A Gamification-Based Approach to Enhance Student Engagement and Attendance in High School Education

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Abstract. *This study explores the design of Class Cup, a gamification approach to enhance student attendance, engagement, and participation that was implemented in a non-profit institution located in southeastern Brazil. The initiative confronts a critical educational challenge: low student engagement and elevated dropout rates. Class Cup aims to reframe school participation as a collective and competitive experience by utilizing team-based point systems, dynamic leaderboards, and tangible rewards. We conducted an exploratory case study to evaluate the Class Cup approach through the perceptions of 159 high school students and six teachers across five classes. After a semester of implementation, 80% of the classes showed improved attendance, resulting in an average increase of 6.22%. The results underscore the potential of a gamified approach to drive measurable behavioral change in educational settings.*

1. Introduction

Integrating technology in education enhances student engagement and reduces the dropout rate. In particular, gamification has attracted the attention of many researchers as an alternative to increase student motivation and engagement, thereby improving academic performance [Sailer and Homner 2020]. In the context of technical education in Brazil, institutions often face persistent challenges related to student absenteeism, low engagement, and high dropout rates. While effective in content delivery, traditional pedagogical approaches tend to overlook motivational aspects, which are crucial for younger students enrolled in IT technical courses. These students often face demanding schedules, with academic activities split between multiple institutions or shifts, contributing to fatigue, disinterest, and ultimately, disengagement.

Class attendance is a factor that improves students' academic results [Crede et al. 2010, Kara et al. 2011, Molnár and Sik 2018, Narula 2013], while absenteeism is directly associated with declines in performance [Romer 1993]. Moreover, school attendance contributes to students' sense of accomplishment and belonging [Colby 2005]. Among the strategies to address these issues, gamification has shown promising results [Barata et al. 2013, Duggal et al. 2021, Khan et al. 2017, Pinter and Čisar 2019], with evidence supporting its role in increasing motivation, engagement, and classroom participation [Domínguez et al. 2013, Reiners et al. 2014]. Thus, this work aims to answer the following Research Question (RQ): *Does the "Class Cup" approach fulfill the purpose of improving attendance, engagement, and participation of students in school activities?*

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In this study, we present the design of a gamification approach called “Class Cup”, aimed at enhancing attendance, engagement, and participation in IT Technical Courses (TC) and IT Integrated Technical Courses (ITC) for high school students at a non-profit institution located in southeastern Brazil. We assessed the approach through an exploratory case study involving 159 students and six teachers distributed across five classes. The “Class Cup” approach focused on educational practice, aiming to address specific problems related to student participation and engagement. We applied a gamification approach to reframe school participation as a collective and competitive experience by utilizing team-based point systems, dynamic leaderboards, a set of predefined rules, and tangible rewards.

Overall, our contributions can be summarized in the following points: *(i)* the introduction of a gamification approach in a high school within a non-profit institution; *(ii)* identification of positive impacts on student attendance, engagement, and participation in events; *(iii)* recognition of the importance of clarity and equity in rules, and teacher involvement in the success of the initiative; and *(iv)* use of evidence as a basis for pedagogical decisions through a case study.

In addition to the Introduction, this study is structured as follows: Section 2 describes related works. The approach is described in Section 3. Section 4 is about the evaluation of the intervention. Section 5 presents the results obtained and the lessons learned. Finally, Section 6 presents the conclusion and future work.

2. Related Work

Gamification in education has gained increasing attention as a strategy to enhance student engagement and participation. For instance, the study conducted by Pinter and Čisar (2019) proposes a gamification-based system designed to improve class attendance and encourage active student involvement in the educational process. Their system comprises two key components: an automated hardware-software platform for tracking student attendance and a gamification framework that incorporates a point-based reward system, a "high score list" for ranking students, and a badge collection mechanism. The results indicate that the system was well-received, with most students valuing their positions on the ranking list. However, some students were more focused on collecting badges than on their rankings. These findings suggest that gamification can be an effective approach to fostering student engagement and improving attendance.

Continuing the focus on student motivation, Duggal et al. (2021) developed a gamified framework to address student disengagement in higher education. The study involved 120 students and incorporated elements such as coins, badges, leaderboards, and reward systems. These features were integrated through a virtual coin-based attendance system, classroom discussions, flipped classroom challenges, and game-based learning activities. The results showed that student attendance and motivation improved, with performance steadily increasing over the first three weeks. However, engagement started to drop in the fourth week, highlighting the challenge of keeping students consistently interested over time.

Khan et al. (2017) examined the impact of game-based learning (GBL) software on student engagement within science classes in secondary schools. Their participants consisted of 72 eighth-grade students from Pakistan who were organized into two groups for this study. This intervention utilized features of the game, such as points, feedback, interactivity, and challenges, to motivate students to participate in learning and to use new

teaching methodologies that would improve learning outcomes. Students' achievement levels improved significantly, surpassing their post-assessment scores from previous evaluations. Interestingly, the effects of gamification were particularly stronger among girls, indicating that certain features of the game could affect student engagement differently for boys and girls.

Considered an emerging field, the intersection of artificial intelligence (AI) and gamification has recently been studied concerning its potential use in enhancing student attendance and engagement in higher education. Limonova et al. (2023) performed a systematic review and revealed that gamification improves motivation, learning outcomes, and engagement. With AI, gamified instructional modules have the potential to be customized, providing non-static experiences for students. Although the shift from conventional teaching to a gamified setting may be difficult for some students, requiring change management processes, it represents an important step toward fostering engagement.

Elias Ratinho and Cátia Martins (2023) performed a systematic review to analyze the effect of gamification strategies on the motivation of secondary and tertiary students. Their observations show that gamification has a positive effect on motivation, especially in the short term. However, the analysis also indicates a decrease in motivation over time, which means that the novelty effect and external incentives enhance engagement but are unlikely to improve motivation in the long term. This points out the importance of careful design and further modification of gamified learning strategies to enhance motivation for a longer duration.

As observed previously, the initial experiences faced challenges maintaining student engagement over time. To address this, an implementation of a semester-based scoring system, complemented by monthly feedback cycles, was made. Although the scores were cumulative over the semester, the monthly reward cycles allowed teams to stay motivated to perform well within each month, as the competition reset at the beginning of every month. Additionally, the approach focused on collective effort rather than individual performance. All rewards and penalties were applied to teams, not individuals, with points always assigned to the respective teams of the competitors, even in competitions. Lastly, we organized school events with bonus points to re-engage students after periods when the competition had been neglected. Table 1 summarizes relevant points of basement on the selected studies.

Table 1. Related studies guiding the design of the Class Cup approach

Studies	Inspiration
Khan et al. (2017)	Application on highschool, use of points and feedback.
Pinter and Čisar (2019)	Gamified attendance tracking, use of points and ranking.
Duggal et al. (2021)	Focused on disengagement of students, use of coins, leaderboards and rewards.
Limonova et al. (2023)	Concluded that gamification improves motivation, learning results, and engagement.
Elias Ratinho and Cátia Martins (2023)	Shows that points, leaderboards and cooperation are largely used.

3. Class Cup approach

The "Class Cup" is a gamification approach designed to enhance student engagement and attendance in the IT technical course in high schools. The approach was inspired

by gamification approaches [Barata et al. 2013, Duggal et al. 2021] aimed at secondary education [Khan et al. 2017, Pinter and Čisar 2019]. Aware of the risks associated with excessive competitiveness [Hanus and Fox 2015], we opted for a model based on collaboration among students.

We applied a gamification approach by reframing school participation as a collective and competitive experience by utilizing team-based point systems, dynamic leaderboards, a set of predefined rules, and tangible rewards. The approach was divided into three steps: (i) approach focus definition, (ii) team definition and (ii) score criteria definition.

3.1. Step 1 - Approach focus definition

The “Class Cup” committee, in collaboration with the school management, initially defined the objective: **improving attendance, engagement, and participation**. During this meeting, they established the need to track school attendance, positive behavior, and active involvement in school events.

3.2. Step 2 - Team organization

Considering the different days and shifts of the classes, the “Class Cup” committee decided to structure the students’ teams based on their respective classes, so each class was organized as a team. This decision aimed to ensure the participation of all students, regardless of workload or school year, while also fostering integration among classmates.

Additionally, the team sought to simulate professional scenarios in which individuals are typically assigned to work teams without the ability to choose members based on personal affinity or preference.Table 2 provides an overview of the five classes of IT technical courses involved in the study with a duration of 4 semesters. The majority of the classes (4 out of 5) are from integrated technical education, reflecting a more presence in the institution.

Table 2. The class overview of the systems development course.

Class name	Number of students	Semester application
DS1A	32	2
DS1B	32	2
DS2A	31	3
DS2B	34	3
3DS	30	3

With team organization based on the existing classes, we assigned a tutor to each of them. Each tutor was responsible for calculating the average monthly attendance of their respective class, recording and summarizing both positive and negative occurrences, and serving as a witness to the events to validate the information reported by the students.

3.3. Step 3 - Score criteria definition

The "Class Cup" approach addresses seven different criteria, as presented in Table 3. Among the elements widely used in gamification strategies and associated with positive results, we highlight the scoring system [Hamari et al. 2014]. Points were awarded exclusively to teams, following a set of predefined rules.

School attendance, widely recognized as a key factor in academic performance, was one of the primary scoring criteria [Colby 2005, Molnár and Sik 2018, Narula 2013,

Table 3. Definition of scoring criteria and assigned value.

ID	Criteria	Score
C1	Monthly frequency	+average frequency
C2	Positive occurrence	+10
C3	Negative occurrence	-10
C4	Participation in events	+10
C5	1st place in event	+30
C6	2nd place in event	+20
C7	3rd place in event	+10

Purcell 2007]. Each month *(C1)*, we calculated the average attendance of each class across all lessons, reinforcing the emphasis on collective effort rather than individual performance. We considered it more feasible to achieve improvements in the average attendance of a group than in that of an isolated student, so we assigned 0.1 points for each 0.1% increase in the class's average attendance.

To foster positive behaviors and improve discipline in school spaces, such as cleaning and organizing classrooms, preserving materials and infrastructure, supporting peers during academic activities, and respecting teachers and staff, we implemented an incentive mechanism based on incident reports. Each positive occurrence *(C2)*, duly recorded through videos, photos, or testimonies from teachers and staff, added 10 points to the team responsible. Likewise, the occurrence of indiscipline, disorder, or vandalism *(C3)* resulted in the deduction of 10 points, following the same evidence criteria.

The school promotes several artistic, cultural, scientific, and social events throughout the year, participation in which contributes to the development of students' socio-emotional skills, in addition to their technical skills. We awarded 10 points to each team member who attended a school event to encourage this participation (C4). In addition, in competitive events, aiming to serve students who are more motivated by challenges, we awarded extra points: 30, 20, and 10 points to the teams that achieved first, second, and third place (C5, C6, C7), respectively. This structure seeks to recognize competitive merit without compromising the collaborative principle of the initiative.

We used an online spreadsheet in which all additions and deductions of scores, as well as their respective reasons, were duly recorded. This approach enabled the management and transparency of the scoring system, as well as auditing and consultation by the management team, teachers, and students. These scores were summarized in a dashboard available online.

4. Case Study

We conducted an exploratory and single-case study to assess the effectiveness of the "Class Cup" approach based on the perceptions of students and teachers from a technical education program. We are interested in measuring the effectiveness of this approach in terms of motivation, perceived usefulness, and satisfaction, with the aim of improving student attendance, engagement, and participation in events related to the integrated courses. We planned and conducted an exploratory and single-case study following the guidelines proposed by [Wohlin et al. 2012].

4.1. Case Study Definition and Design

We used the Goal-Question-Metric (GQM) model [Basili and Weiss 1986] to set out the objectives of the experiment that can be summarized as follows:

*"Analyze **Class Cup approach** for the purpose of **evaluation** with respect to **effectiveness in tracking and encouraging school attendance, positive behavior, and participation in school events** from the point of view of **students and teachers** in the context of **system development technical education programs**."*

To achieve the established objective in this case study, three Analysis Questions (AQs) were defined:

AQ_1**: Does the "Class Cup" have good motivation?**

AQ_2**: Does the "Class Cup" contribute to improving attendance, engagement and participation in school activities?**

AQ_3**: How do you evaluate your experience with the "Class Cup"?**

4.2. Procedure of approach application

The case study was conducted in IT Technical Courses (TC) and IT Integrated Technical Courses (ITC) within High School Education offered by a non-profit institution located in southeastern Brazil. The study was carried out voluntarily between February and May 2024, involving 17 participants, including teachers and students.

The evaluation of the "Class Cup" used a hybrid approach, combining and adapting the Technology Acceptance Model (TAM), widely used in educational contexts [Al-Emran et al. 2018], with the game evaluation model proposed by Savi [Savi et al. 2011]. This approach is structured into three subcomponents:*(i)* motivation,*(ii)* perceived usefulness, and *(iii)* satisfaction. Figure 1 illustrates the operational cycle of the "Class Cup", highlighting the four main stages: (1) Opening of the "Class Cup", (2) In-person disclosure of results, (3) Online monthly disclosure, and (4) Awards. We designed this cyclical process to foster continuous student engagement and motivation throughout the school semester.

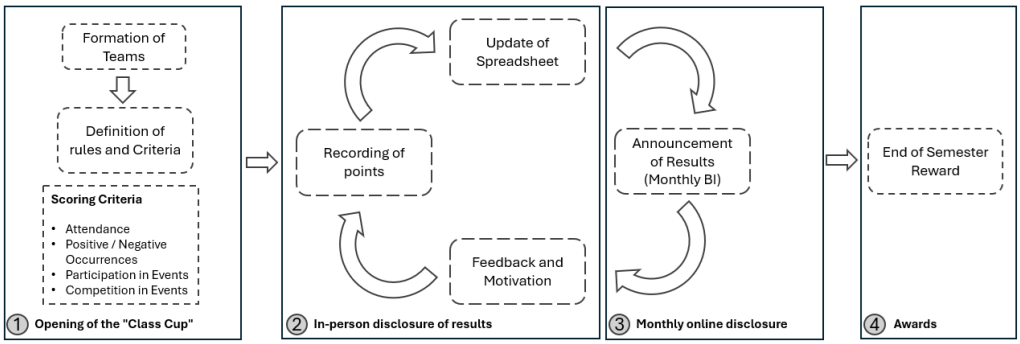

Figure 1. Overview of operational "Class Cup" approach cycle.

In the first stage (**1 – Opening of the "Class Cup"**), held in the first week of February, the event launched the initiative by presenting its objectives, rules, and mechanics, along with the team definitions, as previously described. After that, the first cultural event took place and each team characterized themselves by three main elements: name, coat

of arms, and war cry. These elements were designed by the students with the aim of strengthening the feeling of belonging and promoting collaboration.

Occurrences, both positive and negative, were reported by teachers and students to the teacher responsible for managing the "Class Cup", accompanied by the respective evidence. If the incident was duly proven and in accordance with the established rules, the corresponding score was recorded on the general control spreadsheet, with the appropriate breakdown of the reason. In cases not covered by the competition guidelines, the decision was made collegially between the teacher in charge of the approach and the "Class Cup" committee. At the end of each month, the tutors of each class calculated the average attendance, compiled the recorded occurrences, and formally submitted this information via email. If the tutor did not perform this step, the conference and registration were done directly by the teacher in charge. With the consolidated data, the points were calculated according to the criteria defined in Section 3 and entered in the control spreadsheet.

The second stage **(2—In-person disclosure of results)** was conducted in the second week of March. Two teachers on the "Class Cup" committee formally presented the initiative's overall results during face-to-face sessions. During this occasion, the "Class Cup" committee clarified the rules and the scoring methodology. They also announced that the third stage **(3 – Monthly online disclosure)** would involve publishing the results through interactive dashboards developed in Power BI[1]. The institution displayed these visualizations on its internal communication monitors.

In school events, the participation of any team member was recorded for later awarding of points. In cases where the events were competitive and had a prize podium, the teams ranked in the top three positions also received additional points. All of this information was duly recorded in the spreadsheet and categorized in Power BI under the title "events". One of these events took place during the last month of the implementation of the approach, organized by one of the students' teams, encouraging the participation of all students in the long term, re-engaging them in gamification.

In the final stage **(4 – Awards)**, the institution reinforced that the team with the highest final score would receive an award, in June 2024, as a prize, a visit to the Hopi Hari park, including transportation and food. The gamification strategy was implemented entirely through in-person activities, while the dissemination of results occurred through both physical and digital means.

5. Analysis and Discussion of Results

Out of 166 participants—159 students and 7 teachers—who took part in the implementation of the approach, only 17 completed the evaluation. Of these, 41.2% (7/17) were teachers and 58.8% (10/17) were students. Most of the teachers had high academic qualifications, with 85.7% (8/10) holding postgraduate degrees and 14.3% (2/10) holding undergraduate degrees. They work in the System Development fields. The students were between 16 and 20 years old, mostly without prior professional experience, and attended classes in other high schools or higher education institutions during different periods. Quantitative results regarding school attendance were analyzed during the six months of implementation of the approach and the six months following the end of the initiative.

[1]Accessible at: `https://encurtador.com.br/i4t2V`

5.1. Motivation (AQ_1)

In the "Class Cup" approach, students draw motivation from their internal drive, which leads them to actively engage with and persist in educational activities presented through gamified strategies. Factors such as attention, relevance, confidence, and satisfaction directly influence this motivation. As a result, students engage more deeply in school routines and learning tasks, which helps them retain knowledge more effectively and develop essential skills.

According to the results of the evaluation of students and teachers, which can be observed in Figure 2, 90% of the students "agreed" or "strongly agreed" that *"Class Cup"* influenced regular attendance in classes, whereas one student strongly disagreed, similar to teachers' perception where 85% also "agreed" or "strongly agreed" with that perception and only one "disagreed". Regarding reduction in absences and tardiness, 60% of the students "strongly agreed" that the approach influenced while the remaining students either agreed or remained "neutral" and one student "strongly disagreed". Among the teachers, 70% perceived an improvement in student attendance, while the remaining two were either "neutral" or "disagreed".

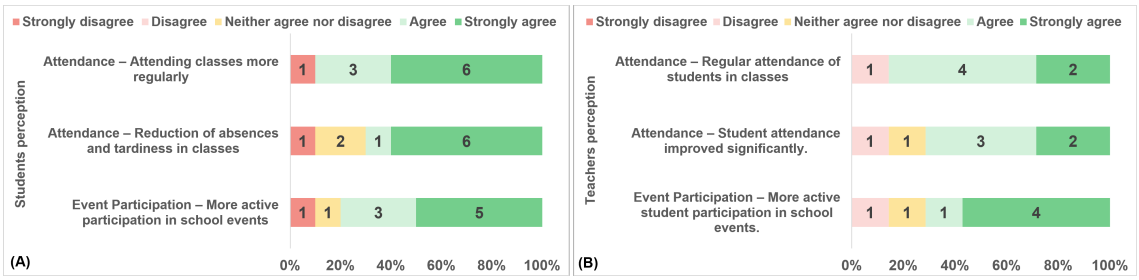

Figure 2. Students' and Teachers' Perceptions of the "Class Cup" approach influence on attendance and event participation

5.2. Contribute to improving engagement and participation in school activities (AQ_2)

This AQ summarizes student and teacher perceptions of the Class Cup's impact on classroom behavior, collaboration, and event participation. As shown in Figure 3(A), 60% of students strongly agreed that it improved classroom behavior, with the rest agreeing or remaining neutral—highlighting the strategy's positive effect on discipline and daily engagement. Most students agreed or strongly agreed that the Class Cup promoted collaboration, though a few neutral and negative responses suggest varied perceptions across classes. For school event participation, 50% responded positively, while others showed limited engagement, indicating that the impact of the initiative differed depending on student involvement and context.

The qualitative responses support these findings. Statements such as "It made our class work harder in the classroom", "I liked the incentives created to encourage students to participate more", and "The Class Cup often served as motivation to engage more" confirm that the strategy positively influenced behavior and involvement. The sense of belonging and healthy competition have motivated students to participate more actively in academic and extracurricular activities. Overall, these results indicate that the "Class Cup" successfully promoted classroom engagement, with moderate success in stimulating collaboration and event participation. While not all students were equally impacted, this

variation can be explained by at least three factors: (*i*) differences in team cohesion across classes, (*ii*) variation in tutor engagement and leadership, and (*iii*) distinct student profiles regarding motivation and interest in extracurricular activities. These findings highlight the importance of adapting the strategy to each classroom context and ensuring consistent support and incentive structures.

In Figure 3(B), the teachers' responses show a similar pattern to the students'. Six out of seven of them strongly agreed that student behavior improved, confirming the positive effect of the "Class Cup" on classroom discipline. Five teachers evaluated collaboration positively, though one disagreed and another strongly disagreed, indicating that the perception of teamwork varied across classes. As for participation in school events, three teachers agreed, two strongly agreed that the initiative had a positive impact, and two remained neutral. These mixed responses suggest that the strategy's effectiveness may depend on class profile, engagement level, and how consistently tutors implemented the gamified approach.

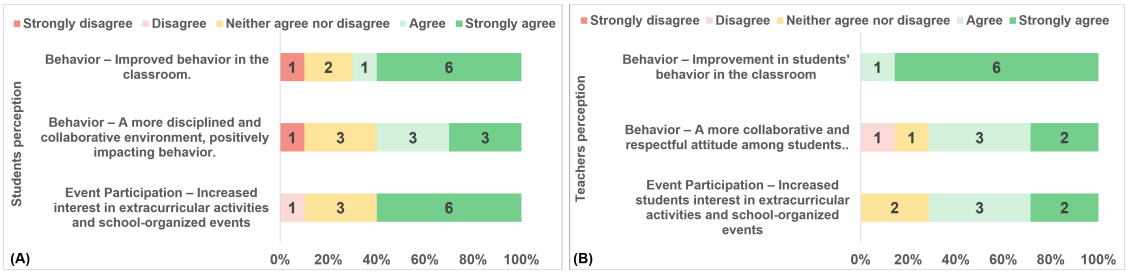

Figure 3. Students (A) and Teachers'(B) Perceptions of the "Class Cup" approach contribution to behavior improvement and event participation

Quantitative attendance data supports these perceptions: 80% of classes experienced an increase during the implementation period, with an average growth of 6.22%, and a peak of 12.36% in one case. These results, shown in Figure4, reinforce the teachers' overall impression that the initiative had a tangible impact on student engagement.

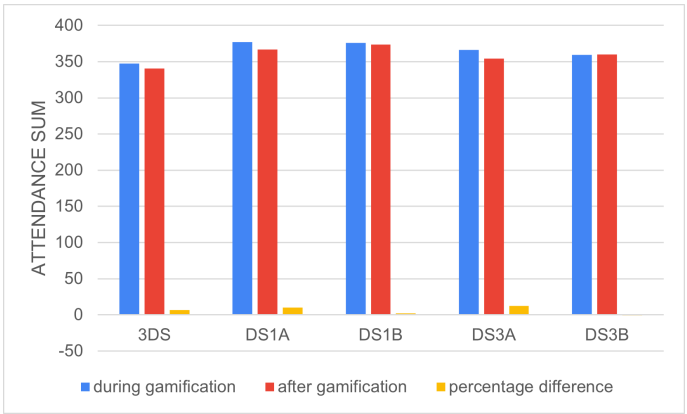

Figure 4. Comparative graph of class attendance during and after applying the approach.

From an analytical perspective, the variation in teachers' responses can be attributed to contextual factors such as (*i*) tutor engagement: classes with tutors who actively monitored scores, gave frequent feedback, and encouraged participation tended to perform

better; (*ii*) group cohesion: more unified classes responded more positively to collective goals; and (*iii*) student profile: some students were more receptive to the competitive and collaborative nature of the gamified approach, while others showed limited interest in school events or were less influenced by the final reward. These aspects help explain why, although the overall impact was positive, it was not perceived uniformly across all classes.

5.3. Experience of Students and Teachers (AQ_3)

This question aims to capture participants' experiences regarding levels of satisfaction, challenges faced, and perceived benefits. Overall, teachers expressed satisfaction with the initiative, stating that it was "a very interactive event involving the entire school" and had "high potential to impact daily school life".

Despite the positive results, it is essential to acknowledge the limitations and potential side effects of gamification in the school context. As shown in Figure 5, half of the participants who answered the survey pointed out inequality in the level of individual student engagement; some participants also reported situations of pressure and competitiveness among groups, excessive focus on rewards, and low development of autonomy, phenomena also discussed in the literature [Hanus and Fox 2015, Ratinho and Martins 2023].

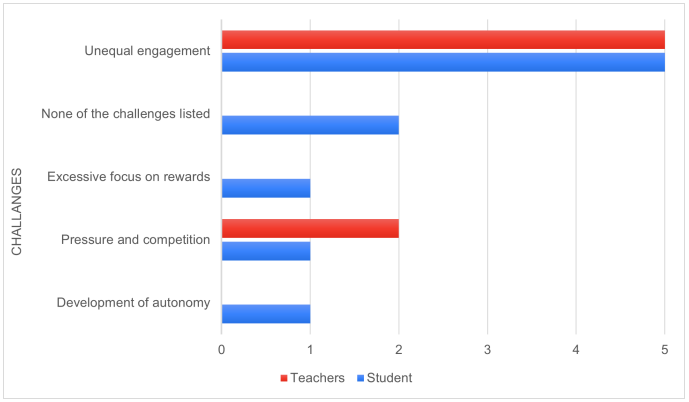

Figure 5. Main challenges observed by Teachers and Students on the "Class Cup".

In highly competitive scenarios, there is a risk that students who are less integrated into the class or less motivated may feel excluded, reducing their sense of belonging and potentially reinforcing attitudes of disengagement from school. This risk highlights the need for continuous monitoring of competition's effects, balancing the emphasis on collaboration with the motivation generated by inter-team challenges. Moreover, gamified strategies that depend predominantly on external rewards tend to progressively diminish intrinsic motivation, since the constant emphasis on extrinsic incentives may overshadow learners' natural curiosity, autonomy, and engagement with educational activities over time [Sailer and Homner 2020]. Although the "Class Cup" has shown immediate gains in attendance and participation, its long-term adoption requires adjustments, such as cycles of rule renewal, combination with non-gamified active methodologies, and greater attention to the socio-emotional dimensions of students. Therefore, the application of gamification should not be understood as a definitive solution but rather as a complementary strategy within a broader pedagogical ecosystem.

5.4. Threats to Validity

Following Wohlin et al. 2012 guideline, we identified four main categories of threats to validity in this study and the strategies adopted to mitigate them. For **construct validity**, the limitation concerns the low response rate to the qualitative questionnaire (17 out of 166 students), which may introduce selection bias and socially desirable answers. To mitigate this risk, we employed data triangulation, combining self-reported perceptions with objective attendance records extracted from the academic system. This combination aimed to enhance the robustness and reliability of the interpretations. In the **internal validity**, the absence of a control group makes it difficult to attribute the observed results solely to the gamification intervention, since other contextual factors (class profile, teacher involvement, individual student characteristics) may also have influenced the findings. To mitigate this limitation, we analyzed multiple classes as units of observation, which allowed us to identify variations of impact among them. Furthermore, we discussed the findings in light of the existing literature, reinforcing a critical interpretation of the observed effects.

Regarding **external validity**, we conducted this study in a single private technical school, which limits the generalization of the results to other educational contexts. Acknowledging this restriction, we argue that the experience provides useful and replicable practical evidence and recommend that future research apply the approach in different institutions, modalities, and educational levels to broaden external validity. Finally, for **conclusion validity**, the reduced number of respondents compromises the statistical power of the qualitative analyses, and no robust significance tests were applied to confirm the observed differences. As a mitigation, we prioritized objective attendance metrics (average improvement of 6.22%) as the central indicator, which is less susceptible to response bias. Moreover, we recommend that future studies adopt larger samples and advanced statistical methods to strengthen the reliability of the conclusions.

6. Conclusion

The work presents a gamification model with the aim of increasing class attendance and greater participation in school events for integrated high school classes and technical courses of system development. The results show that the approach can be an effective tool for increasing class attendance and engagement in school events, and can be applied by other schools, technical courses and different levels of education. All rules and artifacts used were made available for inspiration or use.

In future work, based on the insights collected, some suggestions for improvement were identified. Among them, the need to frequently provide a detailed extract of class scores stands out, allowing for more targeted interventions. The scoring criteria, especially for the behavioral assessment, need to be further refined and have a more transparent way of recording. In addition, it is recommended to create a platform, such as a website or app, so that students can monitor their scores in real time. Finally, increasing the involvement of tutor teachers and including employees in the program were indicated as measures that can increase the effectiveness of the initiative.

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