffold the transition from traditional classroom to a game-based classroom.

Keywords: Adolescents, Game-based Learning, Mathematics, Motivation, Role-playing

Mathematics achievement among US high school students is low; 15-year-old US students’ average mathematics literacy score places them in the bottom quarter of students worldwide (NCES, 2010). According to Loveless’s (2009) review of NAEP data from 2000 until 2007, gains in mathematics for U.S. high school students are minimal, suggesting limited, if any, improvement in recent years. As the global economy becomes more technology-based, a thorough understanding of mathematics literacy is necessary for citizens to function and thrive in a world that is increasingly interconnected. Despite calls by researchers to reform the way the US educates students in mathematics, few students are completing higher-level mathematics courses. Two and four year public and private institutions have indicated that on average 22% of entering freshman took remedial mathematics courses (Parsad, Lewis, & Greene, 2003). Additionally, ethnic minority students are particularly underrepresented in the most rigorous mathematics classes, with low motivation cited as a dominant reason (Riegle-Crumb, 2006, Ruiz, 2011). Lack of student interest in mathematics coupled with low mathematics

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literacy may be detrimental to the United States maintaining its stature in the world community and contribute to the domestic decline of teenagers choosing STEM careers. The purpose of this mixed methods study was to investigate teacher and student responses to algebra instruction that was designed based on the motivational components found in video games.

BACKGROUND

Algebra is widely thought of as a gatekeeper to higher education (Johnson, 2010; U.S. Department of Education, 2008). The earlier that students successfully complete algebra, the greater the probability that they will engage in more challenging mathematics curricula at later points along the educational pipeline (U.S. Department of Education, 2008). Algebra differs from typical elementary mathematics courses; it moves from concrete arithmetic algorithms to more abstract and logical functions, a process that represents a dramatic shift in thinking. A specific area of algebra, learning to graph linear equations, has been found to produce significant difficulties for students (Cavanaugh, Gillian, Bosnick, & Hess, 2008). Graphically representing and interpreting concrete mathematical formulas involves more abstract reasoning than previously learned arithmetic concepts. Inattention to students’ developmental readiness and insufficient conceptual and interactive approaches may compromise students’ learning. (Geist, 2010). Learning to think abstractly often requires instructional scaffolding to maintain motivation and persistence.

Motivation

Motivation to become more mathematically literate is not restricted to formal schooling. Understanding the components of motivation associated with mathematical ways of knowing outside of school can be a catalyst for interpreting motivation to learn mathematics in the traditional didactic ways found in most schools. Video games offer an opportunity for such an examination. Klopfer, Osterweil, & Salen define a game as “a voluntary activity structured by rules, with a defined outcome (winning/losing) or other quantifiable feedback (e.g., points) that facilitates reliable comparisons of in-player performances.” (2009, p. 11).

The video game industry is thriving when most other aspects of the economy are struggling. Reports by the Entertainment Software Association show that the video game industry enjoyed sales of over $25 billion in 2011. Approximately 72% of households play video games on a regular basis (Entertainment Software Association, 2011); thus, most adolescents are familiar with this approach of relating to and engaging in puzzle or problem-solving activities with new or familiar content. Video game players receive no external recognition for their in-game accomplishments and are quite willing to pay significant amounts of money to purchase and play the games. Moreover, video game players spend innumerable hours invested in game play. All of these factors provide noteworthy evidence that individuals are motivated to play video games. As such, it makes sense to research the possibility of successfully operationalizing the approaches that are motivating to gamers in formal educational settings.

While acknowledging that video games are played for fun little research has explored the principle components of the game experience that motivates players to become engaged in the act of gaming. Several researchers have identified the fun characteristics of gaming. However, few have explored the principle components (Huizenga, Admiraal, Akkerman, & ten Dam, 2009; Malone, 1981; Squire, 2006). With new games created daily and bargain bins of unsuccessful games in many stores, trying to specify game characteristics associated with motivation is extremely difficult. This suggestion of either quantifying or using fun to rate levels of motivation also dismisses one’s individual difference and reason for playing games; therefore, a more individualistic empirical understanding is needed.

Yee (2006) and Ryan, Rigby, and Przybylski (2006) applied quantitative methods to examine models of motivation and their
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Fabio Chiarello and Maria Gabriella Castellano (2016). *International Journal of Game-Based Learning* (pp. 1-14).
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