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# Gamification as a Teaching Method to Improve Performance and Motivation in Tertiary Education during COVID-19: A Research Study from Mexico

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**Abstract:** Gamification is usually understood as a pedagogical strategy that favors student engagement and motivation. Traditionally it is composed of dynamics, mechanics, and components. The purpose of this study was to compare Engineering and Economics and Social Sciences undergraduate students in their performance (grades), motivation, quality of assignments, participation, and emotion when their teachers used gamification as an innovative teaching method during the COVID-19 pandemic. Pearson correlations, Principal Component Analysis (PCA), and Mann–Whitney test were conducted. Additionally, four students were interviewed to describe the emotional downside of the lockdown. The main results indicate that there are higher positive relationships among variables in the Engineering undergraduate students rather than in Economics and Social Sciences and show that emotion poorly correlates with performance, especially for the Economics and Social Sciences students, as many have a negative attitude toward learning mathematics. Additionally, gender and scholarship status are not differential factors. Gamification proved to be a useful pedagogical strategy to promote participation and enhance motivation among undergraduate students, particularly in a context of academic confinement. This study gives teachers an idea of the benefits and extent to which gamification can be used in the classroom.

**Keywords:** gamification in education; online teaching; teacher education



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## 1. Introduction

In March 2020, Mexico declared a state of health emergency due to the accelerated spread of COVID-19, which meant that only essential activities remained open, forcing the majority of the population to stay at home. The education sector, both public and private, closed its doors, leaving behind coexistence and face-to-face learning [1]. Education was immediately converted to a remote and online capacity, accessible only to the privileged student population with access to technology and good internet service [2]. It is known that an adaptation process takes between six and nine months, but the severity of the pandemic did not allow for enough time [3], and thus teachers and students had to adapt abruptly, which generated new problems. Various studies found that the changes due to the health emergency have altered the emotional state of students [4]. According to the United Nations, the pandemic has affected 1.6 billion students worldwide [5]. The Association for Psychological Sciences [6] has summarized the impacts on mental health that the pandemic has generated in both children and adults. These are the most noted effects: loneliness, increased levels of stress, anxiety, and depression caused by the large amount of information received, almost 24 h a day. Continuous stress affects both academic performance and mental and physical health [7]. For these reasons, Thomas and Rogers [6] suggested encouraging motivation to reduce frustration, boosting self-regulation and flexibility.

After educational systems had enough time to adapt to the health crisis, we can optimistically say that the situation resulted in a myriad of opportunities for educational innovation [8] and for the development of digital skills in students and teachers, who can discover and develop alternative educational environments that diversify ways of learning [9] and, with this, generate a more inclusive learning environment. In addition, studies such as the one by Korving, Hernandez, and De Groot [10] revealed that year after year there is a larger number of university students who prefer to take online classes in subjects that do not require experimentation or face-to-face work. Although society is indeed facing a global crisis, which places us in front of an abundance of challenges, difficulties can be solved through teacher creativity and transform the educational crisis generated by the pandemic into an opportunity to develop educational environments that promote engagement, attention, and motivation through various didactic strategies, such as gamification.

A decade after its introduction, gamification is still gaining strength in the field of educational research and has become a didactic strategy that favors engagement and motivation [11]. Deterding [12] and Charsky [13] defined it as a strategy that takes elements that typically belong to a gaming environment and applies them in non-gaming contexts, such as health [14], social [15], business [16], and educational [17], among others. Various studies agree that gamification favors sustained attention [18], motivation [19], and learning [20] because it creates an environment of friendly competition and engagement [21]. Gamification includes elements and experiences of games in the design of learning processes (of any area of study) with the purpose of engaging, motivating, and improving learning, as well as developing and strengthening transversal skills such as collaboration, self-regulation of learning, and creativity [22,23]. At the same time, in a gamified learning environment, rules are established, and emotions and social roles are experienced [24]. These are important skills in the formative process of students. Moreover, they are necessary in virtual environments.

Werbach and Hunter [25] proposed a model in which gamification is made up of three elements: dynamics, mechanics, and components. Dynamics make up the application context; mechanics are the activity to be performed; and components are the rewards, boards, and avatars [26,27]. A typical use of mechanics is rewards accompanied by components such as badges, points, or trophies to recognize achievements, as well as the use of the board and avatars to socialize the rewards obtained anonymously [28]. Several studies have found positive results regarding motivation and engagement when badges are used in academic contexts [29,30]. The meta-analysis developed by [31] on the effects of gamification on educational behavior found that the gamification strategy causes a positive change in engagement, learning, and participation. Studies by [32,33] confirmed this fact since they found a positive correlation between the number of badges earned and the level of participation in the course, as well as in attention and motivation. In the workplace, positive results have also been found in the areas of motivation, performance, and autonomy when gamification applications are employed [19].

Gamification promotes intrinsic and extrinsic motivation. Offering rewards favors extrinsic while completing a challenge favors intrinsic motivation [34]. It also offers an experience with rules, emotions, and social roles [24]. In other words, involving gamification with game elements allows for the cognitive, emotional, and social aspects to converge in the learning process [35,36]. The cognitive aspect is given when the pupil receives immediate feedback in several attempts in a way that takes them to a metacognitive process or confronts them with a challenge [37]. The emotional aspect comes in when the student gets recognition for their achievement [38], and the social aspect happens when the achievements are socialized through a board of leadership or when the students collaborate to complete a challenge or mission [39].

Gamification based on a mechanic of rewards has proven to be a useful teaching tool to engage students, particularly in online environments [21,40–42], and also those who live inside an enclosed academic environment [43,44]. In this regard, this study analyzed the

performance of university students, one group from the Engineering school and the other from the Economics and Social Sciences school. We used a mechanism of rewards in order to show the similarities and differences of both schools in terms of motivation, quality of assignments, attention and participation, and emotion and academic performance.

## 2. Context

This study was based on the model proposed by Rincon-Flores and Santos-Guevara [33] shown in Figure 1.

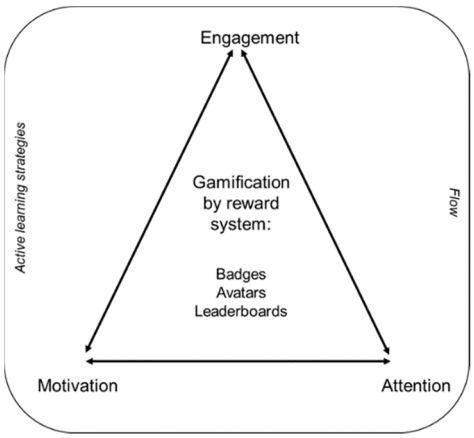



**Figure 1.** Gamification model applied. Adapted from Ref. [33] p. 79.

The mechanics consist of a system of rewards, badges, avatars, and a leadership board as components, with the purpose of promoting motivation, attention, and engagement. The mechanics of rewards are based on the superpowers narrative, which was inspired by superheroes under the philosophy that knowledge, attitudes, and values are the superpowers of every human being. Table 1 shows the badges [45].

**Table 1.** Description of the "Superpowers" Reward System.

| Badge of Power | Description | Points |
|---|---|---|
|  | Undergraduates earned the Flash badge when they answered a challenging quick-response question. The goal was to attract the attention of the class. | 1 |
|  | Undergraduates earned the Stark badge when they answered a more challenging question or placed first in a Kahoot. | 2 |
|  | The Captain America badge recognized students who performed their activities on time, correctly, and well organized. The goal was to acknowledge positive attitudes. | 1 |
|  | The Spider badge recognized students' progress, for example, when they improved in a second assessment. | 1 |
|  | The Groot badge recognized values, for example, when the teacher noticed that the student helped other classmates. | 1 |

**Table 1.** *Cont.*

| Badge of Power | Description | Points |
| --- | --- | --- |
|  | The Fantastic Four badge recognized students' collaborative work. | 1 |
|  | The Thanos badge eliminated the badges won in an evaluation period. Its objective was to punish an academic failure or a disrespectful attitude toward their peers or teacher. | |

Students in both courses had access to their leadership dashboard through the Canvas educational platform. The dashboard was updated every week by the instructor, and the students could only redeem the equivalent of 10 points in each evaluation. The Engineering group had two evaluation periods while the Economics and Social Sciences group had three. It should be noted that the evaluation scale of the university in which the study was carried goes from 0 to 100, and the minimum passing grade is 70. Partial views of the boards of each group are shown in Figure 2.


(**a**) (**b**)

**Figure 2.** Leaderboard, both courses: (**a**) Economics and Social Sciences and (**b**) Engineering courses.

This study used the *Captain America* badges to evaluate the quality of assignments, while the *Flash* badge and *Stark* badge combined were used to evaluate attention and participation. The measurement of the variables grades, motivation, and emotion came from the questionnaire. It is important to note that the leaderboard was built on a table within the Canvas platform which meant that it was flat and that the badges did not have a consistent size.

## 3. Methodology

A mixed methodology of the QUAN-Qual (with a dominant quantitative element) was conducted in this study [46]. The objective was to integrate quantitative and qualitative information to better understand the main research question at hand [47], which we stated as: to know in a more specific way the relationship between academic confinement and gamification through a mechanic of rewards. For the quantitative analysis, the variables

were established: grades, motivation, quality of assignments, attention–participation, and emotion. In the qualitative part, the variables were: emotional effects of academic confinement, effects of gamification in calculus class within academic confinement, and advantages and areas of opportunity of online classes. For this purpose, we applied semi-structured interviews to four students, two from the Engineering course and two from the Economics and Social Sciences course, using individual video conferences. We also included open questions in the instrument.

### 3.1. Main Objective and Research Questions

The objective of the research was to determine the impact of gamification based on the mechanics of rewards in an academically confined environment by comparing two Higher Level Calculus courses, one for Engineering students and the other for Economics and Social Sciences. The main research question was: What is the effect of gamification, in each type of career, in a context of academic confinement?

The study was guided by the following research questions:

(1) What are the differences between students of Engineering and Economics and Social Sciences in terms of preferences in gamification based on the rewards mechanics?
(2) What was the relationship between the quantitative variables comparatively between the Engineering and Economics and Social Sciences students?
(3) What was the effect of gamification based on the rewards mechanics in a context of academic confinement comparatively between Engineering and Economics and Social Sciences students?

### 3.2. Sample

The sample was composed of first-semester students, 45 from Engineering majors and 33 students from Economics and Social Sciences majors. The courses in which the study was developed were Fundamental Mathematical Modeling (Differential and Integral Calculus) in the case of Engineering and Mathematical Thinking I (Pre-Calculus and Differential Calculus) in the case of Economics and Social Sciences.

The mechanics of rewards were applied for 10 weeks in the Engineering course and for 15 weeks in the case of Economics and Social Sciences, the duration of the respective courses.

### 3.3. Instruments

The instrument applied was a questionnaire with a Likert-type scale about the mechanics of rewards, and we included open questions. The Cronbach's alpha of the Likert-type questionnaire was 0.9037, and it was validated by expert judges.

Four semi-structured interviews were all conducted by the students, not the instructors. We also used the final grades for each course.

### 3.4. Data Analysis

For data processing, we computed correlations and conducted principal component analysis utilizing the XL-Stat software to know whether or not there is a relationship between the pre-established variables and if so, to what extent. In addition, we used Minitab software to perform a Mann–Whitney medians difference test with the data of each type of career to determine if gender and scholarship status were related to the gamification variables. We also calculated descriptive statistics on badge preferences, grade point averages, and failure rate, as a comparison between both courses.

## 4. Results

This section presents the main findings: firstly, the sociodemographic and preference results in the mechanics of rewards, then the correlations between the variables (final grades, motivation, quality of assignments, attention–participation, and emotion), followed by a Principal Components Analysis (PCA). There are also differences between the variables

based on gender and scholarship or non-scholarship status. Finally, the results of the semi-structured interviews are presented.

### 4.1. Sociodemographic Results and Preferences in Mechanics of Reward

Out of the 45 Engineering students, 12 were women (26.6%) and 33 men (73.4%). Regarding the Calculus for Economics course, out of the 36 students, 17 were women (47.2%) and 19 men (52.7%). From the School of Engineering, 19 had a scholarship (42.2%) and 17 from the School of Economics and Social Sciences (47.2%). Regarding the preferences in the mechanics of rewards, Figure 3 shows the badge preferences among the students of each course.

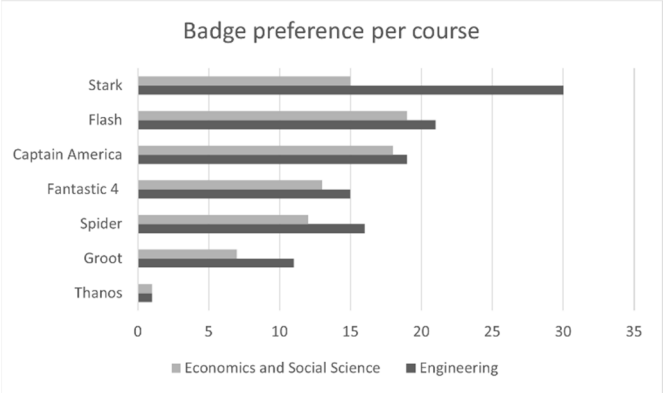



**Figure 3.** Badge preference per course.

It can be seen that the Engineering students had more preference for the Stark badge, which was won by questions that implied more challenge. Some responses to open questions were as follows:

*"I like to find solutions to difficult problems", "I like challenges and use my knowledge to answer questions"*

For the students of Economics and Social Sciences, the most preferred badge was the Flash, which implied being attentive because the questions were asked during the teacher's presentation. Some responses were as follows:

*"I was motivated to participate in class, although it was something I was not used to, winning the Flash badge was rewarding", "They [the badges] made the class more dynamic, they motivated me"*

The next favorite badge in both courses was Captain America. This implied that the students liked to be recognized for doing high-quality assignments. The first two answers are from Engineering students and the rest from Economics and Social Sciences students:

*"[This badge] Influenced the care and cleaning of my notes and tasks", "They [the badges] motivate and help"*

*"Because it [the badge] helps to practice good habits", "They [the badges] motivate me to make an effort despite not understanding the whole topic"*

The rest of the badges did not show a large difference. There were similar preferences in both courses. Some answers about the Groot, Spider, and Fantastic 4 badges, respectively, are the following:

*"I like Groot's because it's cool to win when you help someone without waiting for it"*

*"It motivates me to want to improve and to read the exams more carefully"*

*"I loved the interaction in the class"*

It is interesting to note that Engineering students prefer to be recognized for more challenging questions while Economics and Social Sciences students prefer to be recognized for questions about what was being addressed in the class that implied being attentive, perhaps because the former have a more positive attitude toward Mathematics than the latter [48–50]. Similar preferences and motives are observed with the rest of the badges. In the end, every student wants to be recognized for their effort in developing high-quality assignments, for improving, for helping others, or for good collaborative work.

### 4.2. Correlations and Principal Components Analysis

This section presents the results of the correlations of both courses, as well as the Principal Component Analysis to observe the relationship between the variables. Table 2 shows the correlations of both groups.

**Table 2.** Pearson correlation between both groups: Engineering and Economics and Social Sciences.

| **Engineering Calculus Course** | | | | | |
|---|---|---|---|---|---|
| **Variables** | **Grades** | **Motivation** | **Quality of Assignments** | **Attention and Participation** | **Emotion** |
| Grades | 1 | | | | |
| Motivation | 0.363 | 1 | | | |
| Quality of Assignments | 0.126 | 0.608 | 1 | | |
| Attention and Participation | 0.453 | 0.854 | 0.722 | 1 | |
| Emotion | 0.178 | 0.804 | 0.630 | 0.796 | 1 |
| Economics and Social Sciences Calculus Course | | | | | |
| Grades | 1 | | | | |
| Motivation | 0.222 | 1 | | | |
| Quality of Assignments | 0.408 | 0.427 | 1 | | |
| Attention and Participation | 0.410 | 0.415 | 0.493 | 1 | |
| Emotion | 0.160 | 0.320 | 0.300 | 0.195 | 1 |

As can be seen in Table 2, the correlations are positive in both courses. It can be seen how the Calculus for the Engineering course shows stronger correlations than the Economics and Social Sciences course. It is also interesting to note that the lowest correlations in the Engineering group were Quality of Assignments with Grades, while in the Economics and Social Sciences course, they were Emotion with Grades, though both courses' correlations between Emotion and Grades were low. In the case of the Engineering course, high correlations can be seen between Motivation and Quality of Assignments, Emotion, and Attention–Participation, between Quality of Assignments and Attention–Participation, and between Emotion and Attention–Participation and Quality of Assignments. In other words, the greater the recognition in the quality of assignments and attention and participation, the greater the motivation and emotion. The Grades variable had the highest correlations with Motivation and Attention–Participation, although they did not show strong correlations.

On the other hand, the correlations in the Economics and Social Sciences course did not exceed $p = 0.5$. The highest scores were for Quality of Assignments and Attention and Participation and Motivation. As in the Engineering course, the higher the recognition in the quality of the student's assignments and attention and participation in class, the greater the motivation. Contrary to the Engineering course, the Emotion variable is the one that showed the least correlation with the rest of the variables. As for the variable Grades, the highest correlation was with the variables Quality of Assignments and Attention–

Participation. Both courses coincided in Attention–Participation, that is, the greater the attention and participation in the class, the higher the grade.

It is worth noting that, in both courses, the Attention–Participation variable was positively correlated with the Quality of Assignments variable, that is, greater recognition of one of the variables had a positive effect on the other. Likewise, it is interesting that, in both groups, the correlation of the Grades variable with the rest of the variables was low; however, the group averages were high, and the failure rate was low (see Table 3).

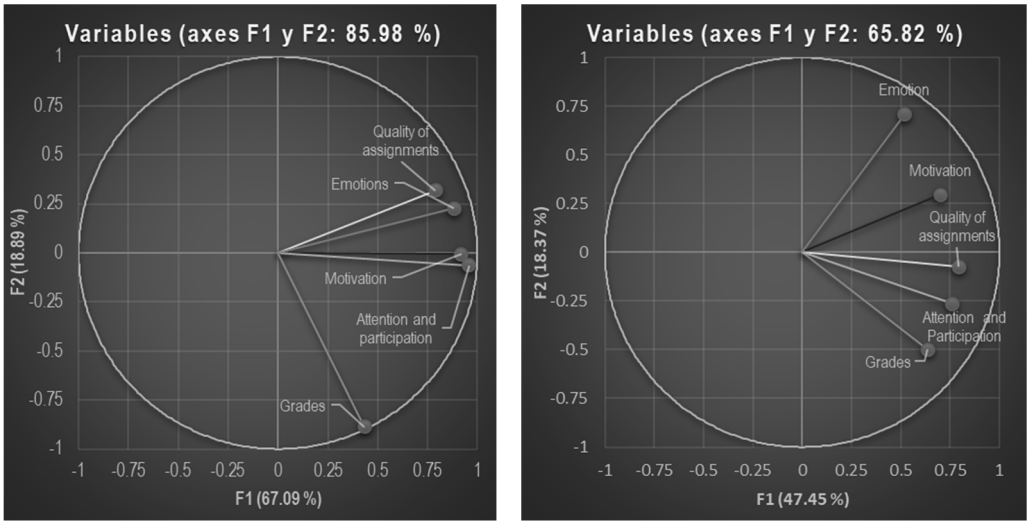
**Table 3.** Engineering and Economics and Social Sciences grades.

| Course | Students | Average Grades | Failure Rate |
|---|---|---|---|
| Engineering | 45 | 82 | 13.3% |
| Economics and SS | 36 | 89 | 0% |

Although the correlation between Grades and the rest of the variables is positive, the values are low, a little higher in the Engineering course than in the Economics and Social Sciences course. That is, there was a higher correlation between Motivation and Attention–Participation, as well as Motivation and the Quality of Assignments, than between Grades and these variables in both groups.

### *4.3. Principal Component Analysis*

In order to establish a graphical relationship between the variables, a principal component analysis was carried out. Figure 4a,b show the graphs of the Engineering and Economics and Social Sciences courses, respectively.




(**a**) (**b**)

**Figure 4.** PCA correlation biplot identifying association between variables. F1 and F2 represent the two principal components. (**a**) Engineering students. (**b**) Economics and Social Sciences students.

In Figure 4a, it can be seen that in the Engineering course the variable Grades is related to F2 and the rest of these to F1. Table 4 presents the contributions of each variable. Regarding the Economics and Social Sciences course, it can be seen that the variables Motivation, Quality of Assignments, and Attention and Participation are related in the F1 axis, while in F2, there are Grades and Emotions (see Table 4). This could imply in a general way that, in both types of students, the reward system had a greater impact on Motivation, Quality of Assignments, and Attention–Participation and that, in Engineering students, it also generated positive emotions.

**Table 4.** Contributions of variables by course.

| | Engineering Course | | Economics and Social Sciences Course | |
|---|---|---|---|---|
| | F1 | F2 | F1 | F2 |
| Grades | 5.6 | 83.4 | 17.1 | 27.0 |
| Motivation | 25.2 | 0.0 | 20.7 | 9.6 |
| Quality of Assignments | 18.6 | 10.7 | 26.5 | 0.6 |
| Attention and Participation | 27.3 | 0.4 | 24.4 | 7.7 |
| Emotions | 23.2 | 5.5 | 11.3 | 55.1 |

It is interesting to note that the Emotion variable is related to the rest of the variables, except for the Grades variable, while in the Economics and Social Sciences course, the variable that is least related is Emotion, perhaps because this type of student has a negative attitude toward learning mathematics [49,50].

Figure 5 shows the box plots for the variables Motivation, Quality of Assignments, Attention and Participation, and Emotion, comparing them between the two groups. The median value is higher in the Economics and Social Sciences group for all the four variables presented. In particular, Attention and Participation was rated with the highest possible score (4) by most of the Economics and Social Sciences students.

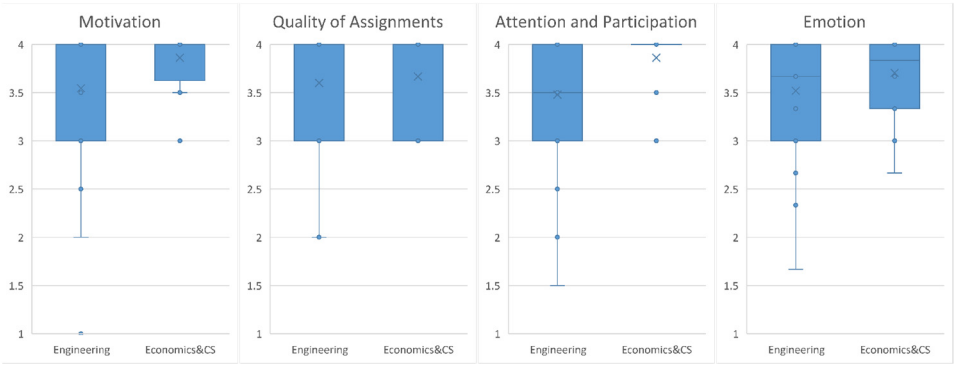



**Figure 5.** Comparative box plot of the quantitative variables.

### *4.4. Differences between Groups Regarding Gender and Scholarship*

For data processing, the information was separated according to gender and also by the scholarship status. Figure 5 shows that data are left-skewed. In addition, once data are separated by gender and course, subgroups are small (less than 30), which justifies the use of a non-parametric hypothesis test to compare subgroups. A Mann–Whitney hypothesis test was conducted to search for differences. Table 5 presents a summary of the results obtained from the Minitab software. In the Engineering course, there were 12 women and 33 men, while in the Economics and Social Sciences group, there were 15 women and 21 men. Regarding the scholarship students, in the Engineering course, there were 19 scholarship holders and 26 non-scholarship holders with median marks of 90 and 80.5, respectively (the average marks were 86.2 and 78.9, respectively), while in the Economics and Social Sciences course, 17 scholarship holders and 19 non-scholarship holders with median marks of 94 and 87, respectively (the average marks were 92.1 and 86.0, respectively).

**Table 5.** Averages of the quantitative variables when students are classified by gender and scholarship status. *p*-value shown comes from the Mann–Whitney test for difference in means.

| Engineering Course | Gender | | | Scholarship | | |
|---|---|---|---|---|---|---|
| | **Female** | **Male** | ***p*-Value** | **Yes** | **No** | ***p*-Value** |
| Grades | 82.4 | 81.8 | 0.312 | 86.2 | 78.9 | 0.018 |
| Motivation | 3.50 | 3.56 | 0.173 | 3.63 | 3.48 | 0.950 |
| Quality of Assignments | 3.50 | 3.64 | **0.036** | 3.58 | 3.62 | 0.252 |
| Attention and Participation | 3.46 | 3.48 | 0.341 | 3.53 | 3.44 | 0.878 |
| Emotions | 3.53 | 3.52 | 0.972 | 3.61 | 3.45 | 0.175 |
| **Economics and Social Sciences** | **Gender** | | | **Scholarship** | | |
| | **Female** | **Male** | ***p*-Value** | **Yes** | **No** | ***p*-Value** |
| Grades | 90.5 | 87.7 | 0.807 | 92.1 | 86.0 | 0.023 |
| Motivation | 3.93 | 3.81 | 0.708 | 3.85 | 3.87 | 0.634 |
| Quality of Assignments | 3.87 | 3.52 | 0.866 | 3.76 | 3.58 | 0.869 |
| Attention and Participation | 3.90 | 3.83 | 0.643 | 3.85 | 3.87 | 0.546 |
| Emotions | 3.69 | 3.71 | 0.524 | 3.76 | 3.65 | 0.528 |

Table 5 shows that, with respect to gender, there was only a significant difference in the Engineering course in the Quality of Assignments variable. With respect to the scholarship status, there was only a significant difference in the Grades variable in both courses in that the highest grades corresponded to scholarship students. This implies that both gender and scholarship status do not influence the variables, with the exception of Quality of Assignments in the case of the gender variable of both groups and Grades in students with scholarship.

### *4.5. Interviews*

The results of four students' interviews are presented in this section: two from the Engineering course and two from Economics and Social Sciences. Based on the nine-question questionnaire, the information was ordered according to the following categories: emotional effects of academic confinement, effects of gamification in calculus class within academic confinement, and advantages and areas of opportunity of online classes.

#### 4.5.1. Emotional Effects of Academic Confinement

The students of both courses agree that confinement has caused them negative emotions such as loneliness, disappointment at starting their university life at home, and impotence due to the lack of communication on the part of some teammates. Physiologically, they felt physically and mentally exhausted, stressed, and some felt depressed. Engineering students commented that they regretted not making use of the labs for their physics or chemistry practices, while the Economics and Social Sciences students regretted not having face-to-face contact with their classmates.

#### 4.5.2. Effects of Gamification in Calculus Class within Academic Confinement

Both Engineering and Economics and Social Sciences students agreed that knowing that they could earn recognition through a badge motivated them to pay attention, not be distracted by the cell phone or television, and this influenced their grades in a positive way. An engineering student commented that he does not like to participate in class but that the badges system motivated him to feel rewarded for the quality of his activities or for improving his performance. In the case of the Economics and Social Sciences course, they agreed that the class time seemed shorter with gamification in place.

#### 4.5.3. Advantages and Areas of Opportunity of Online Classes within Academic Confinement

Students of both courses agree that the advantages of taking the online class as a consequence of academic confinement are saving time traveling from home to the university and being able to review the recording of the class asynchronously. They consider that, although some classes promote collaborative activities in breakout rooms, socialization was not promoted because the teammates had the cameras turned off, which gave the feeling of being alone. In general, students suggest that the teachers make the classes more dynamic and that they apply didactic strategies such as gamification. The Economics and Social Sciences students suggest that teachers should encourage students to have the camera on and even that they should award a badge for this.

## 5. Discussion

Engineering students showed greater preference for the mathematical challenges while Economics and Social Sciences students were prone to class participation. This can be seen in Figure 3 and in the comments made by the students. It coincides with the fact that the Engineering students have a more positive attitude toward learning mathematics [48–50]. However, the mechanics of rewards contributed to making Economics and Social Sciences students more attentive and participating more in class, thus promoting more active learning.

The results show that the mechanics of rewards motivated more Engineering students to perform activities of higher quality, to be more attentive and participative, and more excited, than Economics and Social Sciences students. The results can be seen in the correlations shown in Table 2. When facing an environment of academic confinement due to COVID-19, Thomas and Rogers [6] suggest providing positive feedback as well as innovating the way of learning [9]. Therefore, the mechanics of rewards such as the ones proposed in this study could be positive in virtual environments to promote attention and frequently recognize students.

Another noteworthy result from this study is the fact that the Grades variable was the one with the lowest correlation in both courses and that grades in both courses were higher than 80/100 with a low percentage of failure. In fact, the Economics and Social Sciences group registered zero students that failed the course. This can be observed in Tables 2 and 3. It is interesting that the mechanics of rewards that encourage engagement, attention, submission of high-quality assignments, and emotion can positively affect the performance of students in both types of careers. This matches what was found by [40,43,44]. In this regard, a didactic design based on gamification can be a positive tool for teachers of virtual environments.

Finally, it is worth noting that academic confinement had its advantages and disadvantages. According to the students' point of view, one of the disadvantages they commented on was that it was not required to have the camera turned on and that there should be a badge to recognize the students who kept it on. Among the advantages, in general, was the saving of time and that the class was recorded. Within the courses of this study, they recognized that the mechanics of rewards motivated them to pay attention during classes. Undoubtedly, the pandemic abruptly caused education to move virtually [3]; however, once adapted, it has opened the possibilities for educational innovation [8,9]. Gamification, through mechanics of rewards, can be a tool that allows improving virtual educational environments.

## 6. Conclusions

Gamification proved to be a useful pedagogical strategy to promote participation and enhance motivation among undergraduate students, although it does not seem to increase students' performance in their subjects. On the other hand, gender does not affect motivation much neither in performance nor motivation and emotion. However, as shown in a previous study, men and women approach gamification differently, indicating

that "the emotional dimension showed how women felt more comfortable with more chances to rightly solve the challenge than men" [37] (p. 17). This might show a gender predisposition to problem solving in the classroom. It is important to direct gamification toward a constructive competition in which users of any gender have the same opportunity to win and be recognized.

The scholarly significance of this study is that it provides evidence on how undergraduate students deal with gamification in their classroom. The results indicate that gamification is a potential resource for the instructor to design learning routes. In other words, it gives us an idea of the benefits and extent to which this tool can be used in the classroom. In addition, the *mechanics of awards* are effective in promoting attention and participation during class time, and it can be a positive element to include in online sessions. However, it is necessary to keep in mind that including gamification in completely online courses such as MOOCs triggers technical issues to administer awards or any other gamification elements. Furthermore, gamification is best suited with other teaching methods such as inquiry-based or challenge-based learning that are more complicated to use in fully online classes, as well as when the pandemic lockdowns took place.

In sum, gamification is regarded as a method that gives opportunities to experiment with rules, emotions, and social roles, which ultimately leads to fostering cognitive, emotional, and social aspects—factors that always play a role in the students' learning processes.

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