

Chapter 8

A Psycho–Pedagogical Framework for Multi– Adaptive Educational Games

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ABSTRACT

One of the trump cards of digital educational games is their enormous intrinsic motivational potential. Although learning game design is often understood on a one-fits-all level, the actual motivational strength of an educational game strongly depends on the individual learners, their very specific goals, preferences, abilities, strength and weakness, personality, and experiences with gaming. Considering motivation being a fragile and constantly changing state, it is important to continuously assess learning and gaming processes and the oscillations of motivation and immersion within a game. With this premise in mind, the authors developed a psycho-pedagogical approach to a non-invasive embedded assessment of motivational states and learning progress, feeding into a dynamic, ontology-driven learner (and gamer) model. To evaluate the approach, the demonstrator games were subject to intensive quantitative and qualitative experimental research. Results show that a meaningful personalization and an individual support are key factors of the success of learning games.

INTRODUCTION

Computer games are an incredibly successful genre that captivates children as well as adults and that instantly mirrors the spirit of a time and the state-of-the-art in computer technology.

Computer games combine art and technology in a fascinatingly natural and convincing way. The games' success is reflected in enormous sales figures, economic growth, and numbers of users. Particularly, Massively Multiplayer Online Games (MMOGs), brings together millions of players in

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a single virtual world, and have become a market and technology leader. Thus, it is no surprise that computer games spill over into more serious applications beyond pure entertainment - and the hype over serious games and especially games for learning exists, with a great many initiatives, projects, and even products.

The core strengths of computer games, distilled to their essence, are fun, fantasy, curiosity, challenge, and control (Malone & Lepper, 1987), leading to an enormous intrinsic motivational potential. The idea of utilizing those strengths for educational purposes is amongst the most exciting developments in the area of educational technologies in the past decades. It is thrilling and challenging for educators, researchers, developers, and designers - educators and parents are struck by “*the quality of engagement that stands in stark contrast to the half-bored watching of many television programs and the bored performance exhibited with school homework*” (Kafai, 2006). Of course, the idea is not new. The attempt to utilize technological trends for education has a long history. Technologies such as radio, television, computers, or the Internet were quickly – and successfully – adopted for fostering learning. The motivational potential along with the high level of interactivity and the large degrees of freedom in computer games for educational purposes may open entirely new horizons for educational technology (de Freitas, 2006).

Playing games, in general, is not only one of the most natural forms of human activity but also one of the most natural forms of learning. Children learn to talk by playing with sounds and learn collaboration and strategic thinking when playing *Cowboys and Indians*. Already Johan Huizinga in 1938 ventilated the view that the *Homo ludens*, the playing man, develops abilities through play. Thus it is no surprise that educational computer games have a long history. An early example is the educational game *Oregon Trail*, a resource management game released first in 1971 and re-released by the educational publisher *Brøderbund*

for the *Apple II* in 1985. So in conclusions, the essence of game-based learning is the attempt to utilise the strengths and educationally beneficial aspects of computer games, for example, the high level of intrinsic motivation to play and proceed in the game, a meaningful yet rich and appealing learning context, immediate feedback, or a high level of interactivity, challenge, and competition. It is clear, digital educational games (DEG) can be way more than just “*chocolate covered broccoli*” (Jacob Habgood, 2009).

According to many researchers in the field of game-based learning, however, DEGs are still in their infancy from a scientific and pedagogical perspective (e.g., Fu, Su, & Yu, 2009; Oblinger, 2006). Major challenges for research, design, and development are seen, for example, in finding an appropriate balance between gaming and learning activities (Van Eck, 2006) or finding an appropriate balance between challenges through the game and abilities of the learner (e.g., Kickmeier-Rust et al., 2007). We see the most important challenges for research on educational games in relation to their core strength, which can be summarized with their enormous intrinsic motivational potential. On the one hand, maintaining a high level of motivation requires an intelligent and continuous real-time adaptation of the game to the individual learner, for example, a continuous balancing of challenge and ability, of problems and learning progress. This adaptation and level of responsiveness must occur in the context of learning progress but also in the context of gaming and story. As important the intrinsic motivation is, equally difficult is it to maintain that level of motivation and equally fragile is a suitable balance between challenges and abilities. Essentially, this idea is covered by the concept of flow – a highly immersed experience when a person is engaged in a mental and/or physical activity to a level where this person loses track of time and the outside world and when performance in this activity is optimal (Csikszentmihalyi, 1990).

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