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TEACHERS´ ACCEPTANCE OF EDUCATIONAL VIDEO GAMES: A COMPREHENSIVE LITERATURE REVIEW

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Educational video games (EVGs) are receiving an increasing attention as an approach to teach new generations of learners, such as millennials, who make an intense use of video games, interactive technologies, and digital networks. Extant academic literature suggest several benefits of using EVGs including increasing students' motivation towards learning and enhancing engagement in the learning process. However, teachers are the real agents of change in the classroom and they choose whether to adopt or nor a given technological innovation in their courses. While a great effort has been devoted over the last years to better understanding EVGs effects on learning, research on teachers' acceptance of EVGs is scarcer. Moreover, to the best of our knowledge, no comprehensive literature review has been undertaken to summarize the main findings of this stream of research. To fill this research gap, the main goal of this study is to provide a comprehensive literature review on teachers' acceptance of EVGs. Main findings suggest a

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wide range of barriers and drivers influencing teachers' acceptance of EVGs including i) technical and organizational support, ii) training on EVGs, iii) previous gaming experience, and iv) personal factors such as openness and innovativeness. Findings are summarized in nine propositions with implications for Teacher Training Programmes development.

1 Introduction

Extant academic literature suggest a great potential for educational video games (EVGs) in several areas including: i) increasing students' motivation to learn (Hanus & Fox, 2015), ii) supporting active learning and experiential learning (Oblinger, 2004), iii) facilitating scaffolded instruction (Hanus & Fox, 2015), and iv) improving students' competencies (Savard, 2015; Sung, Hwang & Yen, 2015). Due to the promising impact of EVGs in education there is an increasing interest amongst educational researchers to delve into all facets of this topic. In fact, academic literature related to game-based learning has increased fivefold over the last five years (Martí-Parreño, Méndez-Ibáñez & Alonso-Arroyo, 2016). Despite this increasing academic interest in EVGs, academic research adopting a teacher approach seems to be scarcer than other topics like learning outcomes of EVGs (e.g. Boyle *et al.*, 2016) or instructional effectiveness of EVGs (e.g. Sitzmann, 2011). However, teachers are the true agents of change in schools (Teo, 2008) and the use of EVGs depends largely on the acceptance by classroom teachers (Bourgonjon *et al.*, 2013; Niederhauser & Stoddart, 2001). Moreover, it has been pointed out that research on game-based learning has been largely ignoring the important role teachers play (Jong & Shang, 2015). It has been pointed out that neglecting the important role of teachers in game-based learning violates the literature on constructivist education and COGBL (*Constructivist Online Game-Based Learning*) in which teachers should play a vital role (Jong & Shang, 2015). Hence, teachers' acceptance of EVGs becomes a key issue to make EVGs usage a reality in the classroom.

By undertaking this comprehensive review on the topic we aim to provide researchers, practitioners, EVGs developers, and HR managers at education institutions with valuable insights related to factors affecting teachers' acceptance of EVGs. Our findings will benefit different areas related to the use of EVGs in education institutions including Teacher Training Programmes development.

This paper is structured as follows: first, we summarize literature reviews of EVGs. Second, we present the method used in this research and provide information about the sample and data analysis. Third, the results are presented and discussed. Finally, we present the conclusions, managerial implications, limitations of the study, and future research lines.

2 Literature reviews of EVGs

Several studies have attempted to review academic research aiming to conceptualise, to describe, and to develop theoretical frameworks related to EVGs. By reviewing extant literature on the topic, researchers try to summarize definitions, EVGs characteristics and learning goals, etc. This type of review also helps to clarify, to better define, and to develop a research agenda on the topic. One example of this type of research is Nolan and McBride (2014) in which the authors propose a conceptual framework to use digital game-based learning in early childhood curricula. Another example of this stream of research is Graafland, Schraagen and Schijven (2012) in which the authors systematically review 5 themes to develop a framework to assess digital serious games applied to health care. Systematic literature reviews analyse findings from multiple sources and multiples types of document (journal articles, conference papers, Doctoral dissertations, books, book chapters…) on the same topic. One example of a systematic literature review of educational video games is Boyle *et al*. (2016) who found large empirical evidence about the positive impacts and outcomes of digital video games in education. The authors provide empirical evidence of the use of EVGs in knowledge acquisition, skill acquisition in health and town planning, behaviour change in substance abuse and satisfaction with marital relationships, "as well as supporting collaborative interactions, soft skills and empathy" (Boyle *et al.*, 2016, p. 187). Meta-analytical reviews aggregate statistically data-based findings comparing multiples studies on the same topic. One example of meta-analytical reviews of educational video games is Sitzmann (2011) in which the author, using 65 independent samples, found that post-training self-efficacy, declarative knowledge, procedural knowledge, and retention was higher for trainees taught with simulation games relative to a comparison group. Another example of meta-analysis of educational video games is Wouters and Van Oostendorp (2013) in which the authors meta-analysed 29 studies to find that instructional support improves students' learning in game-based learning. Bibliometric analysis is a research technique using quantitative and statistical analyses to describe distribution patterns of research articles with a given topic and a given time period (Yang, Wang & Lai 2012). Martí-Parreño, Méndez-Ibáñez and Alonso-Arroyo (2016) used bibliometric analysis on a sample of 139 documents to identify distribution patterns of journals articles, most cited researchers and top institutions involved in this research topic. Finally, citation analysis is a bibliometric analysis technique which uses the published citation as the unit of analysis based on the assumption that "a heavily cited article or book must be considered important by a large number of scholars in a discipline" (Pasadeos, Phelps & Kim, 1998, p. 54). One example of citation analysis is Harman,

Koohang, and Paliszkiewicz (2014) although this research focused not only in EVGs but in academic literature related to gamification. Harman, Koohang, and Paliszkiewicz (2014) found that scholars believe gamification is worthy of serious study as proven by the increasing number of research on the topic suggesting that the concept is already vetted by the scientific community. No comprehensive literature review on teachers' acceptance of EVGs was found in this literature review. Hence, this study will fill this research gap.

3 Method

A comprehensive review approach was used in this research. By reviewing a large number of studies on the same topic, comprehensive reviews try to establish general rules and/or paradigms based on conclusive statements found in academic literature (Pasadeos, Phelps & Kim, 1998).

3.1 Search strategy

In order to find potential documents for analysis the following search strategy was run in two well-known academic databases (Web of Science and Scopus): ("GAME*-BASED LEARN*" OR "SERIOUS GAME*" OR GAMIF*) AND EDUCATION* OR "EDUCATION* GAME*" OR "EDUCATION* VIDEO GAME*"

3.2 Sample

The search strategy allowed to retrieve a total of 8025 documents. First of all, duplicates were removed. Following standard procedure the researchers carefully read titles and abstracts on the remaining 6313 documents to verify that all retrieved documents matched the topic under study. Sixty-five documents were removed because did not directly focus on the topic. 6248 documents remained for further analysis. A final sample of 14 documents met the inclusion criteria (were focused on teachers acceptance of EVGs) and were kept for analysis. However, the researchers had no access to the full text of 3 documents being the final sample for analysis 11 documents. Figure 1 depicts the flow diagram of the sample selection process. Table 1 provides bibliometric information of the sample.

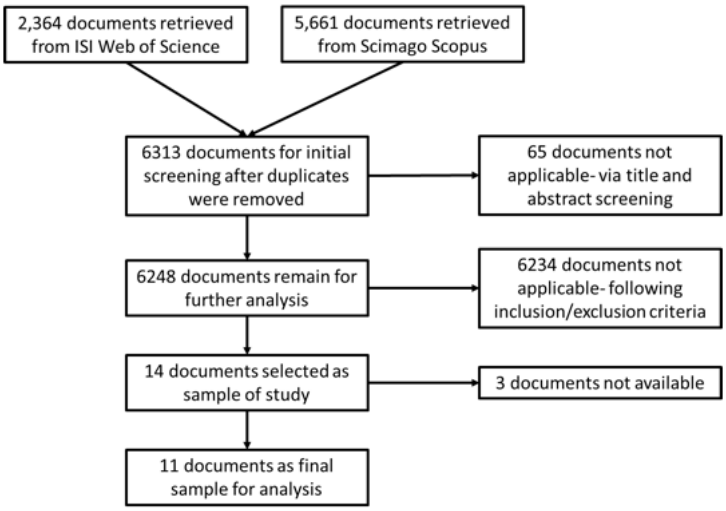

Fig. 1 - Sample selection process

Table 1
DOCUMENTS INFORMATION

Authors	Title	Document type	Publication Source
Emin-Martinez & Ney (2013)	Supporting Teachers in the Process of Adoption of Game Based Learning Pedagogy	Conference paper	VII European Conference on Games Based Learning
Hsu & Chai (2012)	Exploring preschool teachers' technological pedagogical content knowledge with educational games	Conference paper	20th International Conference on Computers in Education
De Grove, Bourgonjon, & Van Looy (2012)	Digital games in the classroom? A contextual approach to teachers' adoption intention of digital games in formal education	Journal article	Computers in Human Behavior
Bourgonjon *et al.*, (2013)	Acceptance of game-based learning by secondary school teachers	Journal article	Computers & Education
Hamari & Nousiainen (2015)	Why Do Teachers Use Game-Based Learning Technologies? The Role of Individual and Institutional ICT Readiness	Conference paper	48th Hawaii International Conference on System Sciences
Barendregt & von Feilitzen (2010)	Attacking Immune Attack™? An Evaluation by Teacher Students	Conference paper	4th European Conference on Games-Based Learning

Demirbilek & Tamer (2010)	Math teachers' perspectives on using educational computer games in math education	Conference paper	WCLTA 2010
Can & Cagiltay (2006)	Turkish Prospective Teachers' Perceptions Regarding the Use of Computer Games with Educational Features	Journal article	Educational Technology & Society
Ince & Demirbilek (2013)	Secondary and High School Teachers' Perceptions Regarding Computer Games with Educational Features in Turkey	Journal article	Anthropologist
Schifter & Ketelhut (2009)	Teacher acceptance of game-based learning in K-12: the Case of River City	Conference paper	Society for Information Technology & Teacher Education International Conference
Manessis (2011)	Early Childhood Post-Educated Teachers' Views and Intentions About Using Digital Games in the Classroom	Conference paper	4th European Conference on Games-Based Learning

4 Results

Table 2 provides basic information on sample characteristics available in the analysed documents. Both educational levels and sample size covered by the documents widely vary ranging from Preschool to High School and from 6 participants to 1668 participants. Turkey is the country in which more research has been conducted on this topic (three of the analysed studies took place in this country). Regarding participants, a large majority of the studies used in-service teachers to investigate teachers' acceptance of EVGs.

Table 2
SAMPLE CHARACTERISTICS

Source	Sample			Geolocation
	Educational level	Size	Participants	
Emin-Martinez & Ney (2013)	High school	6	in-service Teachers	France
Hsu & Chai (2012)	Preschool	352	in-service Teachers	Taiwan
De Grove, Bourgonjon, & Van Looy (2012)	Secondary school	517	in-service Teachers	Belgium
Bourgonjon *et al.*, (2013)	Secondary school	505	in-service Teachers	Belgium
Hamari & Nousiainen (2015)	Primary, lower Secondary and Upper Secondary school	1668	in-service Teachers	Finland
Barendregt & von Feilitzen (2010)	High school	13	Student teachers	Sweden

Source	Sample			Geolocation
	Educational level	Size	Participants	
Demirbilek and Tamer (2010)	lower Secondary and Upper Secondary school	13	in-service Teachers	Turkey
Can & Cagiltay (2006)	-----	116	Student teachers	Turkey
Ince & Demirbilek (2013)	Secondary school and High school	581	in-service Teachers	Turkey
Schifter & Ketelhut (2009)	Secondary school and High school	25	in-service Teachers	USA
Manessis (2011)	Preschool	50	in-service Teachers	Greece

Aggregate data of sample characteristics (Table 3) allows to identifying two research gaps: i) no study explored teachers' acceptance on a University level, and ii) student teachers are underrepresented in the sample with most of the studies using in-service teachers samples (mostly in secondary school).

Table 3
SAMPLE CHARACTERISTICS (AGGREGATE)

Participants	Educational level				
	Preschool	Primary school	Secondary school	High school	University
student teachers	–	–	13	–	–
in-service teachers	402	556	2718	31	–

4.1 Qualitative research

Four of the analysed documents used a qualitative approach using case study (Emin-Martinez & Ney, 2013; Barendregt & von Feilitzen, 2015; Schifter & Ketelhut, 2007); and constant comparative analysis (Demirbilek & Tamer, 2010). Emin-Martinez and Ney (2013) used Roger's Theory of Diffusion of Innovations as a framework to delve into the process of teachers' adoption of EVGs including the external factors that may favour a positive teachers' perception of EVGs (e.g. recommendations, assistance, tutorial, easy identification of domain knowledge and rules of the game…). Their results suggest that teachers move from becoming familiar with using EVGs (*knowledge*) to seeking EVGs consistent with the curriculum they teach (*persuasion*), testing the EVGs (*decision*), defining pedagogical scenarios that describes the integration of the game in a problem-solving approach (*implementation*) and finally, teachers analysed their students' answers to questionnaires on motivation and learning (*confirmation*).

Barendregt and von Feilitzen (2010) used a case study of a real EVG (*Immune Attack*), designed to teach cell biology, to delve into student teachers' acceptance and behavioural intention to use EVGs in their courses. The authors identified four main barriers preventing student teachers to adopt EVGs in the future: usability problems, embedding of the learning content, appeal, and learning motivation. Main factors related to usability problems include non-intuitiveness controls of the game and difficulties in reading and fully understanding the text for non-native English speakers. The participants also experienced a mismatch between playing the game and learning the content resulting in what the authors named as a *problem in embedding of the learning content*. This is, participants reported being able to advance in the game (up to the fourth level) as they were able to successfully manoeuvring the ship and control the technical operations but without learning the content. Another barrier for teachers was a lack of appeal both in terms of the graphic design and the characters (which they considered more suitable for younger children than for the teenagers the EVG is targeted to). Finally, some of the student teachers' participating in the study were no biology teachers and they had no real interest in the topic of cell biology. However, the game did not encourage them to become more interested in this topic, this is, participants did not find the motivational driver which is supposed to be present in EVGs due to the entertainment value.

Schifter and Ketelhut (2009) used a case study approach to delve into teachers' acceptance of an online video game-like multi-user virtual environment (MUVE) called *River City*. This MUVE was designed to teach scientific inquiry and 21st century skills to middle school students. After analysis of a three-year implementation of the project in different schools the authors suggest four principles to implement digital innovations like EVGs in the classroom: i) allow teachers time to practice with the EVG (to develop interest and knowledge, to evaluate usefulness for own classroom and students, to try new skills with students, and to adopt or reject the technology based on these opportunities), ii) effective ongoing, post-training technical support in the classroom, iii) ongoing communication and a local social support system, including significant support from the school's principal or other influential school staff, and iv) changes in classroom structures, roles and behaviours, knowledge and understanding, and values of technology in classrooms.

Demirbilek and Tamer (2010) used a grounded theory approach to analyse semi-structured interviews of in-service teachers through constant comparative analysis. The authors identified 6 main barriers to adopt EVGs including classroom management problems, technical infrastructure (e.g. computers not working or power cuts). Teachers also reported that not all subjects might fit with EVGs and that for teaching maths "board and chalk are indispensable".

Teachers also complained that the current software is not in line with the syllabus and that "because of the anxiety of not being able to complete all the curriculum topics, and because they have a lot of topics to teach, they don't use computer games". Teachers also lack of appropriate education on how to use EVGs. Among drivers, teachers feel that because students are always interested in computer games they can use EVGs to interest students in the classroom activities, this is, teachers believe they can use EVGs as a motivational driver for students. Regarding how to use EVGs in the classroom most of the teachers expressed that EVGs could be employed to re-engage students' attention to the lesson and as after school activities. Some of the teachers expressed that EVGs could be employed for evaluation purpose, as remediation stage, and for reinforcements and elimination of deficiencies. As overall opinions regarding the use of EVGs in maths teaching, most of teachers acknowledge that using EVGs in the lessons can motivate students and catch their attention along with making the lessons more entertaining. Teachers also acknowledge that EVGs decrease the negative attitude and behaviours towards math, help student to overcoming the fear of math, and can help to break the prejudice of math. As positive outcomes of using EVGS some of the teachers tell that educational computer games are: i) effective for making students gain some information and skills, ii) develop students creativity, iii) enrich the knowledge of vocabulary, iv) improve the skill of commenting, v) develop the skill of processing, vi) contribute to individual learning, vii) learning by discovering and learning by trial-and-error, viii) enlarge the scope of the topic, and ix) lessen the process of learning. Finally, participants expressed their belief that utilizing EVGs in the lessons increases the participation of the students, achieving a higher and active student-centric learning.

4.2 Quantitative research

Five of the documents used a quantitative approach using Exploratory Factor Analysis (EFA), Multiple Linear Regression (MLR), and path analysis (Hsu & Chai, 2012); Structural Equation Modelling (SEM) (De Grove, Bourgonjon & Van Looy, 2012; Bourgonjon *et al*., 2013); z-tests Manessis (2011); and Partial Least Squares (PLS) (Hamari & Nousiainen, 2015). Hsu and Chai (2012) developed a questionnaire to investigate preschool teachers' acceptance of EVGs. Results suggest that game knowledge (GK), game pedagogical content knowledge (GPCK), knowledge about how to use games with various pedagogical characteristics for teaching (but not necessarily related to content knowledge) (GPK), attitude towards digital game-based learning, and previous experience with games contribute to teachers' acceptance of EVGs while teachers' preferences for games do not necessarily affect EVGs acceptance.

De Grove, Bourgonjon, and Van Looy (2012) developed a model to test teachers' adoption of EVGs based on school-level variables (e.g. infrastructure, technical support…) and teacher-level variables (e.g. perceived ease of use, previous gaming experience…). Main findings suggest that school-level variables are not related to teachers' adoption while teachers' perceived learning opportunities when using EVGs and previous gaming experience influence adoption. More specifically, learning opportunities mediates curriculum-relatedness, this is, when teachers believe that EVGs can be fitted into the curriculum, they also regard EVGs as tools for learning, leading to a higher teachers' adoption. On the contrary, previous gaming experience was found to negatively correlate to learning opportunities and teachers having experience with games in the classroom consider digital games to have fewer learning opportunities than teachers with less experience.

Bourgonjon *et al.* (2013) tested a structural equation model of teachers' acceptance of EVGs finding that perceived usefulness is the main factor influencing teachers' acceptance of EVGs. The researchers also found that perceived usefulness of EVGs was influenced by personal innovativeness. Social influence also affects teachers' acceptance whereas complexity and previous gaming experience were found weak predictors of teachers' acceptance. However, main findings suggest that teachers were not really convinced that video games are very useful for enhancing their job performance. At the same time teachers believed that video games provide opportunities for learning. Results also suggested that on average teachers do not intended to use video games in their courses in the near future. The researchers also point out that due to the importance of the social influences in their model results suggests that teachers are sensitive to worked examples and showcases of good practices.

Manessis (2011) explores preschool teachers' intention to use EVGs in the classroom. Main findings suggest a high behavioural intention although teachers' intention was influence by years of teaching experience, previous experience in using digital games, and owning a computer at home. More experienced teachers, having a greater experience in using digital games, and owning a computer at home influence more positive views and intention to use EVGs.

Hamari and Nousiainen (2015) suggest that EVGs adoption is affected by teachers' perceived compatibly of Information and Communication Technologies (ICT) with teaching, teachers' perceived self-efficacy with ICT, teachers' perceived supportive ICT organizational culture, teachers' openness towards ICT, and teachers' perceived value of EVGs. Teachers' adoption was also influenced by teachers' openness towards ICT, teachers' attitude towards ICT, and teachers' perceived compatibly of ICT with teaching through teachers'

perceived value of EVGs. Gender affected both teachers' adoption and teachers' perceived value of EVGs whereas age only affected teachers' perceived value of EVGs but not teachers' adoption of EVGs. As a conclusion the authors state that teachers' willingness to adopt EVGs as a teaching methodology rely heavily not only on individual factors but also on social environment (e.g. supportive ICT organizational culture in the education institution).

4.3 Mixed-methods research

Two studies used a mixed-methods research approach. Can and Cagiltay (2006) used frequency analysis to analyse quantitative data while content analysis was used to analyse qualitative data. Ince and Demirbilek (2013) used T-test, ANOVA, and Chi-square to analyse quantitative data while content analysis was used to analyse qualitative data. Can and Cagiltay (2006) provide a descriptive approach to student teachers' behavioural intention to adopting EVGs in their courses in the future: 85% of the participants reported their behavioural intention to use EVGs in their courses in the future. In-depth interviews identified different barriers to adopting EVGs including student teachers' perceptions that EVGs are not suitable for all grade levels and subject matters. Other concerns related to EVGs adoption include: i) lack of possibilities and administrative issues; ii) time needed to use EVGs because they will restrict teaching other course content; iii) students-related factors (e.g. students may not like the selected game and could become bored and also may prefer traditional instruction, surfing on the Internet, or doing something else rather than playing the EVG); iv) problems to integrate the game into the course goals; v) difficulties to make students aware of the aim/goals of the activity involving the EVG (and also to make students aware how they will be assessed); vi) problems in redirecting students from games to normal instruction; vii) noise may increase during game play, and observing and managing the students will be harder; viii) using EVGs in the courses may have a negative effect on students' perceptions toward the importance of the course. An overall concern for teachers was that students may develop negative feelings towards the teacher as a consequence of their perceived inappropriateness of using EVGs in the course. Drivers for student teachers' behavioural intention to use EVGs in their courses include: i) students can learn more useful things using video games with educational features than through traditional methods and this learning will be more permanent; ii) students are engaged in activities during the game play (e.g. they apply their knowledge, they investigate and discover, and they learn by doing); iii) students' critical thinking processes will be enhanced as a result of their dealing with the logical processes of the EVG; iv) EVGs will help students to develop their creativity, imagination,

and visualization skills; v) the course content will be more understandable when using EVGs, and previous knowledge will be reinforced by means of the EVGs; vi) EVGs will also help with the development of eye-hand coordination, interest in computers, and computer-related skills and knowledge; vii) students' motivation, attention, and enthusiasm about learning the course content will increase when playing computer games with educational features, viii) students will have positive feelings about the teacher, and the teacher will be pleased, since the instructional process will be easier, ix) students will be silent during the course, and the classroom management will be easier.

Ince and Demirbilek (2013) investigate Secondary and High school teachers' perceptions about adopting EVGs in their courses. Results suggest Secondary school teachers use EVGs in their courses more than High school teachers (30.12% versus 11.19%) acknowledging the following benefits of EVGs usage: motivation, long-term retention, fun, visual aesthetics, effortless, and individual learning. Student motivation provided by EVGs ranked the highest in teachers' positive perceptions. Teachers' requirements (potential barriers) to using EVGs in their courses include: i) the need of internet access, ii) equipment (computer and projector), and iii) technical information and the ability to judge the appropriateness of the game to match curricular needs. Another potential barrier is that teachers viewed themselves as technically unprepared for computer usage skills needed to manage EVGs and expressed the necessity of increasing the amount of EVGs aligned with the curriculum. A gender effect was found with male teachers having a more positive attitude towards EVGs than female teachers. Results also found that actual users of EVGs in their courses were more positive about the learning potential of EVGs than non-users.

4.4 Drivers and barriers for teachers' acceptance

The main drivers for teachers' acceptance of EVGs include: i) teachers' perceived learning opportunities of EVGs, ii) teachers' personal factors (such as openness and innovativeness), iii) student-related factors (EVGs capacity to motivate students to learn), iv) teachers' previous gaming experience, v) teachers' attitudes towards digital game-based learning, and vi) social influence (e.g. colleagues adoption and examples of best practices). The main barriers identified in this literature review to adopting EVGs include: i) concerns in making possible to integrate EVGs in the curriculum, ii) lack of support (technical and organizational), iii) problems related to classroom management, and iv) lack of training (teachers' ability to use EVGs in their courses). Results suggest the complexity of teachers' beliefs with some factors acting both as barriers and drivers. On the one hand, Can and Cagiltay (2006) found that

teachers believe that using EVGs might increase noise in the classroom during game play, and observing and managing the students will be harder. On the other hand, the authors also found that teachers also believe that using EVGs will make classroom management easier because students will be silent during game play. Student-related factors also arise dual perceptions on teachers. Some teachers are concerned about the possibility of students developing negative feelings towards the teacher as a consequence of their perceived inappropriateness of using EVGs in the course. For example, students may not be aware of the aim/goals of the EVG activity when they play the game and might begin to wonder how they will be assessed. Moreover, students may not like the selected game and become bored. Nevertheless, teachers also believe that EVGs might help them to develop students' positive feelings about the teacher if students do show a positive attitude towards EVGs. Table 4 summarizes the main findings related to factors influencing teachers' acceptance of EVGs.

Table 4
FACTORS INFLUENCING TEACHERS' ACCEPTANCE OF EVGS

Factor	Negatively influences	Positively influences
Classroom management	Demirbilek and Tamer, 2010; Can & Cagiltay, 2006	Can & Cagiltay, 2006
Curriculum integration	Demirbilek and Tamer, 2010; Can & Cagiltay, 2006; Emin-Martinez & Ney, 2013; De Grove, Bourgonjon, & Van Looy, 2012; Barendregt & von Feilitzen, 2010; Ince & Demirbilek, 2013	
Gaming experience		Hsu & Chai, 2012; De Grove, Bourgonjon, & Van Looy, 2012; Manessis, 2011
Environment (technical infrastructure and support)		Demirbilek and Tamer, 2010; Hamari & Nousiainen, 2015; Ince & Demirbilek, 2013; Schifter & Ketelhut, 2009
Social influence		Bourgonjon et al., 2013; Schifter & Ketelhut, 2009
Training on EVGs		Demirbilek and Tamer, 2010; Emin-Martinez & Ney, 2013; Ince & Demirbilek, 2013; Schifter & Ketelhut, 2009
Student-related factors	Can & Cagiltay, 2006	Demirbilek and Tamer, 2010; Can & Cagiltay, 2006; Emin-Martinez & Ney, 2013

Factor	Negatively influences	Positively influences
Perceived learning opportunities		Can & Cagiltay, 2006; Bourgonjon et al., 2013; De Grove, Bourgonjon, & Van Looy, 2012
Personal factor (openness, innovativeness...)		Bourgonjon et al., 2013; Hamari & Nousiainen, 2015; Manessis, 2011

Conclusions, limitations, and future research

This comprehensive literature review suggest the complexity of factors influencing teachers' acceptance of EVGs. Several factors were identified as barriers and drivers of teachers' behavioural intentions regarding the adoption of EVGs in their courses. Moreover, some factors show a dual nature potentially acting as both barriers and drivers. Factors acting as barriers and drivers cover a wide range of areas including environmental factors at educational institutions, student-related factors, and teachers' personal factors. Findings in this literature review can be summarized in the following nine propositions:

- **Proposition 1.** Teachers' perceptions of EVGs impact on classroom management influence teachers' acceptance of EVGs.
- **Proposition 2.** Teachers' perceptions of EVGs integration within curriculum influence teachers' acceptance of EVGs.
- **Proposition 3.** Teachers' previous gaming experience positively influences teachers' acceptance of EVGs.
- **Proposition 4.** Environmental factors (such as technical infrastructure and support from the management at the educational institution) influence teachers' acceptance of EVGs.
- **Proposition 5.** Social influence (e.g. colleagues adoption of EVGs) positively influences teachers' acceptance of EVGs.
- **Proposition 6.** Teachers' previous training in using EVGs influences acceptance of EVGs.
- **Proposition 7.** Student-related factors (such as students beliefs' about EVGs) influence teachers' acceptance of EVGs.
- **Proposition 8.** Teachers' perceived learning opportunities of EVGs positively influences teachers' acceptance of EVGs.
- **Proposition 9.** Teachers' personal factors (such as openness, innovativeness, attitudes towards ICT and video games, and teaching experience) influence teachers' acceptance of EVGs.

By identifying factors influencing teachers' acceptance of EVGs in this comprehensive literature review, managers in charge of Teacher Training

Programmes (TTP) at educational institutions can better design TTP aiming to prevent factors acting as barriers to adopting EVGs. Drivers can be used to better motivate and to encourage teachers to adopting EVGs. For example, TTP might include examples and cases of colleagues using EVGs at the same educational institution to benefit the social influence effect found in literature on teachers' acceptance of EVGs. TTP should also address how to help teachers in integrating EVGs in the curriculum. TPP can also favour teachers' perceived learning opportunities of EVGs to foster teachers' acceptance.

One main limitation of this study is its qualitative approach and the small sample used. Future research might adopt a quantitative approach (e.g. a meta-analytic review) and a bigger sample in order to test the proposed propositions. Another limitation is that the analysed sample presents one important bias with High school teachers underrepresented in the sample.

More research is needed to better understand High school teachers' acceptance of EVGs. University teachers are not represented in the analysed sample suggesting both a research gap and a promising opportunity to expand this stream of research. A better knowledge of student teachers' acceptance of EVGs can also provide useful insights to the topic. Future research should increase the body of reviewed literature incorporating more studies using student teachers samples.

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