

Gamification in Networked Learning Ecosystems: Effects on Student Engagement, Collaboration and Emotional Well-Being

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Abstract: In contemporary educational contexts, increasingly characterized by the integration between digital technologies and online learning environments, the educational experience takes on a progressively distributed, interactive nature that is closely connected to the emotional dimension of the students. In this perspective, gamification is configured as an innovative pedagogical approach, capable of supporting involvement and promoting more inclusive teaching practices. The present study analyzes the impact of gamified teaching methodologies on participation, peer collaboration and emotional well-being in lower secondary school. A quasi-experimental mixed-methods design was adopted involving 120 13-year-old students, divided into an experimental group, exposed to gamified educational interventions, and a control group, engaged in traditional activities. Quantitative data collection was done using the Spielberger Test Anxiety Inventory for Children (STAI-C) and the Group Collaboration Scale. In parallel, semi-structured interviews were conducted with students and teachers, subsequently analyzed by thematic coding. Quantitative analyses showed a significant decrease in anxiety levels and a consistent increase in collaborative dynamics in the experimental group, compared to limited variations in the control group. The results suggest that the adoption of gamification can significantly contribute to the construction of more participatory, inclusive and attentive educational environments to the well-being of students, offering relevant indications for instructional design in contemporary school contexts.

Keywords: School inclusion; Collaborative learning; Digital learning environments



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1. Introduction

In recent decades, the way learning is conceptualized and practiced has undergone a profound transformation, linked to the emergence of digital environments,

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social networks and intelligent technologies that have progressively redefined the boundaries of the human mind (Castoldi, 2020). If for a long time cognition was interpreted as an internal process, confined within the individual brain, today we are witnessing a growing convergence towards theoretical perspectives that recognize the distributed, situated and extended nature of cognitive processes. In this perspective, the mind is no longer understood as a closed entity, but as a dynamic system that develops through continuous interaction with tools, environments and other individuals, configuring itself as an integral part of complex and interconnected network ecosystems (Robasto, 2018).

The paradigm of extended cognition, developed in the context of contemporary cognitive sciences, offers a particularly effective interpretative key to understanding these transformations (Bertolotti, 2024). According to this perspective, digital devices, online platforms and virtual environments are not simple auxiliary tools, but real building blocks of cognitive processes, capable of amplifying, supporting and sometimes redefining the mental capacities of individuals. In this sense, learning is increasingly configured as a hybrid process, which develops through the continuous negotiation between the biological and technological dimensions, between individual experience and collective participation (Kiverstein, 2018). This vision is part of a broader reflection on onlife, a concept that describes the growing integration between physical and digital spaces, making it increasingly difficult to distinguish between what happens online and what happens offline (Smart, 2017).

Within these hybrid ecosystems, learning takes on a deeply relational and participatory dimension, characterized by the co-construction of meanings and the sharing of knowledge within interconnected communities. Digital networks, in fact, not only facilitate access to an unprecedented amount of information, but also foster new forms of social interaction, collaboration and collective production of knowledge (Solé et al., 2026). In this context, the concept of collective mind emerges strongly, understood as the result of the interactions between individuals, technologies and environments, which jointly contribute to the construction of knowledge. This perspective implies a revision of traditional educational models, mainly oriented towards the unidirectional transmission of content, in favor of more flexible, inclusive and participatory approaches (Smart, 2022).

In this scenario of transformation, schools are called upon to rethink their teaching practices, in order to respond effectively to the new needs of students, who live and learn in increasingly complex and digitized contexts. In particular, it is necessary to promote teaching methodologies capable of enhancing the engagement, intrinsic motivation and emotional well-being of students, elements recognized as fundamental to promote meaningful and lasting learning processes. Among the emerging strategies in this area, gamification is a particularly promising approach, capable of integrating typical game elements, such as challenge, immediate feedback, progression and recognition, within formal educational contexts (Pritchard et al., 2021).

Gamification, in fact, is not limited to making learning more "fun", but acts on deep dimensions of the educational experience, influencing students' motivational,

cognitive and emotional processes. Through the structuring of educational activities based on game dynamics, it is possible to encourage greater active participation, stimulate collaboration among peers and reduce negative emotional states, such as anxiety, shame and insecurity, which often hinder students' involvement in traditional school contexts (Lumsden et al., 2016). In this sense, gamification is fully part of the logic of extended cognition, as it helps to create interactive and immersive learning environments, in which students can experience forms of active participation and shared knowledge construction.

A particularly relevant aspect concerns the relationship between gamification and emotional well-being, an increasingly central dimension in contemporary educational research. Numerous studies have shown that emotions play a crucial role in learning processes, influencing attention, memory and motivation. In this sense, the creation of positive, inclusive and supportive learning environments is an essential condition for fostering the educational success of students. Gamification, thanks to its ability to offer structured but flexible experiences, characterized by continuous feedback and a gradual progression of difficulties, can help reduce anxiety levels and strengthen students' sense of self-efficacy, promoting more active and conscious participation (Xiao et al., 2024).

At the same time, the collaborative dimension of learning is taking on an increasingly central role, in line with the transformations of network ecosystems. Gamified activities, in fact, often involve forms of interaction between peers, which can foster the development of social, communicative and cooperative skills (Al-sarayreh, 2026). Collaboration, understood not only as group work but as a shared construction of meanings, represents a fundamental component of distributed learning processes, in which knowledge emerges from the interaction between different actors and resources. In this context, the school can be configured as a node within a broader learning network, in which students, teachers and technologies actively collaborate in the construction of knowledge (Qiao et al., 2023).

In light of these considerations, it is evident the need to systematically investigate the effectiveness of innovative methodologies, in particular gamification, in contemporary educational contexts. Despite the wide diffusion of gamified practices in schools, there are still some critical issues related to the evaluation of their real impact on learning processes and on the well-being of students. In particular, it is essential to adopt research approaches that integrate qualitative and quantitative methodologies, in order to grasp the complexity of the phenomena under examination and to provide solid and articulated empirical evidence (Abbassyakhrin et al., 2024).

This study aims to analyze the impact of gamification on participation, peer collaboration and emotional well-being of students in lower secondary school. Through a mixed methods research design, the study intends to integrate the analysis of the perceptions and experiences of the actors involved, collected through interviews, with the objective measurement of psychological variables such as anxiety and collaboration, detected through validated psychometric tools. This methodological integration allows to obtain a more complete and multifaceted view of the phe-

nomenon, overcoming the limits of one-dimensional analyses and contributing to a deeper understanding of the dynamics that characterize learning in contemporary contexts.

Therefore, exploring the role of gamification within extended learning ecosystems means questioning not only the effectiveness of specific teaching strategies, but also the very nature of the mind and learning in the contemporary world. In an era in which the boundaries between human and technological, between individual and collective, between real and virtual are becoming increasingly blurred, the challenge for educational research is to understand how to design learning environments capable of enhancing this complexity, while promoting inclusion, participation and well-being. In this perspective, gamification represents not only an innovative methodology, but a possible key to access new forms of educational experience, in which the mind is configured as an open, distributed and constantly evolving system.

2. Materials and Methods

2.1 *Study design*

The present study adopted a quasi-experimental mixed-methods design, integrating qualitative and quantitative approaches in order to obtain a broad and articulated understanding of the impact of gamification on student participation, peer collaboration and emotional well-being. This methodological choice responds to the need to grasp, on the one hand, the objective variations in the psychological variables considered and, on the other, the subjective experiences lived by the actors involved in the educational context.

The quantitative component was structured according to a pre-test, mid-test and post-test design, which allowed longitudinal monitoring of changes in anxiety and collaboration levels in the two groups, namely the experimental group, exposed to gamified teaching methodologies, and the control group, which followed a traditional approach. At the same time, the qualitative component involved the collection of data through semi-structured interviews, aimed at exploring perceptions, experiences and relational dynamics within the learning environment.

The design is defined as quasi-experimental as a complete randomization of the participants was not possible, as the groups were constituted on the basis of the already existing classes. However, strategies have been adopted to ensure the equivalence of groups in terms of age, educational level and the presence of special educational needs. The integration of qualitative and quantitative data took place according to a parallel convergent approach, in which the two datasets were analyzed separately and subsequently correlated, in order to strengthen the interpretative validity of the results.

2.2 *Participants*

The study was conducted in a lower secondary school and involved a total sample of 120 students enrolled in the third year, all aged 13. Participants were divided into two equivalent groups, with 60 students in the experimental group and

60 in the control group. In each group there were 10 students diagnosed with specific learning disorders, in particular dyslexia and dysorthography, in order to ensure a balanced representation of pupils with special educational needs and allow targeted comparative analyses.

The selection of participants was made on the basis of strictly defined inclusion and exclusion criteria, in order to ensure the homogeneity of the sample and reduce the influence of confounding variables. Students regularly enrolled in the third year of lower secondary school, who had no previous failures and who had obtained informed consent from their parents or legal guardians were included in the study. This has made it possible to ensure relative uniformity in the levels of cognitive and social-emotional development. As for students with specific learning disabilities, inclusion took place on the basis of diagnostic certifications issued by specialists and validated by the educational institution, thus ensuring the reliability of the information relating to their learning profile.

Students with irregular school attendance during the intervention period, those without informed consent and students with experiences of repeating the school year were excluded from the study, in order to avoid possible distortions related to previous school experiences or discontinuities in participation.

In order to ensure adequate statistical power, an a priori analysis of the sample was conducted using the G*Power software. Considering an effect of medium size, a significance level of .05 and a statistical power of .80, the minimum number of participants required was about 102 subjects. The final sample of 120 students therefore ensured adequate power to detect statistically significant differences between the groups and between the different moments of detection.

2.3 Procedure

The research took place over six months, with a frequency of two weekly meetings lasting about two hours each. Both groups followed the same curricular contents, in order to ensure that any differences in results were attributable exclusively to the teaching methodologies adopted.

The collection of quantitative data was organized in three distinct moments. In the initial phase, prior to the start of the intervention, tests were administered to detect baseline levels of anxiety and collaboration. A second survey was carried out after three months, with the aim of monitoring any intermediate changes, while the final phase, at the end of the six months, made it possible to assess the overall effects of the intervention.

In parallel, semi-structured interviews were conducted with a representative sample of students and teachers belonging to both groups. The interviews explored topics such as involvement in educational activities, the quality of peer interactions, emotions related to the school experience and the perception of the effectiveness of the methodologies used. The data collected were recorded, transcribed in full and analyzed using the NVivo software, which allowed the identification of recurring thematic categories and the comparison between the two groups.

Quantitative analyses were conducted using inferential statistical tests, in particular the t-test for cross-group comparison and analysis of variance for repeated measures, in order to examine differences over time and between experimental conditions.

2.4 Measurements

To ensure a multidimensional evaluation of the variables under study, both qualitative and quantitative survey tools were used.

The qualitative component was based on semi-structured interviews, designed to explore in depth the experiences of students and teachers. The interviews investigated the level of active participation, collaborative dynamics, emotions associated with school activities and the perception of teaching effectiveness. The analysis of qualitative data was carried out through a thematic coding process, which allowed to identify recurring patterns and differences between groups.

The quantitative component involved the use of validated psychometric tools. In particular, the Spielberger Test Anxiety Inventory for Children (STAI-C) (Al-Yateem, & Brenner, 2017) was administered, which makes it possible to distinguish between situational anxiety and anxiety as a stable personality trait. This tool made it possible to assess changes in anxiety levels in relation to different teaching methodologies.

In addition, the Group Collaboration Scale (Bonaiuto, 1997) was used, aimed at measuring the degree of interaction, cooperation and mutual support among peers. This tool provided relevant information on the relational dynamics within the groups and on the impact of teaching activities on collaboration.

Both scales were administered at the three detection points provided for in the research design. The psychometric properties of the instruments were also verified, which showed adequate levels of reliability.

2.5 Intervention

The educational intervention was designed to systematically compare two different teaching approaches, keeping the disciplinary contents unchanged and varying only the teaching methods.

In the experimental group, the teaching activities were structured according to a gamified approach, integrating typical elements of the game, such as challenges, reward systems, levels of progression and immediate feedback. The use of interactive digital tools, in particular the Genially platform, has allowed the creation of dynamic and immersive learning environments, characterized by step-by-step paths, narratives and interactive activities.

Students participated in experiences such as educational escape rooms, quizzes at progressive levels, collaborative missions and role-playing activities, which fostered active involvement and participation. The activities were designed to stimulate problem solving, peer collaboration and metacognitive reflection. Group work was further encouraged through cooperative challenges and team

competitions, accompanied by continuous feedback systems and self-assessment tools.

In the control group, on the other hand, teaching was conducted according to traditional methods, based on lectures, individual study and oral and written tests. The teaching activities included direct explanations by the teacher, individual exercises and moments of guided discussion, without the integration of playful elements or interactive digital tools.

This methodological differentiation has made it possible to systematically evaluate the impact of gamification on student participation, on the quality of peer interactions and on the management of emotions related to the school experience, offering useful evidence for the development of innovative and inclusive teaching practices.

2.6 Statistical analysis

Quantitative data analysis was conducted using IBM SPSS Statistics software (version 27.0; IBM), in order to examine the differences between the experimental group and the control group and evaluate the trend of the variables over time. In a first phase, descriptive statistics, including means, standard deviations and ranges of variation, were calculated for each variable considered, i.e. state anxiety, trait anxiety and peer collaboration, in the three points of detection provided for in the research design.

Subsequently, the main assumptions for the application of parametric tests were verified, in particular the normality of the data distribution, through the Shapiro-Wilk test, and the homogeneity of variances, through the Levene's test. In the presence of such conditions, parametric inferential analyses were applied.

To compare the differences between the two groups at different time points, an analysis of variance for repeated measures was used, which allowed to examine both the main effects of time and the effects of interaction between time and the interaction between time and group. This approach made it possible to dynamically evaluate the impact of gamified intervention compared to traditional teaching.

In addition, t-tests for independent samples were conducted to compare the means between the experimental group and the control group at the individual points of detection, and t-tests for paired samples to analyze intra-group variations between pre-test and post-test. These analyses made it possible to investigate the specific differences and identify any significant changes associated with the intervention.

The level of statistical significance has been set at $p < .05$. For a more accurate interpretation of the results, the effect sizes were also calculated, using the partial square age index for the analysis of variance and the Cohen d-coefficient for the t-tests, in order to estimate the magnitude of the observed effects in addition to their statistical significance.

As regards the management of missing data, a preliminary analysis was carried out to verify its distribution. In cases of limited and unsystematic missing data,

average imputation techniques were used, while in the most relevant cases a listwise exclusion approach was adopted, in order to preserve the integrity of the analyses.

Finally, the integration of quantitative results with qualitative ones was carried out in the interpretative phase according to a triangulation logic, which made it possible to relate the statistical results with the themes emerging from the qualitative analysis, contributing to a more articulated understanding of the impact of gamification on the participation, collaboration and emotional well-being of students.

3. Results

3.1 *Qualitative data analysis*

The qualitative analysis showed substantial differences between the experimental group and the control group, offering a deeper understanding of the dynamics observed in the quantitative data.

In the experimental group, most students described a learning experience characterized by greater involvement and active participation. 79% of respondents reported an increase in motivation and interest in educational activities, underlining how the introduction of playful and interactive elements has made learning more stimulating and less monotonous. The students showed a reduction in the fear of error, perceiving the activities as opportunities for exploration rather than as evaluative moments.

The testimonies collected show how the gamified environment has fostered a more positive emotional climate. One pupil said that working through challenges and games made the activities more engaging and less stressful than traditional modes. Similarly, teachers observed an increase in participation even from the most introverted students, highlighting an improvement in the quality of interaction in the classroom.

In the control group, on the other hand, a more traditional and, in some cases, less engaging perception of the school experience emerged. 61% of students reported difficulty maintaining attention during lectures, while a significant proportion associated tests with states of anxiety and worry. The teachers highlighted a more discontinuous participation and a lower activation of students during teaching activities.

As for peer collaboration, 75% of the students in the experimental group reported an improvement in relational dynamics, emphasizing a greater willingness to support each other and share knowledge. Cooperative activities and group missions were perceived as effective tools to strengthen the sense of belonging and cohesion of the class group. In contrast, in the control group, only 38% of students reported improvements in collaborative dynamics, highlighting a more fragmented and less integrated participation.

The data relating to students with specific learning disabilities were particularly relevant. In the experimental group, 82% of these students said they felt more included and supported, highlighting how interactive and multimodal activities facilitated the understanding of the content and reduced the sense of frustration.

The teachers confirmed an increase in the self-esteem and participation of these students, who showed a greater willingness to intervene and collaborate.

In the control group, on the other hand, students with specific learning disabilities reported greater difficulties, particularly in reading and writing activities, perceived as a source of anxiety. 65% of them described traditional lessons as not very inclusive with respect to their needs, underlining a distance between the teaching methods adopted and their learning styles.

Overall, the qualitative analysis confirms and enriches the quantitative results, highlighting how gamification has contributed to creating a more engaging, inclusive and emotional well-being learning environment, while promoting more effective and meaningful collaborative dynamics.

3.2 Analysis of quantitative data

The quantitative analysis showed statistically significant differences between the experimental group, which followed the educational path based on gamification, and the control group, which adopted a traditional approach.

Regarding anxiety levels, measured through the Spielberger Test Anxiety Inventory for Children (STAI-C), analysis of variance for repeated measures showed a significant effect of time, $F(2, 236) = 18.74$, $p < .001$, $\eta^2p = .14$, and a significant interaction between time and group, $F(2, 236) = 21.56$, $p < .001$, $\eta^2p = .16$. In particular, a significant reduction in anxiety levels was observed in the experimental group between the pre-test and post-test. State anxiety had an average decrease of 24.8% ($M_{pre} = 42.3$, $SD = 6.1$; $M_{post} = 31.8$, $SD = 5.4$), while trait anxiety showed a 29.6% reduction ($M_{pre} = 44.7$, $SD = 6.5$; $M_{post} = 31.5$, $SD = 5.9$), with statistically significant differences ($t(59) = 8.12$, $p < .001$, $d = 1.05$).

In the control group, on the other hand, the changes in anxiety levels were limited and not significant. State anxiety showed an average reduction of 5.2% ($M_{pre} = 41.9$, $SD = 6.3$; $M_{post} = 39.7$, $SD = 6.0$), while trait anxiety showed a decrease of 4.8% ($M_{pre} = 43.8$, $SD = 6.7$; $M_{post} = 41.7$, $SD = 6.4$), with values that are not statistically significant ($p > .05$). Overall, 62% of students in the experimental group experienced a significant reduction in anxiety levels, compared to 17% in the control group.

As for peer collaboration, measured through the Group Collaboration Scale, the results showed a significant increase in the experimental group. The analysis showed a significant effect of time, $F(2, 236) = 22.91$, $p < .001$, $\eta^2p = .17$, and a significant time-per-group interaction, $F(2, 236) = 25.34$, $p < .001$, $\eta^2p = .18$. In the experimental group, mean scores increased by 34.7% between pre-test and post-test ($M_{pre} = 3.1$, $SD = 0.6$; $M_{post} = 4.2$, $SD = 0.5$), with statistically significant differences ($t(59) = -9.03$, $p < .001$, $d = 1.17$).

On the contrary, in the control group, the increase in collaboration levels was modest and not significant ($M_{pre} = 3.0$, $SD = 0.5$; $M_{post} = 3.2$, $SD = 0.6$), with an average change of 6.3% ($p > .05$). Overall, 71% of the students in the experimental group showed an improvement in collaborative dynamics, compared to 22% in the control group.

An exploratory analysis conducted on students with specific learning disabilities showed particularly relevant effects in the experimental group. In this subgroup, a reduction in state anxiety of 39.5% and trait anxiety of 43.8% was observed, with high effect sizes ($d > 1.20$). In parallel, collaboration levels increased by 48.6%, indicating a greater improvement than the average of the entire experimental group.

In the control group, however, students with specific learning disorders did not show significant changes in levels of anxiety and collaboration. In some cases, a slight increase in state anxiety (+4.7%) was observed, suggesting a possible persistence of uncomfortable conditions related to traditional teaching methods.

Overall, the quantitative results indicate that the adoption of teaching strategies based on gamification produced a significant improvement in levels of emotional well-being and collaborative dynamics, with particularly marked effects in students with special educational needs.

4. Discussion

The present study aimed to analyze the impact of gamification on participation, peer collaboration and emotional well-being of students in lower secondary school, adopting a mixed-methods design. The results obtained, both quantitatively and qualitatively, offer converging evidence about the effectiveness of gamified methodologies in promoting a more engaging, inclusive and emotionally sustainable learning experience.

Firstly, quantitative data show a significant reduction in anxiety levels in the experimental group compared to the control group, with particularly marked effects for both state anxiety and trait anxiety. This result appears particularly relevant if we consider the central role that emotions play in learning processes. Anxiety, in fact, has been widely recognized as a factor capable of interfering with attention, working memory and information processing capacity (Varani, 2000). The significant decrease in anxiety levels observed in the gamified intervention group suggests that learning environments characterized by playful dynamics, immediate feedback and gradual progression may help reduce the pressure perceived by students, fostering a more positive emotional climate (Natalini, 2022).

This evidence is also reflected in qualitative data, in which the students of the experimental group describe the teaching activities as less stressful and more stimulating than traditional methods (Cappello, 2013). In particular, the possibility of learning through challenges and interactive activities seems to have reduced the fear of error, transforming it from an element of negative evaluation to an opportunity for learning. This change in perspective is particularly significant, as it helps to promote a culture of error as a resource, rather than as a failure, with relevant implications for the development of self-efficacy and intrinsic motivation (Rosa & De Vita, 2017).

At the same time, the results relating to peer collaboration show a significant increase in the experimental group, confirming the effectiveness of gamification in promoting more active and cooperative relational dynamics. Activities based on

group challenges, collaborative missions and role-playing fostered the construction of a learning context in which knowledge is co-constructed through peer interaction. This finding is coherently part of the perspective of distributed cognition, according to which learning emerges from the interaction between individuals, tools and contexts, rather than from exclusively individual processes (Johnson et al., 1996).

The qualitative evidence further strengthens this interpretation, highlighting how the students of the experimental group have developed a greater sense of belonging and a higher willingness to support each other. The collaborative dynamics observed are not limited to simple group work, but are configured as authentic processes of negotiation of meanings and shared construction of knowledge (Giannandrea, 2008). This is particularly relevant in the context of contemporary learning ecosystems, where the ability to collaborate and interact effectively is a key competence.

A further important element concerns the impact of gamification on students with specific learning disorders. The results show that this subgroup benefited even more from the intervention, recording a significant reduction in anxiety levels and an increase in participation and collaboration. This data suggests that gamification can represent a particularly effective strategy from an inclusive perspective, as it offers diversified, multimodal learning methods that are less rigidly anchored to traditional reading and writing channels (Fornasari, 2025).

The qualitative testimonies of students with specific learning disabilities highlight how the use of interactive tools, concept maps and visual activities has facilitated the understanding of the contents, while reducing the sense of frustration. This result appears consistent with the theories of multimodal learning, which emphasize the importance of offering multiple channels of access to information to respond to the diversity of cognitive styles (Schlemmer et al., 2015). In addition, the reduction in anxiety observed in this group suggests that less evaluative and more experiential learning environments may help improve the emotional well-being of students with difficulties, fostering more active and mindful participation.

On the contrary, the results of the control group show a substantial stability, or in some cases a slight worsening, in the levels of anxiety and collaboration, suggesting that traditional teaching methodologies may be less effective in responding to the needs of contemporary students. The testimonies collected indicate that lectures and traditional assessment methods are often perceived as a source of stress, particularly in contexts where error is associated with a negative evaluation. This figure raises important reflections on the need to rethink teaching practices in a more participatory and inclusive way (Fortuna, 2024).

Theoretically, the results of the study fit coherently into the framework of extended cognition and network learning ecosystems. Gamification, in fact, can be interpreted as a device that extends the mind beyond individual boundaries, integrating cognitive, emotional and social dimensions within interactive learning environments. Digital platforms, game dynamics and collaborative activities

contribute to creating a system in which learning emerges from the interaction between individuals and tools, taking the form of a distributed and dynamic process (Gini et al., 2025).

In this perspective, gamification is not simply a strategy to increase motivation, but is configured as a real cognitive environment, capable of reorganizing the ways in which students learn, participate and build meaning (Hamari et al., 2023). This aspect is particularly relevant in the context of onlife, in which learning experiences develop in hybrid spaces, characterized by the integration of the physical and digital dimensions.

Despite the positive results, it is important to consider some limitations of the study. First, the quasi-experimental design, based on pre-existing groups, limits the possibility of fully controlling the intervening variables and establishing definitive causal relationships. Secondly, the sample, although numerically adequate, is limited to a single school context, which may limit the generalizability of the results to other educational contexts.

A further limitation concerns the duration of the intervention, which, although extended enough to detect significant changes, does not allow to evaluate the long-term effects of gamification on learning processes and emotional well-being. In addition, the presence of uncontrolled variables, such as the teaching style of teachers or the classroom climate, may have influenced the observed results in part.

Despite these limitations, the study has several strengths. Firstly, the adoption of a mixed methods approach has made it possible to integrate quantitative and qualitative data, offering a more complete and articulated view of the phenomenon. Secondly, the attention paid to students with specific learning disabilities is an element of particular importance, helping to fill a gap in the literature relating to the effectiveness of innovative methodologies in inclusive contexts.

Finally, the longitudinal structure of the research design allowed to monitor changes over time, reinforcing the robustness of the results. Overall, the study helps to highlight the potential of gamification as a tool to promote more participatory, collaborative and well-being-oriented learning, offering useful indications for the design of more inclusive educational environments in line with the transformations of contemporary learning ecosystems.

5. Conclusions

In the context of current educational ecosystems, characterized by a growing integration between the digital dimension and teaching practice, the need to rethink teaching and learning processes in a more participatory, interactive and student-oriented way emerges. In this perspective, gamification is configured as a coherent response to the transformations of contemporary cognition, which is increasingly distributed, located and mediated by technologies.

The results of the present study highlight how the integration of gamification in lower secondary school contexts can represent an effective teaching strategy in promoting active participation, emotional well-being and peer collaboration. The gamified approach has been shown to significantly reduce anxiety levels and foster

more positive relationship dynamics, contributing to the construction of more inclusive and motivating learning environments.

Particularly relevant is the impact observed on students with specific learning disorders, for whom gamification has offered more flexible and less anxiety-inducing ways of accessing content, improving both engagement and the perception of self-efficacy. These results confirm the value of innovative methodologies in responding to the diversity of educational needs and in supporting equitable and participatory learning processes.

The study suggests the need to rethink teaching practices in a more interactive, experiential and well-being-oriented way, in line with the changes in contemporary learning ecosystems. In this perspective, gamification is configured not only as a methodological tool, but as an opportunity to redefine the role of the student and the teacher within increasingly dynamic, inclusive and connected educational environments.

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