



## ROLE-PLAYING GAMES AS AN EDUCATIONAL STIMULATION

Eduardo Adrian Chavez Lizama & Ricardo Morales Carbajal

### Abstract

This study assesses the effect of Table-Top Role-Playing Games (TTRPGs) on students' mathematical and social science learning in the Engineering classes of the Autonomous University of Baja California (UABC), Mexicali campus, with students in their first and second semesters of Differential Calculus, Linear Algebra, Integral Calculus, as well as the propaedeutic courses of the Faculty of Medicine of the UABC, Mexicali campus. Two methods were used to measure this impact: first, questionnaires were distributed to students to gather their feedback and perceptions, and second, the academic performance of two distinct groups was analyzed: students who engaged in TTRPGs and those who did not. By comparing these two groups, the study aims to determine the influence of TTRPGs on students' academic achievements.

### Keywords

TTRPG, game-based learning, mathematics students, engineering students, learning outcomes, pedagogy, data analysis

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### Introduction

Gamification was investigated to motivate students to encourage their learning and retention in school. This technique uses games and a reward system to increase students' motivational levels,<sup>1</sup> with appropriate context-based applications.<sup>2</sup>

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<sup>1</sup> R Contreras Espinosa y J Eguia, *Gamificación en aulas universitarias* (Barcelona: Universitat Autònoma de Barcelona, 2016). [In Spanish].

<sup>2</sup> Oriol Borrás Gené, *Fundamentos de la gamificación* (Madrid: Gabinete de Tele-Educación de la Universidad Politécnica de Madrid, 2015). [In Spanish].

Games present a challenge that tests students' intellect and creativity,<sup>3</sup> such as football matches<sup>4</sup> or video games.<sup>5</sup> If teachers applied gamification techniques more frequently in schools, students could receive positive feedback on their acquired knowledge, foster social relationships with peers,<sup>6</sup> and develop their self-confidence<sup>7</sup> since emotions, beliefs, and attitudes can be influenced in the classroom.<sup>8</sup>

If teachers use game dynamics for learning,<sup>9</sup> it would be best to avoid the courses as mechanical exercises with centralized attention to the teacher.<sup>10</sup> Gamification in the classroom is not as simple as setting up a game in a class. Gamification in the classroom consists of applying playful dynamics to generate a learning process that the student can use to construct their knowledge. An example of this game dynamic is through the use of Role-Playing Game system.

In a Role-Playing Game, a group of people record the characteristics of fictional characters on paper or in databases. The fictional characters solve situations that a moderator assigns during one or several sessions.<sup>11</sup> Role-Playing Game encourages reading, imagination, group dynamics, mental calculation, empathy, and tolerance.<sup>12</sup> The Role-Playing Game can hook the students to participate when they have a character that can level it up, acquire new skills or special items.<sup>13</sup> If a Role-Playing Game and teaching were combined, the motivation to learn could increase.

<sup>3</sup> J Chamoso, J Duran, J Garcia, J Martin, y M Rodriguez, "Análisis y experimentación de juegos como instrumentos para enseñar matemáticas," *SUMA* 47 (2004), 47-58. [In Spanish].

<sup>4</sup> A Pineda Guillen y M Méndez Guevara, "Fútbol, una mirada desde la matemática educativa," *Acta Latinoamericana de Matemática Educativa*, Editado por P Lestón (México, DF: Colegio Mexicano de Matemática Educativa A. C. y Comité Latinoamericano de Matemática Educativa A. C., 2014), 657-663. [In Spanish]

<sup>5</sup> See A Esparza Pérez y O Asuman, "De un videojuego a las ecuaciones del tiro parabólico: una propuesta didáctica," *Acta Latinoamericana de Matemática Educativa*, editado por P Lestón (México, DF: Colegio Mexicano de Matemática Educativa A. C. y Comité Latinoamericano de Matemática Educativa A. C., 2014), 871-878. [In Spanish] and A Olvera, A Martínez, y F Villamizar, "Fracciones y videojuegos. ¿una razón para jugar?," *Cinvestav – IPN* 10, No. 1 (2013), 291-298. [In Spanish].

<sup>6</sup> J. M. Gairín-Sallán, "Efectos de la Utilización de Juegos Educativos en la Enseñanza Aprendizaje," *Educar* 17 (1990), 105-118. [In Spanish].

<sup>7</sup> L Mendoza Toro, J Ulloa Ibarra, y E García de Dios, "Actividades lúdicas como estrategia al impulso del talento matemático," *Acta Latinoamericana de Matemática Educativa*, editado por P Lestón (México, DF: Colegio Mexicano de Matemática Educativa A. C. y Comité Latinoamericano de Matemática Educativa A. C., 2014), 1251-1258. [In Spanish].

<sup>8</sup> E Brinnitzer, M Collado, M Fernández Panizza, S Pacheco, S Pérez, y F Santamaria. *El juego en la enseñanza de la matemática* (España: GRAO, 2017). [In Spanish].

<sup>9</sup> M. de Guzmán, "Juegos matemáticos en la enseñanza," *Actas de Las IV Jornadas sobre aprendizaje y enseñanza de las matemáticas*, 1984, 1-38, <https://www.scribd.com/document/468919447/JUEGOS-MATEMATICOS-EN-LA-ENSEÑANZA>. [In Spanish].

<sup>10</sup> J Chamoso, J Duran, J Garcia, J Martin, y M Rodriguez, "Análisis y experimentación de juegos como instrumentos para enseñar matemáticas," *SUMA* 47 (2004), 47-58. [In Spanish].

<sup>11</sup> See P Pedraz, et al., *Educar Jugando: Un Reto Para el Siglo XXI* (Zaragoza, España: Nexo Ediciones, 2018). [In Spanish]. Also see H Sevillano Pareja, "Estudio del sector editorial de los juegos de rol en España: historia, tipología, perfil del lector, del autor, del traductor y del editor (tesis doctoral)," Universidad de Salamanca, Salamanca, España., 2008. [In Spanish].

<sup>12</sup> See S L Bowman, *The Functions of Role-Playing Games* (McFarland & Company, Inc. Publishers, 2010) and Z Reznichak, *Teacher-Gamer Handbook* (Wild Mind Training. 2021), <https://www.drivethrurpg.com/en/product/354223/teacher-gamer-handbook>.

<sup>13</sup> See E Kim, K Namkoong, T Ku, y S Kim, "The Relationship between Online Game Addiction and Aggression, Self-Control and Narcissistic Personality Traits," *European Psychiatry* (Recuperado de <https://doi.org/10.1016/j.eurpsy.2007.10.010>) 23, no. 3 (2008), 212-218, and N Yee, "Ariadne: Understanding MMORPG Addiction," 2002, <http://www.nickyee.com/hub/addiction/addiction.pdf>.

The presence of a Role-Playing Game in the classroom could help the students to increase their interest in learning, their imagination, their level of socialization, and their teamwork.<sup>14</sup>

Therefore, in this work, if a Role-Playing Game is applied as a teaching methodology at the university, the students will be motivated to learn. "Motivation is necessary to guarantee to learn and to evaluate an educational program because when a student is motivated, the effectiveness of the activity increases."<sup>15</sup> In this study, we assessed the effect of Table-Top Role-Playing Games (TTRPGs) on students' learning outcomes. We used two methods to measure this impact. First, we distributed questionnaires to students to gather their feedback and perceptions. Second, we analyzed the academic performance of two distinct groups: students who engaged in TTRPGs and those who did not. By comparing these two groups, we aimed to determine the influence of TTRPGs on students' academic achievements.

### **The Methodology Focused on Mathematical Learning**

The methodology focused on mathematical learning is a didactic methodology of Role-Playing Game developed for teaching. Each student has a character sheet, as shown in Figure 1, in which they record the data of their character based on the profession and "benefits" they can have in the classroom, as mentioned in Table 1. The benefit of each character can increase according to the number of Experience Points (XP) accumulated.

The objectives are to motivate students to work as a team and participate in classes. Meanwhile, the students develop soft skills like social interaction, communication, teamwork, and coordination, and hard skills like mathematical understanding of addition, subtraction, partial fractions resolution, graphing on the Cartesian coordinate plane, solving the linear equations in two or three variables.

This methodology was applied in the Faculty of Engineering of the Autonomous University of Baja California (UABC), Mexicali campus, with the students of the first and second semesters of the subjects of Differential Calculus, Linear Algebra, Integral Calculus, and the propaedeutic courses of the Faculty of Medicine of the UABC, Mexicali campus.

A survey was coordinated by Dr. Ricardo Morales-Carbajal to 95 students from different math groups who had experimented with the Role-playing methodology. For academic performance analysis, the students' grades in three semesters were the first group of Linear Algebra at 8 AM and the second group of Linear Algebra at 11 AM. Each group consisted of approximately 35 students.

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<sup>14</sup> See V Abella García y M Grande de Prado, "Juegos de rol como estrategia educativa: percepciones de docentes en formación y estudiantes de secundaria. Teoría de la Educación," *Educación y Cultura en la Sociedad de la Información* 11, No. 3 (2010), 27-55. [In Spanish]; M Grande de Prado y V Abella García, "Los juegos de rol en el aula," *Teoría de La Educación. Educación y Cultura En La Sociedad de La Información* 11, no. 3 (2010), 56-84. [In Spanish]; R Morales-Carbajal y C Villa-Angulo, "Role playing games for mathematics education," *Education in the Knowledge Society* 20 (2019), 1-13; and P Pedraz et al., *Educar Jugando: Un Reto Para el Siglo XXI* (Zaragoza, España: Nexo Ediciones, 2018). [In Spanish].

<sup>15</sup> R Contreras Espinosa y J Eguia, *Gamificación en aulas universitarias* (Barcelona: Universitat Autònoma de Barcelona, 2010), 28. [In Spanish].



Table 1: List of Professions

<b>Profession</b>	<b>Description</b>
<b>Bard</b>	Students can select a person to be part of your team. The selected person cannot refuse to be part of your team.
<b>Cleric</b>	Students can lend their XP to another partner (valid for one day), so the other partner has the sum of their XP plus that of the clergyman. The sum cap is 150,000 XP. Students can heal a part of their partner's body (once a week). Students can change (for a day) the profession of another partner.
<b>Elements</b>	Students can delay job delivery if they spend 30,000 XP (XP spent cannot be reused).
<b>Warrior</b>	Students can use a calculator.
<b>Mage</b>	Students can try to turn one error into success for every 30,000 XP.
<b>Monk</b>	Students can consult any book and notes.
<b>Scout</b>	Students can visit and search for information on other teams.

Then, the students will be asked to create a team denominated "clan." The students will propose the name and symbol of their clan (it is suggested to be simple because later, they will have to draw it in their character sheets.) The only restriction is that clan members must have different professions, so two or more people with the same professions are not allowed.

Students will face the conflict using the system of the Role Playing-Game *Monster of the Week*. The system can be changed according to the class subject because the main point of this methodology is to reinforce mathematical knowledge playfully.

For example, the teacher will introduce the mathematical subject that the students will work on for the day. Then the teacher will add a fictitious situation, such as monsters invading a town, a meteorite falling to the ground, or an evil enemy unleashing a curse on the world. The teacher will indicate the XP value per correct Monster/problem resolved and the time limit to finish. Then the teacher will assign the students to several teams (recommended between two to four students) according to some students' characteristics, like the same hair length, glasses, shirt color, etc.

If there were at least two students from the same clan on the same team, then, at the end of the activity, they would receive an extra 100 XP. Because clan members always give emotional support. However, anyone using the skills of other professions or without the character's sheet, then he/she will be penalized, as shown the Table 2.

Table 2: Penalties

Event	Description
<b>First time</b>	It will only be a warning with a mark on his/her character's sheet.
<b>Second time</b>	It will not be allowed to use his/her professional benefit the next time that the teacher set an activity.
<b>Third or more times</b>	It will not be allowed to use his/her professional benefit the next three times that the teacher set an activity.

## Process Outline

This is the outline process of Role-Playing Game methodology in a mathematics course of one hour of class daily, five times a week:

1. Monday and Tuesday. The teacher gives a subject as a normal class.
2. Wednesday and Thursday. Activities are carried out:
  - The teacher shows a fictitious situation and invites students to solve it, such as in Figure 2.
  - Work teams (two to four students) are generated randomly.
  - Students are assigned a limited time to resolve the fictitious situation.
  - Students use their benefits based on their chosen profession (Table 1).
  - When the students run out of time, the teacher reviews the work. XP is obtained based on the successful results. The XP is recorded on the character sheet (Figure 1).
  - Any student is sanctioned if he uses a skill when it does not correspond, cheats, or does not bring his character sheet.
3. The teacher randomly chooses a student to face a mini-boss, solving a mathematical problem, such as using a binomial axe to divide terrible polynomial wolves and their respective bosses into small pieces, as shown in Figure 3.

It is essential to take care that the playful character is present during the course because, in this way, the student remains interested and feels invited to participate<sup>16</sup> in the Role-playing methodology. In addition, taking care that the pre-established rules are present in the classroom to avoid indiscipline.<sup>17</sup>

<sup>16</sup> L Mendoza Toro, J Ulloa Ibarra, y E García de Dios, "Actividades lúdicas como estrategia al impulso del talento matemático," *Acta Latinoamericana de Matemática Educativa*, editado por P Lestón (México, DF: Colegio Mexicano de Matemática Educativa A. C. y Comité Latinoamericano de Matemática Educativa A. C, 2014), 1251-1258. [In Spanish].

<sup>17</sup> Z Garrido y Ana Velásquez, "El juego como estrategia de enseñanza aprendizaje de operaciones con conjuntos numéricos," *Acta Latinoamericana de Matemática Educativa*, editado por P Lestón (México, DF:

For the impact level record, the mixed method shall be used by elaborating a questionnaire where students are asked their impression and level of effect (qualitative method) and verify the academic performance of the same subject (quantitative method).



Figure 2: Solving a mathematical problem, where they have to find the type of equation that describes stellar behavior. Note. Exercise where students have to establish a relationship between the trajectory of the stars and the type of mathematical equation graph that resembles. Source: Own elaboration (Morales-Carbajal, 2020).

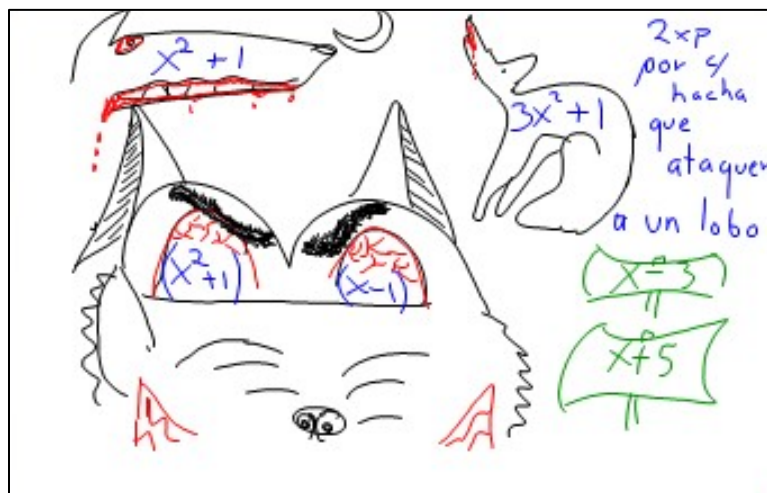


Figure 3: Confrontation against a mini-boss and his polynomial minions. Note. Exercise where students have to establish a relationship between the trajectory of the stars and the type of mathematical equation graph that resembles. Source: Own elaboration (Morales-Carbajal, 2020).

## Example from the Classroom

In the class, there are the following people: Luis, Mary, Juan, José, Antonio, Pepe, Paco, and others.

- Luis, Mary, and Juan created a clan named CO2.
- José, Antonino, Pepe, and Paco started a clan named NARUTO.
- The other students created ROKO, KUPIDO, CLONE, and KAZZA clans.

During profession selection:

- Clan CO2
  - Luis chose Mage
  - Mary chose Warrior
  - John chose Cleric (John wanted to choose Warrior, but since Mary had already chosen, John changed his mind, so all three could be in the same clan.)
- Clan NARUTO
  - Jorge chose to be a Warrior
  - Antonio chose to be Bard
  - Pepe chose to be Monk
  - Paco chose to be Scout

## Day One

The teacher tells a fictional story to the students: "Last night, a meteorite fell near a tribe. People asked them for help because they felt dangerous." The teacher asks the students if they accept the challenge (an invitation is made to students).

**Students:** Hmm.... (The students are not convinced they want to face the situation.)

**Teacher:** Suddenly, more people from the village arrive and comment that the radiation from the meteorite begins to cause adverse effects on people, and if something is not done soon, then everyone could die.

**Students:** We think we could face the situation (one or another motivated voice is beginning to be heard).

**Teacher:** The wise men of the people beg for your help; they tell them to please save the people.

**Students:** Yes, yes, let's go.

**Teacher:** As adventures get closer to the meteorite, they get ambushed by mathematical monsters (apparently, they come from the meteorite), who have several numbers on their foreheads, so the adventures will have to solve certain sums to defeat them.

Since everything was so sudden, the adventures didn't have time to group up with their clan, they would form a temporal team of three or four members based on the same shoe size because they were walking to the meteorite.

The exercise or "combat" that they will face consists of 10 monsters. To defeat them they only need to make 10 sums indicated on the board by the teacher. Each correct resolution is worth 100 XP. The "adventures" have a maximum of 15 minutes to finish the combat.

- Antonio made team with three students from clan KUPIDO, but Antonio has the bard profession, so he used his benefit and asked Jorge to join his team.
- Pepe teams up with Luis, María, and Juan.
- Several students, including Paco, couldn't find anyone the same size as their shoes, so they went to a section called the "section of the marginalized."

The teacher decides who will conform to the new teams that will make up these students.

- Paco teamed up with three students from the KAZZA clan.
- Antonio teamed up with Jorge, and three other companions (from different clans). They worked hard, and Jorge used his "warrior profession benefit" to use the calculator and solve problems.
- The Luis, Mary, Juan, and Pepe team also get to work. Mary has the warrior profession, so she used the calculator. Pepe is a Monk, so he invested his time consulting the books that can give him the wisdom to defeat the mathematical monsters.
- The team formed by Paco and others didn't work so hard, and they decided to take advantage of the benefit of Paco's profession (Scout) so he visited other teams and checked their answers.

After 15 minutes, the teacher began to check each team's results and write down the XP earned on their character sheet.

- Antonio's team had 8 out of 10 correct answers. Therefore, they would only have 800 XP. But Antonio and Jorge belong to the same clan, so they gain 200 extra XP. Antonio and Jorge gain 1000 XP in total, the other three companions only gain 800 XP.
- The team of Luis, Mary, Juan, and Pepe had four correct answers, so Luis applied his mage benefit to correct their wrong answers to have six correct answers and earn 600 XP.
- Paco's team didn't succeed, so they earned zero XP. Therefore, each one marked the right leg on their character sheet, indicating that they fought and got "hurt". When they get all parts of their body injured, they will lose the benefit of their profession. If Paco had chosen the element profession (see Table 1) he could have used the benefit "Students can delay job delivery if they spend 30,000 XP." and he could have asked to be evaluated the next day.
- Another team is formed by Katty, Susan, Jhon and Steve (not mentioned before). Katty, Steve, and Jhon had forgotten their character sheet at home, so they will not receive any XP. Susan brought her character's sheet, and her character profession is monk, but she was frustrated because her team didn't progress very well, so she stood up from her seat and visited other teams to watch how they worked. The teacher realized that Susan hasn't the

scout profession. The teacher asked her to sit down again and set a mark on her character's sheet as a warning that she didn't stay with the rules of her character's profession, so the next time that something like that happen after the teacher make all the students to team up, she will be penalized without using her character's benefit that day according to Table 2.

## The Methodology Applied to the Social Sciences

Each student can create a character and select a set of skills and traits that have been previously defined. Once the character is created (Figure 4) and the "skills" have been learned, they must earn Experience Points (XP) to level up have access to new skills and even obtain items with their Skill Points (SP).

To obtain XP, students must perform various activities set by the teacher where they can earn up to a certain amount of XP according to their skills performance. The teacher will determine the amount of XP that can be achieved by completing the activity. An important point of this methodology is that it has no punitive connotation (i.e. a student cannot lose XP for not completing tasks or not participating), as the aim is to reward them for their achievements.

XP does not replace grades and doesn't affect continuous assessment but only serves to motivate students to participate more. Each student starts at level one and can progress from there and achieve a certain amount of XP. The XP required for level advancement increases exponentially and is intended to motivate students to advance.

It is important to mention when a skill cannot be used (i.e. the ability to skip a task allows you to not complete a task and get full credit, but you have to tell them that it cannot be used in final work or team projects.) Examples of skills are given in the lesson section (Figure 4). It is advisable to design the skills according to the subject being taught.

Character classes (CC) are character archetypes that students must build on, to create their character. There are four basic types, but each teacher is encouraged to create a specialized class for their courses.

The four base types are:

- **Warrior:** This class is about people who like to defend others from injustices, do not stay silent when they see that something is not right, and are the first to go out to "fight" for the rights of others. They have the basic ability to Don't give up!
- **Mage:** This class is about people who value knowledge above all else, are the first to participate in class, and in the work always seek to investigate even the smallest of details and problems of a topic. Have the basic skills of a knowledge Seeker
- **Healer:** This class is for people who always care about the well-being of their colleagues, they are constantly asking if one or the other is well, and if they need anything, they usually put in their teams those who do not have more equipment and always seek well-being above everything else, very empathetic. Your basic skill is Heal Ally
- **Bard:** This class is about people who have a taste and skill for the arts more than anything else, usually excel at tasks that require creativity or design, and are always looking for ways to express their art and style in everything they do, you want them on your team if you want to have a beautiful design, their basic skill is Bard Inspiration!

## Hoja de personaje

Fecha \_\_\_\_\_ Materia \_\_\_\_\_  
 Alumno: \_\_\_\_\_ Grado: \_\_\_\_\_  
 Clase: \_\_\_\_\_

Nivel	Habilidad	Duración	
1	¡No te rindas!	Una vez por unidad	Si tu o un compañero de clase lleva más de 3 actividades sin entregar y ya se les paso la fecha de entrega, puedes usar la habilidad para poder entregar las últimas dos.
2	Valor del guerrero	Una vez por unidad	Si tu o un compañero han tenido su cámara encendida toda la clase durante una semana seguida, obtienen la opción de duplicar sus PE por participación de esa semana
3	Aura de combate	Una vez por semana	Cuando usas alguna de tus habilidades puedes elegir más de un objetivo siempre y cuando no sea el mismo.
4	Grito de guerra	Una vez por tema	Si tu o un compañero han participado en todas las clases del tema y su participación ha sido significativa, pueden recuperar una habilidad usada.
5	Golpe de gracia	Una vez por semana	Si el maestro está ofreciendo un trabajo o una misión puede usar la habilidad para ser elegido primero para hacerla, si más de un guerrero usa esta habilidad el que tenga más PE tiene prioridad.

Items	
Descripcion	Uso

Notas:  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Figure 4: Warrior Class Character Sheet. Source: Own elaboration (Chavez Lizama 2022).

All classes advance at the same pace, however, in the mission sections (Figure 5), proposals are given to take advantage of them. Missions are special activities that teachers can give students the option to perform, these will have no value in the grade but are rewarded with a single-use skill, an item, a large amount of XP, or a prize that the teacher considers. For the missions, it is recommended to carry out some work or activity that requires the use of a social development competence, since this will serve to strengthen social ties.

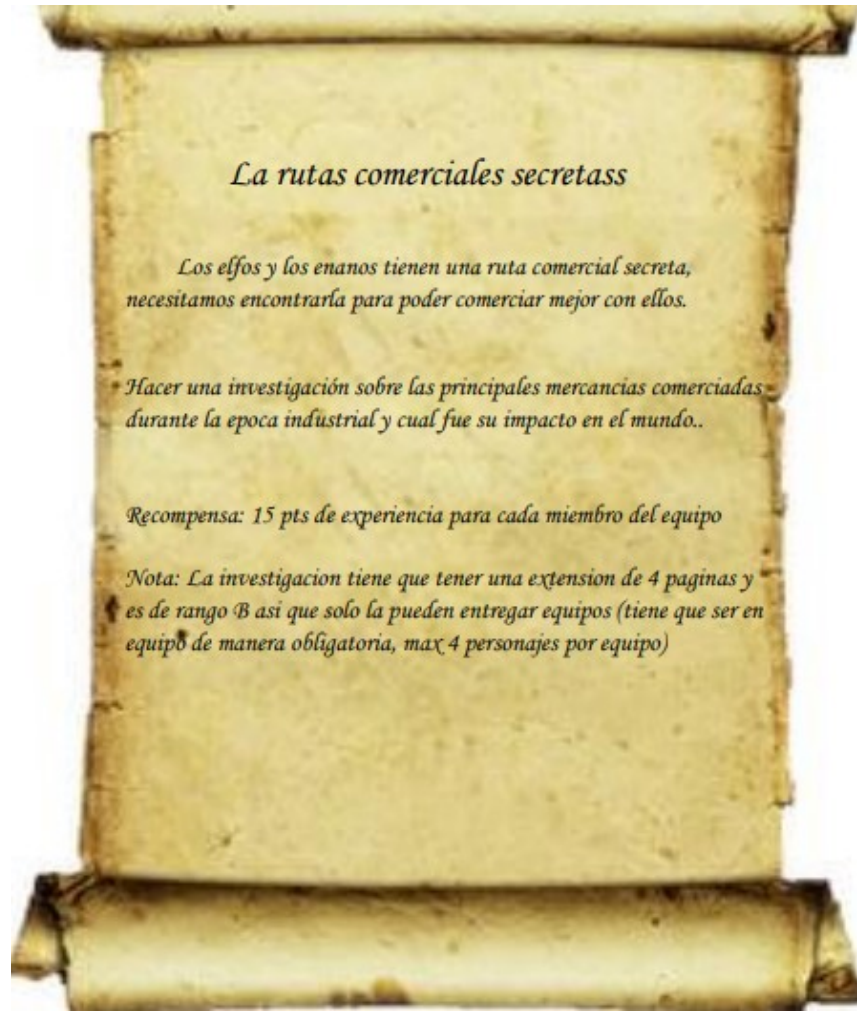


Figure 5: Example of mission to obtain XP. Source: Own elaboration (Chavez Lizama 2022).

Missions should always be performed as a team. If a team of four is made up of one member of each class, it is recommended to give them a bonus. Missions are classified by ranges from **C** to **S** and must be used carefully so as not to unbalance the class.

Items are single-use objects that students can obtain in exchange for XP (Table 3) to be able to use them at any time, the teacher must determine their value and effect, students should and can be encouraged to think about their items, only that the teacher should consider the value.

Table 3: Examples of Items

<b>Name</b>	<b>Cost</b>	<b>Effect</b>
Hourglass	10 XP	Allows you to increase the delivery time of an activity.
Poison bottle	15 XP	Allows you to cancel a minor task.

Veil of darkness	30 XP	The student who does not turn on his camera one day will not affect his reward if some skill asks him to have the camera on.
Phoenix Tears	100 XP	A student who failed by less than ten tenths can use the Phoenix tears to rise to six. (can be used on a partner).
Lenses of Ancestral Knowledge	200 XP	The student can use this Item to avoid having to answer a midterm exam reagent (does not apply in recovery or extraordinary).

Some items should not be offered for sale and can only be reward missions, to encourage participation.

## Results

### Methodology 1

A questionnaire was used as a measurement instrument for Methodology 1, and it was administered to a population of 95 students who were familiar with the Role-Playing Game methodology:

**Question 1.** How easy and simple to understand the Role-Playing Game methodology?

- 49.0% of the students answered "Easy"
- 37.5% of the students answered "Just a little"
- 2.0% of the students answered "Hard"
- 11.6% of the students answered "I don't know"

**Question 2.** Do you think that Role-Playing Game methodology detract from learning?

- 74.1% of the students answered "No"
- 18.0% of the students answered "Just a little"
- 4.0% of the students answered "Yes"
- 3.9% of the students answered "I don't know"

**Question 3.** Do you think that Role-Playing Game methodology motivates the students to learn?

- 61.1% of the students answered "Yes"
- 30.7% of the students answered "Just a little"
- 3.0% of the students answered "No"
- 5.2% of the students answered "I don't know"

They also expressed interest in seeing the Role-Playing Game methodology to be used in other subjects, as they perceived that it would benefit their learning.

## University Grades

We compared university grades from first semester groups that applied Role-Playing Game methodology vs first semester groups that didn't apply it; as a complementary measurement instrument. It's denominated:

- "Group 2013-2A" to the Algebra course with the Role-Playing Game methodology that took time at 8:00 AM in the second semester of 2013.
- "Group 2013-2B" to the Algebra course with the Role-Playing Game methodology that took time at 11:00 AM in the second semester of 2013.
- "Group 2014-1A" to the Algebra course with the Role-Playing Game methodology that took time at 8:00 AM in the second semester of 2014.
- "Group 2014-1B" to the Algebra course with the Role-Playing Game methodology that took time at 11:00 AM in the second semester of 2014.
- "Group 2014-2B" to the Algebra course with the Role-Playing Game methodology that took time at 11:00 AM in the second semester of 2014.
- "Group 2014-2A" to the Algebra course **without** the Role-Playing Game methodology that took time at 8:00 AM in the second semester of 2014. This group functioned as our reference.

Each group consisted of approximately 35 students. Groups from the first semester of the year (2014-1) usually have lower grades, because they consisted of students that had lower grades at high school. Also, there is a gap in the grade point average of 4.1% (Table 4) between Algebra course imparted at 8 AM versus Algebra course imparted at 11 AM. We don't know the reason of that grade gap between the Algebra course with the Role-Playing Game methodology but it kept constant in the semesters 2013-2 and 2014-1; so we decided to don't apply the Role-Playing Game methodology only to the Algebra course of 2014-2 imparted at 8 AM, and we found that the grade gap between an Algebra course with the Role-Playing Game methodology versus an Algebra course without the Role-Playing Game methodology reduced by 2.7% (from 4.1% to 1.4%).

Table 4: *Algebra Course Grades*

Period	Grade Average 8 AM	Grade Average 11 AM	% Difference
2023-2	79.7	76.4	4.1%
2024-1	57.08	54.69	4.1%
2024-2	78.26	77.15	1.4%

*Note: If this methodology had been used previously in the Faculty of Engineering, the number of deserters would have decreased.<sup>18</sup>*

<sup>18</sup> J d D Ocampo D a, M A Mart nez Romero, M de las Fuentes Lara, y J Zatar n Zatar n, "Reprobaci n y deserci n en la Facultad de Ingenier a Mexicali de la Universidad Aut noma de Baja California," *D cimo Congreso Internacional. Instituto Polit cnico Nacional CFIE*, 2010, <http://www.repositoriodigital.ipn.mx/handle/123456789/3653>. [In Spanish].

## Methodology 2

To evaluate the second methodology, an anecdotal evaluation was considered based on the participation in the classroom and their reaction to the activities. This methodology will only impact social sciences students as the main focus will be to create more involvement on the signature and to improve their grades and participation in class. In this regard, you can notice the following data.

The methodological tool was applied at private high school education groups on the island of Cozumel, specifically to two first-semester groups, two groups of third semesters, and a six-semester group.

The participating subjects were History of Mexico, Universal History, Research Methodology, and Community Development 1 and 3. The groups consisted of an average of 12 students and the methodological tool was applied for six months during the first school period (Table 5).

Table 5: Grade Comparison between Two Groups with the Same Subject a Year Apart

Subject	Year	Gamification	Grade Average
History of Mexico	2020	no	85%
	2021	yes	90%
Universal History	2020	no	90%
	2021	yes	92%
Methodology	2020	no	70%
	2021	yes	85%

## Discussion and Conclusions

Based on the results obtained from the survey, it is concluded that the Role-Playing Game methodology is highly accepted by students, it is a tool that helps the teaching and learning process and increases the interest of students to work as a team, socialize, solve situations with mathematical problems and, above all, increases academic achievement, as demonstrated through academic monitoring conducted on three semesters of the subject of Linear Algebra.

Role-Playing Game methodology has shown great potential for improving the rate of student participation and achievement in subjects that have traditionally been considered uninteresting due to outdated and repetitive teaching practices. So, this methodology can be applied to socially-based subjects.

It is considered that the success of the Role-Playing Game methodology lies in the fact that it works under the reward system since each student has a benefit for his fictional character and can increase this benefit, by receiving more XP, as a result of having correctly solved the fictional situations proposed by the teacher. For education, having the ability to use the RPG as a tool that allows students to face a situation that would otherwise cost them a lot of work is of great value to teachers.

The Role-Playing Game methodology helped to increase 2.7% the average grades at the 11 AM Algebra course as showed in Table 4, when it was compared with the 8 AM Algebra course.

By reviewing the table 5 we can see a comparison between 2 groups of the same subject, one year apart. The first group did not have any added gamification tool during their semester, and the second one was subject of this tool, their grades show the impact of the Role-Playing Game methodology on a positive sense on the second group.

Note that there is no data on community development, because due to a change of curriculum it was not possible to conclude the use of the gamification methodology.

Therefore, it is concluded that appropriately using a dynamic of games, can increase the stimulation in students so that there is academic progress and it would be very useful to start implementing it in schools.



**Eduardo Adrian Chavez Lizama, MA** is a teacher and researcher at UNID Cozumel. He holds a Master's degree in education and is also a working archaeologist. He designs pedagogical tools based on modern educational theories such as behaviorism and pedagogical constructivism.

**Ricardo Morales Carbajal, PhD** has been an instructor at the Autonomous University of Baja California since 2011. He has applied role-playing games as a pedagogical tool since 2013. He holds a PhD in Biomedical Engineering and has a background in Electronics Engineering and Neuro-engineering with a main research interest in optogenetics principles in cattle. Since 2017, he has been a researcher in the CONAHCYT program.