

## Chapter 32

# Game-Based Learning: A Review on the Effectiveness of Educational Games

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### **ABSTRACT**

*A new interest in the use of video games for learning has emerged, and a number of claims are made with respect to the effectiveness of games in education. These educational games are considered as new instructional technology with great potential. The suggested positive outcomes and effects have been mentioned repeatedly. In this review, the learning effects of educational games are studied in order to gain more insights into the conditions under which a game may be effective for learning. A systematic literature search in three databases was conducted. Some studies reported a positive effect on learning and motivation, but this is moderated by different learner variables and depends on different context variables. Next to this, the effectivity research on game-based learning is highly susceptible to a muddle of approaches, methodologies, and descriptions of gaming for educational purposes.*

### **INTRODUCTION AND BACKGROUND**

Serious games have become an indispensable topic in the educational technology domain. Although the concept of educational or ‘serious’ games is relatively new, the idea and use is not. Already

in the sixties, video games were implemented in the United States of America for the military and medical schools, as well as in the general academic community (Bergeron, 2006). Recently a new and growing interest in video games designed for the use in educational settings has emerged (Annetta, 2010). This growing interest is apparent in, among other things, the number of published books

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## **Game-Based Learning**

dealing with game-based learning, the multiple seminars and conferences concerning this theme, the large amount of scholars who have been working on this research topic over the years, etc. So a lot of people are full-time occupied with this subject. A well-known example is Marc Prensky. He created more than 50 software games for learning and according to him, game-based learning is much more motivating than formal academic education is for students today. The youngsters have become native speakers of the digital language of computers, internet and video games or 'digital natives' (Prensky, 2001). For Prensky, this implies that this group of learners is different (e.g. they think and process information fundamentally otherwise) and things in education will have to change as for example the way a teacher communicates with his students, the content (s)he is teaching, etc. Another well-known scholar in the game-based learning area is James Paul Gee. He assumes that the youth learns more from digital technologies and video games about art, design and technology than they do at the – according to Gee (2003) – technologically impoverished schools. Other influencing figures are David Williamson Shaffer or Kurt Squire. Both are mostly occupied with the development and design of epistemic or educational games (e.g. Shaffer, 2006a; Squire, 2005). Of course, a lot of other names can be put on this list. The wide interests in the game-based learning domain have led to promising expectations and claims not only from a scientific point of view, but also on the practical work floor of education.

*“Games have the power to teach, train and educate”* and are effective means for learning skills and attitudes that are not so easy to learn by rote memorization (Michael & Chen, 2006, p. 1). This is only one of the many claims made with respect to the games for learning. These educational games are more and more considered as new instructional technology with great potential (Becker, 2007) and are hypothesized to effectively aid instructional purposes because

they (theoretically) provide diverse approaches that can address cognitive and affective learning (e.g. knowledge construction, skills and attitudes acquisition (Akilli, 2007; Gee, 2003; Hayes & Games, 2008; Ke, 2009; Papastergiou, 2009a). What's more, perhaps most critically, playing (educational) games is expected to motivate and engage students in the learning process (Garris, Ahlers, & Driskell, 2002; O'Neil, Wainess, & Baker, 2005; Prensky, 2001; Vogel, Greenwood-Ericksen, Cannon-Bowers, & Bowers, 2006; Wilson et al., 2009). This increase in motivation is assumed to lead to higher invested mental effort, to more intentionally processing of information, and thus to more enjoyable and increased learning (Alessi & Trollip, 2001; Vogel et al., 2006). In sum, an optimistic stance is taken towards the potentials of games in education.

Many of the big pioneers delivered really important contributions to this research field, but their works are often not based on empirical or effectivity research and are frequently restricted to expectations about the potential of educational games or to questions about how games need to be developed to make them instructionally sound (Hays, 2005). The question that may arise here is whether there is indeed empirical research that provides evidence to confirm the high expectations. Naturally we are not the first who reviewed the available literature to draw conclusions concerning game-based learning (e.g. de Freitas, 2006; Egenfeldt-Nielsen, 2006; Kirriemuir & McFarlane, 2004). However, the focus of these previous reviews was not on the educational effectiveness of games, and the assumed added value delivered by the implementation of these games. They were for instance more interested in examining the viability of the different learning theories in the field and presenting some tensions that emerged (Egenfeldt-Nielsen, 2006), or in presenting a series of case studies from practice to illustrate the range of uses of games and to present some key issues and themes arising from learning with educational games (de Freitas, 2006)

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