ABSTRACT

Mobile and in particular pervasive games are a strong component of future scenarios for teaching and learning. Based on results from a previous review of practical papers, this work explores the educational potential of pervasive games for learning by analysing underlying game mechanisms. In order to determine and classify cognitive and affective learning outcomes, the authors propose employing game design patterns for mobile games and context information. Context information, in the course of this article, is introduced as an additional characteristic feature of mobile game design patterns. With the proposed framework the authors aim to understand how pervasive game content may support learning. Findings from their research indicate that context information directs the use and presentation of content within a game and thus influences learning effects of individual patterns. This work concludes with a discussion on the shortfalls and potentials, which the authors’ framework for analysis provides.

Keywords: Educational Games, Game Design Patterns, Learning Outcomes, Mobile Games, Pervasive Learning

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INTRODUCTION

In the past decade, educational systems have experienced growing pressure for adaptation and change. Changes are requisite on many fronts. One of the more significant ones is the younger generation’s habits of using media. Today’s youth is growing up with multiple forms of media, which they use on a day-to-day basis. According to recent studies by the Pew Research Centre nearly 100% of U.S. youths aged 14-17 years possess a mobile device and already 31% of them have a smartphone. Sending text messages is “the dominant daily mode of communication” (Lenhart, 2012, p. 2). On average, U.S. teens send 60 text messages on a typical day. Besides sending text messages, video chatting, recording and uploading video, they play. 97% of U.S. youths aged 12-17 years play video games and 48% use a cell phone to do so (Lenhart, 2009).

Alongside this development, educational practitioners and scientists have started to evaluate the educational potential of game and mobile technologies. Already, a broad range of practical studies across varied domains and applications scenarios have proved the usefulness of these technologies for the process of teaching and learning (Breuer & Bente, 2010; Carstens & Beck, 2010; Garrido, Miraz, Ruiz, & Gómez-Nieto, 2011; Klopfer, Sheldon, Perry, & Chen, 2011; Sánchez & Olivares, 2011). However most studies have still centred on technological aspects. In order to determine factors, mechanisms and design elements that make the use of novel learning scenarios successful and transferrable, it is necessary to explore how these technologies can be used for teaching and learning (Dunleavy, Dede, & Mitchell, 2009; Huizenga, Admiraal, Akkerman, & Dam, 2009; Klopfer, 2008). In a first literature review of the field, the authors have provided a mapping of mobile games for learning onto the educational effects they provide by considering the specific design patterns used within the games (Schmitz, Klemke, & Specht, 2012).

The objective of this article is to further assess and evaluate the educational potential of mobile games for learning and to better understand the specific mechanisms that have led to improved student learning and achievement. It more specifically looks at pervasive and augmented reality (AR) games for learning. Methodologically, we consider evaluation reports of games that make use of the game design patterns Augmented Reality and Pervasive Games. We line them up against Bloom’s taxonomy of educational objectives (Bloom, 1956) and analyse their context parameters in order to evaluate the learning effects these games have. The results could provide valuable insight into the working mechanisms of AR and pervasive games and may positively influence future design decisions.

PERVASIVE AND AUGMENTED REALITY GAMES FOR LEARNING

Pervasive and game-based technologies are commonly expected to gain widespread usage for educational purposes (Johnson, Levine, Smith, & Stone, 2011; Kelly, et al., 2007; Thomas, 2006) and for the last couple of years, pervasive games have increasingly been subject to practical studies (Conolly, Stansfield, & Hainey, 2011; Laine, Vinni, Sedano, & Joy, 2010; Specht, Ternier, & Greller, 2011; Tutzschke & Zukunft, 2009).

The term pervasive games is a rather “elusive concept” (Nieuwdorp, 2007, p. 14). As an umbrella concept it includes location-based and location-aware games as well as ubiquitous games or alternate reality games (Montola, 2011). A core characteristic of pervasive games is that they enmesh the virtual worlds of computer games with the everyday world around us (Benford, Magerkurth, & Ljungstrand, 2005). “While the structure of these games is derived from a digitally created gameworld, the games are framed by the players’ real-life physical surroundings and the players’ interactions with these surroundings” (Thomas, 2006, p. 41) often blurring “the boundary of game and ordinary life so much that it is hard to tell where the
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