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RESEARCH ARTICLE

Higher education instructors' intention to use educational video games: an fsQCA approach

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Abstract
Educational video games (EVGs) offer instructors a myriad of opportunities to motivate and engage students in the learning process. Nevertheless, instructors can be influenced by barriers that prevent them from using EVGs in their courses (e.g. lack of expertise with EVGs). Instructors can also be influenced by different drivers that might increase their intention to use EVGs. This research analyses the effects of four variables (perceived usefulness, perceived ease of use, attention, and relevance) as factors contributing or preventing the use of EVGs by instructors serving in Higher Education institutions. Data of 170 instructors, who were surveyed through an online questionnaire using a snowball sampling, is analysed via fuzzy-set Qualitative Comparative Analysis (fsQCA). Main results suggest that perceived usefulness and perceived ease of use of EVGs are sufficient conditions for Higher Education instructors to show behavioural intention to use EVGs in their courses. Results also suggest that both instructors' perceived capacity of EVGs to attract students' attention and perceived relevance of EVGs affect instructors' behavioural intention. Managerial implications for Instructor Training Programmes (ITP), limitations of the study, and future research lines are also addressed.

Keywords Educational video games · Instructors' intentions · Higher education · fsQCA

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Introduction

The interest in games and education is not new and can be traced back to the sixties in the work of Piaget (1962) but also Abt (1970), Malone and Lepper (1987), and Loftus and Loftus (1983). Moreover, the interest of using educational video games (EVGs) as an instruction methodology is supported by academic literature that suggests a wide range of benefits. These benefits include increasing rates in knowledge acquisition (Boyle et al. 2016), self-efficacy, declarative knowledge, procedural knowledge, and retention (Sitzmann 2011). However, instructors can be the main barrier to adopt EVGs. Instructors are the key agent in introducing new teaching methodologies in their courses (Teo 2008), and educational innovations related to technology (such as EVGs) can challenge instructors. The academic literature acknowledges both first-order barriers (such as limited equipment, training, and support), and second-order barriers (such as beliefs about teacher-student roles, curricular emphasis, and assessment practices) as factors preventing instructors from integrating technology in the classroom (Ertmer 1999). Previous research suggests that instructors might perceive new technological developments in education as a threat, and technological innovations can be a cause of much anxiety (Goodwyn et al. 1997). Furthermore, previous research found that lack of expertise in applying new methodologies or lack of resources are common barriers for instructors when applying technological innovations in the classroom (Mumtaz 2000). For example, lack of training on a new technology is a widely accepted barrier regardless educational level (for a review see: Bingimlas (2009)). Pelgrum (2001) found instructors' lack of knowledge and skills as a serious barrier to using technology in primary and secondary schools. Moreover, the study pointed out there were not enough training opportunities for instructors to be trained in the use of technology in the classroom. At the university level, Friel et al. (2009) used faculty as trainers for the rest of the faculty (*train-the-trainer model*) in order to facilitate new technology adoption, pointing out the need to support staff in order to minimise anxiety of failure when using new technology.

As EVGs can be considered a technological innovation in education, TAM is used in this research as a framework to analyse HE instructors' intention to use EVGs. TAM (Davis 1985) was developed to predict individuals' likelihood to accept technological innovations such as email services. One of the main goals of TAM was to identify the major motivational variables that mediate between system characteristics and the actual use of the system. Davis (1985) identified two major variables influencing attitude towards a given technological innovation: (a) perceived usefulness and (b) perceived ease of use. Both perceived usefulness and perceived ease of use are directly influenced by design features, and finally influence the actual system use (adoption) through attitude. Since its development, TAM has been successfully applied to different technological innovations including mobile commerce (Wu and Wang 2005), internet banking (Lai and Li 2005), and the adoption of mobile internet (Hong et al. 2006). TAM has also been applied to different educational contexts such as online education (Ngai et al. 2007) and mobile learning (Liu et al. 2010). However, TAM has been criticised as a deterministic model where the intention-behaviour linkage is an accepted assumption and where group, cultural, and social aspects are not considered in the model (Bagozzi 2007). TAM has also been criticised for not fully taking into account individual, organisational, and contextual characteristics (McFarland and Hamilton 2006; Mathieson 1991). To overcome TAM's limitations, previous research in technology-related educational contexts such as learning management systems (LMS) has expanded TAM variables with individual (e.g. self-efficacy) and contextual (e.g.

facilitating conditions) characteristics of the user (Fathema et al. 2015; Alharbi, and Drew 2014). Another main limitation of TAM is that the role of emotions in human behaviour is neglected (Bagozzi 2007). From a methodological point of view, it has been pointed out that theory testing in TAM has largely relied on multiple regression or PLS (Partial Least Squares) suggesting little methodological pluralism in TAM (Bagozzi 2007). Therefore, previous research has pointed out that TAM features too few factors, thus being too limited in explaining the adoption intention (De Grove et al. 2012).

This research attempts to overcome some of the limitations of the TAM in several ways. Firstly, the methodology used (Fuzzy-set Qualitative Comparative Analysis) seeks to broaden the methodological pluralism in TAM research. Secondly, two individual-based variables borrowed from Keller's (1987) ARCS model (HE instructors' perception about to what extent EVGs can draw students' attention, and HE instructors' perceived relevance of EVGs in students' learning process) are included in our analysis in order to overcome TAM limitations to explain behavioural intentions. Finally, while most of previous research using TAM to analyse EVGs acceptance has focused on Secondary Education and High School, this research addresses HE instructors' acceptance of EVGs, that is, an educational level where acceptance of EVG research is scarcer.

This research is structured as follows. Firstly, the academic literature of drivers and barriers of EVG adoption is reviewed. Secondly, we present the variables under analysis and posit our propositions. Thirdly, the method is explained, and the results discussed. Finally, conclusions, managerial implications, limitations of the study, and future research lines are addressed.

Factors contributing or preventing the use of EVGs

Academic literature suggests a wide range of variables affecting the adoption of technological innovations by instructors. These variables include changes in schools such as the characteristics of change, local characteristics, and external factors such as government policies, etc. (Ketelhut and Schifter 2011). Literature review also points out that factors impacting change "are particularly problematic around technology adoption for teachers" (Ketelhut and Schifter 2011, p. 540). In the context of game-based learning, Emin-Martinez and Ney (2013) used Rogers' (2003) Theory of Diffusion of Innovations (DOI) to analyse teachers' adoption of educational games. According to Rogers' (2003) DOI, Emin-Martinez and Ney (2013) results suggested the following sequence in instructors' adoption: (a) becoming familiar with using the game (knowledge), (b) seeking game consistency with the curriculum they teach (persuasion), (c) testing the game (decision), (d) defining pedagogical scenarios that describe the integration of the game in a problem-solving approach (implementation), and (e) analysing students' answers to questionnaires on motivation and learning when using the game (confirmation). Rogers' (2003) DOI is one of the most widely used theories to understand why people adopt an innovation, considering as an innovation any product, idea, or practice perceived by an individual (or a group) as new. Attributes in Rogers' (2003) DOI considered by innovators before adopting an innovation include two TAM-related attributes such as the relative advantage driven by the innovation (which can be related to perceived usefulness) and the complexity of the innovation (which can be related to perceived ease of use). Another research by Schifter and Ketelhut (2009) identified four principles to implement an online digital educational video game: (a) allow teachers time to practise with the game in order to develop teachers' interest and knowledge to evaluate the usefulness of the game), (b) post-training technical support in the classroom, (c) local social support system, including significant support from the school's principal or other influential school staff, and (d) changes in classroom structures, roles and behaviours. TAM-related variables such as usefulness and easiness (post-training technical support in the classroom) are identified in Schifter and Ketelhut's (2009). Manessis (2011) research on teachers' intention to use EVGs in the classroom found that years of teaching experience, previous experience in using digital games, and owning a computer at home were factors contributing to teachers' intention to use EVGs. Hamari and Nousiainen (2015) suggested that EVG adoption is influenced by teachers' perceived compatibility of Information and Communication Technologies (ICT) with teaching, along with teachers' perceived self-efficacy with ICT, and teachers' perceived supportive ICT organizational culture. Other personal factors found to positively influence teachers' adopting were teachers' openness towards ICT, teachers' attitude towards ICT, and teachers' perceived value of EVGs. In Ince and Demirbilek's (2013) research, student motivation driven by EVGs ranked on the top of teachers' positive perceptions to adopt EVGs.

Regarding factors preventing the adoption of EVGs, Perry and Klopfer (2014) indicated six main factors acting as barriers inhibiting teachers to adopting games in schools: (a) inflexibility of curriculum, (b) negative effects of gaming, (c) students lack of readiness, (d) lack of supporting materials, (e) fixed class schedules, and (f) limited budgets. As a result of their analysis, these researchers claim that casual mobile educational video games can help to overcome these barriers. Demirbilek and Tamer (2010) found five barriers to adopting educational games: (a) classroom management problems, (b) failures in technical infrastructure (e.g. computers not working or power cuts), (c) subjects misfit with educational games, (d) impossibility to align current educational games with the syllabus, and (e) appropriate training on how to use educational games. De Grove et al. (2012) observed that school-level variables such as available infrastructure and technical support were not drivers for teachers' adoption whereas teachers' perceived learning opportunities when using EVGs and previous gaming experience positively influenced teachers' adoption. That is, De Grove et al. (2012) research suggests that perceived usefulness and familiarity with games affect EVGs adoption. Ince and Demirbilek (2013) identified the following potential barriers to adopt EVGs: (a) the need for internet access, (b) equipment (computer and projector), and (c) technical information and the ability to judge the appropriateness of the game to match curricular needs. Another potential barrier the authors found is that teachers viewed themselves as technically unprepared from a computing skills perspective and expressed the need of increasing the amount of EVGs aligned with the curriculum. Kenny & McDaniel (2011) conducted a research on pre-service teachers discovering that nearly 70% of the participants indicated that "one of the least desirable aspects of video games was that they were too complicated, that video games were too difficult to learn, or that playing them took too long" (p. 206). This finding suggests that the lack of perceived ease of use might be a potential barrier preventing pre-service teachers to adopt educational video games as a teaching methodology. Also, in a higher education context, Karadag (2015) found that pre-service teachers believed game-based learning to be useful as a method to regain students' attention and to evaluate what students have learned. However, students also felt anxious about failing to design an educational game and pointed out that the design process was very time consuming (Karadag 2015). As detected by Kenny and McDaniel (2011) students seem to be quite unfamiliar with EVGs suggesting they might find it difficult to use EVGs in the classroom.

Therefore, the literature review on EVGs adoption suggests the importance of technology-related factors such as difficulty to use EVGs (Karadag 2015; Kenny and McDaniel 2011) and perceived value of EVGs (De Grove et al. 2012) as potential variables affecting the adoption of EVGs.

Variables and propositions

Perceived ease of use and behavioural intention

Perceived ease of use is defined as "the degree to which an individual believes that using a particular system would be free of physical and mental effort" (Davis 1985, p. 26). Hence, this variable can be used to measure both instructors' physical costs (e.g. time devoted to develop or to find suitable EVGs for their courses) and mental costs (e.g. switching from traditional assessment methods to new game-based assessment methods). Perceived ease of use can affect attitude, and, therefore, behavioural intention, in two ways: self-efficiency and instrumentality (Davis et al. 1989). Broadly speaking, the easier the interaction within the system the higher an individual's perception of efficiency and control (Bandura 1982). Therefore, HE instructors' perceived ease of use of EVGs might affect HE instructors' behavioural intention to use EVGs.

Perceived usefulness and behavioural intention

Perceived usefulness is defined as "the degree to which an individual believes that using a particular system would enhance his or her job performance" (Davis 1985, p. 26). Therefore, this variable measures the utilitarian dimension of adopting a technology and assumes that users expect that the use of the technology will help them to accomplish the tasks they must develop. Specifically, perceived usefulness refers to effectiveness at work, productivity understood as saving time and the relative importance of the system for the individual's work (Davis et al. 1989). Within our conceptual framework, perceived usefulness of EVGs can be conceptualised as the degree to which HE instructors believe that using EVGs would enhance their job, this is, it will help them to improve students' learning (e.g. students will learn faster, or students will be more motivated to learn). Previous research found that factors influencing instructors to use technological innovation (e.g. computers) included instructors' perceived usefulness of the adopted technology both for their personal work and their classroom activities (Cox and Preston 1999). Schifter (2008) also found perceived usefulness for one's own classroom and students among the principles for successful technology professional development. Therefore, HE instructors' perceived usefulness of EVGs might affect HE instructors' behavioural intention to use EVGs.

Attention and relevance, and behavioural intention

Keller's (1987) ARCS model is one of the most widely mentioned theories of motivation in education. Moreover, it has been suggested that Keller's (1987) ARCS model should become the standard by which a game increases learning motivation (Karoulis and Demetriadis 2005). In fact, Keller's (1987) ARCS model has been successfully applied to different game-based learning contexts (Su and Cheng 2015; Dempsey and Johnson 1998; Klein 1992).

As all motivation theories, Keller's (1987) ARCS model assumes that individuals are motivated to the extent that their behaviour is expected to lead to desired outcomes (Robbins 2005). The expected outcome is derived from the expectancy-value theory (Tolman 1932; Lewin 1935) which assumes that people are motivated to engage in an activity "if it is perceived to be linked to the satisfaction of personal needs (the value aspect), and if there is a positive expectancy for success (the expectancy aspect)" (Keller

1987, p. 3). Human behaviour is then a compound function of perceived probability for success (expectancy) and perceived impact of the success (value) (Huang et al. 2010).

Keller's (1987) ARCS model assumes that media can moderate learners' attention and curiosity. That is, different media can increase attention and curiosity in different degrees. We conceptualise attention as HE instructors' beliefs that EVGs will help them to draw students' attention to the learning materials. Drawing attention to the learning materials (due to the novelty of innovative learning materials such as EVGs) might be a desirable outcome for instructors when using EVGs because attracting students' attention to the learning materials might increase students' motivation to learn. In fact, players' attention in game-based learning has been found to correlate with learning effects (Juan and Chao 2015). In another study using *Kahoot!*, students reported that they got more engaged in the lecture "when it was spiced up with something fun and exciting that made it possible to keep or re-establish the attention" (Wang 2015, p. 224). Therefore, HE instructors' beliefs about the capacity of EVGs to draw students' attention might affect HE instructors' behavioural intention to use EVGs.

Relevance indicates both the process and the value of the learning content to the learner (Keller 1987). Relevance does not have to come just from the content itself but also from the way something is taught (Keller 1987). We conceptualise relevance as HE instructors' beliefs that EVGs will provide learning value to students and that value comes both from materials used (EVGs) and the way the learning content is taught (game-based learning approach). We assume that HE instructors' beliefs about the relevance of EVGs in students' learning process might affect HE instructors' behavioural intention to use EVGs.

Propositions

As mentioned in the Introduction section, the present research uses the Fuzzy-set Qualitative Comparative analysis (fsQCA) as a data analysis technique. In fsQCA no statistical hypothesis testing is developed, and so the word hypothesis, although sometimes used, it is not very common (Wu, Yeh, Huan, and Woodside 2014). Accordingly, the word *proposition* is the term in-use here to posit the precepts to be tested in the context of this research. Our main goal is to identify which factors (causal conditions in fsQCA terminology) are a necessary and/or a sufficient condition for HE instructors to show intention of using EVGs in their courses. The variables under analysis are: (a) HE instructors' perceived ease of use of EVGs, (b) HE instructors' perceived usefulness of EVGs on student's learning, (c) HE instructors' beliefs of EVGs' capacity to draw students' attention, and (d) HE instructors' beliefs of EVGs' relevance in students' learning process. However, to address this goal two propositions must be analysed previously:

Proposition 1

No single configuration (combination) of HE instructors' perceived ease of use, perceived usefulness, beliefs of capacity to draw students' attention, and beliefs of relevance in students' learning process, leads to a behavioural intention to use EVGs. Rather, there exist multiple, equally relevant configurations of causal factor leading to the same outcome (intention to use EVGs).

Proposition 2

Single causal conditions (HE instructors' perceived ease of use, perceived usefulness, beliefs of capacity to draw students' attention, or beliefs of relevance in students' learning process) may be present or absent within configurations for a behavioural intention to use EVGs, depending on how they combine with other causal conditions.

Analysing the role that single HE instructors' characteristics (causal conditions) have in favouring their intention to use EVGs in their courses implies the analysis of to what extent these characteristics are necessary conditions. That is, causal conditions which produce the outcome but by themselves are not enough and/or sufficient conditions (e.g. causal conditions that always lead to the outcome) for having the intention to use EVGs. As no information regarding the role of each specific causal condition is available from previous literature, we posit the following research question (RQ):

RQ

What is the role of the four analysed variables in terms of sufficiency and necessity for HE instructors' intention to use EVGs?

Method

Participants

A convenience sample of 170 instructors serving in HE institutions was used in this research with snowball sampling (Biernacki and Waldorf 1981) the sampling method used. Although snowball sampling is unlikely to obtain a representative sample because there is no real control of the snowball effect (Hall and Hall 1996) this form of sampling is often used in online questionnaires to target hard-to-reach population subgroups (Sadler et al. 2010). Of the sample, 89.3% reported to be Spanish. Regarding the representativeness of the sample in terms of size, Fuzzy-set Qualitative Comparative analysis (fsQCA) is a case-oriented research approach originally designed for small and medium samples. However, prior research also indicates that set-theoretical approaches are well suited to analyse larger empirical data (Rihoux 2006; Woodside et al. 2012). Accordingly, it can be considered that a sample size of 170 instructors is adequate for this methodology of analysis. Of the sample, 52.35% are males, being the average age of the participants 42.75 years. Table 1 provides sample characteristics.

Procedure

Participants were contacted via email and completed a self-administrated online questionnaire.

Table 1 Sample characteristics

Characteristics	%
Gender	
Male	52.35
Female	47.65
Age range	
26–30	7.6
31–40	37.1
41–50	35.3
51–60	16.5
> 60	3.5
Type of university	
Public	37.06
Private	62.94
Area of knowledge	
Marketing	21.76
Business	8.24
Odontology	7.06
Engineering	6.47
Education	5.88
Physiotherapy	5.29
Advertising	4.71
Translation	4.71
Physical education	4.71
Economy	4.12
Journalism	4.12
Law	3.53
Nursery	2.94
Architecture	2.35
Others	14.12
	100

Instrument

All items used to develop the questionnaire were adapted from existing scales: 5 items were adapted from Davis (1985) to measure HE instructors' perceived ease of use of EVGs (e.g. "I find it easy to use educational video games to teach my classes," "Overall, I find educational video games easy to use"); ten items were adapted from Davis (1985) to measure HE instructors' perceived usefulness of EVGs on student's learning (e.g. "Educational video games enhance students learning effectiveness," "Educational video games make it easier for students to learn"); five items were adapted from Su and Cheng (2015) to measure HE instructors' beliefs of EVGs' capacity to draw student's attention (e.g. "I can use educational video games to draw students' attention on the learning materials," "I can use educational video games to help students to concentrate on the learning activities"); three items were adapted from Su and Cheng (2015) to measure HE instructors' beliefs of EVGs' relevance in students' learning process (e.g. "I can use educational video games to make the learning activities valuable and worth learning");

and three items were adapted from Bauer et al. (2005) to measure HE instructors' behavioural intention to use EVGs (e.g. "My general intention to use educational video games in my classes in the future is high"). All questionnaire items were measured using a 5-point Likert-type scale where (1) = strongly disagree, and (5) = strongly agree. Appendix I shows the measurement instrument.

Data analysis

Before testing the propositions, the psychometric properties of the scales were assessed with a confirmatory factor analysis (CFA), using Eqs. 6.1. According to standard criteria, data showed that the scales were valid and reliable. In this regard, Table 2 shows that all items for each factor had significant factorial loads higher than 0.60, making it unnecessary to eliminate any item from the scales (Bagozzi and Baumgartner 1994; Bagozzi and Yi 1988). Regarding reliability, all the Cronbach alphas (Cronbach 1951) were greater than the recommended 0.70 value (Nunnally 1978; Churchill 1979). The composite reliability index was also above the recommended value of 0.70 (Fornell and Larcker 1981) and the average variance extracted showed values higher than 0.50 (Fornell and Larcker 1981). Table 2 shows reliability and convergent validity of the measures.

For checking the discriminant validity (Table 3), we tested that the confidence interval for the estimation of the correlation between each pair of factors did not include the unit (Anderson and Gerbing 1988). We also checked that the average variance extracted for each factor was greater than the squared of the correlation between each pair of factors (Fornell and Larcker 1981). The data suggested reliability problems between (a) relevance and perceived usefulness, and between (b) relevance and attention; in fact, the square of the correlation between relevance and perceived usefulness (0.61) was higher than the average extracted variance of perceived relevance of EVGs (0.58), and the square of the correlation between relevance and attention (0.84) was higher than the average extracted variance of perceived relevance of EVGs (0.58) and higher than the average extracted variance of HE instructors' beliefs of EVGs' capacity to draw students' attention (0.75). Consequently, a third criterion was used: the Chi square difference test. We calculated the difference between the S-B $\chi 2$ covariance model equal to 1 for those factors with discriminant validity problems (S-B $\chi 2$ covariance model PU-RE equal to 1 = 508.07; df = 290; and S-B $\chi 2$ covariance model AT-RE equal to 1 = 471.30; df = 290) and the S-B $\chi 2$ measurement model (S-B $\chi 2$ = 458.32; df = 289). Considering that the critical value for $p < 0{,}001$ is 10.82, we checked that the Chi square difference was higher than the critical value, in both cases (S-B $\chi 2$ difference = 49.75; d.f. difference = 1 for the case of PU-RE, and S-B $\chi 2$ difference = 12.98; df difference = 1 for the case of AT-RE). So, according to the whole criteria we could assume that the measurement instruments had discriminant validity.

Technique for the analysis: fsQCA

Fuzzy-set Qualitative Comparative analysis (fsQCA) was used as an alternative approach to traditional data analysis. This methodology, introduced by Ragin (2000), allows describing a case as a combination of causal conditions and the outcome. The outcome is the result to be identified (in our analysis, HE instructor's behavioural intention to use EVGs), and the causal conditions are the variables identified as leading to the outcome (in our analysis we consider four causal conditions: HE instructors' perceived ease of use, HE instructors' perceived usefulness on student's learning, HE instructors' beliefs of EVGs' capacity to

Table 2 Reliability and convergent validity of the measures

Factor	Item	Convergent validity		Reliability		
		Stand. Loads (t)	Mean loading	Cronbach α	CR	AVE
Perceived ease of use (PEOU)	PEOU1	0.73 (10.99*)	0.79	0.89	0.89	0.62
	PEOU2	0.86 (14.18*)				
	PEOU3	0.87 (15.08*)				
	PEOU4	0.72 (10.70*)				
	PEOU5	0.77 (16.69*)				
Perceived usefulness (PU)	PU1	0.85 (8.98*)	0.80	0.94	0.95	0.64
	PU2	0.78 (11.68*)				
	PU3	0.75 (9.85*)				
	PU4	0.74 (10.29*)				
	PU5	0.73 (8.45*)				
	PU6	0.85 (9.89*)				
	PU7	0.72 (11.07*)				
	PU8	0.88 (11.29*)				
	PU9	0.84 (10.51*)				
	PU10	0.82 (7.51*)				
Beliefs of capacity to draw student's attention (AT)	AT1	0.85 (9.21*)	0.86	0.93	0.94	0.75
	AT2	0.91 (10.94*)				
	AT3	0.86 (11.00*)				
	AT4	0.89 (9.63*)				
	AT5	0.80 (7.38*)				
Beliefs of relevance in student's learning (RE)	RE1	0.77 (10.23*)	0.75	0.79	0.80	0.58
	RE2	0.63 (7.51*)				
	RE3	0.87 (10.03*)				

Table 2 (continued)

Factor	Item	Convergent validity		Reliability		
		Stand. Loads (*t*)	Mean loading	Cronbach α	CR	AVE
Intention of use (IN)	IN1	0.86 (14.32*)	0.86	0.89	0.90	0.75
	IN2	0.89 (11.35*)				
	IN3	0.83 (9.51*)				

S-B $\chi 2$ (289 df) = 458.32 ($p < 0.000$); BBNFI = 0.75; BBNNFI = 0.87; CFI = 0.89; IFI = 0.89; MFI = 0.61 RMSEA = 0.059

CR composite reliability, *AVE* average variance extracted

*$p < 0.01$

Table 3 Discriminant validity

	PEOU	PU	AT	RE	IN
PEOU	**0.62**	0.05	0.03	0.09	0.05
PU	[0.38; 0.07]	**0.64**	0.48	*0.61*	0.49
AT	[0.35; 0.02]	[0.78; 0.60]	**0.75**	*0.84*	0.57
RE	[0.46; 0.14]	[0.86; 0.70]	[0.97; 0.87]	**0.58**	0.54
IN	[0.40; 0.07]	[0.792; 0.61]	[0.83; 0.67]	[0.83; 0.63]	**0.75**

Under the diagonal: confidence interval for the correlation between each pair of factors

Diagonal: average variance extracted

Above the diagonal: square of the correlation between each pair of factors

draw students' attention, and HE instructors' beliefs of EVGs' relevance in students' learning process). FsQCA does not identify just the main effects among the variables analysed, as other multiple regression analyses do, but it models multiple realities that occur within each data set (Woodside 2014). FsQCA considers that several combinations of the variables under analysis (causal conditions), and not just one, can lead to the same result (outcome) (Woodside 2016). In this regard, an advantage that fsQCA offers compared to other data analysis techniques, is that a variable that affects the outcome in only a small subset of cases can be identified and represented in a specific solution (Vis 2012). In fact, set-theoretic methods, as fsQCA, use a causes-to-effects approach, explaining cases by identifying configurations (possible combinations of causal conditions) whereas correlational methods (such as SEM), use an effects-to-causes approach, estimating average effect of one (or more) independent constructs over all cases (Leischnig et al. 2014). Accordingly, the use of this methodology is not intended to exclude other commonly used data analysis techniques (such as SEM) but to complement them.

Other relevant characteristic that this technique offers compared to other techniques (e.g. Structural Equation Modelling or SEM), is that fsQCA is not based on symmetric relationships among variables. In this regard, it is relevant to recognise that cases contrary to statistically significant main effects almost always occur (Woodside 2016). With the purpose of identifying these contrarian cases and showing support to that proposal, a quintile analysis was performed, dividing the respondent cases from the lowest to highest quintile for each measured construct and examining the relationships among the outcome (intention to use EVGs) and the causal conditions. Cross-tabulations across the quintiles were performed using SPSS (Version 22) Crosstabs function, and the phi^2 measures were calculated, indicating a significant and positive large main relationship (Cohen 1977) between HE instructors' intention to use EVGs and the four causal conditions. Results of the quintile analysis show (see Appendix II) that two variables may have positive, negative, and no effect on the same dataset regardless of the main effect of one on the other (Woodside 2016).

The procedure for the fsQCA: calibrating fuzzy sets

The first step for analysing data with fsQCA was the calibration of the causal conditions (perceived ease of use, perceived usefulness, beliefs about to what extent EVGs can draw students' attention, and beliefs about to what extent EVGs are relevant for students' learning process) and the outcome (HE instructors' behavioural intention to use EVGs). However, fsQCA works with single item variables (or *conditions* in the terminology of fsQCA), what led us to calculate the arithmetic mean of each factor analysed as all scales used were multiple-item. Calibration is a required step in order to obtain the fuzzy variables for analysis. Through this calibration process, each variable is quantitatively evaluated for inclusion in categories ranging from 0 to 1. Three categories are usually established for both the causal conditions and the outcome: full membership (value = 1), full non-membership (value = 0), and cross-over point (0.5) (Ragin 2008). Table 4 shows the threshold used for inclusion of respondents for each variable and category. Considering that this was an explorative study, and we lacked the theoretical or in-depth knowledge to consider a more objective criterion to calibrate, we analysed the sample data distribution for each causal condition and the outcome. Then, we decided to consider the median value of each construct as the cross-over point for all the possible causal conditions and the outcome, as the mean is not recommended for that purpose (Wagemann et al. 2016). Moreover, we considered the 10% percentile for the full non-membership, and the 90% percentile for the full-membership (Table 4), as we assumed that just the 10% of the individuals in both extremes, low and high, of each causal condition and the outcome could be considered fully-out and fully-in the set respectively. The same percentile-based approach is used in previous research using fsQCA methodology (e.g. Andrews et al 2016; Lewellyn and Muller-Kahle 2016). The fsQCA software (using the Calibrate function) transformed the variables into calibrated sets taking into consideration the three data of reference (full non-membership, cross-over point, and full membership), describing how much the case belonged to a set (Ragin 2008).

Results

Once the calibration process was set, we used fsQCA to analyse the extent to which belonging to the different categories for the causal conditions was related to belonging to the outcome (Schneider et al. 2010). The first step in this analysis consisted of analysing the sufficient conditions for HE instructors' behavioural intention to use EVGs. Table 5 shows the results of the fuzzy set analysis provided by the software, resulting in four solutions (configurations of causal conditions). In fact, each solution showed a pattern of causal conditions identified among the cases analysed. In other words, each solution represents a group of different cases, all of them showing HE instructors with a positive intention to use EVGs, but in each group, the variable/s identified as leading to that positive intention was/

Table 4 Threshold used for calibration

Construct	Full non-membership	Cross-over point	Full membership
Behavioural intention	3	4	5
Perceived ease of use	2.6	3.6	5
Perceived usefulness	3.21	4.15	5
Beliefs of EVGs capacity to draw students' attention	3.6	4.2	5
Beliefs of EVGs relevance in students' learning process	3	4	5

Table 5 Analysis of the sufficient conditions for HE instructors' behavioural intention to use EVGs

Configuration	Solutions[a]			
	1	2	3	4
Perceived ease of use	●			
Perceived usefulness		●		
Beliefs of EVGs capacity to draw students' attention			ɸ	●
Beliefs of EVGs relevance in students' learning process			●	ɸ
Raw coverage	0.67	0.73	0.34	0.36
Unique coverage	0.06	0.10	0.01	0.02
Consistency	0.76	0.84	0.79	0.87
Overall solution coverage	0.88			
Overall solution consistency	0.74			

[a]Black circles ● indicate the presence of a condition. Circles with "/" ɸ indicate its absence

were different. The intermediate solution was chosen assuming that only some of the possible causal configurations would have derived in the result (see Ragin and Sonnet 2005). Altogether, the four solutions allowed the identification of 88% of HE instructors showing a positive intention to use EVGs. The minimum suggested values for consistency and coverage to accept that the solutions show sufficient conditions for HE instructors' behavioural intention to use EVGs were 0.75 and 0.60 respectively (Ragin 2000; Schneider and Wagemann 2007). For the overall solution, our results showed that the coverage value was quite above the minimum threshold, but in the case of the consistency value, it was very close (0.74 vs. 0.75) so, we considered the interpretation of the data as acceptable.

The larger identified pattern was the group of HE instructors' showing behavioural intention to use EVGs because they believe EVGs are useful for students in their learning process (Solution 2). The second largest group was HE instructors showing behavioural intention to use EVGs because they believe EVGs are easy to use (Solution 1). The third group was formed by HE instructors showing behavioural intention to use EVGs because they believe EVGs are going to help them to draw students' attention although these teachers believe EVGs are not relevant in the students' learning process (Solution 4). Finally, the fourth and smallest group, was formed by HE instructors showing behavioural intention to use EVGs because they believe EVGs are relevant in students' learning process, although these instructors seem reluctant to believe that EVGs are going to help them to draw students' attention. These findings provide support for the two propositions. Moreover, results

Table 6 Analysis of the necessary conditions for HE instructors' behavioural intention to use EVGs

Causal condition	Consistency	Coverage
Perceived ease of use	0.67	0.76
Perceived usefulness	0.73	0.84
Beliefs of EVGs capacity to draw students' attention	0.75	0.87
Beliefs of EVGs relevance in students' learning process	0.75	0.85

shown in Table 5 also answer the role of the four analysed variables in terms of sufficiency (RQ) for HE instructors' intention to use EVGs.

A second analysis was run to answer the role of the four analysed variables in terms of necessity (RQ) for HE instructors' intention to use EVGs. As shown in Table 6 none of the four analysed causal conditions were necessary conditions for HE instructors' behavioural intention to use EVGs as consistency, and coverage values did not reach the minimum values (0.90 and 0.75 respectively) to affirm this (Ragin 2006).

Discussion

As suggested by our results, HE instructors can be clustered in 4 different groups regarding their behavioural intention to use EVGs in their courses. The first group is composed of instructors showing a behavioural intention to use EVGs in their courses because they believe EVGs are going to help them to draw students' attention. However, this group believe that EVGs are not relevant for students in their learning process. This approach to using EVGs suggests a spurious perception of EVGs related to the *attention effect*. Keller's motivation theory (1987) stated that getting students' attention is not enough to achieve successful learning outcomes but the real challenge is to sustain it throughout a period of instruction. In fact, recent research in game-based learning suggests that students' attention levels towards game-based learning activities can decrease after repeated use if other factors, other than novelty, are not taken into account (Wang 2015). Therefore, one risk for this group of instructors is using EVGs as a standalone strategy just to attract students' attention. Previous research also suggests that the success of using any technology in education depends on how it is integrated in the classroom (Wang 2015) and "spicing up" the classroom a little bit by playing a game seems that will not provide students with a meaningful approach to EVG, but it will just provide them with a *nice variation and break in the lecture* (Wang 2015). A risk for HE instructors planning to use EVGs in such a spurious way is that this strategy might work in the short term but can fail in achieving real learning in the long term.

The group of instructors who show a behavioural intention to use EVGs in their courses because they believe EVGs are easy to use might behave in the same spurious way that their counterparts in the previous group. It is legitimate to use EVGs just as an easy and novel way to motivate students but planning to use EVGs just because they are easy to use will fail in achieving EVGs' full potential for learning. This belief might encourage instructors to use only simple games (because they are easy to use) preventing instructors to use more complex EVGs that allow higher learning outcomes.

The third identified group is that of instructors who will use EVGs because they believe that EVGs will be relevant for students' learning process although they also believe that EVGs will fail in attracting students' attention. Assuming that EVGs will fail in attracting students' attention might be based in instructors' prejudices towards EVGs. For example, some instructors might think that students attend their courses "to learn" and not "to play" considering EVGs as a childish activity that HE students will not pay attention to.

Finally, the fourth group of instructors show a behavioural intention to use EVGs in their courses because they believe EVGs are useful for students' learning process. This is probably the group of instructors whom we can call *believers* regarding the use of EVGs: they will use EVGs because they really believe EVGs are useful for students' learning process even perceiving that EVGs are not easy to use for them. This suggests a student-oriented commitment because this group of instructors think that using EVGs will benefit students' learning process even if the use of EVGs will demand a higher effort on the teachers' side.

Because none of the conditions (variables) analysed must be necessarily present for HE instructors having the intention to use EVGs, our results suggest that the intention can be motivated by different factors (conditions or variables) among the ones analysed for each instructor, the other ones playing no specific role. In this regard, for having the intention to use EVGs it is sufficient with (a) the instructors' own perceptions regarding the ease of use of EVGs, or with (b) the instructors' perception about the usefulness of EVGs on students' learning, or with (c) his/her perception regarding the EVGs' relevance in students' learning although the instructor considers EVGs will not draw students' attention, or with (d) the instructors beliefs of EVGs' capacity to draw students' attention although he/she considers EVGs will not be relevant in the students' learning process.

These results have several implications for Instructors Training Programmes (ITP). Previous research has suggested that "teacher-training programmes need to integrate more activities that introduce future teachers to games on a more inclusive basis" (Kenny, and McDaniel 2011, p. 209). However, as our results suggest not all instructors evaluate EVGs in the same way, suggesting that tailored ITP are needed for the 4 different groups of instructors. Regarding group 1, ITP should prevent the spurious use of EVGs showing instructors the full potential of EVGs for students' learning process beyond the *attention effect* of EVGs. Previous research suggests that "the mere fact of playing and becoming more familiar with a game, even though it was not educational, still appeared to have a positive effect on their [future teachers] judgments and expectations about games" (p. 210). Therefore, ITP might "open the eyes" of this group of instructors who believe that EVGs will not be relevant for students' learning process. As it has been suggested, making instructors play games might help them to evaluate and integrate game technologies and the types of learning that they can expect from EVGs (Kenny and McDaniel 2011).

Because instructors' perceived ease of use in group 2 affects their behavioural intention to use EVGs, ITP for this group should focus on developing instructors' skills to deal with EVGs (e.g. how to assess performance and learning outcomes when using EVGs). ITP should also provide instructors with resources (e.g. online resources) to use EVGs in the easiest way. In this sense, previous research found that instructors experienced problems when designing game-based learning activities as "pedagogical expertise does not appear to be directly transferable to game design" (Theodosiou and Karasavvidis 2015, p. 133). Also, previous research alerts that certain genres of videogames (e.g. strategy-like games such as *Civilization III*) can overwhelm students because of its complexity and difficulty (Squire 2005). ITP should properly train instructors on the way to successfully incorporate these complex games, with powerful learning opportunities, into curricula. Therefore, ITP should enhance instructors' skills to successfully design and to use more complex EVGs and not just simple, easy games.

ITP can enhance instructors' beliefs in group 3 about the suitability of using EVGs to draw students' attention. For example, ITP should learn from previous research which provide information about which game elements can be used to draw students' attention (e.g. Rieber 1996; Hirumi et al. 2010). Also, previous research pointed out that "bringing a commercial-quality educational game into the classroom may create as many motivational problems as it solves" (Squire 2005, p. 2) because not all students are motivated by all types of video games in the same way. Therefore, helping instructors to better identify which type of EVGs will attract the highest level of students' attention based on students' profiles and interests (e.g. using a specific video game genre, gameplay, modality of game, etc.) will be another contribution of tailored ITP.

Because instructors in group 4 believe that EVGs are not easy to use, ITP for this group of instructors should focus on developing teachers' skills and providing them useful resources to better deal with the use of EVGs in the classroom.

Conclusions, managerial implications, limitations, and future research

EVGs represent both an opportunity but also a challenge for HE instructors. Our results suggest that HE instructors' behavioural intention to use EVGs are not driven by the same variables for all HE instructors. On the one hand, two groups of HE instructors might be approaching the use of EVGs from the instructors' perspective. That is, they would use EVGs because they perceive EVGs are easy to use or because they perceive EVGs are useful to better perform their job. On the other hand, two groups of HE instructors might be approaching the use of EVGs from the students' perspective. That is, they would use EVGs because they perceive EVGs are relevant in the students' learning process (even if this group of teachers do not believe EVGs will help them to attract students' attention during the lessons) or because they perceive EVGs are going to attract students' attention during the lessons (although this group of teachers do not believe that EVGs are relevant in the students' learning process). Therefore, these four different groups of HE instructors might require a different approach when developing ITP related to the use of EVGs. For the spurious groups (HE instructors believing that they will use EVGs because they are easy to use and HE instructors believing they will use EVGs as a "nice break in-between real learning activities") the challenge is to convince them to move to the next level, this is, they must understand the true potential of using EVGs as a teaching material. For the other two groups, who already believe that EVGs are useful and relevant in the students' learning process, the challenge is to provide them with skills and resources so they will better use all the educational potential of EVGs in their courses.

One main limitation of this research is the convenience sample used. Future research should use probabilistic samples which expand these findings to a representative sample of the target population. Future research should also analyse gender differences regarding the use of EVGs. Because culture influences human behaviour, future research should also use a cross-cultural approach. Finally, other variables than the ones used in this study should be analysed. For example, media affinity, perceived self-efficacy, or previous experience with video games might also affect HE instructors' behavioural intentions and should be explored in the future. Especially, other motivational and TAM-related variables (such as control, satisfaction, and subjective norm) could be included in future research models.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Appendix

See Tables 7 and 8.

Table 7 Appendix I. Measurement instrument

Construct	Descriptor	Item	Source
Perceived ease of use (PEOU)	Learning to use educational video games is easy for me	PEOU1	Davis (1985)
	I find it easy to use educational video games to teach my classes	PEOU2	
	It is easy for me to use educational video games in my classes	PEOU3	
	Educational video games are clear and understandable for me	PEOU4	
	Overall, I find educational video games easy to use	PEOU5	
Perceived usefulness (PU)	Educational video games improve students learning quality	PU1	Davis (1985)
	Educational video games give students a greater control over their learning process	PU2	
	Educational video games enable students to learn more quickly	PU3	
	Educational video games support critical aspects in the students´ learning process	PU4	
	Educational video games increase students productivity	PU5	
	Educational video games improve students learning performance	PU6	
	Educational video games allow students to learn more than would otherwise be possible	PU7	
	Educational video games enhance students learning effectiveness	PU8	
	Educational video games make it easier for students to learn	PU9	
	Overall, I find educational video games useful for learning	PU10	
Beliefs of capacity to draw student's attention (AT)	I can use educational video games to draw students' attention on the learning materials	AT1	Su and Cheng (2015)
	I can use educational video games to focus students' attention on the learning materials	AT2	
	I can use educational video games to help students to concentrate on the learning activities	AT3	
	I can use educational video games to arouse students' curiosity on the learning activities	AT4	
	I can use educational video games to make students' learning experience more interesting	AT5	
Beliefs of relevance in student's learning (RE)	I can use educational video games to make learning activities valuable and worth learning	RE1	Su and Cheng (2015)
	I can use educational video games to help students prepare for course exams	RE2	
	I can use educational video games to motivate students in the learning activities	RE3	

Table 7 (continued)

Construct	Descriptor	Item	Source
Intention of use (IN)	My general intention to use educational video games in my classes in the future is high	IN1	Bauer et al. (2005)
	I will think about using educational video games in my classes	IN2	
	I will use educational video games in my classes in the future	IN3	

Table 8 Appendix II. Quintile analysis and contrarian case analysis

	Intention to use EVGs				
	1	2	3	4	5
Ease of use ($phi^2 = 0.22$, $p < 0.003$)					
1	*14 (8.2%)*	*7 (4.1%)*	6 (3.5%)	**2 (1.2%)**	**5 (2.9%)**
2	*8 (4.7%)*	*0 (0%)*	8 (4.7%)	**4 (2.4%)**	**8 (4.7%)**
3	4 (2.4%)	4 (2.4%)	13 (7.6%)	4 (2.4%)	8 (4.7%)
4	**4 (2.4%)**	**2 (1.2%)**	15 (8.8%)	*1 (.6%)*	*16 (9.4%)*
5	**4 (2.4%)**	**3 (1.8%)**	10 (5.9%)	*2 (1.2%)*	*18 (10.6%)*
Usefulness. ($phi^2 = 0.41$, $p < 0.001$)					
1	*20 (11.8%)*	*5 (2.9%)*	8 (4.7%)	**2 (1.2%)**	**3 (1.8%)**
2	*6 (3.5%)*	*6 (3.5%)*	18 (10.6%)	**2 (1.2%)**	**8 (4.7%)**
3	3 (1.8%)	1 (.6%)	13 (7.6%)	2 (1.2%)	7 (4.1%)
4	**4 (2.4%)**	**2 (1.2%)**	8 (4.7%)	*6 (3.5%)*	*16 (9.4%)*
5	**1 (.6%)**	**2 (1.2%)**	5 (2.9%)	*1 (.6%)*	*21 (12.4%)*
Attention. ($phi^2 = 0.63$, $p < 0.001$)					
1	*15 (8.8%)*	*4 (2.4%)*	7 (4.1%)	**0 (0%)**	**2 (1.2%)**
2	*14 (8.2%)*	*8 (4.7%)*	25 (14.7%)	**4 (2.4%)**	**5 (2.9%)**
3	2 (1.2%)	1 (.6%)	7 (4.1%)	4 (2.4%)	4 (2.4%)
4	**3 (1.8%)**	**1 (.6%)**	11 (6.5%)	*4 (2.4%)*	*9 (5.3%)*
5	**0 (0%)**	**2 (1.2%)**	2 (1.2%)	*1 (.6%)*	*35 (20.6%)*
Relevance. ($phi^2 = 0.50$, $p < 0.001$)					
1	*14 (8.2%)*	*4 (2.4%)*	7 (4.1%)	**0 (0%)**	**30 (1.8%)**
2	*6 (3.5%)*	*4 (2.4%)*	16 (9.4%)	**2 (1.2%)**	**3 (1.8%)**
3	10 (5.9%)	5 (2.9%)	21 (12.4%)	7 (4.1%)	10 (5.9%)
4	**3 (1.8%)**	**0 (0%)**	6 (3.5%)	*2 (1.2%)*	*5 (2.9%)*
5	**1 (0.6%)**	**3 (1.8%)**	2 (1.2%)	*2 (1.2%)*	*34 (20%)*

In shaded cells, cases in **bold** represent contrarian cases, and cases in *italics* represent main effect

References

Abt, C. C. (1970). *Serious games: The art and science of games that simulate life*. New York: Viking Press.

Andrews, R., Beynon, M. J., & McDermott, A. M. (2016). Organizational capability in the public sector: A configurational approach. *Journal of Public Administration Research and Theory, 26*(2), 239–258.

Alharbi, S., & Drew, S. (2014). Using the technology acceptance model in understanding academics' behavioural intention to use learning management systems. *International Journal of Advanced Computer Science and Applications, 5*(1), 143–155.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modelling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(May), 411–423.

Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems, 8*(4), 244–254.

Bagozzi, R. P., & Baumgartner, H. (1994). The evaluation of structural equation models and hypothesis testing. In Richard P. Bagozzi (Ed.), *Principles of marketing research* (pp. 386–422). Cambridge: Blackwell Publishers.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16*(1), 74–94.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37,* 122–147. https://doi.org/10.1037/0003-066X.37.2.122.

Bauer, H. H., Reichardt, T., Barnes, S. J., & Neumann, M. M. (2005). Driving consumer acceptance of mobile marketing: A theoretical framework and empirical study. *Journal of Electronic Commerce Research, 6*(3), 181–192.

Biernacki, P., & Waldorf, D. (1981). Snowball sampling: Problems and Techniques of Chain Referral Sampling. *Sociological Methods and Research, 10*(2), 141–163. https://doi.org/10.1177/004912418101000205.

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics Science & Technology Education, 5*(3), 235–245.

Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., et al. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education, 94,* 178–192.

Churchill, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research, 16,* 64–73.

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences*. New York: Academic Press.

Cox, M., Preston, C. & Cox K. (1999, November). *What factors support or prevent teachers from using ICT in their classrooms?* Paper presented at the British Educational Research Association Annual Conference, University of Sussex, Brighton.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16,* 297–334.

Davis, F. D. (1985). A technology acceptance model for empirically testing new end-user information systems: Theory and results. *PhD diss.*, Massachusetts Institute of Technology. Retrieved from http://hdl.handle.net/1721.1/15192

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982–1003. https://doi.org/10.1287/mnsc.35.8.982.

De Grove, F., Bourgonjon, J., & Van Looy, J. (2012). Digital games in the classroom? A contextual approach to teachers' adoption intention of digital games in formal education. *Computers in Human Behavior, 28*(6), 2023–2033.

Demirbilek, M., & Tamer, S. L. (2010). Math teachers' perspectives on using educational computer games in math education. *Procedia-Social and Behavioral Sciences, 9,* 709–716.

Dempsey, J. V., & Johnson, R. B. (1998). The development of an ARCS gaming scale. *Journal of Instructional Psychology, 25,* 215–221.

Emin-Martinez, V.& Ney, M. (2013). Supporting teachers in the process of adoption of game based learning pedagogy. Escudeiro, P. & Vaz de Carvalho, C. (Eds.) *Proceedings of the 7th European Conference on Games Based Learning –ECGBL 2013 in Porto*, *Portugal*, Academic Conferences International Limited, pp. 156–162.

Ertmer, P. A. (1999). Addressing first-and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(4), 47–61.

Fathema, N., Shannon, D., & Ross, M. (2015). Expanding the technology acceptance model (TAM) to examine faculty use of learning management systems (LMSs) in higher education institutions. *Journal of Online Learning & Teaching, 11*(2), 210–232.

Fornell, C., & Larcker, D. (1981). Evaluating structural equations models with unobservable variables and measurement error. *Journal of Marketing Research, 18,* 39–50.

Friel, T., Britten, J., Compton, B., Peak, A., Schoch, K., & Van Tyle, W. K. (2009). Using pedagogical dialogue as a vehicle to encourage faculty technology use. *Computers & Education, 53,* 300–307.

Goodwyn, A., Adams, A., & Clarke, S. (1997). The great god of the future: The views of current and future English teachers on the place of IT in literacy. *English in Education, 31*(2), 54–62. https://doi.org/10.1111/j.1754-8845.1997.tb00125.x.

Hall, D., & Hall, I. M. (1996). *Practical social research: Project work in the community*. London: Macmillan.

Hirumi, A., Appelman, B., Rieber, L., & Van Eck, R. (2010). Preparing instructional designers for game-based learning: Part 1. *TechTrends, 54*(3), 27–37.

Hong, S. J., Thong, J. Y. L., & Tam, K. Y. (2006). Understanding continued information technology usage behavior: A comparison of three models in the context of mobile internet. *Decision Support Systems, 42*(3), 1819–1834. https://doi.org/10.1016/j.dss.2006.03.009.

Huang, W. H., Huang, W. Y., & Tschopp, J. (2010). Sustaining iterative game playing processes in DGBL: The relationship between motivational processing and outcome processing. *Computers & Education, 55*(2), 789–797.

Ince, E. Y., & Demirbilek, M. (2013). Secondary and high school teachers' perceptions regarding computer games with educational features in Turkey. *Anthropologist, 16*(1–2), 89–96.

Hamari, J.& Nousiainen, T. (2015) *Why do teachers use game-based learning technologies? The role of individual and institutional ICT readiness: Proceedings of the 48th Hawaii International Conference on System Sciences (HICSS)*. IEEE, pp. 682–691.

Juan, Y. K., & Chao, T. W. (2015). Game-based learning for green building education. *Sustainability, 7*(5), 5592–5608. https://doi.org/10.3390/su7055592.

Karadag, R. (2015). Pre-Service Teachers' perceptions on game based learning scenarios in primary reading and writing instruction courses. *Educational Sciences: Theory and Practice, 15*(1), 185–200.

Karoulis, A. & Demetriadis, S. (2005) The motivational factor in educational games. Interaction between learner's internal and external representations in multimedia environments. Research report, Kaleidoscope NoE JEIRP, D21-02-01-F, 296-312. Retrieved February 12, 2014, from http://athanasis.karoulis.gr/Data/Science/Kaleidoscope/2-MotivFactorEduGames.pdf

Keller, J. M. (1987). Development and use of the ARCS model of motivational design. *Journal of Instructional Development, 10*(3), 1–10. https://doi.org/10.1007/BF02905780.

Kenny, R. F., & McDaniel, R. (2011). The role teachers' expectations and value assessments of video games play in their adopting and integrating them into their classrooms. *British Journal of Educational Technology, 42*(2), 197–213.

Ketelhut, D. J., & Schifter, C. C. (2011). Teachers and game-based learning: Improving understanding of how to increase efficacy of adoption. *Computers & Education, 56,* 539–546.

Klein, J. D. (1992). Effect of instructional gaming and reentry status on performance and motivation. *Contemporary Educational Psychology, 17,* 364–370.

Lai, V., & Li, H. (2005). Technology acceptance model for internet banking: An invariance analysis. *Information and Management, 42*(2), 373–386. https://doi.org/10.1016/j.im.2004.01.007.

Leischnig, A., Henneberg, S. C. & Thornton, S. C. (2014). *Performing configurational analyses in management research: A fuzzy set approach: Proceedings of the 30th Industrial Marketing and Purchasing Conference, Bordeaux*, France.

Lewellyn, K. B., & Muller-Kahle, M. I. (2016). The configurational effects of board monitoring and the institutional environment on CEO compensation: A country-level fuzzy-set analysis. *Journal of Management and Governance, 20*(4), 729–757.

Lewin, K. (1935). *A dynamic theory of personality*. New York: McGraw-Hill.

Liu, Y., Li, H., & Carlsson, C. (2010). Factors driving the adoption of m-learning: An empirical study. *Computers & Education, 55*(3), 1211–1219.

Loftus, G. R., & Loftus, E. F. (1983). *Mind at play: The psychology of video games*. New York: Basic Books.

Malone, T. W., & Lepper, M. R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R. E. Snow & M. J. Farr (Eds.), *Aptitude, learning, and instruction - Volume 3: Conative and affective process analyses* (pp. 223–253). Hillsdale: Lawrence Erlbaum Associates.

Manessis, D. (2011). *Early childhood post-educated teachers' views and intentions about using digital games in the classroom: Proceedings of the 5th European Conference on Games Based Learning –ECGBL 2011, Reading, England, Academic Conferences International Limited*, pp. 753–767.

Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior. *Information systems research, 2*(3), 173–191.

McFarland, D. J., & Hamilton, D. (2006). Adding contextual specificity to the technology acceptance model. *Computers in Human Behavior, 22*(3), 427–447.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: A review of the literature. *Journal of Information Technology for Teacher Education, 9*(3), 319–342. https://doi.org/10.1080/14759390000200096.

Ngai, E. W. T., Poon, J. K. L., & Chan, Y. H. C. (2007). Empirical examination of the adoption of WebCT using TAM. *Computers & Education, 48*(2), 250–267.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education, 37*(2), 163–178.

Perry, J., & Klopfer, E. (2014). UbiqBio: Adoptions and outcomes of mobile biology games in the ecology of school. *Computers in the Schools, 31*(1–2), 43–64.

Piaget, J. (1962). *Play, dreams and imitation in childhood*. New York: W.W. Norton & Co.

Ragin, C. C. (2000). *Fuzzy-set social science*. Chicago: The University of Chicago Press.

Ragin, C. C. (2006). Set relations in social research: Evaluating their consistency and coverage. *Political Analysis, 14,* 291–310. https://doi.org/10.1093/pan/mpj019.

Ragin, C. C. (2008). Qualitative comparative analysis using fuzzy sets (fsQCA). In R. Benoit & C. Ragin (Eds.), *Configurational comparative analysis* (pp. 87–121). London: Thousand Oaks.

Ragin, C. C., & Sonnet, J. (2005). Between complexity and parsimony: Limited diversity, counterfactual cases, and comparative analysis. In S. Kropp & M. Minkenberg (Eds.), *Vergleichen in der Politikwissenschaft¸* (pp. 180–197). Wiesbaden: Springer.
Rieber, L. P. (1996). Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. *Educational Technology Research and Development, 44*(2), 43–58.
Rihoux, B. (2006). Qualitative comparative analysis (QCA) and related systematic comparative methods. *International Sociology, 21*(5), 679–706. https://doi.org/10.1177/0268580906067836.
Robbins, S. (2005). *Organizational behavior*. Upper Saddle River: Pearson Education.
Rogers, E. M. (2003). *Diffusion of innovations*. New York: The Free Press a Division of Simon & Schuster Inc.
Sadler, G. R., Lee, H. C., Lim, R. S. H., & Fullerton, J. (2010). Recruitment of hard-to-reach population subgroups via adaptations of the snowball sampling strategy. *Nursing & Health Sciences, 12*(3), 369–374. https://doi.org/10.1111/j.1442-2018.2010.00541.x.
Schifter, C. C. (2008). *Infusing computers into classrooms: Continuous practice improvement*. Hershey: IGI Global.
Schifter, C. & Ketelhut, D. (2009). *Teacher acceptance of game-based learning in K-12: the case of River City: Proceedings of the Society for Information Technology & Teacher Education International Conference*, pp. 3836–3842
Schneider, M. R., Schulze-Bentrop, C., & Paunescu, M. (2010). Mapping the institutional capital of high-tech firms: A fuzzy-set analysis of capitalist variety and export performance. *Journal of International Business Studies, 41*(2), 246–266. https://doi.org/10.1057/jibs.2009.36.
Schneider, C. Q., & Wagemann, C. (2007). *Qualitative comparative analysis (QCA) und fuzzy sets: Ein lehrbuch für anwender und alle, die es werden wollen*. Verlag: Barbara Budrich.
Sitzmann, T. (2011). A meta-analytic examination of the instructional effectiveness of computer-based simulation games. *Personnel Psychology, 64*(2), 489–528.
Squire, K. (2005). Changing the game: What happens when video games enter the classroom?. Innovate: Journal of online education 1 (6). Retrieved December 3, 2018, from https://www.learntechlib.org/p/107270/.
Su, C., & Cheng, C. (2015). A mobile gamification learning system for improving the learning motivation and achievements. *Journal of Computer Assisted Learning, 31*(3), 268–286. https://doi.org/10.1111/jcal.12088.
Teo, T. (2008). Pre-service teachers´ attitudes towards computer use: A Singapore survey. *Australasian Journal of Educational Technology, 24*(4), 413–424.
Theodosiou, S., & Karasavvidis, I. (2015). Serious games design: A mapping of the problems novice game designers experience in designing games. *Journal of e-Learning and Knowledge Society, 11*(3), 133–148.
Tolman, E. C. (1932). *Purposive behavior in man and animals*. New York: Appleton-Century-Crofts.
Vis, B. (2012). The comparative advantages of fsQCA and regression analysis for moderately large-N analyses. *Sociological Methods & Research, 41*(1), 168–198.
Wagemann, C., Buche, J., & Siewert, M. B. (2016). QCA and business research: Work in progress or a consolidated agenda? *Journal of Business Research, 69*(7), 2531–2540.
Wang, A. I. (2015). The wear out effect of a game-based student response system. *Computers & Education, 82,* 217–227.
Woodside, A. G. (2014). Embrace• perform• model: Complexity theory, contrarian case analysis, and multiple realities. *Journal of Business Research, 67*(12), 2495–2503.
Woodside, A. G. (2016). The good practices manifesto: Overcoming bad practices pervasive in current research in business. *Journal of Business Research, 69*(2), 365–381. https://doi.org/10.1016/j.jbusres.2015.09.008.
Woodside, A. G., Ko, E., & Huan, T. C. (2012). The new logic in building isomorphic theory of management decision realities. *Management Decision, 50*(5), 765–777. https://doi.org/10.1108/00251741211227429.
Wu, J. H., & Wang, S. C. (2005). What drives mobile commerce? An empirical evaluation of the revised technology acceptance model. *Information and Management, 42*(5), 719–729.

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