

## Chapter 9

# Digital Game–Based Learning: New Horizons of Educational Technology

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### ABSTRACT

*Computer games are an incredibly successful technology; due to the dynamic and active nature they are perhaps even more successful and appealing than TV or movies. Facing this success and the significant amount of time young people spend on playing computer games, it is a compelling idea of educators, developers, and researchers to utilize this technology for educational purposes. In this chapter we focus on the emerging technology of digital educational games, we attempt to give a brief summary of the state-of-the-art, and we emphasize leading-edge research in this genre. Moreover, we discuss the psychopedagogical foundations of “good” educational computer games. Finally, we provide an outlook to the future of educational technologies.*

### INTRODUCTION

If certain researchers and educators are right, computer games and the MTV culture changed the way young people perceive and process information and, therefore, the way those young people learn. “Twitch speed” computer games and fast moving video clips and films emphasized specific cognitive

aspects and deemphasized others (Prensky, 2001). According to many authors, the genre of actively played, dynamic computer games affect cognitive aspects as well as individual preferences probably even more than TV or movies does. The generation that grew up with computer technology, the Internet, and digital games—the so-called digital natives—has different demands on educational technology. The consequence is that future educational technology requires a dramatic change of its nature, particularly

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since learning and knowledge is becoming more and more important. So it is not a big surprise that the idea of using the same genre – computer games – for educational purposes is becoming increasingly popular amongst educators.

Computer games are a tremendously successful and popular genre. Since the 1990s research and development has increasingly addressed learning aspects of playing recreational games and also the realisation of computer games for primarily educational purposes. At the beginning of our journey towards successful digital educational games (DEGs) we have to ask why (computer) games are so successful, popular, and important. A great many scientific and philosophical works addressed such factors. According to the work of Lepper and Malone (e.g., Lepper & Malone, 1987; Malone, 1981) four key factors are challenge, curiosity, control, and fantasy. Very briefly, the motivational effect of a *challenge* is seen in the potential to engage a learner's self-esteem using personally meaningful goals with "uncertain" outcomes. According to Habgood, Ainsworth, and Benford (2005) uncertainty can be achieved through variable difficulty levels, multiple goals, hidden information, and randomness. The effect of *curiosity* is seen in the emotional appeal of narrative and game play, stimulating sensory and cognitive components. Curiosity is aroused by the feeling that one's own knowledge is incomplete or inconsistent – in terms of subject matter, game play, or narrative. The effect of *control* is seen in a self-empowerment, an increase of a learner's own control over the events in the game. This perception is triggered by the range of choices offered by a game, by the extent to which the events in the game depend on the actions of the learners, and the inherent power of these responses (Habgood, Ainsworth, & Benford, 2005). A specifically important factor is *fantasy*, which is a type of fictional narrative (e.g., Gee, 2003) and it is either intrinsic or extrinsic to game play. Intrinsic fantasy refers to the degree with which the learning is embedding the fantasy context. Intrinsic fantasy is more

relevant to educational games since it might be "*designed to indicate how a skill might be used in the real-world setting, and may provide metaphors or analogies to aid in understanding*" (Dickey, 2006, p. 254).

The idea of using this motivational potential and the rich and appealing virtual worlds for educational purposes appears to be convincing. As mentioned, modern computer game technology could be used as a novel technology for education that can meet aforementioned new requirements and, even more, that can establish a link between learners and education, which is stronger, more enduring, and more effective than "all" existing educational technology could realize so far. The question is whether learning and gaming, which sometimes are considered being two entirely different concepts, can be merged at all. From a psycho-pedagogical point of view the answer is simple: Playing is (one of) the most natural forms of learning, children start learning to talk by playing with noises or they learn collaboration and strategic thinking when playing *Cowboys and Indians*. Computer games can combine this fact with leading-edge technological possibilities for presenting, practising, and testing knowledge and skills. In addition to these "natural" advantages of digital games, an origin for the increasingly popular idea of game-based learning is the misgiving (fact?) that the majority of current approaches to technology-enhanced learning are based on traditional, unexciting 2D user interfaces. At the same time, this view is compounded by the proliferation of high quality commercial computer games the learners are used to. In addition, traditional interfaces for educational applications have distinct weaknesses from the perspectives of learning psychology and didactics. For example, it is difficult to retain a learner's interest, to provide a meaningful context throughout learning episodes, or to activate prior knowledge in a meaningful context as a basis for learning. Moreover, it is not always possible to provide "real-world" problems for practicing new knowledge and for a purpose-

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