

Published in: Gomes, M.J., Osório, A.J., & Valente, A.L. (Orgs.) (2017). Challenges 2017: Aprender nas nuvens, Learning in the clouds, pp.605-620. Universidade do Minho – Centro de Competência.

USE OF VIDEOGAMES IN HIGHER EDUCATION IN PORTUGAL: A LITERATURE REVIEW

Marta Pinto, Universidade do Porto, martapcarvalho@fpce.up.pt,

Pedro Ferreira, Universidade do Porto, pferreira@fpce.up.pt

Abstract: This article presents a literature review about the educational use of videogames in the context of Higher Education in Portugal. This contribution emerges from the project "Serious Games in Higher Education: Impacts, Experiences and Expectations," which has as one of its aims, to contribute to characterize how students and teachers in Higher Education in Portugal relate to video games and serious games, particularly in educational settings. The literature review reveals an underdeveloped field with most of the studies in the area being published in conference proceedings, and focused on the use and perception of video game by students of Higher Education institutions.

Key-words: videogames; serious games; learning; teaching; higher education.

Resumo: Este artigo apresenta uma revisão de literatura sobre o uso educativo dos videojogos no contexto do ensino superior em Portugal. Este contributo emerge do projeto "Jogos Sérios no Ensino Superior: impactos, experiências e expectativas," que tem como um dos objetivos contribuir para caracterizar como os/as estudantes e os/as docentes do Ensino Superior em Portugal se relacionam com videojogos e jogos sérios, particularmente em contextos educativos. A revisão de literatura revela uma área subdesenvolvida, com a maioria dos estudos publicados em atas de conferências, e focados no uso e perceção sobre os videojogos por estudantes de instituições de Ensino Superior.

Palavras-chave: videojogos; jogos sérios; ensino; aprendizagem; ensino superior.

1. Introduction

There is a visible investment in educational technologies and serious games are part of this trend. Not only the number of serious games has grown rapidly in recent years but their educational uses have multiplied (Young et al., 2012), and this includes tertiary education (Lean et al., 2006). The number of educational games available is growing rapidly, and current uses of video games in education are multiple (Young et al., 2012). Games designed for educational purposes are seen as effective, for example, in motivating students for learning, and in fostering behavior change (Boyle et al., 2012;

Connolly et al., 2012). The case is not radically different when we look at higher education. There is evidence of games especially simulations being used in tertiary education (Lean et al., 2006), and some authors are advocating for the use of serious games to learn complex skills and presenting frameworks and toolkits for the design of serious games to be used at this educational level (e.g. Nadolski et al., 2007; Westera et al., 2008). This presupposes a growing acceptance of the educational potential of videogames (Young et al., 2012), even though it should be noted that resistance and lack of information continue to be present and challenging the adoption of this kind of strategy (Lean et al., 2006).

Aiming to provide up-to-date knowledge on the use of videogames in educational contexts in Portuguese Higher Education Institutions, this paper reviews national studies, analysing the perceptions of use and types use of videogames, as far as educational practice is concerned. This paper documents a first step of a project being developed at the Faculty of Psychology and Education Sciences of University of Porto: “JoSeES - Serious Games in Higher Education: Impacts, Experiences and Potential” (2016-2019). JoSeES aims to contribute towards understanding how Higher Education students and lecturers relate to videogames and serious games, particularly in educational contexts and to further methodologies that can support better uses of these games as educational tools, thus addressing a commonly identified gap in the literature. The main goal of this paper is to make an overview of the studies published between 2006 and 2017 on the use of videogames in Portuguese Higher Education Institutions, in order to update and systematize relevant information to characterize the field of videogames use in Higher Education contexts.

It should be noted that not only literature regarding the Portuguese context is lacking, but also that no prior systematization was found published, which further justifies the present literature review. A better understanding of the research conducted in Portugal, can also contribute to the larger questions of the potential and impact of videogames in teaching and learning contexts. This paper is organized in 3 sections: (i) the methodology; (ii) main results, including a brief reference to the selected documents and their qualitative analysis; (iii) concluding remarks.

2. Methodology

The present literature review covers documents published over the last 10 years, regarding the educational use of videogames in Higher Education Institutions in Portugal. The analysis followed three phases:

- a) The first phase consisted in collecting both empirical and theoretical documents concerning the use of videogames within an educational setting in Higher Education Institutions in Portugal, over the last 10 years – the wide timeframe was chosen due to the scarce number of publications. All the documents that did not match this criteria were excluded.
- b) The second phase consisted in identifying and organizing the listed documents on a grid describing the main purposes, categorizing them by type of publication and main topic.
- c) The third phase consisted of a qualitative analysis of the published results.

2.1. Search strategy

The search strategy included a broad search in the Portuguese Scientific Repository Open Access RCAAP (Repositório Científico de Acesso Aberto de Portugal)¹, Portuguese open access journals such as *Indagatio Didactica*², *Educação Sociedade & Culturas*³, *Formação & Tecnologia*⁴, and search in the proceedings on related topics such as Challenges, TICEDUCA, Ciências e Arte dos Videojogos, Encontro sobre Jogos & Mobile Learning. These choices reflect a concern with including the relevant search locations for national publications on this specific topic. An additional search was also made using Google Scholar.

The search was conducted during the month of February of 2017 and used the following keywords (both in the Portuguese and English languages): serious games, videogames, digital games, games and higher education.

The low number of resulting references that appeared in all the searches combining the keywords listed above led to the decision of both widening the timeframe and the inclusion of more and more diverse sources.

1 RCAAP <https://www.rcaap.pt/>

2 *Indagatio Didactica* <http://revistas.ua.pt/index.php/ID/>

3 *Educação Sociedade & Culturas* <http://www.fpce.up.pt/ciie/?q=publication/revista-educacao-sociedade-culturas/page/revista-esc-educacao-sociedade-culturas>

4 *Formação & Tecnologia* <http://eft.educom.pt/index.php/eft>

After identifying the preliminary set of documents, each reference was analysed in order to identify their correspondence towards the defined criteria of: i) date: documents published between 2006 and 2017; ii) context: related to Portuguese Higher Education; iii) domain: support to teaching and learning practices; and iv) aim: use of videogames.

3. Main results

The systematic search of published material produced a limited number of documents, a total of 12 documents, which could be included in this review. The documents were analysed by publication type, and main topics (Table 1).

Table 1: Documents by authors, type of publication and main topics of publication.

Authors	Type of publication	Main topic
Barroso, B. & Ribas, D. (2009).	Proceedings	Academic production of videogames
Barroso, B., Ribas, D. & Lopes, R. P. (2009).	Proceedings	Academic production of videogames
Carvalho, A.A., Cardoso, I. C., Zagalo, N., Gomes, T., Barros, C., Moura, A., & Cruz, S. (2014).	Proceedings	Use of videogames by students
Carvalho, A. A., Araújo, I., & Fonseca, A. (2015).	Journal paper	Use of videogames by students
Correia, A., Merelho, A., Marques, A., Pereira, D. J., Cardoso, V., & Coutinho, C. (2009).	Proceedings	Use of videogames by students
Lopes, C. & Andrade, A. (2008).	Proceedings	Use of videogames in class by teachers
Lopes, N. & Oliveira, I. (2012).	Proceedings	Use of videogames by students
Lopes, P. N. (2012).	Master thesis	Use of videogames by students
Oliveira, R. & Pessoa, T. (2008).	Proceedings	Use of videogames by students
Oliveira, R., Pessoa, T., & Taborda, C. (2009).	Proceedings	Use of videogames by students
Rocha, A., Reis, A., Ferreira, C., Cardoso, D., & Matias, V. (2016).	Proceedings	Use of videogames by students
Zagalo, N., Carvalho, A. M., & Araújo, I. (2016).	Journal paper	Use of videogames by students

3.1. Type of publications

An illustration of the papers included in the review categorized by type can be found in Figure1. The majority of publications (9) were published in conference proceedings from six different conferences. There are also journal papers (3) and an academic dissertation (1) included.

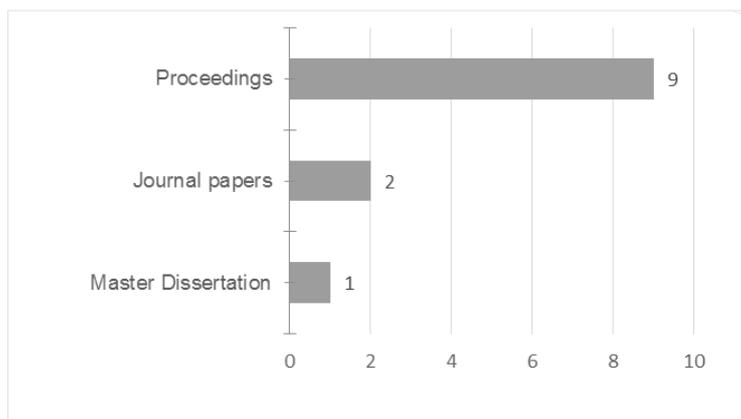


Figure1. Type of publication of selected documents

3.2. Videogame use in Higher Education

The documents selected were organized according to main topics related to the type of use of videogame in Higher Education in Portugal. The documents were divided into three main categories (Figure2): Academic production of Videogames; Use of videogames in class by teachers; Use of videogames by students. The categories are mutually exclusive.

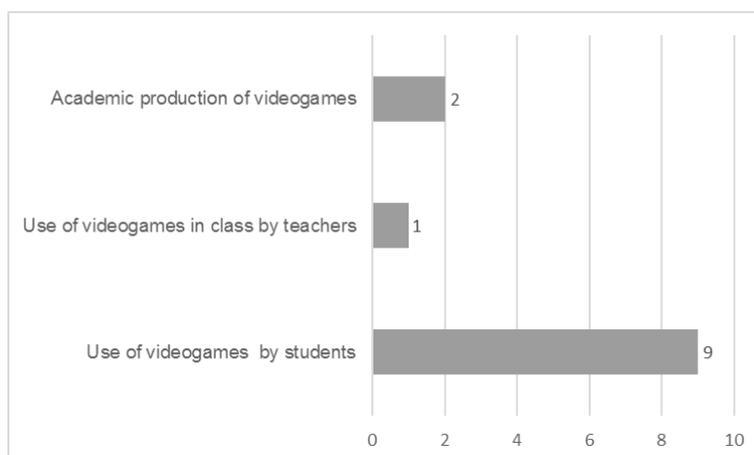


Figure2. Number of documents per categories

3.2.1. Use of videogames by students

The documents collected in this category (8) relate to data collected regarding the use and perceptions of use of videogames by students inside and outside Higher Education classrooms. The results correspond to data collected between years 2008 and 2013, mostly survey data collected using questionnaires applied to students from a total of four Portuguese Higher Education Institutions.

Survey data collected by Oliveira and Pessoa in the year of 2008, include a sample of 689 respondents from one University, with an average age of 19,6 years, of which 63.3% stated to be videogame players (Oliveira & Pessoa, 2008; Oliveira *et al*, 2009). The results were published in two different papers in conference proceedings (Oliveira & Pessoa, 2008; Oliveira *et al*, 2009). The survey had the main goals of describing the profile of videogame players and understanding their motivations to play. Their results highlighted two main findings. The first regards students' main motivations to play videogames, mostly related to the challenge, the rewards and the fun elements of the game played. The second main result revealed that students considered the biggest benefit of playing videogames located in the cognitive dimension involving gains in attention, memory, concentration, reasoning, speed and thinking strategy (Oliveira & Pessoa, 2008; Oliveira *et al*, 2009).

Correia *et al* in the year of 2009, also collected survey data using a questionnaire in this case with a sample of 56 respondents from a single University, of which 28 (50%) stated to play videogames (Correia *et al*, 2009). The results were published in a conference proceeding. Regarding the educational outcomes of videogames, almost all the students agreed that learning can happen when playing videogames, although this agreement was more prevalent in students with ages below 25. Students considered a videogame to be more effective in supporting learning, when it corresponds to one or more of the following main categories: the game is built specifically with an educational purpose; seeks to develop thinking skills; seeks to develop skills such as problem solving; seeks to foster cognitive development; and seeks to develop sensory skills.

Survey data collected by Lopes in year 2012, using a questionnaire, had a sample of 161 respondents from two Universities (Lopes, 2012). The data was collected as part of an academic dissertation study, and the results were published in two different

publications: the academic dissertation (Lopes, 2012), the proceeding of a conference (Lopes & Oliveira, 2012). The questionnaire was divided into sections about students habits, motivations and perceptions about playing videogames. Results showed that the majority of students play videogames as a way to have fun (70,5%), they like to play mostly because of the enabled progress along the game (70,1%,) and because of the challenge of the game (64%). The survey exposes students perceptions regarding educational dimension of videogames. Results showed that the majority of students with ages between 18 to 27 years perceive that playing videogames can also be an educational activity (57.2%). The learning activities marked by students were: learning a foreign language (82.2%); learning the rules and ways of playing different sports (77.4%); learning to use Information and Communication Technologies (75.4%); developing cognitive strategies (66.9%); improving concentration (59.3%); and improving decision-making skills (52.9%). In a somewhat contradictory perception, the same students considered that playing videogames has an impact in their study, leading them to dedicate less time to study (68.7%). This can be verified when looking at the time spent playing videogames, that students state was reduced when they entered university (69,9%), driving students to play mostly during vacations (47%) (Lopes, 2012; Lopes & Oliveira, 2012). Additionally, the author recognized that these students play a wide variety of v of various types (e.g. puzzle; action; strategy; simulation), and identified 52 different games listed by students which included popular commercial games such as Tetris, Call of Duty and The Sims. More recent survey data collected using a questionnaire in the year 2013, in a study with diverse authors (Carvalho, Cardoso, Zagalo, Gomes, Barros, Moura & Cruz, 2014; Carvalho, Araújo & Fonseca, 2015; Zagalo, Carvalho & Araújo, 2016) through an inquiry by questionnaire, with a sample of 1101 university students of which 626 were videogame players. The questionnaire targeted a wide audience of students from different educational levels (basic, secondary education, and Higher Education), but we will only look at results from Higher Education students. The results were published in three publications, one in conference proceedings (Carvalho *et al*, 2014), two in journal papers (Carvalho, Araújo & Fonseca, 2015; Zagalo, Carvalho & Araújo, 2016). The questionnaire was divided in four dimensions: the profile of the students; their habits of playing games; their game preferences; and learning with videogames. According to the authors (Carvalho *et al*, 2014; Araújo & Fonseca, 2015; Zagalo, Carvalho & Araújo, 2016), the results showed that these Higher Education students play videogames an average of

4,2 hours per week. The type of games played is diverse – it includes puzzle, action, strategy and action games – and the researchers registered a total of 177 different games, of which most were mentioned by only one student, that included, among others, popular commercial games such as Candy Crush, Angry Birds, League of Legends, and The Sims. Regarding the educational dimension of videogames, a high percentage of students stated they would like to use videogames in the classroom context as complement to learning (78,12%), mainly referring to three game types (Table 2):

Table2: Preference by game type; n=489 students who listed games (Carvalho et al, 2015, p.37)

Game type	Students (n=489)
Strategy	72,8%
Simulation	58,7%
Action	41,9%

In the study performed by Rocha, Reis, Ferreira, Cardoso & Matias (2016), data was collected using a questionnaire in a survey to Higher Education students of one University. With a sample of 24 students the paper presents the results regarding the four dimensions present in the questionnaire: perceptions about ICT; the use of ICT in class; the impact of ICT in teaching and learning; and use of mobile devices and games to promote learning. Given the topic of this review, we will focus on the results presented concerning the use of mobile devices and games to promote learning. Results show that most students agree or strongly agree that it is possible to learn curricular content playing digital games (12; 50%), that digital games can motivate learning (15; 62,5%), and that the use of digital games contributes to better learning (14; 58,3%). In contrast, a smaller number of students disagree that it is possible to learn curricular content playing digital games (5; 20,8%), that games can motivate learning (3; 12,5%), or contribute to better learning (3; 12,5%) (Rocha, *et al*, 2016).

3.2.2. Use of videogames by teachers in class

The document found to fit this category relates to the use and perceptions of use of computer simulators in the classroom, by lecturers in Higher Education contexts. The results correspond to data collected in 2008 (date of publication, but without a specific date of the data collected) and 2013, using a questionnaire and interviews with teachers of Portuguese Higher Education Institutions.

In the study published by Lopes and Andrade (2008), data was collected using a questionnaire, responded by 216 teachers teaching courses related to Economics and Management, from a total of 12 Higher Education Institutions. This study replicated the study developed by Lean, Towler & Abbey (2006) and comparable data is presented. Nevertheless, we will focus only on the results regarding the use, and perceived barriers to the use of simulation games to support teaching and learning in courses related to Economics and Management. Results revealed lecturers have an overall positive experience related using computer simulators in class with 31,5% of the teachers inquired stating that they have used this as a support to teaching and learning. A high percentage of lecturers disagreed with statements about students negative reaction to the use of simulators (76,9%). Additionally, lecturers were also found to disagree with the idea that there is a high risk in integrating simulators in the classroom (69,8%).

The main effective barriers to the use of simulators in class that were identified, concerned the limited time lecturers say they have to use simulators in class (70,4%), and the limited access to the necessary resources (65,3%). The main effective barriers overlapped with the perceived barriers as lecturers perceived as barriers, the lack of training, the lack of access to adequate resources and the lack of openness of the institution to new educational approaches (Lopes & Andrade, 2008).

3.2.3. Academic production of Videogames

The documents collected in this category (two in total) were published in conference proceedings. They address the topic of academic production of videogames.

The papers by Barroso & Ribas (2009) and Barroso, Ribas & Lopes (2009), present the syllabus of a degree in Game Design, that was offered by Escola Superior de Comunicação, Administração e Turismo (EsACT) and which was starting in the academic year of 2009/2010. The first paper presents the detailed structure of the syllabus, the courses included, and the profile of the professionals they intend to train. The publication also underlines the lack of university training focused on the production of videogames, offered at a national level at the time of the publication. The second paper summarizes of the Portuguese scenario regarding other academic courses offered in Higher Education Institutions in the domain of development of videogames.

Both publications highlight the lack of training offers in videogame development in Higher Education.

4. Perspectives on educational use of videogames

Research concerning Videogames and their use in educational settings in Higher Education embraces different focuses of analysis, and three types of actors involved in the use of videogames: students, lecturers and institutions. Figure 3 shows the target sample (student; teacher; and institution), which is the object of the publications analysed. Most of the publications concern the study of perceptions of use and use of videogames by students in learning processes (9). Publications that focus on the perspective of the lecturers about the use of videogame in class (1) or in the offers in terms of degrees on Videogame development training by Higher Education Institutions (2) are present as well but in smaller numbers.

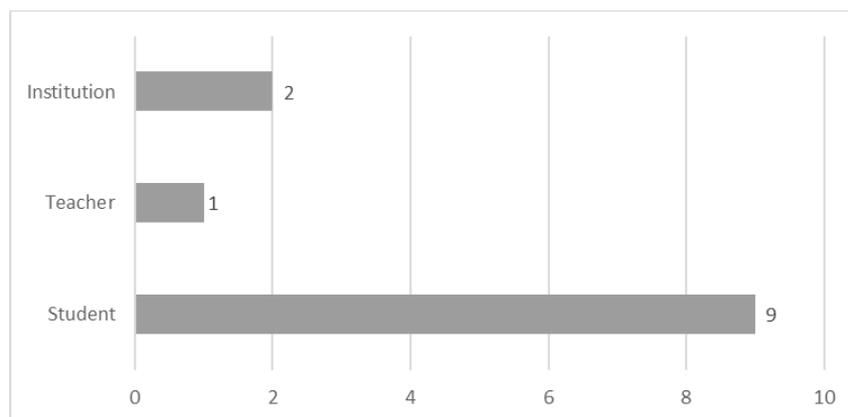


Figure 3: Perspectives of use of videogames

5. Final Remarks

This study is surely limited and does not claim to present an exhaustive or complete portrait of the use of videogames in Higher Education in Portugal. Even though it followed a systematic approach to the identification of relevant literature to review there may be research outlets that were not reached. Nevertheless, the documents analysed revealed some regularities that should be noted: survey data is predominant, and questionnaires were mainly applied to Higher education students, to understand their use of videogames and their perceptions and experiences in the use of videogames for educational purposes. The results reveal that a high percentage of students state that

they play videogames and identify a wide variety of videogames from different genres (Carvalho *et al*, 2014; Carvalho, Araújo & Fonseca, 2015; Zagalo, Carvalho & Araújo, 2016; Lopes, 2012). Results also showed students' perceptions regarding educational dimension of videogames are positive (Oliveira & Pessoa, 2008; Oliveira *et al*, 2009; Correia *et al*, 2009), and that they would like to play videogames as an integrated activity in class (Carvalho *et al*, 2014; Carvalho, Araújo & Fonseca, 2015; Zagalo, Carvalho & Araújo, 2016; Rocha, *et al*, 2016).

A smaller number of studies focused on the perspective of understanding the perceptions and experiences of lecturers regarding the use of videogames in class, although the practices described focused on the specific use of computer simulator games used in business or management classes (Lopes & Andrade, 2008; Kikot, Magalhães & Fernandes, 2013). Lecturers revealed positive perceptions regarding students motivation in the use of simulators in class, and considered this integration of the game in classroom not to constitute a risk for their teaching practice (Lopes & Andrade, 2008). They also identified relevant barriers linked mostly to time and resources that can hinder the use of videogames as educational tools (Lopes & Andrade, 2008).

Ana even smaller number of publications related to the institutional offer of training related to videogame development, but with no description of impacts or outcomes (Barroso & Ribas, 2009; Barroso, Ribas & Lopes, 2009).

The lack of published material in the field in Portugal is also made clear by this review. Keeping up-to-date with the information related to the adoption of videogames in Higher Education in Portugal and their impact on the teaching and learning practices is a necessary and underdeveloped task. The reduced number of publications highlights the need to further the understanding the educational use of videogames in Higher Education, and the exploration of the possibilities they open in terms of teaching and learning in Higher Education Institutions.

6. Acknowledgements

This work was funded by the Portuguese Foundation for Science and Technology (FCT) in support to the project under reference PTDC/MHC-CED/7182/2014.

References

- Barroso, B. & Ribas, D. (2009). Contextualização da licenciatura em design de jogos digitais no panorama português. Proceedings of Simpósio Brasileiro de Games e Entretenimento Digital SBGames, São Paulo, Brasil.
- Barroso, B., Ribas, D. & Lopes, R. P. (2009). Configuração de uma licenciatura em design de jogos digitais. Proceedings of Ciências e Artes dos Videojogos, University of Aveiro, Aveiro, Portugal.
- Boyle, E. A., Connolly, T. M., Hainey, T., & Boyle, J. M. (2012). Engagement in digital entertainment games: A systematic review. *Computers in Human Behavior*, 28(3), 771–780. doi:10.1016/j.chb.2011.11.020
- Carvalho, A.A., Cardoso, I. C., Zagalo, N., Gomes, T., Barros, C., Moura, A., & Cruz, S. (2014). Os jogos mais jogados pelos alunos do Ensino Básico ao Ensino Superior. Proceedings of 2º Encontro de Mobile Learning, Braga, Portugal.
- Carvalho, A. A., Araújo, I., & Fonseca, A. (2015). Das Preferências de Jogo à Criação do Mobile Game Konnecting: um estudo no ensino superior. *RISTI-Revista Ibérica de Sistemas e Tecnologias de Informação*, 16, 30-45.
- Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*, 59(2), 661–686. doi:10.1016/j.compedu.2012.03.004
- Correia, A., Merelho, A., Marques, A., Pereira, D. J., Cardoso, V., & Coutinho, C. (2009). Videojogos e Educação: estudo da relação existente entre a utilização de videojogos e hábitos de estudo. Proceedings of Videojogos 2009, University of Aveiro, Aveiro, Portugal.
- Lean, J., Moizer, J., Towler, M., & Abbey, C. (2006). Simulations and games: Use and barriers in higher education. *Active Learning in Higher Education*. doi:10.1177/1469787406069056
- Lopes, C. & Andrade, A. (2008). Jogos e Simuladores no Ensino Superior de Economia e Gestão em Portugal. Proceedings of Simpósio Internacional de Informática Educativa SIIE, University of Salamanca, Salamanca, Spain.
- Lopes, P. N. (2012). Videojogos e desenvolvimento de competências: estudo sobre a perspetiva dos estudantes universitários. (master's thesis). Universidade Aberta, Lisboa, Portugal.

- Lopes, N. & Oliveira, I. (2012). Videojogos e Desenvolvimento de Competências nos Estudantes Adultos. *Atas do Encontro sobre Jogos e Mobile Learning*: 35-45.
- Nadolski, R. J., Hummel, H. G. K., van den Brink, H. J., Hoefakker, R. E., Slootmaker, A., Kurvers, H. J., & Storm, J. (2007). EMERGO: A methodology and toolkit for developing serious games in higher education. *Simulation & Gaming*. doi:10.1177/1046878108319278
- Oliveira, R. & Pessoa, T. (2008). Benefícios Cognitivos dos Videojogos: A percepção dos jovens adultos. *Proceedings of ZON Digital Games 2008*, Catholic University, Porto, Portugal.
- Oliveira, R., Pessoa, T., & Taborda, C. (2009). Aprender com os videojogos: a percepção dos jovens adultos. *Proceedings of X Congresso Internacional Galego-Português de Psicopedagogia*, University of Minho, Braga, Portugal.
- Rocha, A., Reis, A., Ferreira, C., Cardoso, D., & Matias, V. (2016). O uso das Tecnologias de Comunicação na Educação: resultados de um inquérito na Universidade Portucalense. *Proceedings of 3º Encontro sobre Jogos e Mobile Learning*, University of Coimbra, Coimbra, Portugal.
- Westera, W., Nadolski, R. J., Hummel, H. G. K., & Wopereis, I. G. J. H. (2008). Serious games for higher education: A framework for reducing design complexity. *Journal of Computer Assisted Learning*, 24, 420–432. doi:10.1111/j.1365-2729.2008.00279.x
- Young, M. F., Slota, S., Cutter, a. B., Jalette, G., Mullin, G., Lai, B., ... Yukhymenko, M. (2012). Our Princess Is in Another Castle: A Review of Trends in Serious Gaming for Education. *Review of Educational Research*, 82(1), 61–89. doi:10.3102/0034654312436980
- Zagalo, N., Carvalho, A. M., & Araújo, I. (2016). Elementos do design de videojogos que fomentam o interesse dos jogadores. *Educação, Sociedade & Cultura*, 48, 169-190.