

Game-based Learning. A tool that Enhances the Collaborative Work: A Case study of Undergraduate Students

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Abstract: The way a professor teaches in the classroom mostly at the undergraduate level is constantly changing, and this is reflected in how pedagogical resources are transformed. What was previously unthinkable to use in the classroom is now standard, including an impactful tool, the video games. This digital tool, over the years, has positioned itself as an element that goes beyond entertainment, and have proven that thanks to the interaction that it provides the alumni has gain more capacities and tools beyond the academic goal. The objective of this work was to delve into the relevance of *Game-Based Learning* (GBL) and how it affects students to develop and acquire teamwork competency and strengthen peer collaboration. This paper aims to show the results obtained from the research and analysis of 99 undergraduate students enrolled in creative studies; specially, the majors that are included are: communication, digital art, marketing, musical production, architecture, and industrial design, all these students are part of private college in Puebla, México. The quantitative methodology used a six-item, Likert-scale instrument. This questionnaire was applied to undergraduate students in academic programs related to the creation of multimedia and transmedia content and other creative areas. The results indicated that the students appreciated the educational methodology of using video games as a didactic tool and this creates that the students get more involved not only with the classes, but with their own learning. It must be cleared that this kind of methodology must be applied during the sessions, and, of course, it helps if cooperation exists among the class members inside and outside the classroom. Also, this tool supports teachers in improving class dynamics and the way of teaching changes allowing them to assume a new role as a guide to knowledge and encourager of more student interactions. Thus, recreational activities utilizing video games in various activities potentiates educational innovation. These tools positively impact students' education as their acceptance and willingness to use them improve their learning process.

Keywords: game-based learning, educational innovation, professional education, higher education, teamwork, collaboration

1. Introduction

Students are not just entertained by videogames, in fact, they learn, acquire skills, and develop specific competencies that help them to thrive in various live fields. On the other hand, the teaching profession faces various changes brought about by the impact of technological devices on the dynamics of teaching and learning. Traditional teaching strategies have become obsolete; therefore, teachers must look for new ways of teaching and connecting students to learning. Therefore, Information and Communication Technologies (ICT) and social transformations make it essential to apply new strategies, including a Game Based Learning (GBL) process, where game mechanisms help students acquire and strengthen their knowledge (Gil and Prieto, 2018).

The information previously submitted helps as a basis to understand that videogames can make college learning more dynamic, active, and less inhibited; with this, it can be achieved that the students pay more attention to the content transmitted in the classes.

Considering the above, this research aims to establish the relevance of GBL as a didactic technique, especially considering that teaching strategies based on games combine play, collaborative work, creativity, and imagination to strengthen the learning and teaching process. It is decided to carry out a field study with undergraduate students and verify whether the premise is true. Specifically, this study explains how video games are part of Game-Based learning and encourage collaboration; in addition, videogames develop activities that strengthen students' understanding and encourage decision-making.

2. Theory approach

The pedagogical use of ICT is fundamental to making the educational processes effective in all disciplines. It is necessary to leverage the new generations' natural relationship with digital tools; they become bored without them. The students are more distracted when they do not use technology in class (Rodríguez, Ramírez and Fernández, 2017); therefore, the concept of play as a free, interesting activity of daily life acquires much relevance because, thanks to video games, the feeling of fun and the users' engagement increases (Braghirolli, (Ribeiro, Weise and Pizzolato 2016)

The education sector is dynamic; it offers new technologies and game dynamics that enable students to participate actively in the learning process through activities and problem-solving. Digital tools make learning more visual, reinforcing creative capacity and improving students' ability to manage information, cooperate, and think critically. These systems help reduce the fear of making mistakes, favoring trial-and-error processes that allow mistakes to be rectified (Martínez, 2017).

As an educational innovation, the game is a didactic resource for developing various topics in the curricular content, promoting cognitive progression, and strengthening the relationship between students and teachers (Hierro and Pastor, 2020). This didactic technique supports student interactions to generate patterns, deduce information, and generate strategies based on new experiences; therefore, games become an educational tool promoting theoretical and practical learning linked to life experiences (Ahamer, 2012). Through different techniques, knowledge is acquired due to video games' interactive characteristics, allowing to establish and test new strategies. In addition, they offer the opportunity to learn while performing a mission (Waiyakoon, Khlaisang and Koraneekij, 2015).

Game-based learning fosters motivation promotes competency training and influences behavior; this didactic resource provides numerous benefits for both students and teachers, including high levels of motivation, activity, and promotion of creativity (Parra, Segura and Romero, 2020). In addition, using games in academic activities increases students' concentration, effort, and motivation (Sánchez, 2015).

The definitions, positive aspects, and characteristics of the GBL are diverse; however, there are certain aspects in common: the use of strategies, models, dynamics, and mechanics that aim to transmit a message or contents through an experience that motivates, engages, and entertains (Martínez, Pérez and Martínez, 2016).

Despite the benefits of GBL, the methodology is criticized because of a myth that learning and playing should not be linked. However, one argument in favor of the combination relates to the demands of the new generations, who continuously interact with digital technologies. GBL creates and modifies attitudes and aptitudes in students; due to their cognitive evolution, students can establish relationships and retain much more information (Landers, Armstrong and Collmus, 2017).

As for learning, several definitions include one by Guerrero (2014): it is the process of acquiring knowledge, skills, attitudes, or values through study, experience, or teaching. Gallardo and Camacho (2018) point to learning as a development caused by day-to-day activities. Based on the above and for this research, the learning is viewed as a complex system that acts on the human being and allows him to generate new knowledge. The process allows people to adapt to new situations through developing new skills or improving those already acquired (Londoño and Rojas, 2020).

Video games in non-playful contexts are reflected in the field of education; the balanced use of these provides a series of physiological contributions, for example, the release of epinephrine and dopamine in the brain, in addition to evoking good feelings that potentiate receptivity to learning (Barata, Gama, Jorge and Gonçalves, 2013).

Therefore, the motivating components of the game must be leveraged and transferred to formal contexts to involve users in complex processes and guide them towards the acquisition of learning. Thus, students increase their commitment and participation in educational activities when facing challenges and missions in games (Quintana, 2014). Different studies point to the need to look for methodologies that use gamification as a tool to improve the teaching and learning process. For example, Marín and García (2005) underscore the ability of video games to foster various skills, such as curiosity to learn, curricular transversal competencies, and reinforcement of self-esteem. Specifically, they mention action or sports video games to promote psychomotor development, ocular and manual dexterity, and spatial orientation. Adventure and role-playing games help develop knowledge. Simulations help control tension and develop imagination, and strategy games improve the ability to manage resources.

Thus, as an essential element of GBL, video games help education through immersive activities that cause feelings of absolute dedication, inferring that "gamifying" is a methodology that goes beyond applying a game (Perrotta, 2013).

For its part, playful pedagogy is a response to new educational possibilities. It is necessary to rethink the importance of play and the playful environment as a pedagogical meeting place; it must relate and be immersed in a contextualized didactic project with significance and transformation (Carolei, 2016).

Faced with these different teaching and learning techniques, students and teachers acquire new roles. The teacher must be involved in the educational processes, prepared to present change processes, and open to adapting to daily shifts. Also, the teacher must become an active change agent who can create, propose, evaluate, and communicate the proposals derived from the learners' daily experiences and their contextual environments. In addition, teachers should consider game-based learning as a stimulating tool that boosts students' enthusiasm (Aznar, Raso, Hinojo & Romero, 2016).

As for the students, this educational model proposes that they develop the ability to think and reason by reflecting on their decisions. The game helps them learn to make quick, coherent, and concrete responses to decisions. Thus, the students internalize what they have learned and receive training for competencies they will need in their professional futures (Parra, Segura & Romero, 2020).

It should not be forgotten that teachers teach classes to "digital natives," who characteristically use different digital devices daily in their leisure time for personal development. Therefore, games can motivate and attract this generation and including game elements motivates them, providing an opportunity to reduce the lack of commitment to learning (Simões, Díaz & Fernández, 2012).

Finally, due to the new teaching methodologies, students should see that their opinions have value, they can follow their passions and interests, create new things using all the digital tools that surround them, work through group projects, make decisions, share leadership, cooperate and compete; that is, they should feel that the education they receive is relevant and has value (Prensky, 2005)

For this analysis, the video game is defined as software that aims not only to entertain but also to generate learning in the participants, helping them develop logical, numerical, and technical skills through experience. In addition, they are considered tools to be used for educational purposes. In this sense, Sampedro, Muñoz & Vega (2017) comment that video games can be used as educational tools and are elements applicable to daily routines.

Over 30 years of evolution, video games have incorporated the characteristics and capabilities of new technologies that combine several audiovisual languages, interactivity, information processing, and connectivity (Boscan, Pirela and Velásquez, 2017). It should be noted that video games allow experimenting with identities, exploring new experiences, and even testing the limits of those who play. In addition, they improve attention, concentration, and strategic planning. Other analyses indicate that they promote tolerance towards different ideologies and thoughts and help develop multidisciplinary knowledge, which gives rise to logical and critical thinking (Perrotta, Featherstone, Aston & Houghton, 2013).

Educational institutes' use of video games leads developers to create stories that support experiential learning (Ortíz, Jordán & Agredal, 2018). Therefore, growing interest in using these tools in learning processes and education has arisen because video games facilitate achieving various objectives of the participants. These include diagnosing and improving organizational processes, teaching, or reinforcing concepts of a specific theme, and determining situations of group behavior, all through activities that make learning a friendly process (Londoño, 2014).

When analyzing the structure of a video game, there are similar characteristics to key aspects in the design of educational activities. Three fundamental features evidence such an analogy:

- Goal orientation: the games seek to reach a goal in each time; there are some limitations, but these must be overcome, and, in the end, there will be an apprenticeship.
- Recognition: As the processes continue, there are awards and recognitions that encourage the person to continue.
- Progress: depending on the progress, the student's progress is presented, the more semesters he/she attends, the more knowledge the students have; the same thing happens with games, the more levels a person advances, the more tools this person has so he/she can complete the game.

These three characteristics of video games apply in education and the design of training activities, which supports the feasibility of integrating video games into educational activities.

3. Methodology

This study used a quantitative, cross-sectional methodology from December 2020 to January 2021. There was no modification of variables. The study subjects were the students that are part of a private university in Puebla, Mexico. The population sample comprised the alumni concentrated in undergraduate creative studies programs, including architecture, digital arts, communications, design, and music production. It should be noted that the selected population derived from the direct contact with them, this means that the person who writes this paper belongs and teaches in this area, also, it has direct contact with the teachers that teaches this kind of courses. The other reasons for having selected this sample are:

- This type of curriculum aligns with the project creativity that students usually develop.
- Teachers often use innovative didactic techniques to fortify the teaching and learning process.
- The author of this article studied this area and personally knows these degree programs profoundly.

The population sample to which the measurement instrument was applied consisted of 99 students, which are the totals that are part of the “Creative Study” area. Note that the questionnaire developed was based on previous theoretical and literary research. Before applying the surveys, a pilot study was conducted to thoroughly analyze the questions to be applied. They were shared with another population sample, and the necessary corrections were made. Afterwards, the questionnaire had the following items, which were measured using a five-point Likert scale with the options strongly agree, agree, neutral, disagree, and strongly disagree

1. Game-based learning is a necessary tool for the teaching process.
2. Game-based learning develops teamwork skills.
3. Game-based learning drives educational innovation.
4. Game-based learning makes collaborative work more robust.
5. The teachers with whom I take class use the game-based technique.
6. Comments about game-based learning.

The questions described above were to know the students' perception before GBL and its typical use in the courses, its impact on students, and how this technique can be applied to reinforce learning and encourage collaborative work. The procedure by which this questionnaire was shared was through the *Google Forms* tool. It was used to list the student emails to whom the instrument was sent. They were asked to kindly respond to the questionnaire with the same platform.

4. Results

Once the measuring instruments were applied, we analyzed the questionnaire responses. The following graphs illustrate the results:

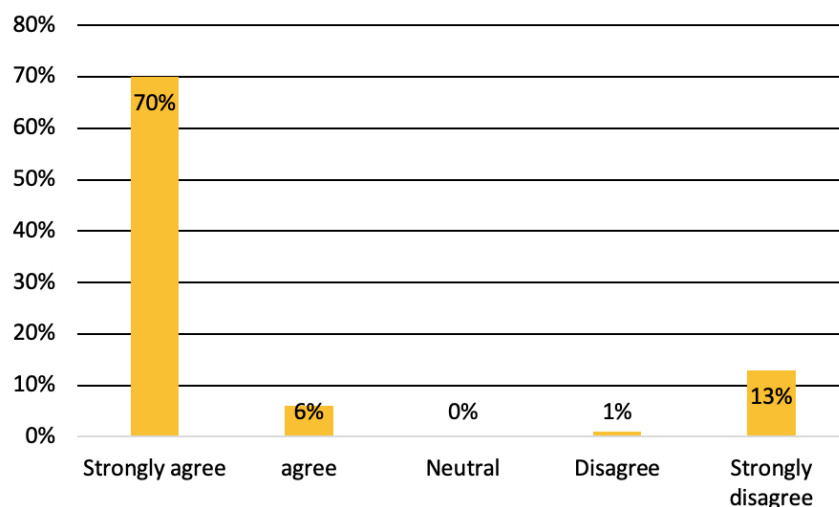


Figure 1: Question 1: Game-based learning is a necessary tool for the teaching process

Figure 1 indicates that most students considered game-based learning necessary for their learning process. Seventy per cent confirmed that this tool strengthens teaching and promotes dynamics for greater interest in the sessions. However, it should be noted that 13% mentioned that game-based learning is not essential to developing their knowledge. Finally, from this question, it's fair to say that video games are an ideal tool for both students and teachers to have a better teaching and learning process.

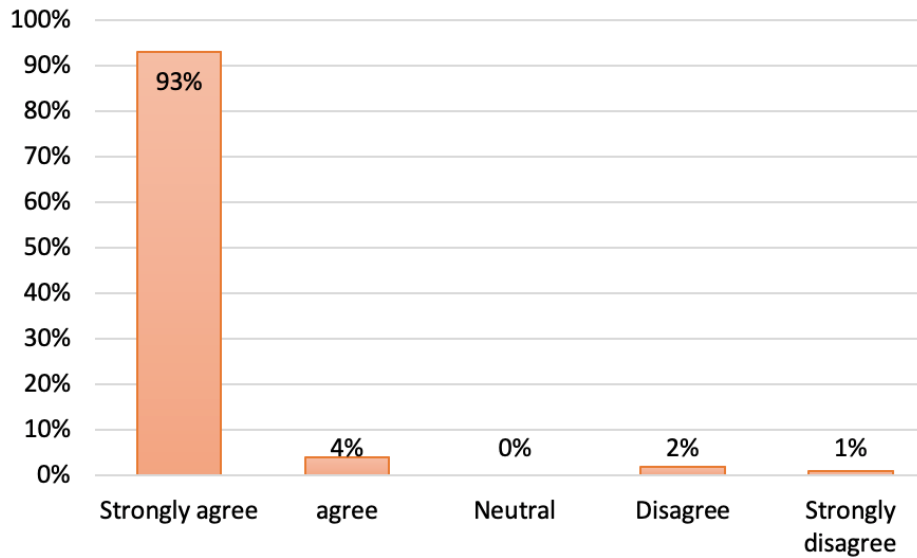


Figure 2: Question 2: Game-based learning develops teamwork skills

This graph shows that 93% of respondents strongly agree that video games increase their teamwork skills. Although they collaborate through a console to overcome the game's challenges, the students can transfer these skills to academic questions, i.e., collaboration becomes more common, and school projects can be completed timelier and with better results. These types of results are more visible when using games with stories that require the immersion of a team to perform a mission. It must be added that, as they advance, the students receive medals, achievements, and prizes that serve as an incentive. It should be noted that only 2% of respondents said they disagreed, and 1% strongly disagreed with the statement that Game-Based learning promotes teamwork.

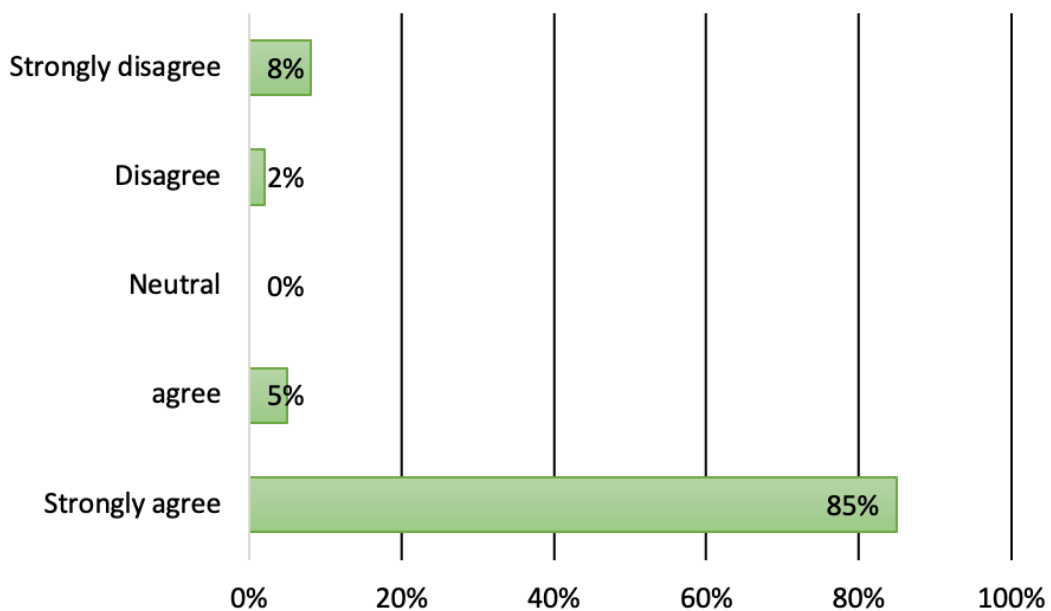


Figure 3: Question 3: Game-Based learning drives educational innovation.

Game-Based learning is a fundamental part of educational innovation; therefore, students must answer this item. This question seeks to clarify whether this technique improves and potentiates the dynamics of teaching

and learning processes. Only 10% answered negatively (adding the strongly disagree and disagree responses) that this is not the case and that there are other ways to innovate education. However, most of those who answered this survey (85%) affirmed that the methodology based on games is undoubtedly a tool that encourages educational innovation and should be leveraged by teachers in the course designs.

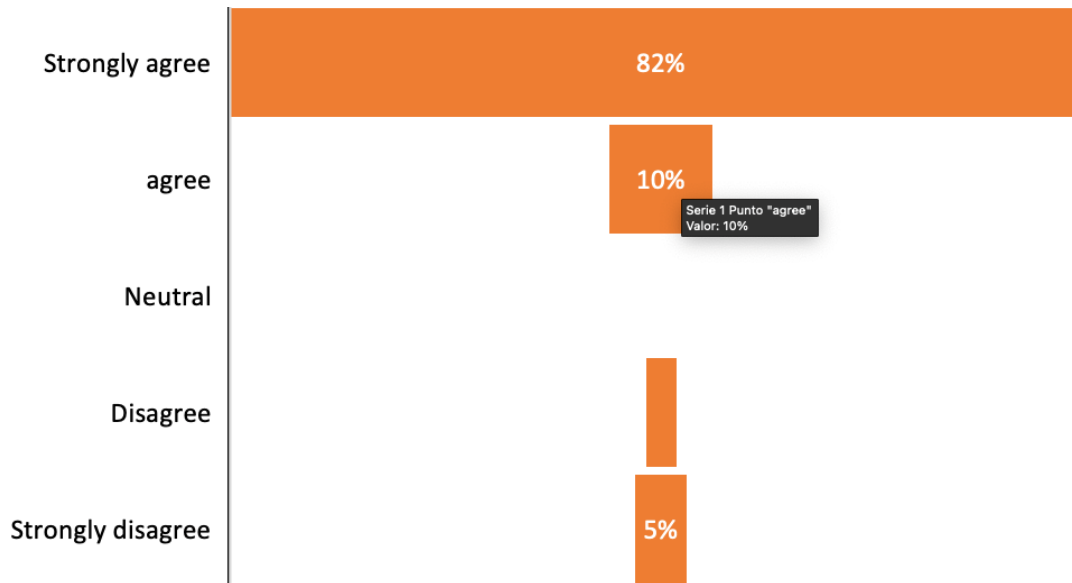


Figure 4: Question 4: Game-Based learning makes collaborative work more robust

One of the advantages of video games is that they encourage the ability to work as a team due to their dynamics, the platform, the narrative, the interactions among characters, and even achieving common goals or objectives leads to greater participation together.

Therefore, students were asked about the potential of Game-Based learning relative to teamwork and collaborative learning. The results showed that more than 80% of students affirm that this type of teaching strengthens collaborative work. Only 5% answered that they strongly disagreed, that means that various games and playful activities of these tools help students think in a group way and reduce individualism.

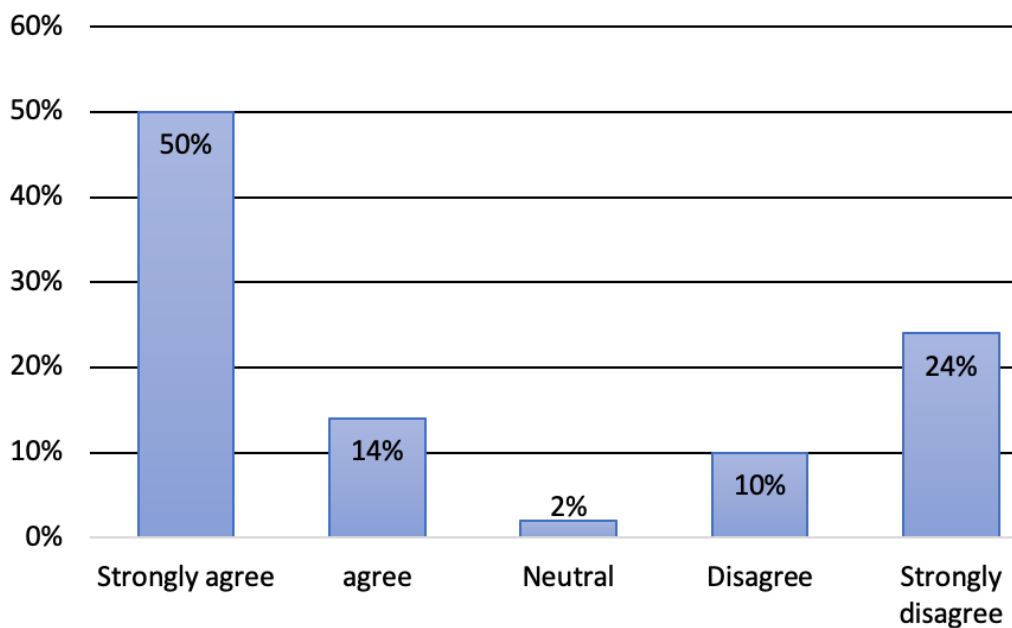


Figure 5: Question 5: The teachers with whom I take class use the Game-Based technique

This last graph shows students' perspectives on their teachers' interaction with Game-Based learning. The respondents' answers are interesting. On the one hand, 50% say they strongly agree that teachers use some

methodological tools based on games to strengthen teaching and make it more active; however, 24% strongly disagreed that the methodology was used in the subjects they had studied. The above shows a contradiction. On the one hand, students know that learning based on games is vital for skills development, fundamental to educational innovation, and improves the teaching and learning process; however, they note that many professors do not use this technique.

After analyzing the instrument results and the students' experiences and testimonies, it can be seen that the GBL technique satisfies some needs, such as the feeling of achievement and desire for reward, prestige, and recognition. It promotes collaboration and teamwork or well-intentioned competitiveness.

It also indicates the need to bring students closer to immediate interactivity in their learning. Using these tools strengthens creativity, personal relationships, and dynamism to understand the topics covered in the class sessions. Above all, these findings challenge teachers to develop other types of class sessions that are not passive, where both students and professors are involved in the educational process.

It should be noted that, although the study focuses on numerical analysis of specific items, it also collected comments and observations vented by the respondents. These reveal that the students have a general knowledge of this dynamic and understand the need to use this technique in sessions or classes. They commented that the ideal is that the teachers involve them in the dynamics of teaching and learning and provide better feedback.

Finally, the students assured that video games could be an excellent resource for class teaching and exemplify theoretical issues covered in the sessions. They commented that the more complex and complete the game's narrative in question, the more robust is the learning, but the important thing is that the faculty is involved in this type of tool to achieve a better result.

5. Conclusions

The results analysis allowed detecting the positive effects of Game-Based learning that promoted teamwork and collaboration among the students. In addition, students tended to be more active during the learning process. Consequently, they are protagonists and builders of their learning. Similarly, creativity is put to the test by both teachers and students. The results of our study of the GBL approach point to the tool as a didactic methodology that can be applied to different undergraduate programs to help both students and teachers develop new roles.

On the other hand, the application of video games in education is a field of knowledge still being analyzed, and there are some challenges. These include the application of practical evaluation tools, analysis of behavioral data resulting from applying the games, finding a balance between learning and fun, and how to address the actual, contextual needs of the participants academically; therefore, the work must continue.

The study results verified that the objectives established were achieved by the methodology employed. Above all, incorporating Game-Based learning can be a relevant dynamic perfectly executed inside and outside the classroom. The ideal is that, through this tool, students can address complex challenges that improve their learning.

Moreover, teachers must have the ability to employ these tools to strengthen educational processes and add energetic dynamics to their class sessions. It should be remembered that the students accept and enjoy this technique and that, according to the study, they are willing to have more significant interactions in the classroom.

Finally, to strengthen this type of analysis, it is pertinent to conduct comparative studies of different academic course designs and to know the students' perceptions of these dynamics inside and outside the classroom. It would also be interesting to study the teachers who apply and who do not apply the GBL in their different subjects. With this, you can measure and compare the levels of learning that the students have in the topics presented in the class sessions throughout the academic period.

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