Gamified Strategies for Teaching Construction Planning

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This study examines a gamified interface that can be accessed over the Web and aims to develop social and cognitive skills in students enrolled in undergraduate civil engineering and technical building courses who will ultimately work in construction companies. The methodological approach chosen is Design Science. This study is aligned with the generalization phase of a gamified solution for construction workers. To support the activities developed in the classroom, considering aspects of context, educational objectives, required skills, desired behaviors, and interactions, the gamified system was evaluated by 7 teachers and students, who focused on the functionalities, usability of the system (System Usability Scale - SUS) and promotability (Net Promoter Score - NPS). It also helps future technicians and engineers learn the importance of meeting deadlines, planning, and organizing the dynamics of the work that needs to be done, negotiating, and making decisions as a group, and reading the instructions to perform the tasks that need to be done in planning and budgeting for construction sites. The approach that the model takes to teach construction planning and budgeting is new and can captivate students, as well as encourage leadership and teamwork among the participants.

Keywords: Gamification. Education. Teaching. Collaboration. IHC. Construction Planning.

Gamification has grown across a variety of socioeconomic areas, including business, health, tourism, and education. These areas are seeking strategies to mediate the teaching-learning process or to boost customer loyalty to a particular brand or organization. This approach has been questioned for a variety of reasons, including the effect of neoliberal policies on behaviorist inspiration, which builds tactics on the paradigm of points, medals, and ranking, demanding a closer look.

To go beyond environments that prioritize competition and prizes, it is necessary to examine behaviors that have emerged in academic and educational settings. The purpose of this article is to examine the theoretical foundations that contributed to the development of a gamified interface that is accessible via the Web and mediates the dynamics of attitude development among construction planning students in technical or higher education courses that are critical to their preparation to become future technicians and engineers working for construction companies.

The article is divided into four sections, with a final thought in mind. The first section's brief introduction serves to establish the article's organizational framework. The second part, named "Gamification," describes the core notions that define and describe this category, as well as the components that should influence recommendations for gamified strategies, which may differ from behaviors mediated by digital and/or analog games. This section also covers a list of projects launched in the educational sector.

The project's strategy, which contributed to the outcomes stated in this article, is detailed in the third part. The empirical data gathered with the aid of the research participants and comments made it possible to suggest alternative applications for the gamified system in other disciplines, notably education. The fourth component proposes a gamified technique to guide building site planning.

This section describes the backdrop that led to the development of a Web interface that may be used on construction sites to facilitate and transparently communicate the tasks with workers in this setting. In this section, we will also go

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over the gamified interface structure and how it is used. To achieve the goal of conceptual learning, preliminary discoveries and interface constraints were highlighted in the final discussions.

The idea is to encourage more critical readings and actions around these approaches by broadening the debate around gamification, particularly in learning environments.

Gamification

Gamified tactics have been solidifying in several industries over the last few years, ranging from airline loyalty programs to health applications that try to guide and encourage users to adopt better habits. In the sphere of education, there has been an increase in both study and creation of gamified apps, particularly during the Covid-19 epidemic, when we witnessed student instructors interacting with Kahoot, an application that incorporates game logic. However, many people do not comprehend what gamification is.

Gamification is the application of game-based mechanics, dynamics, and thinking in a real-world context to improve skills, motivate actions, promote learning, and solve problems [1-6].

Such a strategy seeks to engage a target audience through challenges, missions, storylines, performance-based feedback and rewards to attain predetermined goals. The initial definition by Deterding and colleagues [1] inspired authors such as Leite and colleagues [7-11] to investigate gamification in construction, Sailer and colleagues [12] to study its application in industrial settings, and Moura Junior [13] to create an app using gamified strategies to motivate wheelchair users to avoid injuries, among many others, who conducted research in domains such as teaching, health, work, business, and so on.

The adoption of gamified applications has been growing in the field of education, such as Alves et al [14] who evaluated the interactive environment COMnPLAYer to foster scientific and digital literacy of teachers and students, exploring non-formal learning in science, instigating curiosity, and Alécio and Schweikart [15]who propose for the teaching of English language with the aid of technological resources, in this specific case, the digital platform Duolingo, for children.

However, gamification is not without controversy. Authors such as Mcgonigal [16] regard the method as a pleasant way to engage and encourage others. Thus, surroundings become more intrinsically motivating, promoting total value creation, such as when marketing a product [17] or engaging students in the teaching and learning process, among other options. On the other side, gamification has faced criticism and uncertainty, with some doubting its usefulness and the length of its long-term impact [18]. Bogost [19] suggested the word "exploitationware," which may be translated as 'exploitation form', as a synonym for gamification, whilst Escribano [20] described gamification as a "ludic dictatorship."

Kim and Werbach [21] investigated gamification as a source of exploitation and manipulation, confirming the violation of values such as autonomy, responsiveness to reason, and justice, which can result in harm and humiliation, considering aspects such as dignity, self-esteem, and physical or psychological harm to the participant. Thorpe [22] examined the ethics of gamification in the marketing environment and emphasized the need to make the rules transparent to all stakeholders to fulfill the standards of honesty, truthfulness, and social accountability. Finally, the author proposed that an ethical review be undertaken at each level of creation and implementation process.

According to Chou [23], two elements are necessary to deem a gamified system ethical: full openness about what it is meant for, and the user's agreement to participate in gamification. According to Deterding [24], selecting a gamification architecture refines the practices of the environment to be gamified. As a result, in terms of ethics, it is critical to thoroughly examine how the process functions without gamification. Furthermore, data protection must comply with the General Law on Personal Data Protection [25].

According to Positive Psychology, humans are social, emotional, meaning makers, and growth-oriented [24, p.133]. Positive Psychology began as a research movement dedicated to studying what is healthy in humans, whereas psychology was previously primarily concerned with their disorders. According to Balancho [26], Positive Psychology originated with the purpose of improving public health, balance, and well-being in response to the scientific void created by its initial focus on illness research.

Positive Psychology is the study of positive feelings, emotions, institutions, and behaviors with the goal of human happiness [27] assuming that all people are immersed in a social context, in structures that transcend the individual (family, communities, education, and economic safety nets). Snyder and Lopez [28] define this approach as a scientific focus on the discovery and use of human traits, as well as the development of good functioning.

According to Deterding [24], the application of gamified tactics in the workplace, educational, and corporate environments, among other things, aims to improve practical outcomes. This is because the usage of game design and gamification is based on the well-being requirements of all parties involved, as well as positive psychology, resulting in rewarding experiences for goal completion.

Alves and colleagues [29] presented some criteria that can be considered for the construction of a gamification process: having a well-defined mission; an efficient scoring system so that rewards and feedbacks are fair, gaining the participant's trust; having well-defined narratives and strategies facilitating adherence to the tasks performed; having clear, evident, and organized missions, with a difficulty level appropriate to the target audience, and allowing the participation. Given the perspectives presented above, it is necessary to propose transparent gamified environments that respect their users' sensitive data, while also acknowledging that gamification extends beyond interaction with a playable and ludic environment, as well as stimulus-response mechanics or simple quizzes.

Gamification in Education

Gamified practices have always existed in education, whether through a quantitative assessment system that assigns grades based on performance, the attribution of stars, feedback and collaboration among students for the completion of activities, or more recently through the mediation of applications such as Kahoot (mentioned above) or the development of strategies that motivate students to overcome a specific individual or group challenge.

To Fardo [30], such tactics advocate the development of an educational aesthetic that is more like games in form and language, as it is more recognizable to students, while also delivering entertaining activities. Interactive surroundings and gamified tactics are more likely to excite pupils because they are more closely related to the language of digital games and have a higher level of engagement and connectedness.

Netflix is developing an interesting example with its interactive narratives, such as Stretch Armstrong: The Escape, which presents a gamified structure that can be explored in school settings with children through discussion of the narrative and the implicit and explicit concepts related to curriculum issues [31].

In terms of teaching, with a focus on building technician courses and higher education in civil engineering, gamified strategies can help to increase interaction and collaboration by engaging students in assigning meaning to concepts and actions inherent in their future profession. Thus, incorporating gamification into technical education is one option for improving the teaching and learning process, while constantly keeping an eye on how students react when game design is introduced into the planned activities. According to Deterding [24] the "Gamer Generation" wants non-gaming surroundings to resemble gaming environments, with clear objectives and rules, graphics and game language, and positive feedback. As a result, tactics such as gamification can help students engage, collaborate, and build leadership skills.

Materials and Methods

The research discussed in this article is part of a gamification experiment on construction sites, which resulted in a gamified system for increasing communication with construction workers. This work takes the Design Science methodological approach, which is utilized in research to design, develop, and explore novel solutions [32]. This is an exploratory, empirical, and qualitative study.

The gamification initiative at construction sites was divided into four phases: understanding/ comprehension, development, analysis and assessment, and reflection (Table 1).

Learning objectives include comprehension, development, evaluation, and reflection. Identify and comprehend problems, develop and test solutions, collect and analyze data, and identify theoretical and practical contributions. The process includes selecting a construction site, observing the field, developing a gamified system, testing its usability, and proposing a final model and generalizing it.

The first phase involved recognizing and analyzing the problem to establish criteria for the creation of a solution to improve communication between managers and construction workers. Following the requirements analysis, the second phase specified the gamification methods and implementations required for the solution to perform properly. This phase culminated in the creation of the gamified system. As a result, after listening to the workers and conducting observations on the building site, it was feasible to create a solution, develop and test the gamified system, and incorporate improvements from early testing and assessments.

The final step included reviews with managers, employees, and testers. Among other tools, Brooke [33] developed the System Usability Scale (SUS), which consists of ten statements scored on a Likert scale, with odd-numbered questions having a positive meaning and even-numbered ones having a negative connotation. To account for the outcome, values ranging from 0 to 4 are assigned to the responses; for odd ones, 1 is removed from the value informed; and for even ones, the result is reduced by 5, combining all the results and multiplied by 2.5 to achieve a percentile value [13]. The acceptability categorization uses the following criteria: not acceptable [0 - 49], average [50 - 70], and acceptable [70 - 100].

For the testers, the Promotion Index (NPS) was also used, which, although having only one question, has the primary goal of determining if the user would indicate the product [13]. This index was used to determine if the subject trusted the model enough to recommend it to a friend. In this scenario, a scale of 0 to 10 was employed, with answers divided into three categories: [0-6] - critics, [7- 8] passives, and [9-10] promoters. Finally, the NPS is determined, which is equal to the proportion of promoters minus the percentage of detractors, and classified as follows: Excellence Zone [76 - 100], Quality Zone [51 - 75], and Improvement Zone [0 - 50].

The fourth step, which is the subject of this research, consists of views on generalizing the

Table 1. Research outline.

DSR Driving Stages and Outputs			
Comprehension	**Development**	**Evaluation**	**Reflection**
Problem identification and understanding	Solution development and testing	Data collection and analysis	Identification of theoretical and practical contributions
Construction site selection and field observation	Gamified System Development	Usability test of the Gamified System	Final proposal of Gamified Model and generalization

Source: Adapted from Leite [11].

usage of the gamified system to aid student task planning. The goal of this research is to discover how gamification tactics might promote student engagement by fostering cooperation among team members and boosting natural leader creation. Three professors and four students from technical and higher education courses evaluated the system. The pupils ranged in age from 18 to 25, and two of the professors were between the ages of 26 and 35, with one older than 56.

The gamified system is comprised of a dashboard that can be accessed via the web and is designed to provide feedback to the teams on the progress of the championship. Consequently, it was a straightforward process to generalize the system by simply modifying the objectives and missions that must be completed during the match.

The results and discussion section refers to the analysis of the data from the questionnaires answered by teachers and students for the context of the work and the presentation of a proposal for using this tool in the classroom using new rules but maintaining the soccer championship narrative.

Results and Discussion

The findings were systematized following interaction with the system, considering the data collected in the SUS questionnaire, which was completed by instructors and students of the technical and higher education courses. Thus, using this instrument, the average of the values obtained (Table 2) was calculated, yielding a score of 68.1, indicating the level of tolerance of the aforesaid group to the gamification system. The method was rated average/correct (50-70) points by the assessing public, indicating that there is room for improvement.

To determine the level of trust in the system, students and instructors were asked if they would recommend the system to a friend on a scale of 0 to 10. Three of them scored eight, two scored nine, and two scored ten. So, because three of the raters were passive, the system is in the Quality Zone [51–75]. Because the findings show that the system is correct and in the quality zone, a proposal for employing it with this target audience was created.

A Proposed Gamified System to Guide Construction Planning

Work planning is the translation of a project into executive and financial terms, making it one of the most important stages of management [34]. It is a necessary and crucial stage in developing a project's execution plan. When planning, the manager prepares crucial instruments to direct his efforts, create priorities, monitor service progress, and control through the referential research completed at this stage, allowing him to take appropriate action if these findings alter [34].

To improve production efficiency on the construction site, eliminate waste, promote transparency at all stages, and meet deadlines, the construction industry has adopted the "Lean Construction" method, which is based on the Japanese philosophy of production and seeks to eliminate production losses, i.e., everything that does not add value to the product but consumes time and resources [35]. As a result, while planning is crucial, efforts must also be made to manage buying, budgeting, production, personnel management, communications, and other areas.

The adoption of Lean Construction concepts, along with civil construction work planning [36], has improved the process, allowing enterprises to establish themselves in the market with competitive advantages in the current context. As a result, future construction technicians and engineers must be oriented to give meaning to and absorb lean principles so that they may implement them in their everyday lives as professionals in the field.

Given this context and the profile of students enrolled in building and civil engineering courses who have interacted with interactive environments such as digital games since childhood, a gamified system for the web was developed with the goal of guiding planning practices on construction sites.

The narrative's topic was chosen in accordance with the profile of civil construction workers, as

Table 2. System usability scale (SUS).

Teacher / Student Buildings	How old are you?	I think I would like to use this system often	I think the system is unnecessarily complex	I found the system easy to use	I think I would need support from a technical person to be able to use this system	The various functions in this system have been well integrated	I think there is a lot of inconsistency in this system	I would imagine that most people would learn to use this system very quickly	I found the system very complicated to use	I felt very confident using the system	I needed to learn a lot about context before using this system	Results
Student	Between 18 to 25	4	0	4	0	4	2	4	0	3	0	71.5
Teacher	> 56	4	3	4	0	4	0	4	0	4	0	70.0
Teacher	From 26 to 35	4	0	4	0	4	0	2	0	3	0	74.5
Student	Between 18 to 25	2	0	0	4	2	2	4	0	0	0	50.5
Student	From 26 to 35	3	1	4	3	2	1	3	1	3	3	50.0
Student	From 26 to 35	4	0	4	0	4	0	4	0	4	1	75.0
Teacher	From 26 to 35	4	1	4	2	3	1	4	0	3	0	65.5
Student	Between 18 to 25	4	0	4	0	3	0	2	0	4	2	69.5
												68.1

determined by a semi-structured questionnaire administered in person and designed to learn significant information about this group, such as age, degree of education, time of service, hobbies, and so on.

The group's hobby was the soccer championship, which subsidized the system's gamified strategy by including a simulation of this activity in its narrative, which is a sport that has a high level of engagement not only for construction workers but also for students.

This environment, which can be accessible immediately on the web via an Internet connection, is linked to a gamified proposal for the subject construction planning and budgeting, which is available to fourth-year students in the technical building course and the Civil Engineering course.

The concept sought to encourage timeliness in activity delivery, reading content prior to courses, and team collaboration to complete and present the work on time. In this way, the proposed system aimed to create real-life situations for the budget and construction planning teams, allowing students to interact with decision-making activities such as bidding, meetings with top management to discuss projects and deadlines, and so on. Thus, this plan was created in accordance with the web environment and will be presented in this paper, highlighting the educational opportunities and limitations.

The gamified environment can expose students to circumstances that teach them the value of meeting deadlines, planning and arranging the dynamics of the work to be done, negotiating and making group choices, reading assignment rules, and so on. These elements are essential to the practice of construction management and planning.

The gamified learning environment replicates the dynamics of building planning operations through weekly tasks and missions, with a set of rules, feedback, and incentives. The missions are week-long assignments connected to building planning, such as logistics and material control, construction cost spreadsheets, and so on, with a teacher-set deadline. The challenge, on the other hand, is a surprise element introduced by the instructor into the classroom and will have a deadline for the teams to complete before the conclusion of the meeting.

A challenge might be a question concerning the class's topic, a brief activity, or a puzzle to solve with instructions from the teacher (live clue) or a video made accessible by him (online clue). The task and challenge do not have to take place at every meeting.

The team performance screen will display feedback to the teams using the system's symbols. The award is up to the instructor; it might be a point at the conclusion of the course for the winning team, a digital certificate for the winner of the "Best Construction Planning Team" championship, or anything else to stimulate the students. However, learning is the most valuable reward.

The planned tournament is inspired on the 'Brasileirão', an annual competition between soccer clubs. During the season, clubs earn three points for victories and one for draws. In the 'Brasileirão', no points are granted for defeats. This score in the gamified system is adaptable and configurable since it was designed to foster more collaborative practices and teamwork while diminishing the focus on competition.

In each round, the players' motions determine the score. What motivates the players are the activities created by students in class, such as providing exercises, publishing engaging information on the course website, attending meetings, and meeting deadlines. These examples might teach students, in a humorous way, circumstances that lead to better time management and teamwork.

To demonstrate the dynamics described above, the following scores were used: ball in the net - 5 points; ball against goal - 3 points; ball out - 1 point; and free kicks and penalties: ball in the net - 10 points; ball against goal - 6 points; ball out - 3 points. As a result, even if the team fails to score a goal, they can still receive points.

To earn the highest score, teams must have the cooperation of at least two-thirds of their members. As a result, if just one-third of the group members participate in the activities, the team 'balls out'. If

half of the group participates, 'ball in the goalpost'; if more than two-thirds participate, 'ball in the net'. This is a method of increasing engagement, which translates into a desire to participate in the team, and cooperation, which is demonstrated by an interest in planning the week's assignments.

The free kick represents the team's progress toward fulfilling the challenge given by the instructor in class, while the penalty shootout represents the completion of the objective defined over the week. At this stage, the teacher assesses how successfully the team met its goal and notifies the system.

Similarly to the Brazilian Championship, clubs are classed in each round based on total points scored, however the season's champion team is determined solely by goal differential. The goal difference is calculated by the number of times a team has attained 'ball in the net' status, and the team with the biggest goal difference wins the title at the conclusion of the season. In the event of a tie in each round, everyone is awarded a trophy, which will be gathered over the season.

The gamified system has no grade; it consists only of attitudinal norms such as time management and timeliness in delivery; cognitive rules such as decision making under time constraints; and collaboration with other team members.

Missions and challenges are components that contribute to team empowerment, which is vital when collaboration and cooperation are needed [37]. While collaboration necessitates learning to work with others, cooperation entails conducting mental processes with others in interaction spaces [37]. Missions are long-term tasks that need elaborate planning, whereas challenges are one-time events.

According to Schell [38], competition satisfies the player's deep internal desire to identify their skill level in comparison to another person in their social group, allowing them to employ more complicated strategies and behavioral choices. Collaboration, on the other hand, according to the author, is the "other way" of interacting with the other, allowing you to participate in actions and employ game strategies that would be impossible with just one person, as well as providing a deep sense of satisfaction from solving group problems and being a part of a team that wins the game.

Collaborative games are modeled after team sports, allowing for both the pleasures of collaboration and competitiveness [38].

Burke and colleagues [39] argue that for gamification to be effective, both competition and cooperation must be mixed. Competition can elicit sentiments of belonging to a group [40], whereas collaboration might foster the desire to collaborate toward a shared objective [12,21].

In collaborative knowledge creation, live hints are gathered through interaction with people who possess the information required to produce a certain project or challenge. These cues might be supplied by the teacher or anybody he designates. Online Clues, on the other hand, are digital features that give some signal for the development of the mission or challenge; these elements can include QRCodes or any other form of access to material essential to the task's completion [38].

To engage in the gamified system, students should create teams of four to six individuals and identify their team (see team shield in Figure 2), using the 'Brasileirão' as a metaphor for storytelling (as previously stated).

Given the positive potential of collaboration and cooperation, the system developed does not emphasize competitive activities, while we feel that competition in a regulated and contextualized setting can be a motivating factor in mobilizing individuals in pursuit of their goals.

System Interface

The gamified system consists of two screens: one with the weekly goals and one with the team performance.

Figure 1 depicts the weekly goals screen, which includes a table with the teams playing, the assignment description, and the weekly objective. The system refers to each week as a 'round' to relate it to the soccer championship. The example

provided is for the sixth round, which corresponds to the building budget. While the work is in progress, the information 'Shots on goal' will show in red. After delivery, it will turn green to indicate that the assignment has been completed.

On the right side of the screen, a picture of the project on which the teams are working is displayed; this might be a blueprint or even a 3D graphic that clearly shows the week's aim. This page also shows you what happened in prior rounds.

The Detail capability displays a screen that permits video watching, where the teacher can submit a video including some task-related information. The Overview capability allows you to display a 3D image of the entire project (parts, facade, etc.) with the goal of describing the job to be completed.

Figure 2 depicts the teams' performance screenswhich begin on the day of class 6 and terminate the day before class 7, corresponding to the sixth round. The screen displays the championship teams, the players' actions during the tournament, and whether a mission or a challenge exists in each round.

To get points for the players' motions, the team must complete the following activities: (1) Mov. Defense: hand in summaries before class (promote teamwork and individual time management); (2) Mov. Attack - be present in class (to encourage individual time management); (3) Move. Midfield - share intriguing stuff on the discipline page (to encourage cooperation); and (4) Move. Goalkeeper - complete activities on time (stimulate team time management).

The 'Free Kicks' and 'Penalty Kicks' require task division, decision-making, and everyone's teamwork to produce on time.

The values of the week (round) are totaled in points scored to decide which team leads the round and is most likely to win the weekly trophy. Throughout the competition, the number of times the team has a 'ball in the net' is recorded in the goal balance.

The rules governing the gamified environment are:

Figure 1. Weekly goals

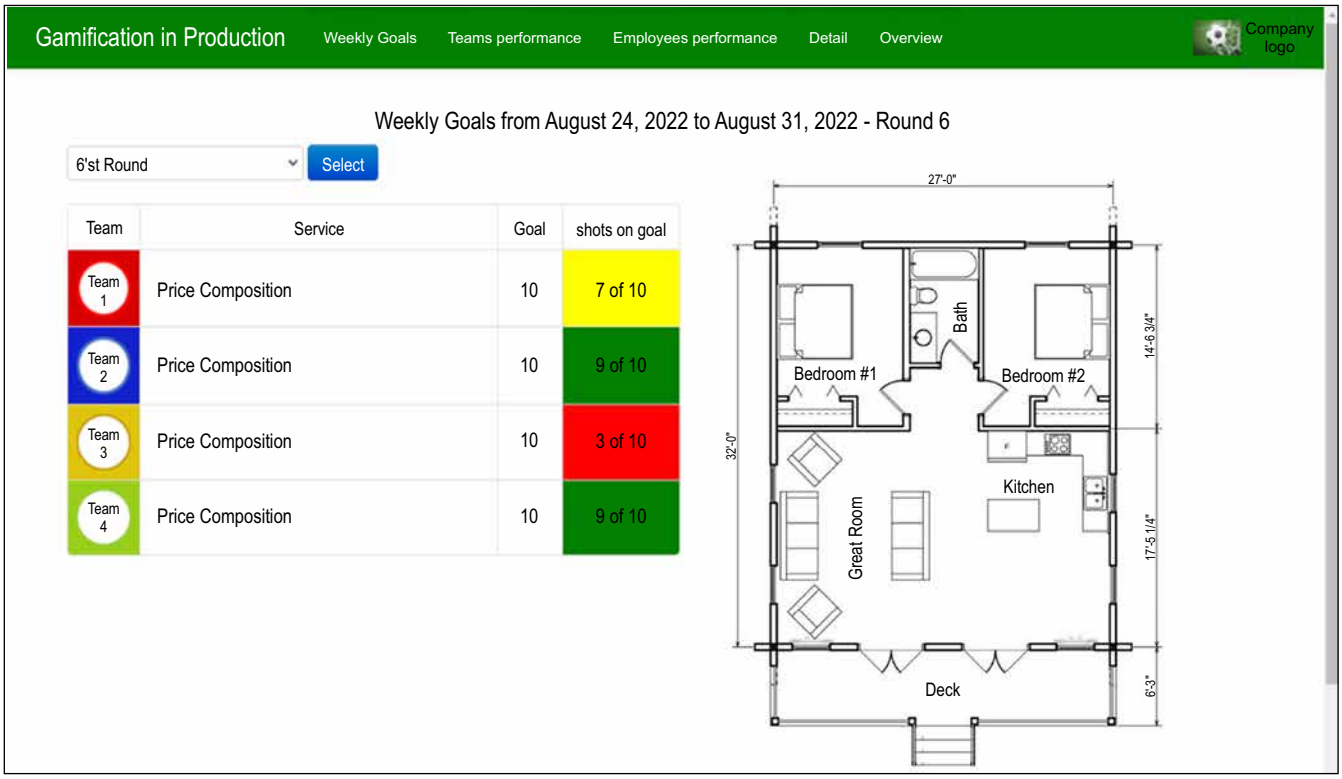
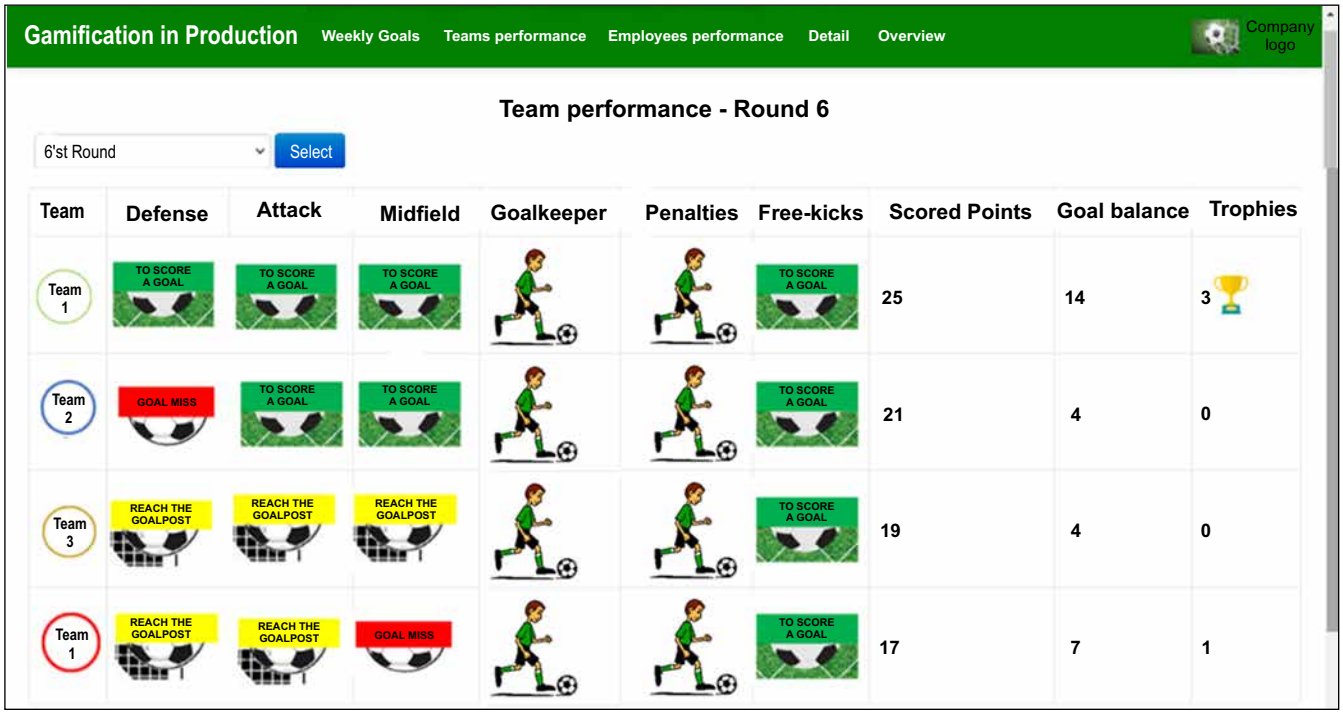


Figure 2. Performance of the teams after class 6.



- Student involvement is voluntary and limited to teams.
- The student may quit the team at any moment but cannot join another.
- Any team that does not engage in activities for four consecutive meetings will be eliminated from the tournament.
- Abstracts must be submitted using the online platform (Google Classroom) up to 15 minutes before the start of class.
- Missions (out-of-class assignments) must be submitted using the online platform (AVA) by the deadline.

In the 'Brasileirão', the seasons and rounds correspond to nine months and one week. These deadlines are changeable in the system; thus, they may be set by the system administrator, who may also be the teacher.

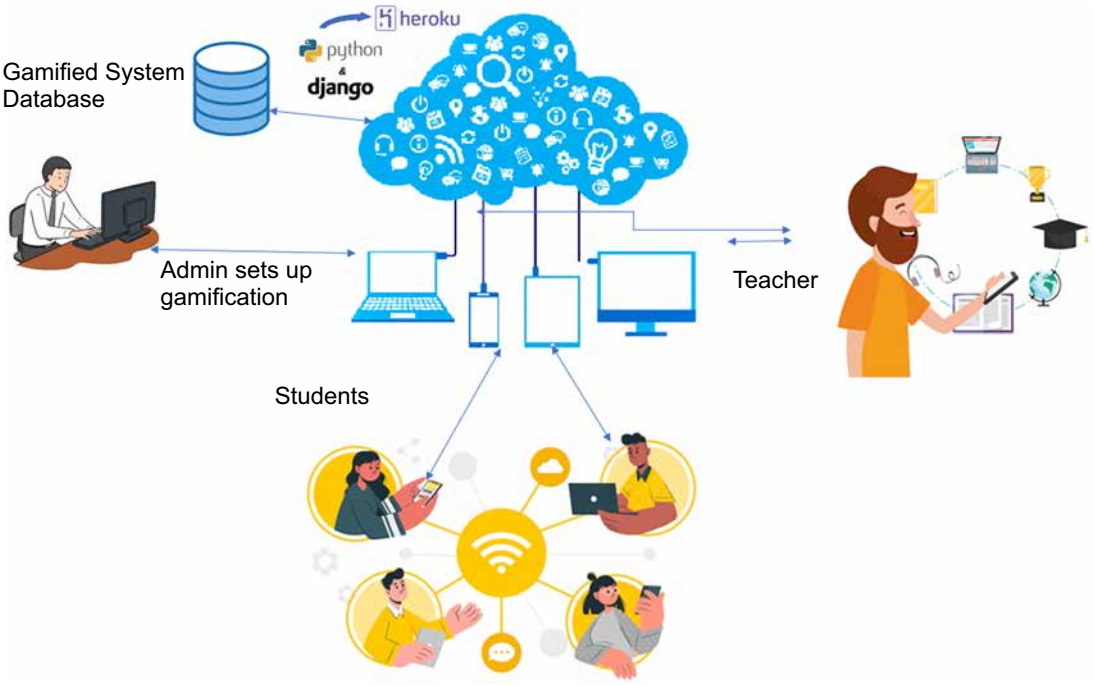
The volunteer team leaders will get all the participants' names and forward them to the administrator so that they may be entered into the system. The system is divided into two modes: administrator, where data is entered, and viewer, where users may view and track weekly objectives and team performance via mobile device or monitor (Figure 3).

Only the administrator profile may insert data. The system was written in Python, and the database is hosted on the Heroku cloud platform (Figure 4), which employs data protection measures in accordance with the General Data Protection Regulation [25].

Simulating a Pedagogical Practice in the Gamified Environment

The example below was intended to help students comprehend the dynamics of the classroom setting. Analyzing the example shown in Figure 2, which corresponds to the status of the teams at the end of the practical home budget work class that appears in the image, on the right side of the screen in Figure 1, the first team is an example of cooperation and good individual time management, with three trophies accumulated from previous classes. All the components planned for the class were there, and the course page had engaging information. The

Figure 3. Sketch of the gamified environment.



second, although being there and earning points for submitting material, did not add to the summary.

Observing the third team, not all members were present in class; some presented summaries and shared interesting stuff. The fourth team, whether none or just one, offered noteworthy stuff. This demonstrates that the squad was not particularly involved this week, despite having previously won a trophy in the previous class, and this attitude may alter before the end of the season. The week's objectives have yet to emerge; nevertheless, once the deadline is met, the result of the sixth round displayed in this sample should alter.

Conclusion

Gamification in the classroom aims to motivate and engage students in carrying out the discipline's activities, as well as to assist them in reviewing their practices, evaluating their attitudes, achievements, and difficulties in the face of learning new concepts and practices, so that they feel more confident in acting in the planning of works.

In terms of system implementation, the plan fits the ethical standards for voluntary involvement, rule openness, and scoring mechanisms. The system tracks the teacher's efforts in parallel, and even though it is a competition, it never reveals a specific student's status because grades are not disclosed in this discipline. The rivalry between teams, as envisioned in the system, is an incentive for the team to be among the best scorers, and compliance with the defined regulations is sufficient to achieve the suggested goals.

For the student, the gamified environment proposes to motivate him through team rivalry, with the idea that this form of stimulation stimulates teamwork, whether in classroom participation or in the preparation of extra class activities. As a result, gamification can help to improve understanding by motivating students to access the discipline's contents in advance, either by summarizing the available material or searching to post on the discipline page, allowing the class to be transformed into a more interactive space with questions and discussions on the issues.

Furthermore, students are driven to do extra class duties as a result of team collaboration and competitiveness. The gamified system can also increase communication between teachers and work

teams by revealing what is expected of them on the system's first screen, making duties more engaging and relaxed.

One restriction of the approach is that the system must be tailored to the setting in which the gamification is intended before it can be implemented. In the future, other elements that allow users to participate more in the gamified environment can be investigated. Furthermore, it is aimed to investigate methods of integrating data with the platforms utilized in the disciplines.

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