

ACQUISITION OF SKILLS THROUGH SERIOUS GAMES IN THE ACCOUNTING AREA: AN EMPIRICAL ANALYSIS

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Abstract

The current higher education system is based on active learning by the student focused on the development of generic and specific competencies. In this context, many authors defend the use of simulations that promote such learning and the so-called " *serious games* " (*SG*) adapt to this challenge. However, the push that could be expected from the development of new technologies and the arrival of the so-called " digital natives " to the classrooms is not coherent . neither with its degree of implementation nor with the limited research developed on the effectiveness of its use. The objectives of this study are to describe a teaching experience of implementing a SG in the university setting of a management accounting subject and to evaluate the acquisition of both generic and specific competencies previously defined as the objective of said subject, through the analysis of perception of the students. Two pre- and post-activity questionnaires are used , and it is concluded that, a priori, there is no There appear to be neither technological nor demographic barriers to its use. Additionally, students perceive that the SG contributes significantly to the acquisition of skills. We also directly observe that teamwork is encouraged . _ _ _ This work contributes to the scarce empirical research on the use and potential of SGs as effective instruments of learning, specifically in the field of university education in the area of management.



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Introduction

The adaptation of education and training systems to the needs posed by today's society has meant that competency-based learning has become firmly established in pedagogical discourse and in European and international educational policies . Modern effective learning theories suggest that learning is most effective when it is active, experiential , problem - based , and when it provides immediate feedback (Boyle, Connolly , & Hailey, 2011; Benzanilla, Arranz, Rayón, Rubio, Menchaca, Guenaga et al. al., 2014). There are many authors who maintain that the most appropriate teaching methodologies should be based on simulations that are as close as possible to reality, in which the student takes an active role (Marcelo, Yot and Mayor, 2015). In fact, university education at ~~initial~~ level and, specifically at a European level based on the convergence process within the EHEA , has faced this change of educational paradigm in which how one learns (learning theories and approaches), together with how one teaches (teaching methods) become fundamental axes of it (González and Wagenaar , 2003) .

Additionally, in recent years there has been a change in perception about the way of learning of the so-called " NET " generation (Oblinger and Oblinger , 2005 ; Piscitelli , 2006; Urquidi and Calabor, 2014) or digital natives , who operate comfortably and naturally with multimedia information , which _ _ _ They consume data simultaneously from multiple sources and expect immediate responses .

In this context, technology offers an opportunity to transform university teaching and optimize the quality of student learning. These teaching media or resources help create different and conducive environments for learning , linking abstract concepts with real-world problems (Ben-Zvi, 2010). In this sense , Deterding , Dixon, Khaled and Nacke (2011) argue that in the last three decades video games have become a cultural and source of training experiences as for previous generations were literature, cinema or television.

The technology, rhetoric, references and metaphors, the way of thinking and the practices that derive from games permeate today's society (Deterding et al., 2011 , p.10). For its part, as Kapp (2012) states , games are the ideal environment for learning, they allow learning from mistakes, stimulate critical thinking and provide the student with a feeling of control over their learning. They are a way to take advantage of the student's commitment and imagination .

The term *serious games* (SG) refers to the games used in training and education, whether they are simulations, video games, virtual worlds or augmented reality. Many authors consider ICT in general and SG in particular, as useful methods to ~~spot~~ the teaching - learning process and as adequate resources for the development of competencies (Marcano , 2008 ; Gandía , Montagud and Calabor, 2008; Gee, 2009; Arias Aranda, Haro Domínguez and Romerosa Martínez, 2010; Connolly, Boyle, MacArthur, Hainey , & Boyle, 2012; Ranchhod, Gurău, Loukis and Trivedi, 2014 , Fitó Bertran, Hernández Lara and Serradell-López, 2014). Thus Johnson, Adams Becker, Estrada and Freeman (2014) They conclude that game-based learning allows the acquisition and practice (in simulated real contexts) of competencies and skills such as collaboration, problem solving, communication, critical thinking or digital literacy, among others. Simulation games allow you to develop experiences in which to put them into practice and train situations close to real life (Ritterfeld, Shen, Wang, Nocera & Wong, 2009; Romero & Turpo Gebera, 2012; Guenaga & Arranz, 2013).

Despite this , the use of SG in the university classroom is something relatively new (Poy-Castro, Mend a n ~ aCuervo and González , 2015). Research on the topic has largely remained at a conceptual level, which determines, according to many authors , the need for greater empirical evaluation with the in order to contrast the hypotheses established at a theoretical level in relation to the properties of the game, its

characteristics, its effectiveness in the learning process or the expectations that it generates (Tobias and Fletcher, 2012; Young et al., 2012; Clark, Tanner-Smith, & Killingsworth, 2016). Additionally, much of the research on SG with empirical contrast on learning is not conclusive regarding its effectiveness (Connolly et al., 2012).

However, these investigations either ignore the curricular development framework of the subject in which they are integrated, or are based on the hypothesis that serious games, by themselves, are capable of improving both the quality and quantity of learning acquired by the student, which is not necessarily true (Egenfeldt-Nielsen, 2004; Wouters, Van der Spek and Van Oostendorp, 2009).

Connolly et al. (2012) carry out a systematic review of the literature on serious games and their application in education, showing that only 2% include empirical evidence regarding the impact of the game on learning results . Of these, only 6% correspond to the economic/business area, with none of them making reference to accounting disciplines. Although in Spain there are pioneering experiences in the implementation and analysis of SG in accounting ~~ms~~ with satisfactory results (Escobar and Lobo, 2005) carried out in those first years of implementation of the EHEA. A decade later, there has been a development of these tools that, from a technological and conceptual point of view , has been dizzying (Gros Salvat, 2014). Likewise, we face a generation of students, all of them belonging to the "net" generation , with potential skills and relationship with virtual reality that allow us to experiment, ~~and the situation is not~~ ~~more~~ more favorable and definitely different from the one we faced in those years (Ben - Zvi , 2010; Palmunen, Pelto, Paalumäki and Lainema , 2013). Rebele and StPierre (2015) based on literature review articles published since 1991 in *The Journal of Accounting Education* (Apostolou , Dorminey, Hassell and Rebele, 2015) , analyze the type of research that is being carried out regarding the teaching of accounting . The authors

question whether the research carried out is having a real application in educational practice, and point out that the lack of research on the use of educational technology in accounting subjects is an important ~~definy~~

We therefore consider it necessary to develop research on the use of serious games in matters related to accounting information, either as the main axis or as an integrated aspect in business strategies . More specifically, we consider it interesting to investigate the impact of SG on learning with experiences in which its use is contextualized in the subject 's teaching guide and integrated into the curricular framework . of the degree, in the planning of the activities and in the guidelines provided to the participants in that context. As Rodríguez-Hoyos and Gomes (2013) ~~point~~, we consider that framing the activity will allow, on the one hand, to improve knowledge about relevant aspects of the use of the game in the classroom, and on the other hand , to determine the appropriate methodological strategies for its introduction as an educational resource. Finally, we consider an additional contribution to the literature to carry out this teaching experience in a typology of students who are already part of the so -called " digital natives " and whose perception and predisposition may have changed substantially with respect to previous experiences .

In this context, the main objective of this work is, first of all , to apply and describe a teaching experience of implementation of SG in a management accounting subject of a university degree . Secondly, we aim to demonstrate the effectiveness of the SG by analyzing the previous attitude of the students based on their characteristics and finally analyze their subsequent perception of learning, using questionnaires in both cases.

The rest of this work is structured as follows : the second section highlights the

conceptual framework and previous literature in relation to the empirical experience of SGs ; In the third section we present the teaching experience and the design of our study ; In the fourth section , they present the main results obtained, and finally, in the fifth section we show the conclusions and final reflections.

Previous literature

The term *SG* is commonly accepted since it refers to games used in training and education , whether simulations , video games, virtual worlds or augmented reality . Serious gaming has been constantly updated with technological advances , allowing for multiple types of games and supports for them . For Squire (2008) serious games are more than just technology, they are also indicative of the broad technological and social changes with consequences for education.

In fact, although the terms simulation and SG are sometimes confused , there are fundamental differences between them . Simulations are “ an attempt ” to accurately represent a real phenomenon and are specifically designed to support learning (Bratley, Fox , & Schrage, 1987) . For their part, the designs _ SG creators deliberately simplify or distort reality in order to focus the player's attention on two fundamental elements : learning and *entertainment* . In the SG, therefore , the educational element is as important as the recreational objective (Crawford , 1984), so that It combines elements of the game: competition, cooperation, rules, roles or prizes, with elements of simulation.

Research at the theoretical and conceptual level of SGs as a pedagogical tool has been quite prolific (Connolly et al., 2012). There are numerous works that determine from a conceptual methodology that SGs require student action based on their knowledge and the use of metacognitive and reflection skills after the action. The player must be attentive, understand the rules, reflect to improve his experience by looking for

alternatives or exits that favor his position and act with caution. imagination and common sense (Bonwell and Eison, 1991; Schrage, 2001; Salen and Zimmerman, 2003; Zyda, 2005; Bokyeong, Hyungsung and Youngkyun, 2009). It is noted as a quality of the SG that these instruments or learning tools allow participants to experience situations that are impossible in the real world , whether for reasons of security, cost , time , etc., being able to learn from their mistakes and gain experience safely (Susi et al ., 2007; Sed e n ão , 2010). It is concluded that the game should serve to experiment, try multiple solutions, explore, discover information and new knowledge without fear of making mistakes (Aldrich, 2005), and it is based on the dichotomy between successes and errors when greater learning occurs (Axelrod , 2006) . If the intention with the use of the SG is to achieve an educational objective , the player must be made aware of the knowledge they are acquiring through it (Gros-Salvat, 2009) , since the A learner 's relationship with the game is not the same as that of a player.

However, although there is a lot of theoretical analysis on the benefits of games with digital technology in learning and education, and the need detected by university institutions, researchers and teachers themselves to adapt the training process to the new generation of students, it continues highlighting in the literature the scarcity of empirical evidence that confirms optimism about the potential of SG for learning (De Freitas, 2006; Michael and Chen, 2006; Wouters et al., 2009; Ke, 2009). And in fact , the situation does not seem to have improved significantly in the second decade of the 21st century , nor in the implementation of games (Tobias and Fletcher, 2012 , Young et al., 2012 , Clark et al ., 2016), nor in academic research on teaching, at least in our discipline (Rebele and StPierre, 2015).

Additionally, much of the research on the use of serious games in learning ignores the

curriculum development framework in which they are integrated, which is why they demonstrate the effectiveness of the game in the acquisition of certain competencies, but isolated or decontextualized. This type of work focuses on relating the competencies demanded of citizens by 21st century society, to later demonstrate that a certain game allows practicing some of the related competencies (Zamora Roselló , 2010; Romero and Turpo Gebera, 2012). That is, the effectiveness of serious games in the acquisition of skills is studied, without taking into account how they are integrated into the training process and curriculum, so it could be stated that it is difficult to reach conclusions about their educational impact. The methodology is difficult to extrapolate to other experiences, and the experiments are very short and do not provide longitudinal data (McClarty et al., 2012). The objective pursued when carrying out an educational innovation experience based on serious games should be for the student to acquire and develop competencies, skills and abilities that adapt to the curricular needs (Squire, 2008), that meet the requirements demanded by companies and society and, therefore, close the space between theory and reality (Alfaro Tanco, Rodríguez Chacón and Amorrortu Gervasio, 2014).

Many of the previous empirical studies on the use of serious games in learning are based on the hypothesis that serious games allow greater acquisition of knowledge by the student, and therefore that the games themselves are capable of improving the amount of learning acquired. However , these studies reach contradictory results among themselves (Bruhn, Mozgira and Lindh, 2007 ; Annetta, Minogue, Holmes and Cheng, 2009; Kebritchi, Himuri , & Bai, 2010). Some authors point out that this premise is ~~correct~~, since the introduction of these tools in the teaching - ~~learning~~ process does not intend for the student to acquire different knowledge or more knowledge than with other tools, but rather that what is intended is adapt teaching methodologies to

the characteristics of the students , their way of learning and their abilities (Tobias and Fletcher, 2012) . As evidenced by the study by Connolly et al. (2012), the studies that analyze the empirical application of SG in the classroom and its impact on learning are not numerous , and specifically in the area of economics and business they are very scarce. Specifically, in the case at hand, the work of Lindh , Hrastinski , Bruhn and Mozgira stands out , in which these authors explore the drawbacks and advantages of using this type of games in business courses based on interviews , questionnaires and observations in class. Surprisingly, they conclude that , while teachers see games as good tools for learning , 73.1 % of students do not perceive that simulation games are more effective for learning than readings or seminars .

In the field of university accounting education , there are works from the 1990s in Spain in which , before talking about the acquisition of skills and new teaching methodologies , — — — — — ance, some authors pointed to the use of determination strategies to achieve certain abilities and achieve improvements in the level of learning and motivation using simulations. For example , Arquero and Jiménez (1999) carried out a teaching experience in which they applied simulated cases in learning accounting analysis using a sample of control and preparing questionnaires for students . In this work they conclude that case simulations allow the development of different capacities and motivate to a greater extent than more traditional teaching methods based solely on master classes and exercises .

Regarding the specific application of SG, there is previous evidence in Spain , specifically in the case of accounting subjects that analyze simulation games as a teaching strategy . Thus, Escobar and Lobo (2005) use a hotel management game that they applied to a management accounting subject in a sample of 35 students from the 2002-2003 academic year and conclude from their teaching experience that This

methodological innovation had fostered the interrelation of the acquired knowledge, and developed certain decision - making , communication and teamwork skills . They used two questionnaires, one before the activity and another after (based on Arquero Montañó and Jiménez Cardoso, 1999) to analyze the attitude and perception of the students who had used the game, and from whose results they conclude that the students positively value the impact that the game has had on the acquired skills.

Both the questionnaires from the works on the use of cases in accounting analysis by Arquero Montañó and Jiménez Cardoso (1999) and the use of the simulation game in the case of Escobar and Lobo (2005) in management accounting They are fundamentally based on capturing the students' perception of the subject. However , in the present study we will _ Design the questionnaire to basically capture the student 's perception of the serious game to acquire the skills that appear in the ~~teaching~~ guide for the subject. Unlike these previous works, the ultimate goal of our analysis is the evaluation of the game. Likewise, a difference that a priori we consider What can be substantial in the predisposition and appreciation of the game as a pedagogical tool by the students is that, a decade after the work of Escobar and Lobo (2005) was carried out , the students have changed and they all belong to the called " net " generation . Thus, some reluctance that students of that time might have depending on their characteristics should have disappeared or been considerably reduced in the period of our study. In fact,Ebner, Kickmeier-Rust and Holzinger (2008) conclude that the use of a wiki system in higher education is more complicated and requires more development time than expected .

wait for a « give-and-take » generation ¹ . For their part, authors such as Schrader, Zheng and Young (2006) or Bennett, Bishop, Dalgarno, Waycott and Kennedy (2012) point out that when students have little prior experience with

technologies they have problems seeing the use value for the learning, and are not fully aware of the pedagogical content of these tools, which affects their willingness to use them.

Additionally, there is prior evidence that other demographic characteristics, such as gender, could affect the predisposition to use a game as a learning tool. In fact, Bertomeu (2011) analyzes the data obtained by the Centro e-igualdad ² observatory in the period 2007-2010, which confirms that gender biases persist in the use of video games in this generation . Although, a deeper analysis of the causes leads them to argue that Traditional video games maintain sexist models and this is what drives women away from their use, which could lead to a spiral that explains the persistence of gender differences in research . However , according to this author " *the new consoles offer other game models .* "

¹ It refers to the generation of students who have grown up with digital technology and are characterized by preferring teamwork and collaboration.

² <http://www.e-equality.net/>.

more equitable, open to group play in which they feel comfortable and active » (p. 187).

The fact is that , despite the good results presented by
In these works, the use of serious games in general and in accounting subjects in particular as a teaching tool is practically non-existent, which is totally incoherent with the development in the last decade of both pedagogical concepts , ICT , games themselves and the skills and characteristics of the students . In fact, a decade later, when talking about the introduction of serious games in learning in general and of the accounting discipline in particular, we continue to use the expression " educational innovation . "

The teaching experience: sample and teaching methodology

Description of the subject and the role of the teaching staff

The subject to which we have applied this teaching experience is *management accounting* . This is an annual compulsory subject in the second year of the degree in finance and accounting. It has a volume of work for the student equivalent to 9 ECTS, This workload takes the form of face-to-face and non-face-to-face activities. The face-to-face activities are divided into 45 hours of theory classes, 30 hours of classroom practices and 15 hours of computer classroom practices to be carried out in the second semester of the course. It is in this last activity that our experience is developed. .

The main objective of the subject is to present a work methodology that allows the student to assimilate the concepts, techniques and tools linked to management accounting, so that this knowledge allows them to prepare useful information, interpret and analyze said information . information and make decisions.

In order to specify the objective of the subject , the teaching guide for the subject is analyzed, which establishes the skills to be acquired by the student. Regarding the specific competencies of the accounting module, we find the « ability to identify, measure and value business costs » . This specific capacity of the module is complemented by another series of specific capacities of the subject.

With this experience specifically , it is intended that the student:

- a. Reflect on the need for information for decision-making within the company and how accounting is articulated as the ideal and necessary means to obtain the aforementioned information.
- b. It approaches the knowledge of how economic and financial relationships are established within the company.
- c. Identify the mediate and immediate consequences of certain management decisions in risk-free environments.
- d. Address the interpretation of economic-financial information, at least at the user level.
- e. Acquire critical skills in analyzing situations and solving problems.

In addition to these subject - specific competencies , the student must progress in the acquisition of certain generic competencies of the degree such as the ability to adapt to new needs, the ability to solve problems and the ability to use computer tools. The determination of these objectives allowed us to reflect on the pedagogical intentions of the course, in addition to constituting a element of communication and guidance for students , and a point of comparison to subsequently determine their level of performance. This in turn allows the choice of the SG that adjusts as a learning technique to obtaining the

objectives set by the subject.

The role of teachers in this teaching experience is essential. Firstly , after carrying out an analysis of the starting situation , that is, the students ' prior knowledge and skills , we tried to make them aware that the activity is framed within a structured teaching plan . That is, it is explained to them that the use of the SG is a tool to achieve an end so , first of all , they are explained what learning objectives are intended to be achieved and the means and procedures necessary to achieve said goals or objectives are described , including the use of a SG . Subsequently, the characteristics of the game are presented to them . specific simulation that is going to be used , clearly establishing what we want them to learn through its use , differentiating between knowledge of the theoretical content of the subject or information that is needed and knowledge of the process , that is , how use the SG and the techniques and tools they need to use it.

Thus , the teacher must ensure, prior to using the game, that the students know and practice a set of techniques necessary to be able to use the SG correctly . Once the use of the SG has begun, the teacher continues to guide, provide support , propose strategies to follow, as well as information on conceptual character that they specify throughout the development of the activity, fundamentally related to the analysis and interpretation of the results obtained after each play . It is essential to guide the student in their decisions so that they do not lose sight of the learning objective and can, where appropriate , learn from their mistakes . analyzing and interpreting the information. Finally, the teacher constantly evaluates the activity, energizing the process and encouraging co - evaluation among participants , generating discussion, directing consensus , and facilitating the contribution of suggestions.

Motivation, guidance and evaluation throughout the activity allow the student to be

aware of why and how they are practicing both skills (generic and specific) and knowledge of the subject.

Description of the student sample _

The sample is made up of 80 students enrolled in the subject. The vast majority were born in the late 80s and early 90s , which is why they are considered in previous literature as *digital natives* (Prensky, 2001; Oblinger and Oblinger, 2005 ; Piscitelli, 2006; Jones, Ramadau, Cross and Healing, 2010). It can be stated that all these students already belong to the first generations that have arrived at university classrooms having been immersed in digital technology from an early age. Thus, both due to the age range and the use and management of these technologies, our students all belong to the generation of digital natives described by the literature, so, unlike previous studies, they do not come from distinctions between natives ver- their digital immigrants. These characteristics of the students represent a first novelty with respect to previous evidence in similar subject content contexts with potential impact on research outcomes.

Of the 80 students, 59% are women and 41% are men. The reason for proposing the division of the sample by gender is the previous evidence on gender differences when facing aspects related to technologies in general and video games in particular. In principle, although it is not the objective of this study to cover aspects of potential gender differences, in the gameobject of analysis do not exist in our understanding, at least in a

Teaching resources and the simulation game _ _

Given the characteristics of our course, the tools used are all technological, both for synchronous and asynchronous communication with our students.

Firstly, all course sessions take place in computer rooms, in which each student has a computer to work on and this computer is permanently connected to the

Internet. Secondly , a university application is used that allows the management of resources in teaching groups and offers the possibility of sharing documents, creating discussion forums , notifying by email or having activity calendars . own and groups , among other functions. Thirdly, the simulation game is introduced into the classroom as a pedagogical tool. In principle , the activity, since the application allows it , is proposed individually , although it is explicitly allowed that they can work in pairs.

After a first session, students are informed of the learning objectives of the activity (framed in the teaching guide of the subject), the case study is presented and they have access to the game demo and all the materials that it provides. - ciona , so that they become familiar with the tool and can use it, analyze the case study or practice outside the classroom if they want it. In a second session, a sharing is carried out among the students in order to verify that the case has actually been analyzed, has been understood and, therefore , is in a position not only to understand the situation, but can also mark the possible strategies to follow.

The game used in this research is « *Platform wars simulation* » , developed by the Massachusetts Institute of Technology (Sterman, 2010) ³ . It is a dynamic simulation system oriented towards the specific problems of markets with crossed externalities (*multi-sided markets*).

This gives it special interest since, currently , strategic competition and business management decisions based on financial information (both quantitative and qualitative) constitute an element of vital importance in the entire business system. At the same time , the high degree of realism of this simulation contributes to making clear the need for a diagnosis and conceptual reasoning in business management , qualities, on the other hand, generally developed by business simulation games

regardless of other possible merits.

The material was delivered to the students , both on the operation of the simulation (demo) and on the background of the platform market in general and the historical evolution of the Sony company in particular (case). With these materials we intend to give the student a vision of a real situation of a sufficiently well-known company.

The simulation is designed in such a way that it is highly formative in preparation for business management in highly competitive environments, in which success depends on long-term strategic decisions . This is achieved by interweaving, in a balanced manner, fundamental variables in business reality (potential market, production capacity and volume, fixed and variable costs, contribution margins, economic and financial profitability).

This simulation has been chosen since it provides significant advantages over others analyzed:

obvious , sexist or violent components , but is framed



in the rating of strategy games, so, without raising a priori expectations, we have considered it interesting to divide the sample by gender in the analysis of the results.

³ MIT Sloan Teaching Innovation Resources (MSTIR) is a collection of teaching materials , including case studies and management simulations , offered by MIT Sloan as a free and open teaching resource (<http://mitsloan.mit.edu/MSTIR/Pages/default.aspx>).

- a. It forces participants to enter the plot of purely managerial decisions , in terms of objectives, philosophy and company strategy. To do this, the student is subjected to a series of choices regarding the royalty policy for game producers/developers , the adaptation or not of their product to other devices on the market and/or the compatibility of their product. with other platforms. With all this, the participants necessarily have to look for logic in the objectives-strategies-tactics process.
- b. The teacher can choose to use the simulation as a transparent box or black box simulation , the latter being the chosen one . This simulation game allows the teacher to vary the parameters or conditions of the market , so realistic, hypothetical or ideal scenarios can be established according to the pedagogical needs detected .

The player acts on three variables (sales price, commission charged to game sellers and cost for the development of compatible games), so their interpretation and their interrelation is easily observable , the relationship between the decision made (strategy followed by the player) and the result obtained allows reflection, analysis and interpretation in a simple way for the student, which a priori we argue can be very useful pedagogically.

The game allows , based on an email address, the registration of students with the role of player; After registration, the teacher receives individualized information about each of the decisions made and the result obtained, the system prioritizes and classifies the results obtained by each participant. This possibility and having a computer for each student means that the activity is considered individually.

Decision making in the game is accompanied by an analysis and interpretation of the results obtained , in order to specify the strategy followed and make the next decision . The system immediately provides the results after the decision, both graphically and numerically , in order to facilitate its analysis and interpretation . Information allows the student to specify, vary or reaffirm the strategy followed and make the next decision.

We observe that alliances between colleagues and the formation of work groups automatically occur ; Before each decision they ask, share and explain it (informally and spontaneously). While the first decisions are made in small groups or pairs , once immersed in the game ,work teams are clearly formed . In fact, during the In the game, students not only decide to position themselves in the market, but the rest of the team becomes their competition . In our case we decided to allow these alliances, since although it was not initially proposed that the activity be carried out working as a team, we did consider that it is important for the student to develop this competence (collaboration) and an effective way to improve communication between equals and leadership.

The game ranks the results, and establishes among the participants who is the winner among those who achieved a greater market share than their competitor (player vs. simulator) and obtained greater accumulated profit for their company (player vs. player).). They have 10 time periods (plays) to monopolize the market, but with good decisions they can achieve it sooner. Therefore , the winning team for the system will be:

1. The one who first (with fewer moves) manages to monopolize the entirety, or practically the entirety, of the market.
2. Given the same number of plays, the one who achieves a greater accumulated benefit for his company.

Since the game administrator (the teacher) can choose the setting of the scenario, such as the intensity of the effects on the market by controlling its sensitivity to the number of consoles or the availability of games, different strategies can be explained based on multiple scenarios; Furthermore, taking into account that the game is based on a real case (launch of Sony's Play Station 3), the real situation can be simulated and shown how the market leans towards the most aggressive strategies and what the limits of

this type are . of strategies. The role of the teacher in this This point is crucial, not only as an evaluator but also as a guide and motivator towards learning.

Research design and results

The main objective of the preparation and analysis of the surveys is to contribute to demonstrating the effectiveness of the game as a pedagogical tool in the subject, both due to their previous attitude and their own perception of what they have learned.

We used two questionnaires to carry out our analysis . The first is done before completing the teaching experience and the second once it is finished. The first questionnaire, hereinafter pre-activity questionnaire, aims to analyze the characteristics of the sample and their aptitudes and attitudes before undertaking the experience. The second, hereinafter post-activity questionnaire, will allow us to analyze, always from the student 's perspective , the effect that this methodology has had on the acquisition of skills.

We therefore do the evaluation of the acquired competencies partially indirectly, based on the student's perception, as done in previous works (Huang et al., 2013 Huang, Johnson and Caleb Han, 2013 ; Ranchhod et al., 2014).

Generic competencies included questions about whether the game allows applying theoretical concepts, analyzing and integrating information , solving problems and making management decisions. Regarding the specific competencies of the subject, they were evaluated with questions on the identification, measurement and assessment of business costs, the interpretation and analysis of said costs and the usefulness of the company's economic-financial information to make decisions.

Once the questionnaires were prepared, we verified their validity in terms of the content and the scales used. For this purpose, the opinion of students and teachers who use the game in extracurricular business creation courses organized by the university, without any connection with this experience, was requested in order for them to assess

the measures used, the clarity of the instructions, - nes and content of the questions. Their evaluations, comments and recommendations were incorporated into the final draft of the questionnaires.

All questions were assessed using a 5-point Likert -type additive scale , from value 1 " totally disagree " to value 5 " totally agree " , with the stated statements .

The results of the preactivity questionnaire are reflected in Table 1 . Although the descriptive analysis is not shown , it is important for our work to know the predisposition and knowledge of our students about digital technology since this conditions the way we approach the activity . In this aspect we obtain the data that 100% of the participants have a computer at home with Internet access , 97 % access Internet every day , mainly from mobile devices (95%) and generally as a hobby (88% of respondents). This information is collected with the intention of confirming that our students belong to the so-called digital generation (they know, have and use digital media naturally) . It must be taken into account that, if Although it is true that they are in the age range determined by experts (16 to 36 years) for this ~~group~~ geographical , economic and personal circumstances may have influenced the

Table 1

Usage and game preferences _

Do you use video games?	Men		Wom		Tota	
	%	n	% en	N	%	l n
Yeah	87.29		70.2	33	77.5	6
	9					2
No	12.4		29.8	14	22.5	1
	1					8

What genre of video game do you like?	Men	Women	Total
%	n %	N %	n
Skill (shooter , puzzles , mazes ...)	45.5	89.4	57
Action (fighting , arcade , platform ...)	75.8	48.6	39
Strategy (role playing games , war game ...) _	81.8	65.0	52
Simulation (sandex , situational , sports ...)	66.6	66.3	53

access to technology and, therefore, generational homogeneity may not be a fact.

The results of the survey show a certain reluctance on the part of women towards all those games with warlike connotations and a very high predisposition towards games of skill . In the case of men, the ones preferred by the vast majority are strategy games, followed by action games. It seems that the perception persists of equating the term video game with games of violence and fighting , which , as we pointed out, include generally characteristics that have been highlighted as sexist . _ The result we obtain is that 30 % of the students surveyed say they do not use video games; however , when asked about the type of video game they prefer , only 10 % stop selecting skill games . This result would be consistent with this argument and leads us to think that certain leisure applications are not considered video games by female students, which may contribute to maintaining this " *perception* " of gender bias among digital natives . In fact , in informal conversations held with them throughout the activity we verified that both men and women believe that They play more video games in general. However,

our results, if we focus only on the so-called games of skill or strategies, do not confirm this intuition.

It should be noted that more than 66% of those surveyed, both men and women, affirm that they like simulation games and, therefore , although it is not a resounding majority, it reinforces the idea that the adoption of this type of the game is a priori accepted, it is significant that in this type of game (simulation) there is a total consensus between genres, an extreme that does not occur in any other type of game. The fact that it is something new for the vast majority as a teaching methodology, and influenced by their previous experiences with games for entertainment, may be related to a lower predisposition than we expected given the characteristics of the students, and taking into account The rest of the survey results count.

Once the activity was carried out, the post-activity questionnaire was passed to the students, anonymously, with the purpose of determine your perception regarding a possible improvement in your competency profile. The results of the survey are detailed in Table 2 .

Regarding the generic competencies analyzed in our study , we verified that the student perceives these games as useful to improve their profile in generic competencies . Due to their level of agreement among participants, decision making (79% approx.) and problem solving (76 %) stand out as the most practiced skills in the game . Likewise we would like It should be noted that practically 100% of our students consider, to a greater or lesser extent, that they have practiced all the generic skills in the activity.

In this sense, we believe it is necessary to highlight some results obtained from the survey that, although they are not reflected in the results shown in Table 2 , are

implicitly extracted from them . Thus, the generic skills that all of our students claim to have practiced are made up of:

Instrumental competencies , which involve a combination of *cognitive* abilities : understanding and using ideas; *methodological* : making decisions and solving problems ; *linguistics* : knowledge and practice of a second language; and *technological* : use of information and communication technologies.

Interpersonal **skills** , which help people achieve correct social interrelation and cooperation with others , individually : enabling collaboration on common objectives ; and *social* : related to the ability to work as a team.

Systemic competencies involve a combination of understanding , sensitivity and knowledge that has allowed us to see how the parts of a whole relate and are grouped.

On the other hand, the results of the survey reveal that the vast majority (82.5 %) of the students perceive that learning accounting concepts from the SG has allowed them to improve their ability to analyze and interpret business costs . , and approximately 74% agree or strongly agree that: " understood as using the company 's economic-financial information to make their decisions . _ Although it is true that

Table 2

Assessment of generic and specific competencies

Generic skills		1	2	3	4	5		
Apply theoretical concepts		0	3.7	30.0	55.	11.		
		.	5		0	25		
		0						
Analyze and integrate information		0	8.7	30.0	46.	15.		
		.	5		25	0		
		0						
make decisions		0	0.0	21.25	50.	28.		
		.			0	75		
		0						
Solve problems		0	2.5	21.25	42.	33.		
		.	0		50	75		
		0						
Specific competencies				1	2	3	4	5
Identify, measure and value business costs				1.2	5	3	42.5	13.
				5	.	7.		75
					0	5		
Interpret and analyze business costs				0.0	2	1	53.7	28.
					.	5.	5	75
					5	0		
Use the company 's economic -financial information to make decisions				0.0	3.75	2	48.7	25.
						2.	5	0
						5		





The objective of the game was not the calculation of costs, more than 56 % of those surveyed claim to have improved their knowledge regarding the identification and assessment of business costs, leaving 37 % of the students in neutral positions . These specific competencies are crucial since they give identity and consistency to the learning program. The results obtained indicate that the student perceives the verticality and transversality of knowledge, as well as its necessary integration with previous knowledge , obtaining a holistic vision . of their learning. These results are consistent with the arguments that serious games are effective when students have to develop decision - making skills to manage complex and dynamic situations (Pasin and Giroux , 2011; Romero and Turpo Gebera, 2012). Likewise, they agree in general terms with authors such as Escobar and Lobo (2005) , that students, while learning accounting concepts through simulations as a teaching methodology , develop an improvement in their ability. of analysis and in its vision of reality .

Conclusions and final reflections

This work focuses on carrying out a teaching experience in an Accounting subject , introducing SG as an additional pedagogical tool and exploring the student's perception of this tool , as well as the improvement in their competency profile with its use before and after carry out the activity, contributing empirical evidence of its effectiveness. In this sense, among the contributions and general contribution of our work it is worth highlighting that, unlike much of the



previous research , we have analyzed the relationship between a video game and the acquisition of skills by framing it in a specific subject context . with objectives and skills to acquire. Additionally, the analysis of the students' perception is related to the tool and not to the subject they are going to study.

From the teaching experience we have been able to contrast that the simulation game promotes teamwork , leadership and creativity of the student, interpersonal and systemic competencies that are not the object of direct evaluation in our study, but that have been evidenced during the classroom activity . _ This assessment is consistent with previous research in which these capabilities are analyzed , and They are ~~not~~ skills enhanced by serious games (Faria and Wellington, 2004; De Freitas, 2006 ; Romero and Turpo Gebera , 2012). In this sense , ~~whi~~ striking is the type of strategies that are built between several companions , who in the game become perfect allies developing common processes and strategies; Something as difficult as promoting effective teamwork and something that is so overwhelming for us teachers , they are capable of developing it almost naturally and spontaneously around an end that is meaningful to them.

We would like to highlight that in our students ' responses we have not detected significant differences by sex in terms of the use of video games with these characteristics. Our results are consistent with the evidence that women are reluctant to play games that have warlike or sexist connotations , while they actively participate in all those games in which that enhances skill , collaboration , equity or intellectual competence . _ Although , in order to extrapolate the data to the entire

population, a more in -depth study of these gender differences would be needed ; In our study we do detect that simulation games in which collaboration and interaction are enhanced Problem solving at a cognitive level (analysis, interpretation, decision ...) are a meeting point between genres and anecdotal differences in use .

The results obtained from the post -hoc surveys allow us to assess, rather than evaluate , the acquisition of skills. The Obtaining a very positive assessment from the students with respect to the generic and specific competencies analyzed is overwhelming since 100% of the participants in the activity agree that they have practiced the aforementioned competencies to a greater or lesser extent.

Therefore , and given that the objective of our research is to contribute to determining whether serious games are effective tools in the student 's competency development , we can conclude that , indeed , serious games are an effective tool for this purpose and that the students They value this type of activities very positively , they perceive that they better understand the information, how the contents learned are related and how they can be used in real or quasi-real situations.

These results also allow us to conclude other aspects, in our opinion important, related to the approach to higher education training by competencies: on the one hand, the serious game has allowed us to relate, combine, integrate and practice " knowledge . " in its broadest sense and in all its facets :

i) knowing-knowledge, ii) knowing how to do-skills, iii) being able to do-skills and, iv) wanting to do-attitudes; On the other hand, the

serious game has allowed us an integrated and transversal vision of the company and knowledge, in which accounting, as an information system, provides the necessary tools to face complex problems and be able to respond to the context in which There are, on the other hand, essential functions of accounting education.

We want to reflect here on the fact that , for the specific case of the accounting discipline in Spain , the work of Escobar and Lobo (2005) already concluded positively in ~~his~~ sense when analyzing a sample of students a previous decade . That is, although the students in their sample could not be considered digital natives, for What a priori could be thought was that less familiar with these tools, with ICT in general, the experience and perception of the students regarding the acquisition of skills was successful, and yet little progress has been made in the study and implementation of simulation games in our discipline . In fact, we consider it potentially relevant that the use of video-games of strategy and skills that despite being a minority, there is still a percentage of students in our study, who are already " digital natives " , show neutrality or not too much enthusiasm for using a video game to learn in this subject. Taking into account Given their satisfaction after the fact , we could infer that it is precisely the lack of application and lack of research that may be influencing, among other variables, their lack of implementation.

The discussion about the educational potential of SG among teachers and researchers continues to be an open topic on the one hand due to the skepticism that teachers show towards these tools (Chin, Dukes and Gamson , 2009) , on the other hand due to the series of problems that



identified in their introduction in the classroom and that constitute effective barriers when it comes to integrating them into the training process (Chang, 1997 ; Faria and Wellington, 2004; Lean, Moizer, Towler and Abbey, 2006) and, on the other hand, due to the scarce empirical research on the use of educational technology in the field of university teaching in general and in accounting in particular (Rebele and StPierre, 2015).

In short, we consider it essential to research serious games in general and in the accounting discipline in particular in several ways. First of all, to contribute to the development of these games, we must investigate what their attributes should be so that they are as effective as possible in the accounting learning process . Secondly, we consider it essential to investigate which variables are influencing so that Despite the experiences that are published , although few are positive , these games are not being used widely in university teaching and ~~only~~ to society 's demand for better education . quality university . Specifically, the research on the teachers, their characteristics, attitudes, opinions and experiences seems to us to be a poorly developed area of research and enormously important to be able to successfully implement this and any other pedagogical tool.

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