The impact of coupled games on the learning experience of learners at-risk: An empirical study

Birgit Schmitz *, Roland Klemke, Marcus Specht

CELSTEC, Valkenburgerweg 177, 6419 AT Heerlen, Netherlands

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ABSTRACT

Offering pervasive game-based learning scenarios to at-risk learners is considered effective and motivating. This experimental study offers a detailed example of an educational setting that couples a mobile game with a PC browser game. It evaluates how this coupling supports engagement and learning for the target group. Nineteen participants aged between 17 and 21 years played and explored the game. The findings through seven-week gaming indicate that coupled games have potential to increase learners' interest in a topic and can support learning activities.

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1. Introduction

Todays young adults have grown up using devices like computers, mobile phones, and video consoles for almost any activity. Their habits in using media strongly contrast with traditional schooling methods, which seem little motivating in the light of these devices [1]. While young adults conduct a substantial part of their lives via the mobile phone, schools and universities have long pursued other forms of educational interaction and contact [2]. However, for nearly half a decade now, digital and in particular pervasive game-based learning scenarios have started to gain traction among educational practitioners [3–5].

Pervasive learning games provide motivating, low-threshold learning opportunities and enable the creation of situated learning scenarios that enhance encoding and recall [6,7]. As Traxler [8] points out, mobile devices provide chances to counteract social exclusion by offering learning opportunities for students "unfamiliar with and lacking confidence in formal learning and its institutions, e.g. the homeless, gypsies, marginal groups, and NEETs (Not in Education, Employment or Training)" (p. 132), providing them chances to develop and improve confidence, autonomy, and engagement [9]. Especially the NEET group comprises individuals who, regardless of their educational level, are disengaged from work and education and are therefore at a higher risk of labor market and social exclusion [10]. They are regularly associated with negative respondence to educational offers, difficulty adjusting to school, unacceptable social behavior, or literacy and numeracy needs [11]. On the basis of a multitude of cultural, social and/or socioeconomic problems, these learners are at risk of dropping out of school. They have been excluded or truanted due to disaffection or bullying and often face difficult personal circumstances such as caring responsibilities, domestic violence, or learning disabilities [12]. The target group's personal, economic and social backgrounds have thus led to a lack of "the cognitive schemata upon which classroom instruction is ordinarily based" [11, p. 37]. Consequently, "their opportunity of functioning successfully as adults in roles associated with work and family is jeopardized" [13, p. 30]. It is thus one of the main challenges for the educational system to bring these youngsters back into education and training.

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* Corresponding author.
E-mail addresses: birgit.schmitz@ou.nl (B. Schmitz), roland.klemke@ou.nl (R. Klemke), marcus.specht@ou.nl (M. Specht).

From their learning history the target group has concluded that school and education are something difficult to handle. In most of the cases this has led to disengagement from both work and education [10]. Innovative, media-based forms of learning and teaching that include mobile devices and game environments may countervail the "alienating classroom" [11] and are thus regarded as one toehold to face the challenge. The increasing spread and technical capabilities of mobile devices support this development.

With this work we scrutinize how at-risk learners with different abilities and capacities can be effectively and efficiently supported by a mobile learning game. In order to do so, we employ game design patterns for mobile games [14] and more specifically the pattern *Coupled Games* [15]. Patterns have become a recognized approach to better understanding the complex issue of digital game-based learning. Recent studies have thus started to explicitly focus on the effects of individual patterns as a learning intervention [16–21]. With this paper, we aim at contributing to this research. In our research we use patterns provided by Davidsson [14], these patterns advance the work of Björk and Holopainen [17]. Davidsson has described game design patterns by a core definition, a general definition, example(s), descriptions of how to use the pattern (by listing related patterns or patterns that can be linked to it), the description of its consequences, relations with regard to instantiation (patterns causing each other's presence) and modulation (patterns influencing each other), as well as Ref. [11]. In the context of our ongoing research we focus on the pattern *Coupled Games*.

Coupled Games are defined as games that share some amount of player-accessible data. They "always refer to at least two games. A single game cannot be coupled. The coupling occurs when the games in question share some data" [14, p. 16]. The shared data can be anything from player specific data, virtual resources such as gold coins, to the actual world where the game takes place. The game *Sonic Adventures* (Sega), for example, uses this pattern. *Sonic Adventures* is a console game. As part of the game, players have to find Chao Eggs, which they can hatch and transfer to a Gameboy Advance. The Chao can then be raised on the mobile device and separately from the console game. The pattern *Coupled Games* is instantiated by (caused by the use of), e.g., the pattern *Trans-Game Information*. This pattern in turn is defined as the information that is passed from one game session to another game session. *Sonic Adventure* uses this pattern too. Chao go through several stages in their lives, from egg, child and adult, to death. The stages last from a few minutes (eggs), up to twenty hours (adult). If the Chao has enjoyed life, it will enter a pink cocoon and reincarnate. An egg will then be left so that Chao can enjoy life another time. In most cases *Coupled Games* are *Asynchronous Games* and "actions that take place in one game become Trans-game Information in the other" [14, p. 16].

With the pattern *Coupled Games* we investigate one mechanism of pervasive mobile learning games. In the context of our research the coupling comprises two components: short messaging services (SMS) notifications that we designed as a quiz and a PC-based browser game.

In order to assess the educational effects of the pattern *Coupled Games* for learners at-risk, this paper firstly provides an overview of related work on the use of SMS for education. Subsequently it outlines the educational intervention and technical infrastructure of the game. The paper then describes the methodology of the study and depicts how the characteristics of the target group have informed the game design and the methodological approach of the study. It concludes by presenting results of the study and discussing possible implications for future design decisions.

2. Related work

Before outlining the educational intervention, we present a representative selection of studies on the use of SMS notifications for educational purposes, followed by a discussion of their shortcomings and restrictions.

Text messaging has become the dominant mode of electronic communication amongst young adults and plays a central role in maintaining their social networks [2,22,23]. Building on this evidence, practitioners and academics are looking at the design and impact of SMS for teaching and learning [24–27]. Even though using SMS technology is a comparatively old concept, research into this field states that students' familiarity with this type of conversation [28], the minimal disruption it causes [29], the potential of for SMS for interactivity or the low-threshold access it provides with regard to learning and technology [23,30] make it favorable for use in an educational context.

The study by Santos [27] showed that using SMS in the classroom encourages students' further thinking and exploration of course topics outside class time and Carvus [31] reports that using SMS effectively supports students' learning of new technical English language words. Attewell and Savill-Smith [32] argue that SMS provide low-threshold learning opportunities and, instead of inhibiting the learning of spelling and grammar as frequently suggested, contribute to improving young people's literacy (p. 5). Harley [2] stresses that text messages facilitate the development of productive relationships for those who would otherwise be socially isolated. A study on the impact of SMS on students' self-regulated learning strategies argues along these lines. It suggests using the principles of persuasive technology for sending SMS messages especially for the high risk students [33]. The study shows that students who received persuasive SMS intervention performed better than students who did not receive any SMS intervention. Additionally, the study demonstrates the positive impact of persuasive SMS on students' learning and suggests that the intervention can improve students' self-regulated learning effort. Crabtree et al., [34], in their report on the mobile game *Day Of The Figurines*, have evaluated the potential of a game that exploits SMS as a primary means of interaction. Their findings indicate that the success of the game relies on the "orchestration of messaging by behind the scenes staff" (p. 42). This for example includes "categorizing messages so that appropriate next actions can be taken, which relies on interpretive work to make sense of messages" (p. 42) or "crafting responses to engage players in the game" (p. 43).