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HIGHER EDUCATION STUDENTS' ATTITUDE TOWARDS THE USE OF GAMIFICATION FOR COMPETENCIES DEVELOPMENT

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Gamification is gaining momentum as an educational innovation to motivate and to engage students in their learning process. Nevertheless students' beliefs towards educational methodologies can affect both their motivation and attitude towards a given educational methodology. This study main goal is to explore key drivers of students' attitude towards the use of gamification as an educational methodology to develop their competencies. Using Keller's ARCS model (1987) a research model is developed and tested via Partial Least Squares (PLS) on a sample of 128 undergraduate students enrolled in a private Higher Education institution in Spain. Main results suggest that perceived attention, perceived relevance, and perceived confidence influence in a direct and positive way students' attitude towards the use of online educational video games to develop their competencies. Both attention and confidence also affects students' perceived relevance of online educational video games as a suitable means to develop their competencies. Managerial

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implications for managers of Higher Education institutions are addressed.

1 Introduction

Gamification is receiving an increasing attention from educational researchers as a means to increase students' intrinsic motivation to learn (Hanus & Fox, 2015). Literature suggests that both the nature of games and the elements that make games fun are intrinsically motivating (Adams *et al.*, 2012) providing a huge potential for educational application (Cheng, She & Annetta, 2015). It has also been stated that gamification allows to learn in new ways and also to enjoy otherwise tedious tasks (Hanus & Fox, 2015). The potential benefits of gamification seem especially relevant in e-learning contexts where several factors, including low student involvement, might threaten the effectiveness of e-learning. For example, despite the enormous success of MOOCs it has been criticized the low involvement of students in these type of Massive Online Open Courses (Dneprovskaya *et al.*, 2016) which translates in a high rate of drop out of MOOC students (De Waard *et al.,* 2011). Other benefits of a game-based approach to education include the immediate and frequent feedback of students' learning progress through visual displays and badges (Kapp, 2012). A constructivist approach to game-based learning has pointed out that the Social Play Continuum (Broadhead, 2006) concurs with Vygotsky´s Zone of Proximal Development 'by depicting a progression of social development through play" (Liu, Yuen & Rao, 2015, p. 11) providing a framework in which games can be used to develop social competence and social status (Liu, Yuen & Rao, 2015). Literature review also provides evidence that game-based learning improves competencies such as critical thinking and decision-making (Savard, 2015); problem-solving (Sung, Hwang & Yen, 2015); conflict-resolution (San Cristobal, 2015); and communication skills (Reinders & Wattana, 2014). Nevertheless, students are the real agents in their own learning process and the motivational drivers affecting their attitude towards any given educational methodology must be identified in order to successfully apply the appropriate teaching methodology. While previous research has focused in exploring the outcomes of using video games for educational purposes on knowledge acquisition, retention or social/soft skills (for a review see: Boyle *et al.,* 2015) to the best of our knowledge no previous research has analysed students' attitude towards the use of online video games as an educational methodology to develop their competencies. Moreover, despite all the potential of gamification to develop students' competencies most of extant research on game-based learning has been conducted with children or teenagers (Savard, 2015; Sung, Hwang & Yen, 2015; Reinders & Wattana, 2014) with few research focused on undergraduate students, postgraduate students or adult population

(Charland *et al.*, 2015; San Cristobal, 2015). This study main goal is to fill this research gap in the academic literature.

This paper structures as follows: first, we review literature on gamification and competencies and Keller's ARCS model (1987) before setting the hypotheses and presenting our research model. Second, we present the method used and the results. Finally, we address discussion, conclusions, limitations of the study, and future research lines.

2 The gamification of education

Gamification has been defined as 'the use of game design elements in non-game contexts' (Deterding *et al.,* 2011, p. 9) and has been applied to different contexts such as business, health care, and education. Although gamification is not limited to the use of technology-driven games for educational purposes (for example educational video games in the shape of *serious games*) video games account for a high percentage of all gamification efforts in education. Van Eck (2006) summarizes the use of video games in education in three main strategies: a) the use of commercial off-the-shelf videogames (COTS) that take advantage of the existence of contents in these games that can be used for educational purposes, b) the use of *serious games* –a type of video games developed with non-recreational purposes where learning is the primary goal–, and c) to make students build their own games allowing the development of problem-solving abilities, programming skills and game design skills. Examples of the use of commercial off-the-shelf videogames include the use of *SimCity* to strengthen leadership decision-making (Lin & Lin, 2014) and *RollerCoaster Tycoon 3* which has been used to support student learning of systems thinking (Shah & Foster, 2014). Serious games have been defined as 'video games (VGs) intended to serve a useful purpose" (Girard, Ecalle & Magnant, 2012, p. 207) where the 'useful purpose" is learning. Examples of the use of serious games include mass-market serious games like *Where in the World is Carmen Sandiego?* which was developed to teach geography (Sitzmann, 2011). Other examples of serious games are *ETIOBE Mates* which was developed to improve children's nutritional knowledge (Baños *et al.,* 2013) and *ECOPET* which was developed to educate learners to use home-energy conservatively (Yang, Chien & Liu, 2012). One example of making students to build their own video games as part of their learning process is the case provided by Yang and Chang (2013) where students designed digital games based on biology course content to enhance both retention of the course content and critical thinking skills. Even complex online video games such as MMORPGs (Massively Multiplayer Online Role-Playing Games) are now used in language teaching (for a review see: Reinders & Wattana, 2014). For example, Peterson (2010, 2011) found

that in a language learning context MMORPGs reduce anxiety and improve self-confidence because the anonymity and the reduced inhibition provided by personal avatars, and the reduction of paralinguistic cues in real-time chat.

3 Competencies and gamification

A competency-based education is a key asset for today students to success in a globalized workplace that challenges university graduate students' employability based on a better alignment between industry needs and classroom teaching (Strata-Etan Expert Group, 2002). It has been pointed out that nowadays the 'basic objectives of higher education consist of providing university graduates with a system of essential knowledge, abilities, and skills, and also of developing their capacity and readiness to put their knowledge to work in professional activity' (Noskov, 2007, p.70). Moreover, to achieve complex knowledge and to develop the ability to put knowledge into practice 'the competency-based approach has emerged as the new educational paradigm' (Charland *et al.,* 2015, p. 31). Extant literature suggests that gamification can contribute to develop high order cognitive abilities such as problem solving skills (Oblinger, 2004; Klopfer & Yoon, 2005). Previous research found that mobile serious games improved students' problem solving and collaboration skills (Sánchez & Olivares, 2011). Serious games have also been found to contribute the development of the so-called 21st Century skills such as teamwork, communication skills, and social/cultural skills (Romero, Usart & Ott, 2015). In this sense, gamification represents a great potential for a competency-based education in which 'the emphasis is not on the curriculum and domain specific knowledge but is oriented to a learner-centered and outcome-based approach' (*Ibidem*, p. 150). More specifically gamification facilitates scaffolded instruction based on each individual student's needs (Hanus & Fox, 2015) and provides each individual student immediate and frequent feedback on a trial-and-error learning process (*Ibidem*). Nevertheless, few research has delved into students' beliefs regarding gamification and competencies development. One such example is Fitó-Bertran, Hernández-Lara, & Serradell-López (2014) who explored students' perceptions about the effectiveness of business games to improve their competencies. To the best of our knowledge no previous research has delved into students' beliefs contributing a positive attitude towards the use of gamification to develop their competencies.

4 Hypotheses and model development

Keller's ARCS model (1987) is one of the most widely mentioned theories

of motivation in education which uses a multidimensional approach to measure the motivational drivers of individuals focusing on the following dimensions: i) attention, ii) relevance, iii) confidence, and iv) satisfaction. It has been suggested that Keller's ARCS model should become the standard by which games increase learning motivation (Karoulis & Demetriadis, 2005). In fact, Keller's ARCS model has been widely used to evaluate and design instructional programs' motivational stimuli (House, 2003; Chang & Lehman, 2002; Song & Keller, 2001; Wongwiwatthananukit & Popovick, 2000) and has also been tested in computer-based learning (Huang *et al.*, 2006) and gamification contexts (Su & Cheng, 2015; Dempsey & Johnson, 1998; Klein, 1992). Therefore, it is widely accepted that the ARCS model is suitable to investigate motivational issues in gamification contexts (Astleitner & Wiesner, 2004).

As all motivation theories, Keller's 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, Huang, & Tschopp, 2010). Motivation is therefore a result of an interaction between a situation and an individual and 'it is premised on an individual's desire for change, which is situationally driven' (Su & Cheng, 2105, p. 271).

Perceived attention and attitude

We conceptualize *attention* as students' beliefs that online educational video games will help them to focus their attention in learning activities aiming to develop their competencies. Keller's ARCS model (1987) assumes that media can moderate learners' attention and curiosity, this is, different media can increase attention and curiosity in different degree. In this sense, we assume that students will believe that the interactive and entertaining nature of online educational video games along with the novelty of this methodology will draw their attention to learning activities using online educational video games designed to develop their competencies. In fact, in a study conducted by Wang (2015) 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' (p. 224). Students also know that keeping attention during classroom activities is a key factor for succeeding in learning so we also assume that students believing that online educational video

games will draw their attention will show a positive attitude towards online educational video games designed to develop their competencies. Therefore the following hypothesis is posited:

H1: students believing that online educational video games will draw their attention will show a positive attitude towards online educational video games designed to develop their competencies.

Perceived attention and relevance

In Keller's ARCS model (1987) relevance is related to both the content that is taught (knowledge relevant to students' present and future career opportunities) and the way the content is taught. We assume that students believing that online educational video games will draw their attention to the learning activities designed to develop their competencies will perceived online educational video games as relevant for their process of competencies development because these online educational video games will help students to better focused in activities designed to develop their competencies. Therefore the following hypothesis is posited:

H2: students believing that online educational video games will draw their attention will perceive online educational video games designed to develop their competencies relevant to their learning process.

Perceived confidence and attitude

Confidence –or expectancy for success– might influence learners' persistence and accomplishment (Keller, 1987). Because fear of failure is important for students (*Ibidem*) we assume that students' believing that they can succeed when using online educational video games to develop their competencies will show a positive attitude towards the use of online educational video games to develop their competencies. Extant literature of game-based learning suggests that students better control their learning process by means of immediate and frequent feedback of games (Kapp, 2012). Game-based learning also allows scaffolded instruction based on each individual student's needs (Hanus & Fox, 2015) so students can learn at their own pace. The visual display of progress when using educational video games –i.e. badges– can also facilitate students' control of their learning process. Therefore the following hypothesis is posited:

H3: students believing they can successfully use online educational video games to develop their competencies will show a positive attitude towards

online educational video games designed to develop their competencies.

Perceived confidence and relevance

We assume that students believing they can successfully use online educational video games to develop their competencies will perceive online educational video games as relevant to their learning process. Relevance refers to a goal directed activity and confidence is related to the learners' impression that some level of success is possible if effort is exerted (Keller, 1987). This is, students will perceive online educational video games relevant if they believe they can successfully use online educational video games (confidence) to develop their competencies. Therefore the following hypothesis is posited:

H4: students believing they can successfully use online educational video games to develop their competencies will perceive online educational video games designed to develop their competencies relevant to their learning process.

Perceived relevance and attitude

Learners will perceive a course (or in this case online educational video games) relevant to the extent the course offers opportunities to satisfy different needs (affiliation, achievement...) (Keller, 1987). We assume that to the extent students perceive online educational video games relevant to achieve their goal (developing their competencies) students will show a positive attitude towards educational video games designed to develop their competencies. Therefore the following hypothesis is posited:

H5: students perceiving online educational video games relevant to develop their competencies will show a positive attitude towards online educational video games designed to develop their competencies.

Figure 1 depicts a graphical representation of the hypotheses and the research model.

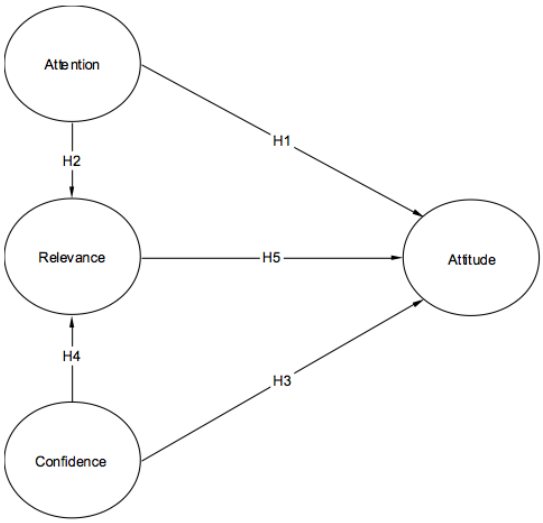


Fig. 1 - Research model and hypotheses.

5 Method

A quantitative design was used in this research. Data was gathered through self-administrated questionnaires using a convenience sample. Students were contacted on campus and gave their permission filling a written informed consent to take part in this research.

5.1 Participants

A total of 128 students enrolled in a private Spanish University filled in the self-administrated questionnaire. Of the sample, 28.95% of the students are enrolled in the Degree of Physiotherapy; 24.56% of the students are enrolled in the Degree of Marketing; 19.3% in the Degree of Criminology and Psychology; 11.4% in the Degree of Odontology; 5.26% in the Degree of Law; 4.39% in the Degree of Languages and Intercultural Communication; 3.51% in the Degree of International Relations; and 2.63% in the Degree of Architecture. The average age of the participants is 21.6 years old, being 52% females. Table 1 shows sample characteristics.

Table 1
SAMPLE CHARACTERISTICS

Characteristics	%
Gender	
Male	48
Female	52
Age	
17-19	35,54
20-22	43,8
23-25	10,74
26-41	9,92
Degree	
Architecture	2,63
Criminology and Psychology	19,3
Law	5,26
Physiotherapy	28,95
Marketing	24,56
Odontology	11,4
International Relations	3,51
Languages and Intercultural Communication	4,39

N = 128

5.2 Survey instrument

All items used to develop the questionnaire were adapted from existing scales. Perceived attention was measured adapting four items from Su & Cheng (2015) (i.e. 'Online educational video games can help me to focus on learning activities designed to develop my competencies'). Four items were adapted from (*Ibidem*) to measure perceived relevance (i.e. 'Online educational video games can be used as learning activities designed to develop my competencies'). Perceived confidence was measured adapting four items from (*Ibidem*) (i.e. 'I believe I can successfully use online educational video games to develop my competencies'). Attitude towards online educational video games was measured adapting three items from Chattopadhyay and Basu (1990) (i.e. 'I have a favourable attitude towards the use of online educational video games designed to develop my competencies'). All questionnaire items were measured using a 5-point Likert-type scale where (1) = strongly disagree, and (5) = strongly agree.

6 Results

We estimated the proposed theoretical model using Partial Least Squares (PLS) algorithm via SmartPLS 3.0 (Ringle *et al.*, 2014); 500 samples were bootstrapped to calculate the significance of the parameters. PLS was used for data analysis because is a powerful data analysis technique when small samples are used and because this technique does not make relative assumptions regarding data distribution (Chin & Newsted, 1999; Chin, Marcolin & Newsted, 2003).

Regarding design factors, the optimal sample size to estimate the model was calculate taking into account two factors: a) no formative indicators were used in the model, and b) the heuristic rule assumes the need of ten cases for predictor. Therefore, the optimal sample size is the result of multiplying ten cases for each one of the three predictors or latent variables conforming a dependent construct (Chin & Newsted, 1999), in this case, 30 cases. Our sample size (n=128) clearly satisfies this requirement.

Before testing the hypotheses, it was verified that the measures had the necessary conditions of reliability, convergent and discriminant validity. Table 2 shows the results of reliability and convergent validity. Indicators demonstrate the high internal consistency of the constructs. In each case, Cronbach's alpha exceeded Nunnally and Bernstein's (1994) recommendation of.70. Composite reliability represents the shared variance among a set of observed variables measuring an underlying construct (Fornell & Larcker, 1981). Generally, a composite reliability of at least.60 is considered desirable (Bagozzi & Yi, 1988). This requirement is met for every factor. Average variance extracted (AVE) was also calculated for each construct, resulting in AVEs greater than.50 (Fornell & Larcker, 1981). As evidence of convergent validity, results indicate that all items are significantly ($p<.01$) related to their hypothesized factors, and the size of all the standardized loadings are higher than.60 (Bagozzi & Yi, 1988).

Table 2
VALIDATION OF THE FINAL MEASUREMENT MODEL. RELIABILITY AND CONVERGENT VALIDITY

Factor	Indicator	Factor loading	*t* bootstrap	α	CR	AVE
Attention (ATN)	ATN1	.82*	19.84	.86	.91	.71
	ATN2	.86*	30.99			
	ATN3	.88*	43.24			
	ATN4	.80*	22.27			

Factor	Indicator	Factor loading	*t* bootstrap	α	CR	AVE
Relevance (REL)	REL1	.85*	36.57	.89	.92	.75
	REL2	.83*	27.16			
	REL3	.86*	34.78			
	REL4	.84*	28.09			
Confidence (CON)	CON1	.68*	10.08	.82	.88	.65
	CON2	.79*	19.31			
	CON3	.87*	32.49			
	CON4	.87*	44.05			
Attitude (ATT)	ATT1	.91*	54.44	.85	.91	.77
	ATT2	.89*	37.46			
	ATT3	.84*	18.27			

Note: α = Cronbach's alpha; CR = Composite Reliability; AVE = Average Variance Extracted
*p < .01

Evidence for discriminant validity of the measures (table 3) was tested checking that the shared variance between pairs of constructs was less than the corresponding AVE (Fornell & Larcker, 1981). No special problems arise. On the basis of these criteria, we concluded that the measures in the study provided sufficient evidence of reliability, convergent and discriminant validity.

Table 3
VALIDATION OF THE MEASUREMENT MODEL. DISCRIMINANT VALIDITY

	1	2	3	4
1. Attention	.84			
2. Relevance	.77	.86		
3. Confidence	.70	.77	.81	
4. Attitude	.74	.77	.80	.88

Note: Diagonal represents the squared root of the average variance extracted; while below the diagonal the covariance between constructs are represented

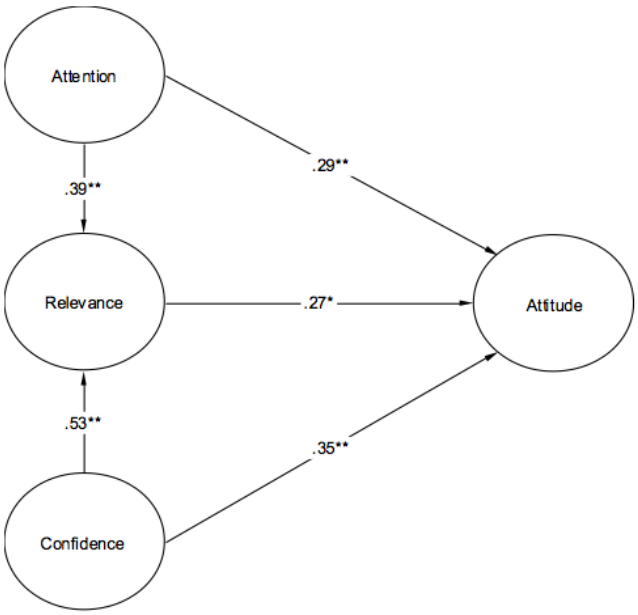
We provide the results of the model estimation in table 4. The model estimation shows that students' beliefs about the capacity of online educational video games to draw their attention positively influences students' attitude towards online educational video games designed to develop their competencies (β=.29, p<.01; H1 accepted). Students believing that online educational video games will draw their attention also perceive online educational video games designed to develop their competencies relevant to their learning process (β=.39, p<.01; H2 accepted). Furthermore, a positive confidence

towards successfully using online educational video games to develop their competencies exert a positive and significant effect on attitude (β=.35, p<.01; H3 accepted) and perceived relevance (β=.53, p<.01; H4 accepted). Finally, students' beliefs about the relevance of online educational video games to develop their competencies have a significant but less intense effect on their attitude towards online educational video games designed to develop their competencies (β=.27, p<.05; H5 accepted). Figure 2 illustrates the results of our study.

Table 4
STRUCTURAL EQUATION MODELLING: CAUSAL RELATIONS ANALYSIS

H#	Structural relations	λ	*t* Bootstrap	Contrast
H1	Attention → Attitude	.29**	3.74	Accepted
H2	Attention → Relevance	.39**	6.29	Accepted
H3	Confidence → Attitude	.35**	3.90	Accepted
H4	Confidence → Relevance	.53**	8.49	Accepted
H5	Relevance → Attitude	.27*	2.48	Accepted

* = p < .05; ** = p < .01
R2 (Attitude) = .68; R2 (Relevance) = .72
Q2 (Attitude) = .54; Q2 (Relevance) = .57



* = p < .05; ** = p < .01

Fig. 2 - Research model results.

7 Discussion

All proposed relationship have been found to be statistically significant providing a robust framework to model students' attitude towards the use of online educational video games designed to develop students' competencies. Students believing that online educational video games will draw their attention show a positive attitude towards the use of online educational video games designed to develop their competencies. A main implication for instructors is that instructors must carefully choose online educational video games features which will not fail in attracting students' attention. This is important because video games widely vary in terms of genres and gameplay and game design elements can be either drivers or barriers to draw students' attention towards an online educational video game. Moreover, previous research found gender differences related to attitudes towards using instructional games (Bressler & Bodzin, 2013) and gameplay (Bonanno & Kommers, 2008) so instructors using online educational video games designed to develop students' competencies should pay special attention to video game features in order to satisfy both females and males requirements in order to successfully attract their attention based in design features or themes used in the video game.

Perceived confidence to successfully use online educational video games designed to develop students' competencies also drives a positive student's attitude towards the use of online educational video games so instructors should pay attention to the level of difficulty of the online educational video game. Some video game genres are easier to play than others (for example, a paddle video game versus a *Massively Multiplayer Online Role-Playing Game* or MMORPG) so instructors using online educational video games designed to develop students' competencies should check both students' gaming literacy and the difficulty of the online educational video game in order to prevent students' drop out and frustration if the online educational video game demands are higher that students' competencies to deal with the game.

Although students' perceived relevance of the use of online educational video games to develop their competencies also drives a positive attitude towards the use of online educational video games this effect is significant in a lower degree than the other analysed constructs (0.05 level). This result suggests that students might be not totally sure about the suitability of using educational video games to develop their competencies. Even for students who play video games during their leisure time some prejudices might arise related to the use of video games for learning purposes. Instructors using online educational video games designed to develop students' competencies should start the instruction period pointing out the benefits of using online educational video games and the suitability of using online educational video games to

develop students' competencies to avoid students' prejudices about the use of video games in education. In this sense, because both perceived attention and perceived confidence contribute to students' perceived relevance of the use of online educational video games designed to develop students' competencies, instructors might use both design features (attention) and difficulty (confidence) to increase students' perceived relevance of the use of online educational video games to develop their competencies. For example, students might perceive as not relevant an extremely simple video game they cannot relate to competencies development. Information about why, how and what for can help instructors to increase students' perceived relevance of the use of online educational video games to develop their competencies.

Conclusions, limitations, and future research

This study main goal was to develop and to empirically test a research model of factors contributing students' attitude towards the use of online educational video games designed to develop their competencies. Main findings suggest that all analysed variables (perceived attention, perceived confidence, and perceived relevance) contribute positively to students' attitude towards the use of online educational video games designed to develop their competencies. Managers of Higher Education institutions can use these findings to better design Teacher Training Programmes which address students' expectations when using online educational video games designed to develop their competencies. We can summarize students' expectations in three main areas: a) online educational video games designed to develop students' competencies must contain features which draw students' attention to the online educational video games, b) online educational video games designed to develop students' competencies must be balanced, taking into account the level of difficulty and students' gaming competences, c) online educational video games designed to develop students' competencies must be perceived as relevant by the students. Both perceived attention and perceived confidence can be increased by game design while perceived relevance can be increased by the instructor himself pointing out to students why the online educational video games is being used to develop their competencies, how will be used and which is the expected learning outcome.

A main limitation of this study is the sample used both in terms of size and sampling method. Although using a convenience sample of 128 undergraduate students provides an exploratory approach to the topic, future research should use a probabilistic sample in order to generalise our findings to the target population. This research is quantitative in nature. More qualitative research is needed to more deeply delve into the factors included in this research model. For example, why students perceive as relevant (or not) the use of online

educational video games designed to develop their competencies? Which online educational video game features (for example, a real-time chat) increase students' attention towards online educational video games?

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