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Company–University Collaboration in Applying Gamification to Learning about Insurance

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Abstract: Incorporating gamification into training–learning at universities is hampered by a shortage of quality, adapted educational video games. Large companies are leading in the creation of educational video games for their internal training or to enhance their public image and universities can benefit from collaborating. The aim of this research is to evaluate, both objectively and subjectively, the potential of the simulation game BugaMAP (developed by the MAPFRE Foundation) for university teaching about insurance. To this end, we have assessed both the game itself and the experience of using the game as perceived by 142 economics students from various degree plans and courses at the University of Seville during the 2017–2018 academic year. As a methodology, a checklist of gamification components is used for the objective evaluation, and an opinion questionnaire on the game experience is used for the subjective evaluation. Among the results several findings stand out. One is the high satisfaction of the students with the knowledge acquired using fun and social interaction. Another is that the role of the university professors and the company monitors turns out to be very active and necessary during the game-learning sessions. Finally, in addition to the benefits to the university of occasionally available quality games to accelerate student skills training, the company–university collaboration serves as a trial and refinement of innovative tools for game-based learning.

Keywords: gamification; university; education; serious video games; game-based learning; professors; video games design; knowledge; skills training; digital technologies; automated learning

1. Introduction

Gamification is one of the great technological advances of the last decades. It has been developed mostly inside the video game industry in an effort to improve the attractiveness of its entertainment products. Recently, such know how is being transferred to a wide variety of sectors such as education and training, health and fitness, transport, service-marketing, environment, corporate management, welfare initiatives, politics, etc. [1,2], with the purpose of designing gamified experiences, simulation games, or serious video games that will increase their activity performance. In 2018, the video game industry turnover amounted to $137.9 billion worldwide, which is higher than the volume of the music business. Of this amount, 87% is derived from digital businesses via the internet [3]. The number of players in the world is already 2.3 billion, 47% of whom are women. The growth rate of the sector is 8% per year with serious video games having an increasing weight in that growth.

Gamification applied to university teaching is the focus of our study. Gamification can be defined, specifically when applied to the education sector, as a system of procedures for the flexible application

of game playing elements to skills development and/or knowledge learning. It follows the line of the generally accepted definition proposed by Djeerling, Dixon, Khaleed, and Nacke: "Gamification, as the use of game design elements in non-game contexts" ([4], p. 9). The term gamification is also used when just one or very few game design elements are applied without producing a game as such. That was the focus of some research on gamification in Hamari's work on the impact of "badges" in customer engagement [5] or the study on gamification in education by Dicheva, Dichev, Agre, and Angelova who excluded games as such [6]. Besides, the debate on the categories for classifying, either game design elements or implementation impacts, remains quite open because gamification brings together multidisciplinary aspects where game design technology and human–computer interaction (HCI) increasingly share this space with social sciences like psychology, pedagogy, marketing, business, or sociology [4]. This multiplies the number of approaches and scientific production. The data offered by Hamari, Kolvisto, and Sarsa on the number of empirical studies on gamification published in SCOPUS journals or registered in Google Scholar show an increase from an average of 50 in 2011 to 160 in 2012 and 200 in 2013 [1].

Regarding the education sector, a revolutionary technological innovation in the field of learning such as gamification, is very attractive to teachers dealing with students who are products of a rapidly developed digital culture. Faculty members, particularly at the secondary and university levels, face new generations of students who are part of the digital culture, and the video game genre opens new perspectives for accelerating experiential learning. Serious simulation video games, such as those for learning how to fly planes or perform surgery, have already had great commercial success in the education sector, due to the savings represented by the virtual formula of acquiring practical skills while avoiding the real risks of possible destruction or injury, resulting from wrong decisions.

But those teachers who have an interest in transferring gamification to their classes encounter various types of difficulties. First and foremost are the financial difficulties due to the high cost of designing a video game of sufficient quality to attract the interest of students. In addition, teachers lack training in the areas of systems analysis and design of educational video games and, therefore, are not able to collaborate effectively with video game manufacturing companies. A study on gamification in education concludes that early adopters of gamification in universities tend to be the computer science/information technology educators; limited by the lack of appropriate supportive technology [6]. Another obstacle that stands out is the attitude of the parents of the students and those responsible for the educational policy who tend to express an opinion of the video game as a distraction instead of an instrument for accelerated learning.

This introduction presents a selection of contributions of state-of-the-art and controversial interpretations concerning: The trends of the video game industry towards the production of serious video games for education; the gamification elements that make a product more attractive to users or consumers; the attitudes shown by the public sector; and university teaching staff towards gamification as an instrument or set of techniques for learning. The introduction ends with an explanation of the aim of this study: Evaluating company–university collaboration in applying gamification to university education. To this end, we use a case study involving the participation of groups of economics students from the University of Seville in the 2017–2018 university championship of the BugaMAP game (MAPFRE Foundation), a simulation game used for successfully managing insurance companies.

1.1. The Production of Serious Video Games in the Video Game Industry

In the video game industry there is a moderate production of serious video games. In Spain, for example, 14% of all video games produced annually are serious video games [7]. Among serious games there are those for the education sector, health, culture, public administration, marketing, or others.

Furthermore, it tends to be the big companies, large Non-Governmental Organizations (NGOs) and international organizations, and not so much the universities, that are leading the production of serious video games and likewise assuming the costs of making gamified learning available to the citizens and the educational sector ([8], p. 665; [9], p. 1053).

The video game industry is the leader in gamification. It dominates a global market industry, with multi-billion-dollar business figures ($137 billion in 2017) and it reaches an audience of some 2.3 billion players with products in several languages. Of every 10 dollars of the video game market, 5 are spent in the Asia Pacific region, 3 in the American continent, and 2 in Europe, Middle East, and Africa regions.

By country, the main video game consumption markets are China and the US (with $38 and $30 billion, respectively). They are followed by Japan with about $20 billion. And then come countries such as South Korea, Germany, the United Kingdom, France, Canada, and Spain with markets of $4 to $2 billion. Spain, with 46 million inhabitants and 36 million people connected online, is ranked 9th in the world market of video games by country with a volume of $2.03 billion.

The industry was born in the 1970s and one of its major technological breakdowns occurred in 2004–2005 when free software became available for the design of video games and it also became possible to play online without having to buy games. Thus, companies and products grew exponentially, especially "indie" (independent) companies that would upload their games to platforms to be tested by the users. In the last decade, access to games through mobile devices led to this way of gaming being preferred by 95% of the world's players by 2018 [3].

In 2007, the year of the iPhone, the video game industry was a $35 billion industry, and in just one decade it grew to $137 billion. Nowadays the video game market is classified as those who play (playing), those who watch videos about games (viewing), and those who buy them (owning). According to the CEO of Newzoo Consultancy, a new large expansion of the industry is coming due to the demand for gamification from traditional sectors [3].

> "As we look towards the future, we foresee games playing an increasingly impactful role in disrupting and reshaping traditional industries, from implementing individual game mechanics to an array of mergers and acquisitions crossing the boundaries of traditional industries." ([3], p. 5)

Other authors have offered glimpses into the past regarding the expansion of the serious games market. Michaud et al. ([10], p. 7) estimated in 2010 that global revenue from serious games was $1.5 billion, and that it would have a projected sales growth rate of 47% between 2010 and 2015. Other sources such as Markets and Markets (2015) [11] estimated that the serious games market could reach $5.5 billion in 2020.

To identify the institutions that lead in the production of serious video games, the case of serious environmental video games has been studied because information about them has already been analyzed by Rojo and Dudu (2017) [12]. Their review of previous studies (see below) shows that for the North American market, the prominent producers of serious video games are large companies, universities, and independent developers. In Spain, the leading producers are large companies and NGOs, followed by regional public administrations.

That conclusion for the American market came from a study by Katsaliaki and Musafee (2015) ([8], p. 665) who analyzed 49 sustainable development video games. As for the study on serious environmental video games in Spain, Ouriachi et al. ([9], p.1053) analyzed 24 such games for young people which were accessible online free of charge. In comparing both studies, the conclusion is that universities play an important role in serious games production in the North American market, but they are not currently involved in Spain.

1.2. Gamification as a Unique Way to Engage in Learning

In the presentation of the 2018 Newzoo video game industry report, its CEO and co-creator Peter Warman, acknowledged that its strong growth and success was due to "our industry's ability to offer unique ways to engage" ([3], p. 3). The way to engage is the main achievement of gamification as a technological innovation that has developed within the video game industry from its beginnings in 1970 to the present. And, according to authors such as Tom Chatfield [13], gamification consists of

creating a virtual environment in which activities get the participant hooked by using seven different ways of rewarding the human brain (see Table 1).

Table 1. Gamification brain reward techniques for a pleasant learning experience. Source: elaborated from Tom Chatfield 2010.

1. Levels of experience that measure progress	2. Multiple short- and long-term objectives
3. Gifts for efforts	4. Answering in a quick, frequent, and clear way
5. Uncertain final outcome. Increases dopamine	6. Windows with information, both to help decision making and to learn from decisions impact
7. Other persons (collective game or comparing and comments with others)	

Thus, gamification manages to make learning experiences pleasant, or to seduce users towards simulated behaviors that are rewarding to their brains. And among the gamification tools pointed out by Chatfield (2010) [13] in Table 1, several can be highlighted: setting clear objectives, rapid and frequent response, timely contributions of helpful information, the element of uncertainty about the final results, and contact with other players.

French researcher Elisabeth Grimaud (2017) [14] uses the term "dose" to refer to brain neurotransmitters that favor brain synapses. Dopamine, for example, is mobilized with the pursuit of goals and the success of achieving them. Oxytocin is associated with qualities of affection; thus, it is mobilized by the encounter with others. Serotonin is what the brain produces when we are happy, proud, and satisfied with ourselves. Endorphins occur in the management of the effort to continue, to keep going. So, the information that comes to us, or the behaviors that a gamified learning process asks us to perform, can achieve these types of rewarding brain chemical changes.

Lara Boyd (2015) [15] studied the effects of video games on the recovery of patients with cerebral infarction. She found that changes in the brain are both functional and structural when patients practice behaviors to achieve learning skills or abilities. The first good news is that the brain learns throughout life for the neuroplasticity that characterizes it. The second is that the best driver of neuroplastic change in the brain is behavior.

As behaviors are practiced to develop skills or abilities, the brain changes functionally. Whether one is a musician, taxi driver, researcher, or bricklayer, each profession with its own skills and abilities usually activates certain springs of the brain. In that way, when a capacity or ability has developed sufficiently, a part or region of the brain becomes accustomed to being activated until it develops more.

But, mastering an activity can require around 10,000 h of practice. This is where gamification intervenes and accelerates learning by creating practical experience levels of virtual behavior. Faced with the challenges such as curbing climate change and reducing pollution by means of resource-saving behaviors, serious environmental video games contribute to accelerate citizen responses (Rojo and Dudu, 2017 [16]). Also, simulation games involving risk behaviors, such as piloting planes or performing surgery, are accelerating learning and reducing costs in time and equipment for the training of these professionals.

Other investigations such as the framing theory, modernly reformulated by authors such as Lakoff (2010) [17], reinforce the importance in gamification of "setting clear objectives" and "providing information windows with clear, fast and frequent responses" on the part of the game. According to Lakoff (2010) [17], the theory of framing proposes that communicating information or data on an issue is only effective when the recipient has a framework or system of neurological frames in the brain, in which the data or information can fit or articulate with one´s accumulated knowledge. Thus, ideas framed in a certain way are settling in the brain.

1.3. Gifts for Effort and Motivating through Gamification

In the gamification of virtual experiences, the first clear idea that designers need to have is the direction in which the person is motivated, what behaviors are desired or most valued in the game or gamified experience. One can differentiate two modes of motivation in the content of a game: intrinsic and extrinsic.

(a) Intrinsic motivation is usually different for each game/person. It is about what attracts the person towards a task or a set of tasks that result in achieving and living certain experiences. And, there will be a range of activities/tasks such that the user likes some more than others. Authors such as Kapp et al. ([18], p. 164) advise designing this intrinsic motivation aspect of the game through its content in narrative, its history, or the mystery or puzzle to be solved such that the action itself is the prize. This means looking for design components that lead the player or user to live the experience. According to experts in school motivation, Ryan and Deci (2000) [19], intrinsic motivation results in high quality learning and creativity; it accrues from engaging in interesting activities and then behaviors become "volitional and accompanied by experience of freedom and autonomy" ([19], p. 65).

Werbach and Hunter (2012) [20] establish three basic rules that must be fulfilled for an activity to intrinsically motivate a person: competence, relation, and autonomy. According to Ryan and Deci (2000) [19], those three social context rules are relevant for intrinsic motivation because they support three innate needs the person faces when he/she is exposed to new ideas and exercises new skills: to feel connected, effective, and agentic ([19], p. 65):

- Competence—that the person can be effective in the tasks performed. According to Frasca (2012) [21], gamification has the effect of activating the desire to improve personal performance in a task. A final "try again" message for example, makes it possible for the user to make mistakes without dramatic consequences. According to Ryan and Deci's research on education, if the student feels efficacious, he/she will more easily adopt a goal as their own, thus in order to facilitate internalization of a goal they recommend offering "optimal challenges and effectance-relevant feedback" ([19], p. 64).
- Relation—that the person can interact and be involved. To describe this aspect, Smethurst (2015) [22] suggests using "interreacting with the game" as the most appropriate term to emphasize that it consists of an innovation that goes beyond simply "interacting" which was already possible with more traditional media such as television or radio. In their self determination theory about motivation in school (SDT), Ryan and Deci name this aspect "sense of relatedness" meaning "sense of belongingness and connectedness to the persons, group, or culture" which is obtained by being valued by significant others to whom one feels connected.
- And, autonomy—that the person can feel in control of his/her own life. That is, the user makes decisions and discovers his/her own way (more on the aspect of decisions below). According to research done by various authors reviewed by Ryan and Deci ([19], p. 63) autonomy and self-regulation contexts facilitate internalization of goal and behavioral regulations at schools. By the contrary, when students were more externally regulated, they showed a tendency to blame others for negative outcomes while more autonomy correlated with interest and enjoyment ([19], p. 63).

(b) Extrinsic motivation in gamification systems consists of dynamizing through scores, prizes, and certificates. Scores or points inform the player of progress, and work as a continuous evaluation that is very stimulating. Prizes or cards (badges) as well as certifications recognize intermediate successes and degrees reached (leaderboards), motivating the player towards enhanced performance. In their review of literature on gamification of education, Nah, Telaprolu, Ayyappa and Eschenbrenner agree to the above mentioned modalities of gifts and add two more: level/stages and progress bar (Nah et al. 2014 [23]).

Kapp et al. ([18], p. 147) recommend a procedure for rewarding the player. First establish the needs and objectives of the game, then determine what should be measured and then give those components

a value. Points measure mainly the dedication of the player and progression in the tasks. They provide explicit and frequent feedback. In many video games, points are redeemable for possessions or provide access to resources needed for better performance. It can also be seen in terms of goal orientation and "layers" of goals, where reaching a long-term goal requires having completed medium-term and short-term goals, as well as missions broken into multiple tasks (Nah et al. 2014 [23]).

The prizes (badges) are usually applied when a certain score is reached, often in the form of gradients that are achieved within a ladder. Hamari ([5], p. 476) studied the effect of applying a gamification element such as batch system to the case of Sharetribe, an international peer-to-peer trading service. Its results show that customer engagement efficiency tends to decrease when it ceases to be a novelty and that the consumer's personality could be a significant variable to explain the differences in behavior when faced with the batch system.

Badges give the player a rank in terms of level reached in one or several competitions, and engenders empathy with those who have reached similar ranges. They are reputation markers. "Leaderboards" offer a final qualification in the game by making public the results of all the players and making it possible to compare oneself to others.

Werbach and Hunter ([20], p. 76) point out some aspects that can be demotivating, such as games with "leaderboards" that remain static, games that reward activities that are intrinsically motivating, or games that exhibit conflicts between prizes and achievements.

1.4. Other Aspects in Gamification: Decisions and Narrative

From the analysis of intrinsic motivation, two new fundamental elements stand out for the success of a gamification process: narrative and decision making. So, it seems convenient to add them to Chatfield's list. Narrative refers to the fact that the story, experience, or activity proposed in the game or game experience has interest in itself. Ryan and Deci (2000) [19] refer to intrinsic interest activities as those that "have the appeal of novelty, challenge, or aesthetic value for the individual".

Generally, it is well known that those are aspects that anyone looks for to submerse in a good story with epic moments. The narrative structure refers to the script of the game itself and what happens in the game in terms of the process that is followed to experience the behavior the game is designed to train. As Werbach and Hunter (2012) [20] suggest, the narrative is about defining a magic circle, a little world that is meaningful to the players. The game is what happens inside that circle.

Also, within the gamification there is a prominent role for creating options and decision-making opportunities. The game has to offer elections. The sense of control that players have in games is powerful because of the choices they make that produce an emotion of dominance, of power, over the events and results of the game. Not all games are fun, but they are volunteers. The one who plays makes decisions, chooses, with consequences that affect the gaming experience.

For authors such as Cervera (2012) [24], discussed below, "make own decisions and take on the consequences that they have" as well as "be yourself and live your own experience" are two of the important skills acquired and trained by the video game player. From the perspective of game design or simulation, to train those skills you have to create decision making options and a story, a "narrative".

1.5. Trends towards Gamification in University Education to Train Generic and Transversal Skills

Institutional public discourse to promote gamified learning in public education is rare. Only some international institutions such as United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the United Nations (UN), openly express support for educational video games, promote them for training on issues of peace and environmental protection, and even support expert recommendations on their design [25].

Within the public education sectors, however, the number of professors who favor the incorporation of gamification into the courses they teach is increasing. Contreras and Eguía (2016) [26] argue that traditional education is perceived by many students as boring and that teachers face the challenge of motivating students who are digital natives. There are basically two schools of thought among

professors. There are those who believe that video games will replace them as workers, and there are those who believe that video games require supervision by the professor and bring greater productivity to their work.

Players with more than 10 years of experience with video games such as H. Cervera (2012) [24], recognize that they have acquired skills and competences that include: taking risks, having purposes, thinking long term, managing resources, making their own decisions and taking the consequences, and learning to collaborate with others (see Table 2). Many of these skills are specific competences or generic transversal competences that are part of the curricula of university degrees.

Table 2. Gamification and skills acquired by the video game player. Source: Humberto Cervera (2012) [24].

1. Have purposes that get results	2. Think long-term
3. Manage and optimize resources	4. Take risks, dare to risks
5. Compete in face of achievable challenges	6. Ask all the possible questions
7. Be yourself or live your own experiences	8. Make your own decisions and take on the consequences that they have
9. Explore the surroundings	10. Collaborate with others in multiplayer games, learn to play together.

For Contreras and Eguía (2016) [26], the main skills that video games should teach are, in addition to the acquisition of knowledge, the resolution of problems (all skills in Table 2 are involved in problem resolution), and collaboration, or communication (both are included in skill 10 in Table 2). The skills listed in Table 2 are reinforced by the conclusions of the video game designer McGonigal (2015) [27], and creator of the game "superbetter". McGonigal especially points out three groups of psychological skills or strengths that the games help a person to develop:

- The ability to control attention: thoughts and feelings (skills 1 and 2 in Table 2);
- The power to convert others into potential allies and to be able to strengthen the relationships that we already have (skill 10 in Table 2);
- Natural ability to motivate and overload heroic qualities (willpower, compassion, and determination) (skills 4, 5, 7, 8, and 9 in Table 2).

This means that the skills that video games usually train have a high equivalence with those pursued in universities. Therefore, the implementation of gamification in university education, whether through games or gamified experiences, is an unavoidable trend for these avant-garde institutions. But we have also seen that the political environment and cultural attitudes are somehow adverse to expect that in the short term universities achieve financial autonomy to undertake gamification projects or quality video games on their own.

On the contrary, we have seen that private companies in different branches of the economy do show a state of alert and progress in the production of serious video games or in the gamification of their products and services. The video game companies themselves have also visualized the expansion of the gamification market and are becoming active.

In this situation, how can universities advance in the gamification of their teachings? To what extent can universities use collaboration modalities with companies that own quality games to share their products or for joint developments? In order to answer the questions, we have studied the case of the collaboration of the Universidad de Sevilla (Spain) with the Foundation of the MAPFRE Insurance Company, the BugaMAP game owners (see Figure 1), in order to implement the game with economics students of the 2018–2019 academic year. Until then, the game had only been used by the MAPFRE Foundation for internal training of its employees, as well as in universities in Latin America [28].

In BugaMAP simulation, students in each session are distributed in teams of five players representing management teams of different insurance companies (see Figure 2). Competition among

insurance companies (teams) is aimed at increasing their market value by making appropriate decisions. They have three tries. They all receive a certificate for participating, and the session and competition winners receive material gifts.

Figure 1. Online presentation of BugaMAP game. Source: Fundación MAPFRE website [29].

2. Materials and Methodology

This study uses an empirical, theoretical, qualitative, and quantitative methodology. The methodology has consisted firstly of a bibliographic search and analysis to construct an analytical theoretical framework which presented in the introductory chapter. Next, a quantitative methodology has been applied with statistical analysis of the data from the evaluation survey answered online by students after finishing the experience of the game. This is, the statistical data available to evaluate the company–university collaboration in applying gamification into university education with the outcome of the opinion and attitudes questionnaire to the BugaMAP players of the University of Sevilla, academic year 2018–2019.

A qualitative methodology has also been applied, and specifically, two techniques: the participant observation of the collaborating teachers and the analysis of the content of the BugaMAP game itself (objective evaluation). For the analysis of game content, eight variables or gamma elements were selected, which were considered essential for a game to fulfil the functions of player involvement, content learning, and skills training, with fun. The content analysis was descriptive, and checked if the game contained the variable and described its format.

Figure 2. BugaMAP game is a team competition. Source: Fundación Mapfre [29].

At the University of Seville, the activity was done as a special class day, and the professors were accompanied by MAPFRE monitors. The game experience consisted of 10 sessions, lasting 4 h each, in which a total of 200 students of economics courses from various degree plans of the University of Seville participated (see Table 3). It took place between days 12 and 20 of March 2018. The activity distributed in the following manner: day 12 (professors meeting), day 13 (1 session), day 14 (2 sessions), day 15 (2 sessions), day 16 (1 session), day 19 (2 sessions) and day 20 (2 sessions).

2.1. Methodological Aspects of the Subjective Evaluation

To collect opinion data about the game (subjective evaluation), a structured response questionnaire was sent to the 200 participants through the Google Drive application, the Google Forms tool that allows questionnaires to be made and statistics obtained from the results of the surveys. As far as reliability is concerned, consistency has been evaluated using the Cronbach alpha coefficient which is the coefficient most widely used to estimate reliability in applied research. Its values range from 0 to 1 [30]. In our questionnaire the value of Cronbach alpha coefficient is 0.942 meaning a high reliability of the instrument used.

The analysis of student opinion data about the game (subjective evaluation) was done based on data collected through an online questionnaire, which was answered by 142 of the 200 students who participated in the game. Using a Likert scale assessment of 5 to 1, they were asked about their satisfaction with the game, the learning achieved, and their opinion regarding various characteristics of the game.

From the 142 participants who answered the questionnaire, of whom 69% were women. Most of the students, 52%, belonged to the degree plan in Labor Relations and Human Resources, and the rest came from degrees plans in Tourism, Statistics, Statistics and Mathematics and Labor Relations and Finance. They were mostly second-year students (64%) and 70% were between 18 and 21 years of age (see Table 3).

Table 3. Sociodemographic characteristics of BugaMEP registered gamers questionnaire sample Univ. Sevilla. All students of economic courses in different degrees, year 2017/18.

By Degree Studying	**Statistics**	**Mathematics & Statistics**	**Labor Relations & Human Resources**	**Tourism**	**Labor Relations & Finances**
142	18	19	74	16	15
100%	13%	13%	52%	11%	11%
By Years	**First Year**	**Second Year**	**Third Year**	**Fourth Year**	**Fifth Year**
142	16	91	10	22	3
100%	11%	64%	7%	15%	2%
By Age	**18/19 Years**	**20/21 Years**	**22/23 Years**	**Other**	
142	45	54	22	21	
100%	32%	38%	15%	15%	
By Gender	**Women**	**Men**			
142	98	44			
100%	69%	31%			

Source: Elaborated from questionnaire to participants.

2.2. Variables and Indicators for Objective Evaluation

The analysis of qualitative data on the gamification patterns of the BugaMAP game (objective evaluation) was done using a test consisting of eight variables defined with qualitative measurement indicators, based on the contributions of several authors including Chatfield (2010) [13], Gee (2010, 2016) [25], Rojo and Dudu (2018) [12], and Cervera (2012) [24]. See introductory chapter of this article for more detailed information regarding authors' contributions supporting the nine elements

characterizing gamification we ended up selecting in order to build a qualitative test for objective evaluation of the BugaMAP simulation game.

The eight qualitative variables selected to test the learning gamification contained in the BugaMAP game are listed below. They are the seven variables proposed by Chatfield (2010) [13] plus the variable "narrative and decision making". For each variable, two to four qualitative indicators that describe it are specified. The indicators are taken from the list of principles of video game design of Gee (2016) [25] (see the list of 24 principles in the Appendix A) as well as the list of skills acquired by the player, according to Cervera (2012) [24].

- Narrative and decision making—This variable is about discerning the experiences for problem solving that the game designs (Gee 1). Each game has a story that enlivens the game, a story that makes the game interesting and motivating in itself. Describing the narrative consists of reconstructing the story, the real story that is simulated in the game, and determining in what territory or place it is framed, who are the characters, what is the role of the player or team of players, what is the objective of the game, and what resources are available to reach the objectives. This part trains skills such as "make your own decisions and take the consequences" (Cervera 8) and "be yourself and live your own experience" (Cervera 7).
- Levels of experience that measure progress—This variable is a very relevant part of the gamification process and consists of the game being able to create flow starting with manageable challenge and low stress (Gee 8); allow for early success and the margin to accommodate larger challenges (Gee 7); lower the cost of failure to encourage exploration and innovation (Gee 19). It is part of the motivation aspect, that the player looks competent because he/she is addressing achievable tasks. This part of the gamification would train for the ability to "take risks, dare to risks" (Cervera4) and to "compete in face of achievable challenges" (Cervera 5).
- Multiples short term and long-term objectives—This variable addresses how the game manages the economy of attention (Gee 2); if the game does a good job of combining the mechanics with the contents (Gee 4); if the game starts with simpler mechanics at the beginning and then goes deeper (Gee 6); and if the game orders the problems well, so as to generate ideas (Gee 10). This part of the gamification trains the ability to "have purposes to accomplish objectives" (Cervera 1) and the ability to "think long term" (Cervera 2).
- Gifts the efforts—This variable addresses analyzing which behaviors are most valued by the game, in which direction the person is motivated, and what awards/rewards are given in the sense that the game relies on learning by doing (Gee 11). These data indicate if the game transmits motivation, involvement, persistence, identity (Gee 3) and that the mechanics of the game have a "fair" functioning (Gee 5).
- Respond quickly frequently and clearly—This variable addresses the game's ability to provide data useful for solving problems (Gee 12); to give a lot of feedback useful for progress (Gee 17); to provide data that advise growth and trajectory (Gee 21); provide data to assure learning is integrative and that there is evaluation (Gee 22). The skill related to this part of the gamification would be to "ask all the possible questions" (Cervera 6).
- Element of final uncertainty (epic moments)—This variable addresses whether the game manages to create the expert cycle, practice-domain-challenge (Gee 9); if the activities connect with achievements and strategies (Gee 13); if systemic thinking is encouraged (Gee 24). By systemic thinking it is understood that the game allows the player to see the whole picture and not just individual actions, which helps the player see how the pieces fit together or can fit together.
- Windows of information to assist with decision making and learning from decision impacts—This variable addresses whether the game places meaning of words with actions (Gee 14); if it gives language and information just at the right moment (Gee 15); if the game creates "fish tanks" and "sandboxes" to reflect on (Gee 16). As seen in the framing theory, information given at the right time is assimilated better.

- Other people–collective game or comparing and commenting with others—This is a variable that can be measured in terms of individual play or team play, if there is a pooling, whether the decisions are individual or in teams. And, according to Gee 18 and Gee 20, it also measures whether the teachers give feedback to the game designers, and if the game offers options and opportunities of customization. This part of gamification addresses training related to the ability to collaborate with others in multiplayer games and the ability to learn to play together (Cervera 10).

3. Results

Results have been classified into two parts: results of the student opinion questionnaire evaluating the BugaMAP game (subjective evaluation); and results of the analysis of patterns of gamification of learning contained in the game (objective evaluation).

As a reminder, in the game BugaMAP each student is part of a management team of an insurance company along with four other students. In each session, the management teams representing several different companies compete with each other to better position their company in the stock market. They have three playing opportunities to make decisions and reach their desired goal.

3.1. Results of the Subjective Evaluation by Questionnaire to Players

The game BugaMAP is fun in the opinion of 88% of the students who answered the questionnaire (see Table 4). Finding the game to be fun, however, does not mean that they consider it easy (only 35%). This indicates that the game manages to be intrinsically motivating in a way that the challenge of overcoming obstacles or difficulties is a pleasant challenge.

For more than 90% of the students, the gradient of difficulty and progression of the game is highly valued as is the contributions of information helpful for decision making and learning from decision impacts. More than 80% of the students consider the game to be well organized, that previous concepts and instructions are clear, that it has a good pace and duration.

Table 4. Subjective perception of the game BugaMAP.

		Agree (4–5)	Neuters (3)	Disagree (1–2)	Total
1	It is fun	88%	10%	2%	100%
2	It is easy to play	35%	51%	14%	100%
3	It is well organized	92%	6%	2%	100%
4	It is creative	85%	13%	2%	100%
5	It is useful for learning	83%	13%	4%	100%
6	The concepts and previous instructions are very useful for decision-making	76%	18%	6%	100%
7	Facilitates and provides business and insurance sector knowledge	84%	12%	4%	100%
8	The duration of the activity has been adequate to acquire the objectives that were proposed at the beginning	68%	19%	13%	100%
9	The number of decision-making opportunities is adequate	80%	17%	3%	100%
10	The contents developed during the training activity have been useful and have been adapted to my expectations	71%	25%	4%	100%
11	It reflects the business reality (insurer)	83%	16%	1%	100%
12	The knowledge acquired will be useful in the future	70%	23%	7%	100%
13	Value the acquisition of soft skills (management of your work time, leadership and teamwork)	79%	19%	2%	100%

The game is considered by students to be creative, but it also is valued as a realistic simulation. The majority of students appreciate that the game represents the reality of the current sector and that the knowledge acquired will be useful in the future.

Opinion of the students about skill training has also been evaluated. A total of 79% of the participants agree that the game does a good job of training people for public speaking, teamwork, and the management of decision-making time.

Finally, there are the results from the part of the questionnaire regarding self-perceived satisfaction (see Table 5). A total of 85% of the students indicate overall positive satisfaction with the game. They considered that their expectations and the objectives were met, and 88% indicated that they would recommend participation in a future BugaMAP activity to their colleagues.

Table 5. Self-perceived satisfaction of the BugaMAP game.

		Agree (4–5)	Neuters (3)	Disagree (1–2)	Total
1	Overall satisfaction	85%	14%	1%	100%
2	The expectations I had regarding the usefulness of the BugaMAP simulation game in which I participated have been met	80%	16%	4%	100%
3	In general, I am satisfied with the development of	83%	16%	1%	100%
4	I would recommend this training activity to other colleagues	88%	9%	3%	100%

3.2. Results of the Objective Evaluation of the Gambling Experience

Below are the results of the objective evaluation of the gamification of the game BugaMAP, which is broken down into eight variables.

3.2.1. Narrative and Decision Making

Our player holds a high professional position in an insurance company and has power and autonomy to take well informed decisions inside a board of directors. The context of the BugaMAP simulation game is that of a closed market in which several teams representing different insurance companies compete against each other in one or more branches: automobiles, multi-risk, health, civil liability, and companies. The objective is for each insurance company to maximize the value of its shares in relation to the others owing to the correctness of its business management decisions.

Each team is composed of five players representing the Board of Directors of the company. The positions of CEO, Financial Director, Risk Director, Human Resources Director, and Director of Administration are distributed among the players, and members have to agree to make decisions as a team.

Each insurance company competing in a session starts the game with the same market share, number of customers, insurance prices, payroll, etc., and with a value of 100 points per share. Throughout the game, each team of players will have to make decisions about its pricing policy, underwriting, distribution, remuneration to sellers, distribution of investments, level of expenses and reinsurance [28].

3.2.2. Levels of Experience that Measure Progress

The levels of experience correspond to the four stages of the game throughout its four-hour duration (see Figure 3). The first stage is the introduction and presentation of the game and the economic concepts of the insurance sector. The next three stages all begin with a decision-making assignment, followed by a simulation and common analysis of the results. The game ends with a final presentation of results, a colloquium, and conclusions.

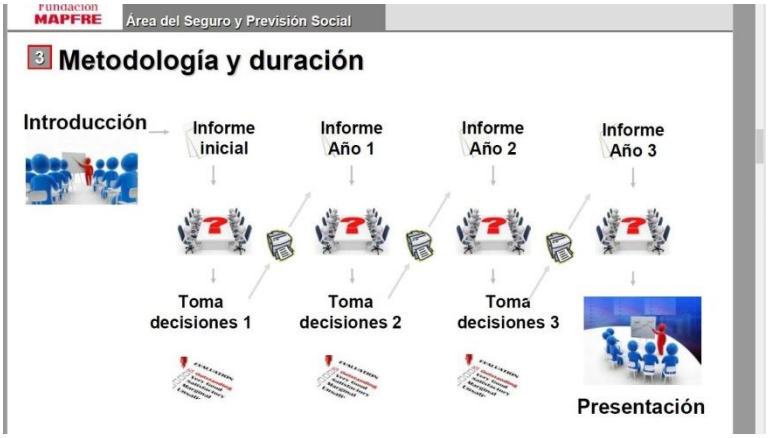

Figure 3. The four stages of the BugaMap game. Source: Fundación MAPFRE [29].

Each team of players can see how its insurance company performed after a first-year of exercise and how it compared with other companies that made different decisions. In addition, in the analysis of the results of each stage, a representative of each team explains why the decisions were made and analyzes the results and their consequences.

As the game continues for two more exercises, each team of players will see their progress and the intermediate results they are achieving. In addition to the decisions as a team, each insurance company will be affected in the game by the uncertainty of the markets and factors exogenous to the company that can combine against or in favor of its annual results.

3.2.3. Multiple Short-Term and Long-Term Objectives

In the short term, the objectives are to become familiar with the economic concepts and content of the activity, how decisions are made in insurance companies, and the competitive market in which companies operate. That is, to develop an understanding of complexity.

And, in view of the impact of their decisions on the company's overall results and the causes of their intermediate results, each business team gets involved in understanding the impact that some decisions may have when combined with others and external risks that can affect the insurance companies' profitability. In this way, teams advance towards the objective of achieving the ultimate success of maintaining or increasing the value of their company via their actions and decisions.

The business team that achieved the best results in the BugaMAP tournament at the University of Seville was the team known as "Europe", which had an ending share value of 97.5 points. This emphasizes the difficulty of the game given that each team started with a price of 100 points per share. And the simulated insurance company that won the BugaMAP competition at the University of Seville was composed of five second-year students.

This was a surprise, because the MAPFRE Foundation considered the game to be aimed at professionals, or students in their final year of a Master's degree program. The fact that students with a lesser educational base and knowledge of economics managed to win the tournament may be explained by the overall vision of gamified learning which is offered in a way that facilitates complex intuitive thinking that speeds up decision-making. Conversely, those students with formative structures of information accumulation may see their decision-making slowed down.

3.2.4. Gifts for Efforts

The prize structure of the BugaMAP game shows that it mainly relies on its own narrative and fair functioning. The game, as it is aimed at professionals in the insurance sector or students in the area of economics, and the prize structure acts as an extrinsic motivation to attract players to get involved in. For simply finishing the game, the players were rewarded with a certificate of participation issued by

the MAPFRE Foundation. For winning the game within a session, each member of the winning team received a pen drive. For winning the tournament each member of the winning team was awarded 200 Euros in Amazon shopping cards.

3.2.5. Respond Quickly, Frequently, and Clearly

The BugaMAP game is based on learning by doing, provides data for the resolution of decision-making problems faced by players and provides data that inform the growth and trajectory of playing. But, the BugaMAP game system of providing that information is probably not as fast or as often as is found in commercial video games. The BugaMAP game uses a way of providing information that allows for discussion within all the teams that participate in a game session.

There are several particularly relevant moments when the game provides data. Data are provided at the beginning of the game during the briefing in which, in addition to explaining the concepts and narrative of the game, players are given brief written explanatory material. At the beginning of the first annual exercise each team is given strategic and economic documentation on the insurance market. Decisions of each team are based on the analysis of this documentation.

Later, the decisions made by each business team are acted on by the game software to produce results that constitute a response of the game and a contribution of information on the impact of the team's decisions on the company's profit and loss account. That information on results is provided by the game in each of the three waves (annual exercises) of the game.

Finally, the game generates and provides data on serious claims that happen randomly and on the occurrence of a catastrophic event that causes a rise in the claims rate thus impacting the company's income statements.

3.2.6. Element of Final Uncertainty (Epic Moments)

The game has its great epic moment at the end, because that is when all results from all decisions made by each management team are resolved and hierarchy of ranking is determined. But, there are also epic moments of lesser intensity at the end of the two previous waves, because each team can see the impact of their decisions. Epic moments can also be considered those that are experienced within each business management team when making decisions. And, there is no doubt that the news of catastrophes or external events provided by the game are also times of impact due to the uncertainty about the results.

The BugaMAP game is full of emotion-provoking moments. As decisions are made, the teams are practicing and learning how to play the game better, although there is still uncertainty until the last match as to what a team's final position will be. If they adopt their strategies properly, they can achieve the expected results. Throughout the different decision-making processes, they can modify their strategies if they consider that those previously adopted have not been the right ones. There is feedback among the players, and the results of decisions made in one phase of the game allow them to learn and better define future strategies, until the great epic final moment arrives.

3.2.7. Featured Attention Windows. Information Contributions

The BugaMAP game uses written information instead of attention-grabbing windows built into the software. It has already created those elements of language and information it has to provide at any given moment, but it still needs to develop the software so that players can access the information virtually.

In the game version of this experience, Fundación MAPFRE's monitor played the role of providing information and resolving doubts at the precise moment. It was also necessary for the monitor to enter data of the team's decisions into Fundación MAPFRE's computer. This is something that has already been modified in the new version of the game; the foundation provides a computer to each team to enter the data of their own decisions, thus speeding up the process.

It can therefore be considered that the game BugaMAP is still under development especially with regard to information inputs to and outputs from the game.

3.2.8. Other People–Collective Gamers or Comparing and Commenting with Others

The very nature of the BugaMAP game emphasizes its character as a collective game that makes it possible to train users in the abilities of communication, oral presentation, and team work. Because the game is established as a competition between companies, a player needs four other players to form the management team of a company. This means that continuously, throughout the game, players are debating and commenting on the problems they face and the possible decisions to be made.

After each of the three waves of the game there is a pooling in which each company presents to the other four companies involved in the game, how they arrived at the results of their company and why they made their decisions. Hence, the collective exchange expands from 5 to 25 people interacting.

Also, the university professors and the MAPFRE Foundation monitors take part in the results debates and interact with the players to clarify doubts and provide information that feeds back to the course of the game.

All of this interaction and communication is focused mainly on the objectives of the game, but also addresses aspects of how to improve the game itself in its digital format. Therefore, it can be considered that both the professors of the University of Seville and the students who were involved in the sessions, contribute to the MAPFRE Foundation as testers of the game and collaborators in its further development.

In all practicality, personalization that the game allows is currently limited to choosing the insurance branches preferred by each business team.

4. Discussion

This study focuses on gamification opportunities for university teaching with specific attention to the option of company-university collaboration for implementing and developing serious videogames or gamified experiences. In addition to reviewing a selection of literature on the state of the art regarding the use of gamification for education, this study has addressed the case of collaboration between Fundación MAPFRE and University of Sevilla in applying the Foundation's game BugaMAP to university students training about insurance.

With the support of several authors, we have shown that the advances in gamification that have revolutionized and made a world-wide $138 billion dollar video game industry, with 8% annual growth and 2.3 billion players, consist fundamentally of a set of techniques that succeed in involving people in complex learning and skill-acquisition activities [2–4,7,13]. Outside the entertainment industry, some economic activity sectors such as education have become interested in the skills acquisition aspects of gamification [2,26], while others such as marketing and services have become more interested in the fidelity or engagement of the users [5].

The diversity of interests and impacts that surround gamification leads us to consider that it, as a technological advance, represents a great new paradigm in the history of knowledge acquisition. Transversality of the scientific disciplines involved is wide, both because of new multidisciplinary scientific knowledge and because of economic and productive performance. The fields of knowledge that combine gamification range from computer science and mathematics, through neurology and graphic art, to behavioral sciences, marketing, sociology, pedagogy and communication [1,4,6,14,15].

In recent years, game technology has been in a process of transference, in the form of serious games or gamified experiences, towards many other sectors such as defence and security, health and fitness, commerce, marketing and services, education and training, social welfare utilities, etc. [5,10,11]. The market for serious games isestimated to reach $5.5 billion in 2020 [11]. Currently, only one serious game is produced for each five produced for entertainment; however, game industry reports for 2018 show that there has been a significant increase in demand for gamification in all sectors [3,7].

Regarding institutions involved in producing serious video games, data from research done on free, serious environmentally-oriented videogames indicate that large companies, major NGOs, international organizations and universities tend to be leaders in serious games production in the North American market [8]. Spain is similar except for the involvement of universities. We find that at present universities in Spain are seldom connected with the production of serious video games and that public administrations avoid budgetary commitments to support this involvement [9,12]. Those free online access videogames on environmental issues analyzed by Ouariachi 2017 [9] were tested with students in research done by Rojo & Dudu 2018 [16] using the Gee 24 criteria list. University students from third year questioned their quality and found them far from attractive or interesting. The majority of serious video games were criticized by students on the basis of their narrative, goals, decision-making opportunities for the player, simplicity, the impossibility of recovering from bad results, etc. [12,16].

This seems to be different with regard to companies that strive to develop a quality game without giving free or commercial access to other users. The experience analyzed by the MAPFRE Foundation with the BugaMAP game shows that most companies are considering their game a patrimonial investment destined for the training of their own technicians. The opinion of the Seville students who played theBugaMAP, however, was very different. For more than 80% of the students the game was fun, organized, creative, not easy, useful, provided them with knowledge reflecting the business reality of the insurance sector, had an adequate number of decision-making opportunities, met their expectations and they would recommend it to other students [31]. But, such a product as BugaMAP may have taken the company more than a decade to develop, and since the collaboration with the University started Fundación MAPFRE has introduced improvements every year. That is why collaboration with universities was seen by the MAPFRE company as part of an improvement strategy and also as a way to disseminate knowledge about an industry, such as the insurance industry in this case.

The formula of collaboration between universities and companies in the development of video games owned by the latter has proved to be of interest for both companies and universities.

For universities, the interest lies in the fact that this collaboration enables them to introduce educational innovations and experiential learning methods into the classrooms. An additional interest is that these collaborations are formative for professors, because teachers in general and university professors in particular find few opportunities to train in digitalization and gamification of content. Other authors subscribe to the idea that "teachers or professors and game designers need to work together" [2,25].

Professors collaborating with companies see the video game industry as an ally to gamify and spread with fun the teaching skills in their respective subjects that have taken them so many years to acquire. As the results of the BugaMAP case study show, contrary to the notion that the use of gamification in education would lead to replacement of the teacher, the introduction of a serious game in university learning may require collaboration among several teachers and the help of professional technicians (monitors) familiar with the rules, process and software of the game. This means that at least in the stages of development of gamified products or serious video games for the university, there would be an increase in the demand for specialists rather than a decrease.

In reference to the benefits for companies collaborating with universities for the development of video games or gamification, the BugaMAP case study presented here showed that the company that owns the game was able to identify areas of potential improvement for developing a more advanced version of the game for the following year. Thus, this type of collaboration is also beneficial for the company. Among the weaknesses of the game that were identified, the most important were in the domain of human-computer interaction, time delay in scoring and that the information necessary for advancement of the game was delivered on paper and explained verbally. As a result of this collaboration, the version that would be used in the University of Seville during the following academic year presented a more advanced virtual format.

Concerning the way gamification works, there is general agreement on the key elements that reward the brain and engage the participant through forms of intrinsic motivation (e.g., narrative, autonomy, decisions, goals, framed information, relations) and extrinsic motivation (e.g., gifts, batches, rewards) [13–15,18–20]. Quality gamification (design of video games, serious games or gamified experiences) has high costs, but its effectiveness rests on its quality. Gamification is seen as capable of reducing significantly the time required to train a person with new professional skills or behaviors by creating virtual environments that simulate real experiences [27]. In the case of the BugaMAP game, for example, four hours were enough for a team of five economics students to experience the equivalent of one year of behavior as well informed responsible executives who make complex decisions about the management of an insurance company [28].

In this study, eight fundamental elements were identified as basic content for an acceptable level of gamification in game design. They were selected on the basis of the contributions of Chatfield 2010 [13], Gee 2016 [25] and Cervera 2012 [24], which compared well with the considerations of other authors [2–4,6,10,16–22]. This list proved to be a valuable tool for evaluating qualitative data from the BugaMAP case study, and it also validated the contributions of the authors above mentioned. The list of variables is as follows: narrative and decision-making; levels of experience that measure progress; multiple short-term and long-term objectives; gifts for efforts; respond quickly, frequently and clearly; element of final uncertainty (epic moments); windows for information to assist with decision-making and learning from decision impacts; and other people (playing with others and commenting with others).

Results of the objective evaluation of the BugaMAP game show that some elements of its gamification or game technology are more developed than others. Among its strongest points are narrative and decision making as well as commenting on or relating to others. Its weakest points arethe speed of the response, the gifts for efforts and the information windows. Other issues that this test reveals are that the part related to the interaction with the HCI computer and the graphic design of the BugaMAP game left out of the evaluation would require a specific study in itself [4,25].

For future research, it is necessary to go further in finding specific indicators that measure the differences in level of advancement in gamification relative to each of the variables or elements of gamification identified in this study. This is important for comparing differences among games in a more precise way, and is also necessary for establishing a way to measure the aspects of graphic design and human-computer interaction elements of a game. Another research issue that arises from this study is to inquire about the factors that influence the slowness with which the educational system is incorporating innovations in gamification. In particular, the values and attitudes of public opinion towards videogames in education and public administration discourse are poorly studied.

An educational video game or simulation of learning experience requires a significant investment of time and knowledge from initial product conception to design, computer programming and essay production. On the other side, only those learning instruments based on well-designed games or games of relative quality are usually satisfactory for students who are products of a digital culture. Thus, if public university institutions were to develop their own videogames, they would require the support of public administrations and companies to cover the high financial cost. The case studied here shows that in Spain and similar serious games markets, a feasible option at present for university professors and students to become familiar with content gamification techniques is through collaboration with those large companies that produce and/or have serious games for education and professional skills training. Likewise, such collaboration could extend to game design enterprises.

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Appendix A 24 Principles of Video Game Design for Learning (Gee 2016, UNESCO)

1. Design experience for problem solving
2. Manage the economy of attention
3. Motivation, involvement, persistence and identity
4. Game mechanics more content, well combined
5. "Fair" operation of game mechanics
6. Simpler mechanics at the beginning and deepening
7. Early success and margin to accommodate larger challenges
8. Create flow. Start with manageable challenge. Little stress
9. Create the expert cycle: practice-domain-challenge
10. Order problems well: generate ideas
11. Relying on learning by doing
12. Give data, for problem solving
13. That the activities connect with achievements and strategies
14. Place meaning of words with actions, etc.
15. Give language and information just at the right time
16. Create "fish tanks" and "sand boxes" to reflect on
17. Give lots of feedback on your progress
18. Teachers give feedback to game designers
19. Lower the cost of failure to encourage exploration and innovation
20. Offer options and customization
21. Advise growth and trajectories with data
22. Integrative learning and evaluation (with data)
23. Stimulate the modification and doing (be them designers)
24. Encourage systemic thinking

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