The Usage of Game-Based Learning in University Education. How to Motivate and Foster Creativity among Adult Students through Board Games

Juan Luis Gonzalo-Iglesia, Natàlia Lozano-Monterrubio*, Jordi Prades-Tena**
*Universitat Rovira i Virgili, Department of Communication Studies, ASTERISC - Communication Research Group

ABSTRACT

In the last decade, the emergence of innovative teaching methodologies such as Game-Based Learning, Flipped-Classrooms or Problem-Based Learning have meant an important change in the way students learn. All these turn the student into the core of its own education process and use participative and cooperative techniques that encourage 21st century skills as well as motivation improvement. The purpose of this paper is to analyse and evaluate the potentialities of Game-Based Learning methodology with commercial board games in higher education with special focus on students' motivation. This investigation was an exploratory two-stage process. The first one involved three experimental interventions in courses of six bachelor degrees of Communication and Biochemistry studies (n=196 students). In these interventions, teachers introduced commercial board games that were related with the contents of the courses and organised games among students. The second stage was data-driven. It was gathered through a survey among the students that had participated in the GBL interventions (n=87). It included questions related with the teaching methodologies experienced at university, their perceptions about games as a teaching method and the benefits of the GBL sessions with board games. Results show that GBL sessions significantly motivated students; promoted their active participation in class and developed transversal skills such as teamwork and communication.

Keywords: Game-Based Learning; Board Games; Motivation; University Education.

Introduction

Playing and games have always been elements closely linked to teaching, but today they are claimed as a strategic innovation tool to improve learning processes. In the last decade, several theoretical and practical perspectives have emerged that approach this issue such as *gamification* (Deterding, *et al.,* 2011; Kapp, 2012), *pervasive games* (Montola *et al*., 2009), *serious games* (Ritterfeld *et al*., 2009) or *Game-Based Learning* (Tobias, Fletcher & Wind, 2014). Although they offer different approaches, their nexus is the usage of the principles of games or even games themselves as tools to influence learning and increase motivation and engagement of students. All these methodologies turn the student into the core of its own education process and use participative, experimental and cooperative techniques that encourage 21st century skills (critical thinking, creativity, collaboration and communication) as well as motivation improvement.

Although boundaries between the concepts are in many cases diffused, the terminological debate is placed in the pedagogical/ludic axes and created games/gaming experience. For example, while gamification is considered the design of activities which use "game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems" (Kapp, 2012) and are more concerned about the global experience of the participants than in the usage of a particular game (Cornellà & Estebanell, 2017), serious games put emphasis on the learning objectives rather than in the playful structure. As Wu & Lee (2015, p. 414) exemplify:

> Climate change games are considered 'serious games' that are designed to have underlying objectives beyond mere entertainment such as instructional goals. Game characteristics such as goals, rules, or the use of fantasy not only promote player engagement, but also influence learning.

Within this debate, some authors see contradictory the usage of games in education, because they would be the opposite of serious (Wechselberger, 2013). On the other hand, Rubio (2013) states that educational games do not always achieve their goals because they forget to design the most playful aspects, which are the most influential in the effectivity as a pedagogical tool according to experts (Gee, 2008). However, those elements that stress on the characteristics of the game

(interaction, decision-making, fun, challenge, competition, etc.), arouse greater interest in the participants, without detriment to the learning process.

Within all these trends, Game-Based Learning (GBL) is a methodology based on the creation of games and simulations or using existing ones, preferably digital, as teaching resources in the classroom. Close to the serious games technique, its main difference would be the usage of playful characteristics of *noneducational games* to produce and improve the experience and learning. A relevant aspect to consider is that knowledge and game culture are caught on among new generations. This means working with familiar tools to several students. As Hamari *et al.* (2016, p.176) state:

> Serious games present the opportunity for indwelling, when familiarity with ideas, practices, and processes are so ingrained that they become second nature. However, because these ideas, practices, and processes are components of tacit knowledge, they are difficult to measure.

These learning instruments are not exclusive of primary levels of education, but they are used in multiple ways at higher education. Although most gamification and GBL experiences are based in digital resources and videogames (de Freitas, 2006; Zin, Yue, & Jaafar, 2009; Crocco, Offenholley & Hernández 2016), board games are experiencing a new boom and their several options open new possibilities to the usage of physical resources in higher education classrooms. In this sense, new commercial board games turn to be a privileged resource to bear in mind as a valid option.

However, there is a gap of academic studies focused on the usage of board games as a tool to apply in GBL or gamification. For this reason, our objective is to analyse and evaluate the potentialities of Game-Based Learning methodology with commercial board games in higher education with special focus on students' motivation.

Advantages of Using Contemporary Board Games at Higher Education

Contemporary board games refer to those commercial board games that have appeared in the last twenty years and include titles as *Catan* (1995), *Cascassone* (2000) or *Ticket to Ride* (2004). This new generation of games focuses in the

playful elements of the game with the aim to reach a transversal and wide public. This new universe of games is a fruitful field to work in GBL as they balance the tension between learning objectives, ludic dimension and the game experience.

Following this path, we find several examples of the application of analogic noneducational games in higher education. Huang & Levinson (2012) assess the usage of commercial games such as *Air Baron, Metro, Rail Baron, Rail Tycoon, Empire Builder, China Rails* and *1870* to learn the planning of transport systems in civil engineering. Berland & Lee (2011) use the game *Pandemic* to analyse how logical and *computational thinking* processes of collaborative strategy games players work. And, Castronova & Knowles (2015) have changed the game CO_2 to explain and discuss the functioning of climate policies. There is also an inverse case such as *KEEP COOL*, which is a board game that was specifically design to spread climate change among "families, students, journalists, and politicians, environmentally concerned and game enthusiasts, consultants, and nongovernmental organizations (NGOs)" (Eisenack, 2012, p.329) and that later became marketable.

Apart from the terminological complexity of the field or the specific format of games, studies suggest that games may produce some advantages in education such as its motivating potential, the possibility to generate an active learning, its impact in personal and emotional skills (overcoming challenges, self-confidence...) which favour interaction and sociability and allow learning by competencies (Romero y Gebera, 2015) as well as give a general overview to complex issues. But, above all, they place participants in the core of the learning process (Garris, Ahlers & Driskell, 2002).

> [Games] help to motivate students and to involve them into the teaching and learning process by providing the necessary tools to put them in the centre of the teaching action and making them main characters of their learning (Cornellà & Estebanell, 2017).

Nevertheless, demonstrable evidences do not always support these statements and some authors claim that more studies should focus in the evaluation of real effects (Crocco, Offenholley & Hernández 2016, p.406).

In cases that board games were used, the most valuable aspects are direct interaction between players and presence:

> It should be a board and not a computer game, as face-to-face communication is a more appropriate way to simulate real-world climate negotiations. Moreover, a face-to-face game encourages discussion and questioning; thereby, direct experience from the game provides a natural starting point for debriefing (Eisenack, 2012, p. 333).

Other authors valued aspects that were directly related with the physicality of games and its components because avoiding the complexity of digital systems and a technological mediation one can be more flexible with the rules or can deepen into the psychological aspects of the simulation (Meijer, 2015, p.531). On the other hand, Castronova & Knowles (2015) argue that commercial games offer additional advantages due to the range of topics and existing options that are in the market and that could be the base for inspiration to a modification or redesign of the game that fit the desired goals. It is also remarkable to highlight that using these games in the classroom may also be problematic as players need to know the rules and it is difficult to create a correct learning curve due to the possible loss of participants' interest (Eisenack, 2012). These problems may become more pronounced with existing commercial games if the level of difficulty is not correctly valued (Huang & Levinson, 2012).

Apart from evaluating the efficiency of these learning techniques, research have also gained in-depth knowledge about students' learning perception of games as teaching methods at higher education and their consequences. Some studies about the specific usage of GBL state that students admitted "higher levels of interest, enjoyment and confidence compared to traditional methods" (Crocco, Offenholley & Hernández 2016, p.407). It seems that the motivation increase, immersion and engagement were also aspects identified and most valued by students (Vandercruysse *et al.,* 2013; Hamari *et al.,* 2016). However, most of these experiences applied to Digital GBL interventions. Consequently, there is a lack of studies about students' perception of usage of board games in university lectures.

Methodology

This investigation on Game-Based Learning experiences in higher education was exploratory, two-stage process. The first stage involved three experimental interventions in three courses of six bachelor degrees involving 196 students of

Universitat Rovira i Virgili (Tarragona, Spain). Students were attendants of the following courses:

a) History and Structure of Communication —second year of the BA in Journalism (38 students), BA in Advertising and Public Relations (44 students) and BA in Audio-Visual Communication (37 students),

b) Advertising Creativity —third year of the BA in Advertising and Public Relations 24 students) and

c) Legal, Social and Communicative Aspects of Biotechnology —fourth year of the BSc in Biotechnology (36 students), Double BSc in Computer Engineering and Biotechnology (6 students) and Double BSc in Biotechnology, Biochemistry and Molecular Biology (11 students).

The three interventions had different levels of application of the Game-Based Learning according to the objectives and contents of the course. These interventions will be detailed in the results.

The second stage was data-driven. It was gathered through an online survey among the students that participated in the experimental interventions, which included quantitative and qualitative questions with the objective to discover their previous assumptions about games and its usage as teaching methods at a university level; the appreciated skills that were practiced during the sessions; their personal engagement in the courses after the experiment. The survey obtained 87 responses. Although the results of the survey have limited representation due to the number of participants, the qualitative data collected is especially relevant.

Results

a) First Stage Process: Game-Based Learning Sessions

As mentioned before, the GBL sessions took place in the courses of *History and Structure of Communication*; *Advertising Creativity* and *Legal, Social and Communicative Aspects of Biotechnology* (see Table 1).

The impact of the board games differed in the three practices according to teaching objectives. In the case, of *History and Structure of Communication,* Game-Based Learning was used as a starting point for research about course contents.

Students experienced this method for a month whereas in *Advertising Creativity*, games were used in one session to spur imagination and creative writing among students. But, in *Legal, Social and Communicative Aspects of Biotechnology*, the objective was to show learners different ways to explore and communicate science. Current media environment should facilitate the comprehension of research by non-specialists and, when possible, to promote a two-way exchange and engagement between scientists, stakeholders and the whole public in order to improve the research' impact. Accordingly, GBL methodology took two sessions in this course. The former introduced the concept of Responsible Research and Innovation, which claims communication "from science in society to science for society, with society" (Owen *et al.* 2012, p.751) and the later presented the concept of Social Impact of Science:

> "[…] we are talking about beneficial changes that will happen in the real world (beyond the world of researchers) as a result of your research. This can include 'negative impacts' such as evidence that prevents the launch of a harmful product or law. […] Impacts occur through processes of knowledge exchange [management, sharing, co-production, transfer, brokerage, transformation, mobilisation, and translation] where new ideas are developed in relationship with the people who will put those ideas into practice" (Reed 2016, p.10).

Apart from the aforementioned aims, the usage of GBL was also to encourage motivation among students by introducing more participative, social and innovative methods in class.

The GBL sessions in the course of *History and Structure of Communication,* the activity was scheduled within a month. Their objectives were to work and get an experiential comprehension of the theoretical contents of the syllabus, documentation search and graphic design. For so, students were divided into groups and were introduced to the commercial board game *Timeline* of Asmodee, which organises famous events in a chronological line (inventions, music, history…). Once played to the original game, students had to select 20 key events of the history of communication within a specific thematic area (i.e. press, radio, advertising, internet…). Groups had to design and produce their own game elements (cards) that reproduced the original game. With the new cards of all groups, students created

a new and unique game. It was used as a final stage when students put their acquired knowledge to test in a game session.

In the case of the course of *Advertising Creativity,* the objective for the usage of GBL in class was to warm up lateral thinking with two commercial board games *Dixit* of Libellud and *Días de radio* of Mont Tàber Edicions. The teaching session consisted of three parts. First, in playing to these board games in small groups. Secondly, after two games (40-45 minutes), students were required to associate the concepts of a card of *Dixit* (picture) and *Días de radio* (word) with a commercial brand. The whole group had the same assignment: to write a story for a radio advert that contained the two selected concepts and created brand identity. Finally, each team shared their commercials with the rest of the group. Students could appreciate how prolific and different their ideas, stories and narrative styles were.

In the *Legal, Social and Communicative Aspects of Biotechnology* course, the commercial board games used were *Cytosis*, *Peptide*, *Virulence* and *Covalence* edited by Genius Games. As students were in their last bachelor year (fourth year), they had advanced knowledge of biotechnology. Thus, the main objective of board games usage was not the acquisition of new knowledge in their specialities but to show an original perspective from social sciences and humanities of how to communicate, transfer and socialise science to lay people in a ludic way. The teaching sessions consisted in splitting out students into groups and play the purposed games. Once played, students had to assess the mechanics, design and motivators of the games. Finally, sessions ended with a debate about their opinions and considerations of what could be useful in socialisation, Responsible Research and Innovation and Social Impact of Science.

Table 1. Courses, commercial board games used and teaching objectives of the three GBL interventions.

Courses	Degrees	Board games used	Specific teaching objectives
History and Structure of Communication	BA in Journalism BA in Advertising and Public Relations BA in Audio-Visual Communication	Timeline	Experiential comprehension of the syllabus Documentation search Graphic design
Advertising Creativity	BA in Advertising and Public Relations	Dixit Días de Radio	Creativity Communicative skills
Legal, Social and Communicative Aspects of Biotechnology	BSc in Biotechnology Double BSc in Computer Engineering and Biotechnology Double BSc in Biotechnology, Biochemistry and Molecular Biology	Cytosis Peptide Virulence Covalence	Socialisation of science Awareness of Responsible Research and Innovation (RRI) and Social Impact of Science (SIS) concepts

Source: Authors.

b) Second Stage Process: Surveys

In order to evaluate how the introduction of these practices were perceived by students, an online survey was send to the students that had participated in the Game-Based Learning sessions. A total of 87 responses were collected.

Profile of the Sample

Most of the participants were students of Communication Studies degrees (63.2%) and the rest belong to Biochemistry Studies (36.8%). In short, the sample is mostly represented by the students of the BA in Advertising and Public Relations (33.3%), followed by students of the BSc in Biotechnology (27.6%) and the BA in Journalism (20.7%). With less representation there are the students of the BA in Audio-Visual Communication (9.2%), Double BSc in Biotechnology, Biochemistry and Molecular Biology (6.9%) and Double BSc in Computer Engineering and Biotechnology (2.3%).

In their leisure time, participants of the survey are more used to play to board games (64.4%) rather than videogames (47.1%), but videogamers play more frequently as 25.3% of participants play to videogames at least once per week in front of 14.9% of board gamers. And, among these weekly videogamers, 6.9% play daily whereas any participant plays to board games every day. These figures help to predict that there is a predisposition of participants to be open-minded about the usage of games at higher education (see Figure 1).

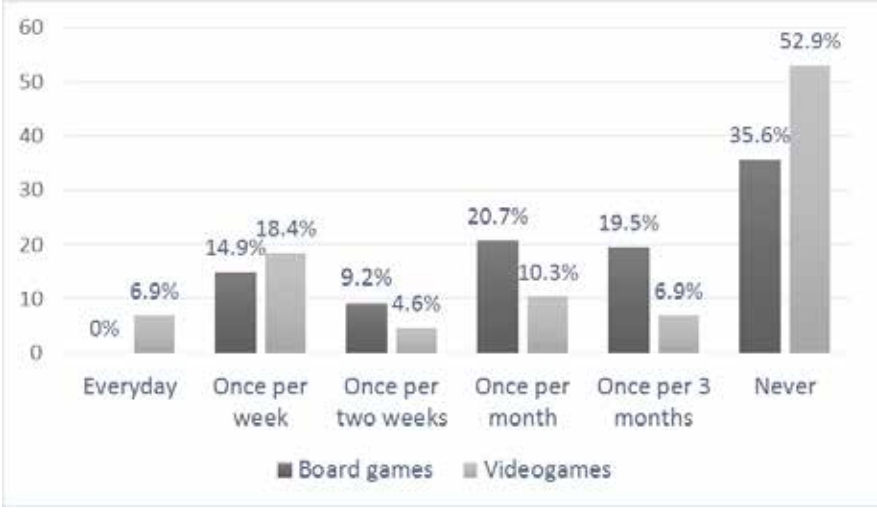

Figure 1. Gaming frequency in board games and videogames of the sample.
Source: Authors.

Teaching Methodologies at University

When asked about what teaching methods students receive more frequently at university, students chose masterclasses (95.4%) and student oral expositions of the contents (79.3%) as the most common methods. However, these were the least preferred when asked about what teaching methods students would wish to receive at higher education (masterclasses received 10.3% and student oral expositions 9.2%). Workshops and experimentation in labs (51.7%) and Problem-Based Learning (23%) were the third and fourth most extended teaching methods at university. In these cases, they are also wished by students (47.1% workshops and experimentation and 43.7% for Problem-Based Learning).

Methodologies that were more expected at university were simulations and role playing games (67.8% of interested students) and Game-Based Learning (64.4%) but they are not fostered in current lectures (16.1% of participants found simulations and role playing in their lectures and 10.3% selected Game-Based Learning). Other methods that are not commonly used in lectures nor extensively desired among students were Flipped-Classroom, Gamification and Transversal Projects. Authors of this study deduct that these innovative methods had few support because students have poor knowledge about how they consisted in (see Figure 2).

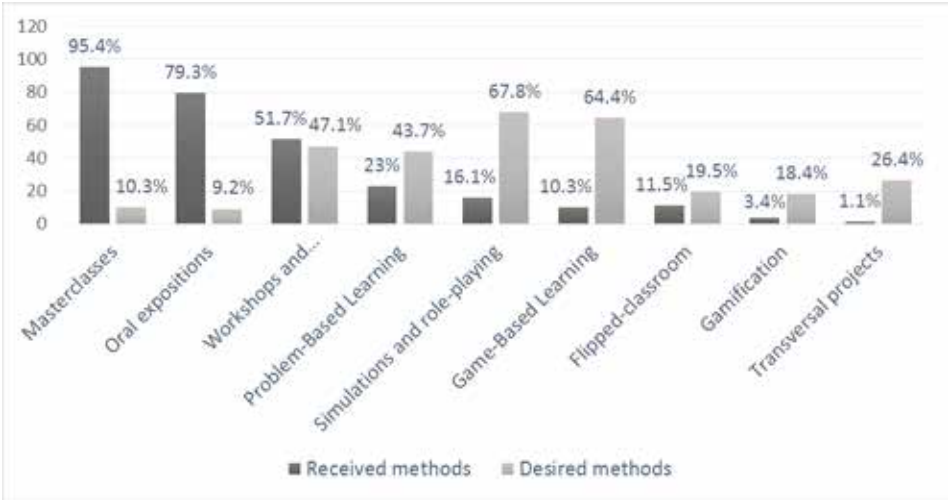

Figure 2. Comparison between received and desired teaching methods at university
Source: Authors.

Perceptions about Games as a Teaching Method

Before asking about the GBL sessions experimented, researchers of this study wanted to check if participants had any prejudices about the usage of board games at higher education such as considering playing a childish activity or that videogames connect better with youngster motivations. Therefore, they were asked to answer their level of agreement about several assumptions.

Results clearly show that a majority of participants completely reject the assumptions that "playing is an activity reserved only for children" (87.4%) and that "playing is an unproductive activity" (77%). Less forceful, but still a majority of participants completely disagree in the assumptions that "games detract prestige to

higher education" (59.8%) and that "at university students should not play to board games" (57.5%). In fact, 55.2% of the sample is highly or completely agrees with the statement that "Game-Based Learning methods could support regular master classes" and a 29.8% of the participants feel neutral with the statement.

About the presumption that youngsters prefer videogames in front of board games, results of this study show the contrary. There is a timid preference for analogic games rather than digital ones as 41.4% of participants highly or completely agree with the assumption that "Game-Based Learning should use board games" whereas 34.5% of those polled highly or completely agree with the statement that "Game-Based Learning should use videogames".

Perceived Benefits of GBL Sessions with Board Games

In the survey, 89.7% of students declared that they found motivated when the professor proposed the activity with board games, only 5.7% of those polled were not motivated. The rest 4.6% did not response it.

This question was accompanied with a qualitative one about why students considered that the activities with board games motivated them or not. They discourses emerged 9 different categories. Some of the quotes could be classified in more than one theme. In here, categories are ordered according its popularity:

1. **Active and new methodology**. *Game-Based Learning is a dynamic, different and not very extended methodology (mentioned by 34.2% of participants).*
   "It is a different methodology in which you can actively participate during all the time without switching off" (participant 2, BA in Journalism).
   "It has motivated me because it has helped me to learn in a dynamic, different and entertaining way" (participant 31, BA in Journalism).
   "It is a new way of teaching that I have never experienced before" (participant 56, BSc in Biotechnology).

2. **Funny methodology.** *Game-Based Learning allows student to learn while having fun (mentioned by 26.3% of participants).*
   "It motivates for several things: mainly to win, then you have fun with classmates and you can learn concepts without being stuck on a book and without the pressure of having an exam" (participant 46, BSc in Biotechnology).

"The activity motivate me because you have a lovely time, you laugh… and you learn and contents are better engraved in the memory" (participant 87, BA in Advertising and Public Relations).

3. **Out of the routine methodology**. *Game-Based Learning helps to escape from the regular monotonous lectures (mentioned by 15.8% of participants).*
   "It was something different from the routine and interactive way to learn. It was entertaining" (participant 43, Double BSc in Computer Engineering and Biotechnology).
   "The activity has been different to all the lectures I am used to and it was fun. I am sure that if there were introduced more board games and other alternative and active methodologies related with the syllabus, lectures would be more bearable and productive" (participant 62, BSc in Biotechnology).

4. **Support methodology**. *Board games may help to understand contents of the course (mentioned by 13.1% of participants).*
   "It is a different way to learn where you put in practice several concepts that could not be understood with just a magister class" (participant 1, BA in Advertising and Public Relations).
   "It is a different way of learning that suits to people that find difficult to study" (participant 69, BA in Journalism).

5. **Sociability.** *Games help me to mix with classmates (mentioned by 10.5% of participants).*
   "To me motivation comes when there is no pressure to do your best, and you have fun and you can relate with other people in an unusual way" (participant 58, BSc in Biotechnology).
   "It has been dynamic and fun to play with classmates. What is more, you talk with people that you have never done it before" (participant 72, BA in Journalism).

6. **Identification and design.** *Possibility to custom and personalise the game to feel it as its own (mentioned by 6.5% of participants).*
   "Because the cards of the game were very personal and you try your best in its design" (participant 6, BA in Advertising and Public Relations).

"Because designing the cards we learned a lot and when we had them printed we felt totally fulfilled because they were very similar to the original game" (participant 41, BA in Advertising and Public Relations).

7. **New perspectives.** *Games open up new ways of thinking and perspectives (mentioned by 6.5% of participants).*
   "It has been a different way to explore communicative and creative aspects" (participant 12, BA in Advertising and Public Relations).
   "Games stimulate the brain, they are a good way of learning" (participant 7, BA in Advertising and Public Relations).

8. **Setting challenges.** *Having objectives as mechanics for playing motivates to learn more (mentioned by 5.2% of participants).*
   "Because you are more eager to learn, and thus, win" (participant 9, BA in Audio-Visual Communication).
   "When you have a goal, you try harder, and it is more entertaining" (participant 27, BA in Audio-Visual Communication).
   "I am a competitive person. Therefore, I concentrate and motivate myself to win. This favours my learning (since I pay more attention)" (participant 85, BA in Journalism).

9. **Waste of time.** *Playing with board games at university is a waste of time (mentioned by 5.2% of participants).*
   "The activity did not motivate me, I think we did not learn anything, it was a waste of time" (participant 45, BSc in Biotechnology).
   "The activity took me time that I had to invest in the projects of other subjects" (participant 49, Double BSc in Computer Engineering and Biotechnology).

Finally, students were asked about what skills they had worked during the GBL sessions (see Figure 3). In here, the majority of participants considered that teamwork (80.5%) and communicative skills (78.2%) were enhanced. With less force, but also a majority opine that creativity (67.8%), problem resolution (64.4%), decision making (64.4%) and social skills (62.1%). Only one participant answered that any skill was enhanced. This participant also answered that he was not motivated at all by the GBL sessions.

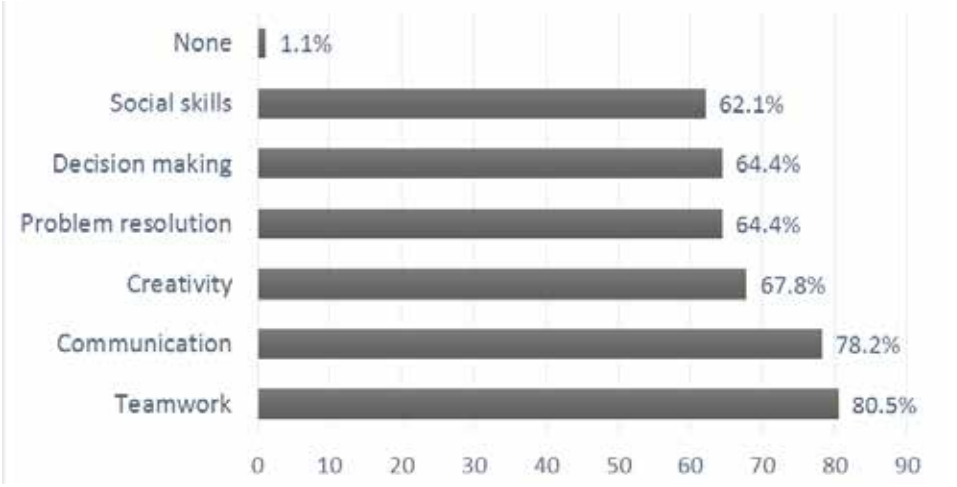

Figure 3. Perceived skills worked during the GBL sessions
Source: Authors.

Conclusions

Results of the survey prove that students of the analysed Game-Based Learning interventions share a positive perspective on the usage of this teaching methodology. Answers reveal that the sessions generated high perception levels of engagement and motivation.

On one hand, participants appreciated the usage of active and dynamic learning techniques, which were different to the usual ones, but always as supporting sessions of traditional lectures. In this sense, the question remains to what extent novelty and breaking with routine really captivate the perception of students. On the other hand, participants admitted that playful aspects such as entertainment, socialisation, competitiveness and the setting of challenges influenced their involvement in the activity. Students identified elements and mechanics of the game as main driving forces of engagement. Hence, it seems that the application of noneducational games with high playful components that were strategically selected to fulfil the desired educational objectives influences in the effectiveness of the activity.

One of the most interesting results of this study is that over a quarter of the students are conscious that GBL sessions allowed them to learn while having fun.

Furthermore, a large majority do not have prejudices when introducing games in higher education classrooms, as they do not understand playing as an unproductive or childish activity.

In relation to skills, students also valued very positively some abilities linked to the characteristics of the games (problem resolution or decision making).

Nevertheless, we must take into account that a minority group did not feel motivated by the chosen teaching methodology, even completely rejected it. It is necessary to bear in mind that Game-Based Learning needs complementary tools to include and encourage all participants in their learning processes. It would be recommendable to discover why they were not attracted to the teaching practice. Maybe they did not like the proposed games or do not understand GBL practice at university or maybe there were external reasons for this analysis.

After this research, several issues remain to be studied in depth. For example, the results show that a significant number of participants had previous knowledge about games or were usual players either to board or videogames. Consequently, it still needs to be evaluated to what extent game culture familiarity is an element that facilitates engagement, motivation and, finally, learning.

In this study, students recognised that skills like teamwork or communication were worked through the usage of those games; but it remains to be assessed the learning of theoretical contents and other sorts of skills. It would be interesting that later studies could analyse the real influence of applying contemporary non-educational games in higher education at a long-term period.

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