

# UnplugGamify: A Didactic Material to Support Student-centered Unplugged Gamification

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**Abstract**—Currently, an essential challenge in education in Brazil is to promote quality education that reaches all schools in the country, even those with limited technological educational resources. With this work, we have made a contribution to the field of gamified education by creating a comprehensive didactic booklet that has been translated into Brazilian Portuguese, English, and Spanish, thereby facilitating educators to gamify their classrooms in an unplugged and personalized way. We have introduced an innovative approach to designing unplugged gamified classes, aiming to provide engaging and enjoyable learning for students. This instructional material is based on a framework of five distinct gamification designs, offering teachers a versatile toolkit to gamify their classes, even if they never had any experiences with gamification. Our resources not only serve as valuable aids but also function as guides for teachers, empowering them to gamify their classes in a manner that is both student-centric and adaptable to different contexts, an essential characteristic with the possible variations of the students and places. This booklet is the result of an intensive training course provided to 15 Brazilian teachers, even in a short period of time, training them with essential knowledge and skills. These educators gained proficiency in several key areas, including *i*) understanding the fundamental concept of gamification and your more common definition, profiling their students and recognizing the pivotal role this plays in designing effective gamified learning experiences for the evolution of them, *ii*) familiarization with the various gamification elements and their organization into the five distinct designs, and *iii*) crafting context-free lessons that align with each of these innovative gamification designs. In an evolving educational landscape, our work stands as a beacon, enabling educators to harness the power of gamification and create dynamic, interactive learning environments for their students. This initiative has the potential to improve the quality of education and awaken in students a curiosity that transcends traditional borders. Such a transformation in the educational landscape could have far-reaching effects, ultimately contributing to the cultivation of an innovative, engaged, and motivated future generation, which will drive progress and innovation in various contexts.

**Keywords**—Unplugged gamification, Student-centered gamification, Gamified education, Gamification design, Didactic material

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## I. INTRODUCTION

The educational and learning context is the most common in gamification studies [1]–[4]. The results are mostly positive [5]–[7], however, some studies have already reported that gamification can also have negative impacts on users' experience, such as disengagement and motivation [8]–[10]. One hypothesis for these negative results is closely linked to the fact that people have different user profiles/traits, or, in other words, different preferences and perceptions about game elements/designs [11]–[16]. Thus, the need for materials centered on the user's profile arises, considering that people have different characteristics and, therefore, are motivated in different ways [14], [17]–[19].

In addition to the well-known difficulties in producing materials centered on the user profile, the process becomes even more complex when producing it in unplugged gamification contexts (*i.e.*, without the use of digital technologies) [1]. One of the reasons is the fact that although there are studies that show the importance of considering the characteristics of users when designing environments and activities [20]–[22], these studies use computational approaches, which makes production in unplugged environments difficult [19]. Thus, the lack of materials capable of providing the teacher with resources to apply gamification (especially considering the different profiles of students) in an unplugged context makes the teacher unable to plan gamified classes in unplugged environments [23].

To face this problem, in this work, we propose a didactic material (*i.e.*, a didactic booklet) capable of enabling the teacher to gamify classes in unplugged environments considering up to five different gamification designs and encompassing different user profiles. Thus, through this material (distributed in three different languages, English, Brazilian Portuguese, and Spanish), we allow teachers to gamify their classes in an unplugged way.

The study was carried out in four different steps: *i*)

collaborative work, by two instructors and three assistants in a workshop in what participated 15 teachers, whose objective was to give training to the teachers about gamification, *ii*) collaborative creation of unplugged gamification designs by the teachers, *iii*) refinement of the developed designs (by the instructors involved in the first step), and *iv*) evaluation of the proposed material.

The main result of this study is the didactic material. The content of this material is a set of activities developed in a personalized way for each gamification design. The proposed material contributes to the field of gamified education so that professionals can gamify their activities already having ready-made activities based on gamification designs.

## II. BACKGROUND

In this section, we present the main topics covered in this paper (*i.e.*, unplugged gamification and user-centered gamification design). Also, we present the main related work.

### A. Unplugged gamification

Gamify goes far beyond technology, as it involves design focused on experience, engagement, and interaction [6]. Thus, it does not depend on the digital world, as it is possible to set goals, provide feedback and create challenges without using virtual resources [24]. Although technology has the power to enhance some experiences, the essence of gamification is the ability to awaken motivation through challenges with an engaging narrative [6], [24]. Thus, gamification can be designed and developed in different virtual and/or face-to-face environments, with or without technological support [1].

There is still no consensual definition of unplugged gamification in education. González [24] makes a first approximation, in which unplugged gamification is defined as that in which “game techniques, elements and strategies are applied in activities developed in environments without technological support”. In this sense, an unplugged gamified activity can be performed using cards, board games, or the escape room type, in which the student must solve puzzles to open doors, boxes, among others [24].

Despite this advance in terms of understanding and defining unplugged gamification, there are still few practical contributions (*e.g.*, frameworks, methods, and guidelines) focusing on planning and creating gamification designs for unplugged environments [24], [25]. Thus, a current challenge in the field of unplugged gamification is to provide approaches to help researchers and practitioners (*e.g.*, teachers) design unplugged gamification.

### B. Student-centered gamification design

Understanding that people have different profiles and are motivated in different ways according to these profiles, can help the researcher/teacher who is using gamification to understand why a certain activity motivated some students and not others [4]. Over the years, several types of gamification designs have been studied [18], [26]–[29].

On this line, Marczewski [30] developed the Gamification User Types Hexad framework, based on research on human motivation, player types, and practical design experience (the first specially focused on gamification). Marczewski [30] also suggested different game design elements that can support different types of users [31]. Six types of users of the Hexad model were defined, namely Philanthropists, Socialisers, Free Spirits, Achievers, Players, and Disruptors. These types of users are related to game design elements suggested by Marczewski [30] to address the motivations of each type [25].

- **Philanthropists** are motivated by purpose. They are altruistic and willing to give without expecting a reward [30].
- **Socialisers** are motivated by relatedness. They want to interact with others and create social connections [30].
- **Free Spirits** are motivated by autonomy. They like to create and explore within a system [30].
- **Achievers** are motivated by competence. They seek to progress within a system by completing tasks or prove themselves by tackling difficult challenges [30].
- **Players** are motivated by extrinsic rewards. They will do whatever to earn a reward within a system, independently of the type of the activity [30].
- **Disruptors** are motivated by the triggering of change. They like to test the system’s boundaries and try to push further [30].

### C. Gamification designs and user types

In the last few years, studies have tried to understand which gamification designs are most effective for each user type. Specially, Toda *et al.* [32] proposed five different types of gamification designs [18], [32]: social, performance-based, ecological, personal, and fictional designs. These designs are linked to the user types, as each design has elements that positively or negatively impact these users to some degree. This relationship will be addressed after defining the designs.

- **Social gamification** is a type of personalization that refers to interactions between students in the environment, seeking to expose only gamification elements that intend to impact students’ social interaction [32]. This gamification design has the following elements: Social pressure that is related to social interactions that put pressure on the learner. Competition is related to challenges in what a user faces another user to achieve the same goal. Cooperation, which is also known as teamwork, refers to tasks that the user must collaborate to achieve a common goal. Reputation is related to titles that students can earn and accumulate within the environment [32].
- **Performance based gamification** has elements associated with the response of the environment, which can be used to provide feedback to students [29]. This gamification design has the following elements: Point is the unit used to measure the performance of users. Progression allows students to locate themselves (and their progress) within a game. Level, which is

hierarchical layers presented in a game as they provide a gradual path for students to gain new advantages as they progress. Statistics are seen as information used by students, related to their game results. Recognition concerns the title that player has in the game [32].

- **Ecological gamification** is related to the environment in which gamification is implemented. It is formed by the following elements: Chance refers to characteristics of randomness and probability to increase or decrease the odds of certain actions or outcomes turn real. Imposed choices are decisions that students are forced to make to move forward in the game. Economy is the in-game transactions, monetization of in-game values, and other elements. Rarity is the limited and collectible resources. Time pressure concerns pressure over time within the game [32].
- **Personal gamification** is about the learner who is using the environment and has the following elements: Sensation is the use of students' senses to create new experiences, such as visual stimulation and sound stimulation. Objective is to guide the actions of students. Puzzles are challenges within the game that should make a player think, such as cognitive tasks and mysteries. Novelty is any new or updated information presented to the player continuously. Renewal has to do when students can redo/reset an action [32].
- **Fictional gamification** is a mixed dimension which is related to the user and the environment. It has two elements: narrative and storytelling. Narrative is the order of events in which they take place in a game. These are choices influenced by students' actions. Storytelling is the way the game's story is told (like a script) [32].

Regarding the user types, design elements are suggested that can motivate them based on their characteristics. For the Philanthropists, the elements are suggested: collection and trading, gifting, knowledge sharing, and administrative roles [29]. For Socialiser, the elements are suggested: guilds or teams, social networks, social comparison, social competition, and social discovery. In relation to the Achievers Suggested design elements: challenges, certificates, learning new skills, quests, levels or progression, and epic challenges (or "boss battles"). Players suggested design elements: points, rewards or prizes, leaderboards, badges or achievements, virtual economy, and lotteries or games of chance. Disruptors suggested design elements: innovation platforms, voting mechanisms, development tools, anonymity, and anarchic gameplay.

According to Santos *et al.* [29], the Philanthropist profile has no significant association with any gamification design. In addition, this profile has a negative association with the fictional gamification design in terms of perceived sense of accomplishment and preference, the only design that did not have the "assistant" that explained what the student would do in that gamification design. Considering that philanthropists are motivated by interaction with others [33], this lack of

"assistant" presence can be understood by philanthropists as a lack of interaction [29].

Socializers are positively associated with the perceived sense of accomplishment in Fictional, Personal and Social designs, with a more significant association with Social design. Considering that the social design when implemented in a system can lead the socializers to the relationship, which would motivate them. Considering the game elements of the Social gamification design (*i.e.*, Social Pressure, Competition, Social Status and Cooperation), probably the strong significant association with the Fictional gamification design occurred because the Narrative game element is related to the user's interaction with the game. system [32], and the slight significant association with Personal gamification design because of the Puzzle (Challenge) game element, which has been linked with this user orientation before [33]. They also showed a significant slight and negative association with Performance gamification design, likely due to game elements showing progress in that gamification design.

In relation to achievers, these are positively associated with the perceived sense of accomplishment of the Performance and Social projects, as these two designs have elements that can make the user feel accomplished and demonstrate competence, which intrinsically motivates this type of user [32]. In this sense, when implemented in a gamified system, the Performance gamification designs, in which its game elements are: Level, Point, Progression, Stats and Recognition; and Social, whose elements were mentioned earlier, would probably lead entrepreneurs to have a feeling of advancement in their skills and thus motivate them [29].

Players, on the other hand, are positively associated with the perceived sense of accomplishment of Ecological and Social designs. This association with ecological design is due to the game elements Rarity and Economy. With regard to Social design, the relationship would be in the fact that players tend to be motivated by competition and cooperation, as well as the sense of perceived achievement [29].

Free spirits are negatively associated with all gamification designs. However, only the association with social design is considered significant, and this situation is considered unexpected by the authors [29].

Disruptors, on the other hand, are positively associated with Social design. This association is highlighted by the authors due to the competition game element. In the study by Tondello *et al.* [34] it was identified that competition is a game element that may be related to this user orientation, and according to Orji *et al.* [11] competition would motivate people with high disruptive tendencies. Also, Social gamification design is one that shows interactions with other students, and disruptors need interactions to influence other users to try to change the system [30].

#### D. Related work

The study conducted by Baldeón *et al.* [35] proposes the LEGA, a student-centered Gamification Design Framework that focuses on who the student/player is and supports teachers

interested in applying gamification in the classroom. Similar to our study, Baldeón *et al.* [35] uses the method proposed by Toda *et al.* [32]. However, despite the advance it represents for the community, LEGA is not focused on unplugged.

The study conducted by Buckley *et al.* [23] provided a catalog of specific components used to implement gamification, which can serve to guide the work of academics and professionals. The catalog can be used to implement gamification in different contexts, however, despite indicating the importance of personalizing gamification, it does not propose any material that can help teachers to gamify their classes based on the profile of their students.

The study conducted by Hitchens *et al.* [5] proposes a gamification design based on three principles: relationship, competence, and autonomy. In addition, it highlights the importance of motivation for student engagement in the classroom. However, different from our study, the gamification design used is not based on a specific frame nor considers student profiles, and is not unplugged.

The study conducted by Sumer *et al.* [15] proposed a set of gamification design principles, focused on design gamification for open and distance learning programs in higher education. As a contribution, they point out that there is no secret recipe for integrating gamification into open and distance learning programs, however, that designers can use different elements in different combinations according to their groups of students. Also, they do not mention how these combinations can be used unplugged.

The study conducted by Towongpaichayont [36] indicates the objectives of gamification and presents a guideline for the process of design. Unlike our user-centered material, Towongpaichayont [36] proposed a design based on the conditions of their classroom, on the purposes and pain points for implementing game elements. Table I summarizes the information from these related works.

TABLE I  
RELATED WORKS COMPARISON

Study	Y	DG	FG	U	PA	CG
Baldeón <i>et al.</i> [35]	2016	Yes	No	No	Yes	No
Buckley <i>et al.</i> [23]	2019	No	No	No	Yes	No
Sumer <i>et al.</i> [15]	2022	Yes	Yes	No	Yes	No
Towongpaichayont [36]	2021	Yes	Yes	No	Yes	No

**Key:** S: study; Y: year of the study; DG: proposes an approach to gamification design; FG: focused on gamification; U: works indicate unplugged use; PA: considers personalization aspects; GC: guides how to customize the gamification.

In summary, the related works propose approaches related to how educators can use gamification in classes and activities and highlight the importance of personalizing gamification. However, these studies did not consider the profile of students in unplugged environments. Thus, as far as we know, our study is the first to propose a didactic material to design student-centered unplugged gamification.

### III. STUDY DESIGN

In this study, we propose a didactic material to design user-centered unplugged gamification. To achieve our goal, we conducted a design science research-based study [37]–[39].

#### A. Materials and method

To define the process of designing the gamification, we used Gamify-SM proposed by Toda *et al.* [40]. In this work, four steps were defined: *i)* Definition of content: This phase contains sub-steps, which are content analysis, activity mapping, and representation. The first sub-step consists of analyzing the previous content that was generated to understand and define the tasks that were proposed to achieve a certain instructional objective. Next, it is necessary to map the tasks that will be performed. Finally, representation, which is used to understand the logical flow of content and how tasks are connected to it; *ii)* Definition of game elements.

To define the gamification elements, we used the taxonomy proposed by Toda *et al.* [32]. Their taxonomy is composed of 21 game elements organized into five dimensions, namely Social, Ecological, Fictional, Personal, and Performance (see subsection II-B for a better understanding of the dimensions); *iii)* Implementation: It is necessary that the rules for the gamified activity be explained clearly to the students, allowing them to choose whether to participate in the activity. Once this is done, it is time to observe the students' reactions throughout the activities and take notes of daily perceptions, and *iv)* Evaluation: It's time to remember why you're gamifying. Then define what you want to observe or measure and choose a mediation instrument. Finally, discoveries and new knowledge can be reported [32].

For developing the proposed didactic material, the work was organized in **four steps**: *i)* we invited teachers to participate in the workshop; *ii)* we provided training about gamification for them; *iii)* we proposed an assignment to teachers in which they should create (unplugged) gamified designs and *iv)* we refined their proposals. In Figure 1, each step of the method is illustrated (Participants' selection; Participants' training; Practice, and Analysis of the proposed designs).

The first stage was the selection of teachers, in which 15 were selected to participate in the training. In the second step, the concepts related to gamification and personalization were explained. The training was gamified, allowing participants to experience elements of gamification designs while learning the theory of it. In the third step, there was the practice (brainstorming), in which the teachers were organized into five groups, with the objective of each one proposing a gamified and unplugged design based on one profile. In the fourth step, the instructors/experts analyzed each design to ensure that all game elements were present and how they were being addressed.

#### B. Contextualization of training and workshop

The workshop lasted four hours, the objective of which was to train teachers on gamification. Participants were randomly assigned to start activities.

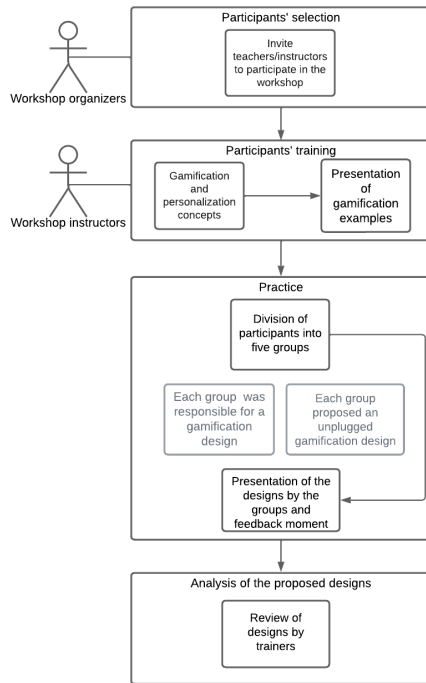


Fig. 1. Method

1) *Participants, data collection and analysis:* The 15 participants were aged between 22 and 52 years old. Most of them (26.7%) work in High School and Technical School. The most experienced participant has 35 years of teaching. In addition, about 60% of the participants are already used to play some game. Puzzles and strategy games stood out. Regarding the number of hours played per week, the highest occurrence was between 1h and 3h. Furthermore, 86.7% of the participants had already heard the term gamification. The workshop was conducted by two instructors and three assistants. One of the instructors taught the workshop content, while the other was responsible for observing and taking notes. The monitors, on the other hand, acted during the practical activity, being able to answer questions from the participants when requested. In addition, each group was in charge of a gamification design, having to propose a gamified class in the practical activity using the elements of the specific design assigned.

#### IV. RESULTS

In this section, we present the main result of this work (that is, the didactic material that can be used by different user profiles in an unplugged context). This didactic material is structured by different activities and divided into five dimensions (*i.e.*, social, performance-based, ecological, personal and fictional designs). Each dimension has the purpose of motivating a certain student profile based on their personal characteristics. Thus, when applying the teacher is considering the profiles of their students.

#### A. Didactic material

The material is organized into activities arranged in five gamification designs (*i.e.*, Social Gamification, Ecological Design, Fictional Design, Personal Design, Performance-based Design).

##### Social Gamification

**Initial proposal:** The teacher must inform the subject to be addressed and divide the class into teams. Then, it should be organized following the structure:

- 1) The class should be divided into teams.
- 2) Teams will compete against each other (Competition).
- 3) Each team must go through three challenges.
  - a) The winning team is the one with the most titles at the end of the challenges. In the event of a tie, the team that received the most titles for completing the challenges wins.
  - b) Challenge 1: Double Dare - question and answer competition, in which a question will be asked to a team member who he can answer or pass it to another team if he doesn't know the answer. The other team can reply or pass it on back. Participants who answer wrongly will be eliminated from the game. The winning team is the one with the most participants at the end of the competition, or until the number of questions stipulated by the teacher runs out.
  - c) Challenge 2: Each group must receive a paper with a question with alternatives, and the challenge is to find the correct answer and explain why the others are wrong (Cooperation).
  - d) Challenge 3: Who am I: guessing game, in which the teacher will choose a famous personality (in their area). One of the team participants will hold a paper on his forehead with the name of that personality. The goal of the game is for the participant with the paper on his forehead to guess who the famous personality is, through questions that they will ask his/her team, which will only be able to answer with yes or no (Cooperation).
- 4) After completing the challenge, the team with the best performance is awarded a different title in the form of a pin, for example: "Pathfinders", "Adventurers", and "Fearless" (Reputation).
- 5) At the end of each challenge, the teacher should consult something related to the subject: the challenge in class. If the team gets it right, it gets an extra title, and if it gets it wrong, it doesn't get any (Social Pressure).

##### Ecological Design

**Initial proposal:** The activity consists of personalized environments/spaces, where each space will address a specific theme. Initially, the teacher must inform the content of each environment. Then, the teacher must perform a draw to allocate which sequence of environments should be followed by each student. The class should be organized according to the following structure:

- 1) The student must decide which path he/she should follow (Imposed choice).
  - a) Path 1: The first environment that the student will go to will be decided through a lottery carried out by the teacher (Chance).
  - b) Path 2: The student chooses which path he/she wants to start (Imposed choice).
- 2) Despite starting in different environments, the students must “travel” through all environments.
- 3) The student starts the activity with an amount of fictitious money (Economy) given by the teacher.
- 4) The student must obtain three objects in each environment. One of these objects must be a rare object (Rarity).
- 5) If the student acquires the three objects, he/she receives an additional amount of money (Economy).
- 6) Students should have a time limit to pass in all environments (Time Pressure). Students who run through all environments in less time win (Time Pressure).

### **Fictional Design**

**Initial proposal:** The teacher should explain the roles of the author and actor (to the participants of the activity); afterward, the teacher should let the students choose between being an author or actor; finally, the teacher should start to tell a story (involving the content of the class), which will be continued by the students. The class should be organized according to the following structure:

- 1) The student must decide which path he/she should follow (Imposed choice).
  - a) Path 1: The first environment that the student will go to will be decided through a lottery carried out by the teacher (Chance).
  - b) Path 2: The student chooses which path he/she wants to start (Imposed choice).
- 2) Despite starting in different environments, the students must “travel” through all environments.
- 3) The student starts the activity with an amount of fictitious money (Economy) given by the teacher.
- 4) The student must obtain three objects in each environment. One of these objects must be a rare object (Rarity).
- 5) If the student acquires the three objects, he/she receives an additional amount of money (Economy).
- 6) Students should have a time limit to pass in all environments (Time Pressure). Students who run through all environments in less time win (Time Pressure).

### **Personal Design**

**Initial proposal:** Initially, the teacher will hand out the maps to each student. The class should be organized according to the following structure:

- 1) The teacher should explain the role of the author and actor in the narrative.

- 2) Students are free to choose between being an author or an actor, respecting the amount stipulated by the teacher.
- 3) The teacher starts the story.
- 4) The authors continue the story, which must be bibliographical, but not necessarily faithful; students are free to use creativity and change the course of the story depending on the decisions that are made in the narrative process (Narrative).
- 5) The authors create the narrative so the actors will interpret the characters of the narrative (Storytelling).

### **Performance based Design**

**Initial proposal:** The teacher should explain which aspects will be evaluated and introduce the scoring system to students. The class should be organized according to the following structure:

- 1) Three goals: delivery of activities, student punctuality in class, and discipline.
- 2) A chart will show students which aspects they are earning points in and which they are not (Progression).
- 3) According to this score, the level at which each student is (Level) will be displayed.
- 4) At the end of the bimester, the board will show which and how many points (Point) each student earned during that bimester (Statistics).
- 5) The student who most meets the goals, and consequently has a higher one, will receive a trophy (Recognition).

The existing gamification elements are organized in the five designs suggested by Toda *et al.* [41], served as the basis for the construction of our didactic material. This material is available in English, Portuguese, and Spanish and has been removed for anonymous review.

### *B. Discussion*

Facing the challenge of having materials that can help the teachers to use unplugged gamification considering the profile of the students, we propose didactic material. In this study, we associate the designs with the profiles of the Hexad model, to relate the gamification elements that motivate a certain profile with the activities proposed in our material.

In the proposed social design, the challenges seek to attract participants through interactions, given that this design is engaging Socialiser users, who are motivated by relationships with other people. For this reason, the challenges contained in the design are in a group, aiming to instigate cooperation and competition. The social pressure and reputation elements present are also social aspects that attract socializer users [32].

In ecological design, the fact that students need to get a rare object, and get fictitious money in a limited time is a purpose and can motivate Philanthropists type users, who are willing to give without expecting a reward. Thus, this rare object is not treated as a reward but as a purpose [32].

In fictional design, the proposal is focused on history and narrative, for this reason, the activity is divided into who tells the story (author) and who lives it (actor). Therefore, users of the Disruptor type are motivated in this design considering

that they are motivated by triggering the change, and in the proposed activity the activity changes depending on the actions of the players. In addition, another profile that can be motivated by this design is the Socialiser, since the authors and actors will have to work together to carry out the activity, which generates social interactions and motivates this profile [32].

Finally, this design can also motivate Free Spirits, given that they are motivated by autonomy, by the freedom to express themselves and act without external control, and authors can use all their creativity in the story, having autonomy to change the events.

Regarding the proposed personal design, the activity of three puzzles is closely linked to the environment, and its elements can engage the Disruptor profile since they are motivated by changes in the systems, and the novelty and renewal elements present in the first and second puzzles provoke these changes.

In performance-based design, the point, progression, level, and statistics elements present make this design have the potential to engage Achievers users, who are motivated by competence, and looking to progress within a system. Thus, all these metrics provide the visualization of the progression of that user in the system. In addition, there is still the recognition element, which can engage Players who are motivated by rewards. Thus, as proposed in the design, the participant with the highest score will receive a trophy, that is, he will be rewarded [17].

In addition, our study, as well as the related works presented previously, also highlights the personalization of gamification as a factor that can bring positive results to the student's experience, motivating them. However, unlike related works, we propose an unplugged material, which in addition to gamification designs, also considers user profiles.

### *C. Practical implications*

The process presented in this work can be used by teachers interested in gamifying their activities in a personalized and unplugged way to increase student participation and engagement. Especially for teachers who have access to little or no technology and want to use gamification as an innovative strategy in their classroom.

The didactic material presented in this work can be used by teachers interested in gamifying their activities in an unplugged way, considering the profile of their students. By using this material, the teacher can increase student participation and engagement. This material can be especially useful for teachers who have access to little or no technology and want to use gamification as an innovative strategy in their classes.

### *D. Limitations*

The study has some limitations that should be addressed in future work. Initially, not all teachers (who participated in the workshop) had previous experience with gamification. To mitigate this issue, we dedicated part of the workshop to training them on gamification. The workshop time (four hours)

may not have been enough for an in-depth discussion of all the designs. Participants were divided into groups (randomly) so that each group was responsible for a type of design. In the end, all designs were openly presented and discussed by participants and instructors.

The initial designs proposed by the teachers contained some mistakes in terms of use of elements of gamification (e.g., some designs were missing elements and others had them from other dimensions). In addition, the concern with only creating an activity with a limited amount of elements may have made the designs proposed by the teachers unattractive to the students. To mitigate this limitation, during the evaluation and subsequent refinement of these projects, we reevaluated and changed some strategies that were proposed and that we judged to be unattractive to students. The material itself does not teach the teacher to gamify his class but gives instructions on how to design gamified activities that consider the profile of students in an unplugged context.

### *E. Directions for the future*

Based on our results and limitations, we can suggest future steps that can be implemented by the community. The next stage of this study would be to carry out new workshops to refine the proposal, allowing a comparison between the designs generated and exposed in this work with the new designs.

In addition, the creation of complementary material could also teach teachers to gamify their classes, aligning with the didactic material produced in this work. A suggestion for this complementary material is that it be structured in the form of storyboards, considering that they provide a visual language that facilitates the user's understanding, which is used in recent studies of gamification [25], [30], [42]. This approach could facilitate the understanding of the entire process, as well as its reproduction by teachers.

This other phase of the study can be divided into two stages: *i)* evaluation of specialists in gamification projects to validate the proposed projects and *ii)* elaboration of case studies. This assessment is important because these experts can identify different strategies to increase the effectiveness of these solutions in disconnected environments. In addition, understanding at what level this resource is context-free, and what type of audience it is suitable for, among other questions that remain open.

## V. FINAL CONSIDERATIONS

This work proposed a didactic material to be used by different user profiles in an unplugged and gamified context. The purpose of this material is to help teachers who want to gamify their activities considering that their students have different profiles. Furthermore, the material is especially for those teachers who have little or no access to technological resources and wish to use gamification as an innovative strategy in their classroom. As future studies, we intend to present this material, which is in the form of a booklet, with complementary storyboards that might facilitate the understanding of how to apply gamification.

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