



Acceptance of game-based learning by secondary school teachers

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ABSTRACT

The adoption and the effectiveness of game-based learning depend largely on the acceptance by classroom teachers, as they can be considered the true change agents of the schools. Therefore, we need to understand teachers' perceptions and beliefs that underlie their decision-making processes. The present study focuses on the factors that influence the acceptance of commercial video games as learning tools in the classroom. A model for describing the acceptance and predicting the uptake of commercial games by secondary school teachers is suggested. Based on data gathered from 505 teachers, the model is tested and evaluated. The results are then linked to previous research in the domains of technology acceptance and game-based learning.

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1. Introduction

Whilst the use of video games in education has been studied for several decades (Wu, Chiou, Kao, Hu, & Huang, 2012), academic interest in the topic only became widespread in the 2000s (Kebritchi & Hirumi, 2008). Based on the seminal work of – among others – Lepper and Malone (1987), Papert (1980), and Rieber (1996), new media and literacy scholars have linked video gaming to dominant learning theories and cognitive science (Garris, Ahlers, & Driskell, 2002; Gee, 2003). Since then, the relation between games and learning has been studied from different perspectives: focusing either on the informal learning that occurs during play (e.g. Steinkuehler, 2005; Williams, 2006) or on the integration of games in formal education. According to Van Eck (2006), the research on using games for formal learning centers on three different approaches: (a) using commercial games such as Civilization, The Sims or RollerCoaster Tycoon as learning tools (Egenfeldt-Nielsen, 2007; Miller & Hegelheimer, 2006; Sandford, Ulicsak, Facer, & Rudd, 2006; Squire, 2004), (b) integrating serious games, games for learning and multi-user virtual environments in the learning process (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Ke, 2008; Kebritchi, Hirumi, & Bai, 2008; Ketelhut & Schifter, 2011), and (c) designing games with the students in which the practice of designing serves as a learning process (Kafai, 1995; Robertson, 2012). As Van Eck (2006) identified the use of commercial games as the most suitable approach to digital game-based learning, the present study focuses on the practice of using commercial video games as learning tools in the classroom.

Positive claims have been made about the educational potential of and learning opportunities provided by commercial games, such as increased motivation, raised interest in specific subjects, multiple representations, open-ended approach to information, students in control of their own learning processes, and peer collaboration (for an extensive overview of these claims, see Egenfeldt-Nielsen, 2007, p. 84). However, despite this plethora of theoretical claims, research has been slow to provide hard empirical evidence (Hays, 2005; Papastergiou, 2009; Wrzesnien & Alcañiz Raya, 2010). A notable exception is the recently published meta-analysis by Connolly, Boyle, MacArthur, Hainey, and Boyle (2012). Based on a study of 129 papers, the authors found evidence for all learning and behavioral outcomes, including “knowledge acquisition, perceptual and cognitive, behavioral, affective, motivational, physiological and social outcomes, but with the exception of soft skills” (p. 671). Surprisingly, while they also found more papers addressing *commercial games in education* than *games for learning*, they considered it a challenge to identify empirical papers in which actual use of commercial games by in-service teachers was

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described. If it is true that entertainment video games offer promising opportunities for learning and teaching, an important question comes up: Why are commercial games still underutilized in practice?

Research has already partially answered this question, by showing that the adoption (Bakar, Inal, & Cagiltay, 2006; Din & Caleo, 2000) and the effectiveness (Baek, 2008; Egenfeldt-Nielsen, 2007) of game-based learning largely depend on the acceptance by classroom teachers. This is in line with findings in the broader field of information technology integration and implementation (Albirini, 2006; Ghaith & Yaghi, 1997; Kao & Tsai, 2009) in which the importance is shown of how teachers perceive and think about the educational use of new technologies (Usluel, Askar, & Bas, 2008). In fact, as the success of any technology integration project in schools is closely linked to teachers' perceived values, teachers can be considered the true change agents of the schools (Teo, 2008). Consequently, it has been suggested that we need to understand teachers' perceptions and beliefs that underlie their decision-making processes (Kriek & Stols, 2010).

This paper aims at contributing to the analytical understanding of teachers' decision-making processes. Its goal thereby is not so much to promote the use of commercial video games in education per se as to understand, explain and predict changes in teachers' behavior with regard to adopting these tools (see also Compeau, Higgins, & Huff, 1999). To attain those goals, a careful research design is set up. Firstly, previously validated scales are used to measure teachers' acceptance beliefs. Secondly, as there are many inconsistencies within the literature regarding teachers' acceptance of game-based learning, special attention is paid to the careful collection of data, in order to avoid any type of bias and to increase the generalizability of the results. Thirdly, a model-based approach to teachers' beliefs is presented and evaluated, based on the understanding that "teachers are faced with many variables that interact with each other to either facilitate or discourage the acceptance of technology" (Teo, 2009). Thus, this study contributes to an established body of research that has examined general reasons for playing video games (Ryan, Rigby, & Przybylski, 2006), the play behavior of teachers and teachers-in-training (Jones, Copeland, & Kalinowski, 2007; Kenny & McDaniel, 2011); and teachers' acceptance of educational computer games (Ketelhut & Schifter, 2011).

2. Literature study

2.1. Teachers' acceptance of technology

The issue of technology adoption has been tackled from a variety of disciplinary perspectives. There is a large body of research dedicated to the discrepancy between the advances in hardware and software capabilities and the relative lack of implementation (Venkatesh & Davis, 2000). Within this research tradition, the measurement of potential adopters' perceptions of innovations is common practice in order to assess uptake (Moore & Benbasat, 1991). This practice is now making its way in educational research as well, as concerns are raised about the "peripheral and minimal" uptake of computers in classrooms and the ineffective use of technology by teachers (Teo, 2009, p. 302).

Cuban (1986) pointed out that many top-down attempts to integrate technology in education have failed to impose a long-term effect on teaching and learning, in part because they ignored the perceptions of teachers. Albrini (2006) concurs, stating that technology implementation plans are focused too much on the technology aspect and its effect on students' achievement. This can be considered a flaw, because teachers are in many areas the true change agents of schools in terms of modes of education (e.g. Fullan, 2001; Teo, 2008; Usluel et al., 2008; Van Driel, Verloop, Van Werven, & Dekkers, 1997).

Recent studies have attempted to fill this gap by applying research models that originated in behavioral theory and information system research (Kiraz & Ozdemir, 2006). These models allow examining and predicting the actions of teachers. According to a recent meta-analysis on e-learning acceptance (Sumak, Hericko, & Pusnik, 2011), the most popular theory among these models is the technology acceptance model (TAM, Davis, 1989). This TAM model was developed based on the assumption that the acceptance of any technology can be predicted by (a) the perceived usefulness, and (b) the ease of use. In addition, it hypothesizes a direct relationship between these two user beliefs; according to TAM, people will consider a technology to be more useful when it is easier to operate. This can be related to the observation from educational research that teachers will not use a technology in the classroom, unless they understand how it will help their current practice by offering either administrative or teaching advantages (Hord, Rutherford, Huling-Austin, & Hall, 1987; Schifter, 2008).

The problem with TAM-research is that the findings have been rather inconsistent (Legris, Ingham, & Collette, 2003; Mathieson, Peacock, & Chin, 2001). Two explanations have been recurrent in the literature. Firstly, the effect sizes of the different paths in the model appear to vary depending on the types of users and the type of technology, especially in educational settings (Sumak et al., 2011). Not only were inconsistencies found between students and teachers, but the acceptance process is also different when studying educational technologies or more office-oriented tools (Sumak et al., 2011, p. 2076). Secondly, a major problem of the traditional technology acceptance model is its inability to account for individual, organizational, and contextual characteristics (McFarland & Hamilton, 2006; Mathieson, 1991).

In the context of game-based learning, Bourgonjon, Valcke, Soetaert, and Schellens (2010) have tried to overcome these problems when studying students' acceptance of game-based learning using TAM-hypotheses by including technology-, user-, and context-specific antecedents such as learning opportunities, experience, and gender to the model. By attributing these additional concepts, their video games acceptance model was able to explain 63% of the variance in students' preference for video games in the classroom. The goal of the present paper is similar, however, based on the earlier discussion about inconsistent findings in TAM-research, the relationships between factors and the effect sizes are expected to be quite different for teachers than for students. As there is a need for a grounded theoretical teacher-oriented model to describe and explain the adoption of digital game-based learning, it is therefore important to examine the available literature on teachers' acceptance of games first. This will provide evidence-based insight in the crucial factors affecting game-based learning acceptance.

2.2. Teachers' acceptance of video games

Over the last ten years, teachers' perceptions of the use of digital games in the classroom have been studied mainly in two ways. Firstly, in questionnaire research both the willingness of the teachers to try out games and the different factors contributing to the acceptance or refutation of game-based learning have been addressed (Baek, 2008; Becker & Jacobsen, 2005; Can & Cagiltay, 2006; Pastore & Falvo, 2010;

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