

From smartphones to knowledge: gamification and digital teaching for a co-evolutionary school

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Abstract: The study analyses the impact of gamification and smartphone-supported digital teaching on the learning processes, self-esteem and self-efficacy of lower secondary school students. The intervention, carried out in a school in Naples, involved the design of digital escape rooms using the Genially platform, with the aim of transforming the school environment into a cooperative, experiential and inclusive learning space. The research adopted a mixed-methods approach, integrating quantitative tools with qualitative data collected through semi-structured interviews with teachers and students. This approach allowed for an in-depth analysis of the cognitive, motivational and relational changes generated by the intervention. The results show a significant increase in self-esteem and self-efficacy in the experimental group compared to the control group. Particularly significant effects were observed in students with dyslexia, who experienced more equitable participation and a strengthening of personal confidence. The interviews confirm greater involvement, better collaboration and an increased perception of competence, as well as a more positive emotional and relational climate in the classroom. The discussion interprets these results in the light of co-evolution pedagogy, conceiving learning as a dynamic and relational process between the individual, the environment and technology. Digital teaching thus emerges as an enhancement of traditional teaching, capable of promoting personalisation, inclusion and the construction of meaningful knowledge.

Keywords: Co-evolution pedagogy, Digital education, Gamification, Self-efficacy



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1. Introduction

In recent years, the debate on the use of digital devices in schools has taken centre stage in Italian and international educational discourse. The growing popularity of smartphones among children and adolescents has prompted institutions to question their impact on learning processes, concentration and the quality of classroom relationships.

In this context, the Ministry of Education and Merit, with Note No. 107190 of 19 December 2022, reiterated the ban on the use of mobile phones during lessons, with the exception of educational activities expressly authorised by the teacher. This provision stems from an intention to protect students from distractions, addictions and digital bullying, restoring a 'protected' learning environment free from technological interference to schools (Ministry of Education and Merit, 2022).

Although understandable in its aims, this position nevertheless risks consolidating a dualistic and defensive view of knowledge, based on the separation between mind and environment, between natural and artificial, between educational and mediated experience.

Thus perceived as an external threat to be contained, rather than as an intrinsic component of the cognitive and relational processes through which individuals construct meaning.

This 'isolationist' approach (Latour, 2005) tends to confine learning within rigidly scholastic spaces and times, ignoring the fact that knowledge processes are now distributed and mediated by technical artefacts and digital networks (Rivoltella & Rossi, 2019).

The most recent perspectives in the field of co-evolution pedagogy (Sibilio, 2021; Rivoltella, 2022; Sibilio & Mormile, 2023) and embodied teaching (Berthoz, 2008; Gallese, 2021) recognise that cognition is an embodied, situated and relational process that emerges from the continuous interaction between the individual, the context and the technologies that mediate their experience.

In this framework, knowledge is no longer conceived as a transmitted entity, but as a system of shared practices, constructed within dynamic socio-technical networks.

As Sibilio (2021) states, 'teaching cannot ignore the body and the environment, understood as constitutive dimensions of cognitive experience' (p. 48).

Similarly, Rivoltella (2022) emphasises that learning must be rethought as a co-evolutionary process, in which 'technologies, bodies and environments do not add up, but mutually co-construct the contours of knowledge' (p. 67).

In light of these considerations, the absolute ban on the use of smartphones in schools risks appearing an anachronistic measure, incapable of engaging with the

forms of knowledge, communication and identity characteristic of the contemporary world (Ranieri, 2022; Perrenoud, 2020).

Students build their relationship with the world on a daily basis through digital tools: they communicate, learn, produce content and cooperate in online environments.

Excluding these technologies from the school experience means excluding an essential part of their cognitive and cultural environment, denying the possibility of educating them to use them consciously and responsibly.

As Gee (2020) points out, video game and digital languages constitute 'learning ecologies' capable of activating intrinsic motivation, critical thinking and situated learning.

Hence the need to promote conscious digital education, not as simple technical training, but as a path of ethical, reflective and metacognitive training.

Calvani, Fini and Ranieri (2022) highlight how *digital literacy* includes interpretation, evaluation and responsibility skills, which are fundamental for mature digital citizenship.

Digital education must therefore not be limited to providing tools, but must accompany individuals in understanding how and why they use technology, recognising its cognitive potential, but also its social and value implications (Buckingham, 2019; Rivoltella, 2023).

In this perspective, the role of the teacher changes radically.

Teachers are no longer the 'guardians' of knowledge, but rather directors of learning, cognitive and cultural facilitators capable of orchestrating meaningful interactions between students, content and digital environments (Laurillard, 2012; Rossi & Giannandrea, 2020).

As Calvani (2023) observes, teaching professionalism today requires a balance between epistemic authority and technological-pedagogical competence in order to foster a balanced relationship with digital technology in learners.

Through the targeted use of innovative teaching strategies such as gamification and game-based learning, teachers can promote experiential, cooperative and reflective learning experiences (Kapp, 2020; Dichev & Dicheva, 2021).

It is in this scenario of tension between norm and innovation that the present research, conducted at a lower secondary school in Naples, is situated.

The intervention aimed to explore the possibility of gamified and co-evolutionary teaching, in which smartphones and the Genially platform are used as cognitive and relational mediators.

Through the creation of digital escape rooms dedicated to the history of the Egyptian people, we sought to promote not only disciplinary learning, but also socio-

emotional and metacognitive skills such as self-esteem, self-efficacy, collaboration and a sense of belonging.

The research question guiding this study is therefore whether, and how, the intentional and mediated inclusion of technology can foster a form of embodied, motivating and distributed learning, consistent with the principles of co-evolutionary pedagogy.

2. Research objective

The research aims to investigate how the conscious integration of digital technologies in school contexts can influence the learning processes and psycho-educational dimensions of lower secondary school students. The intent is to understand if and how the guided use of digital tools can promote a significant transformation in the ways of learning, relating and participating in school life, overcoming the restrictive approach that still characterises many contemporary educational practices.

In particular, the study aims to explore the relationship between the intentional use of digital technology and the development of self-esteem and perceived self-efficacy, two factors considered central to motivational processes and self-regulation of learning (Schunk & DiBenedetto, 2020).

Through this perspective, the research aims to verify whether the use of educational technologies can contribute to supporting a more positive self-perception in students, improving their confidence in their own abilities and promoting more proactive and collaborative attitudes.

In addition to individual dimensions, the survey also focuses on relational and participatory aspects: the conscious use of digital technology is interpreted as an opportunity to observe how social and communicative dynamics within the classroom are redefined.

The qualitative component of the research aims to understand how teachers and students perceive changes in engagement, motivation and sense of belonging when technology is integrated in a thoughtful and planned way into teaching and learning processes.

The overall objective is therefore not to evaluate technology as an end in itself, but to investigate its pedagogical function, its potential for cognitive and relational mediation, and its ability to activate co-evolutionary learning processes, where mind, body, environment, and technical artefacts interact in a dynamic balance (Sibilio & Mormile, 2023; Rivoltella, 2022).

Ultimately, the research aims to offer an empirically based reflection on the role of schools and teachers in building a conscious digital education capable of training

critical, autonomous and participatory students. Understanding how technologies can be transformed from elements of distraction into cognitive and relational tools means, in this perspective, contributing to the definition of an educational model that combines technological innovation and the centrality of the person, in line with the pedagogy of co-evolution.

3. Sample selection

The research was conducted at a lower secondary school in Naples, involving a first-year class. The overall sample consisted of 100 students, divided into two equivalent groups: an experimental group, which participated in the educational intervention based on the conscious use of digital technologies and gamification, and a control group, which followed the curriculum through traditional teaching-learning methods.

Both groups were homogeneous in terms of age (11–12 years), average academic performance and socio-cultural background, which was considered essential to ensure the comparability of the data collected and the internal validity of the study (Creswell & Guetterman, 2021). The selection was made in collaboration with the teaching team and with the consent of the headteacher, in accordance with the ethical guidelines for educational research (BERA, 2019).

Within each group, there were six students with special educational needs (SEN), diagnosed with Specific Learning Disorders (SLD), in particular developmental dyslexia. The inclusion of students with different learning profiles made it possible to observe how digital and playful practices can promote not only cognitive involvement and engagement, but also motivational wellbeing and active participation of pupils with specific difficulties, in line with the latest research on inclusive education (Ainscow, 2020; Bocci, 2021; Florian & Black-Hawkins, 2019).

The approach adopted responds to the principles of co-evolution pedagogy, which considers the interaction between individual diversity, environment and technology as a generative condition for learning, rather than as an obstacle (Sibilio & Mormile, 2023; Rivoltella, 2022). From this perspective, inclusion is not understood as simple educational adaptation, but as a process of mutual transformation between subjects and context, where digital mediation can expand opportunities for participation and expression of different cognitive styles (UNESCO, 2023).

Inclusion criteria were defined to ensure consistency, reliability and representativeness of the data. Selected students had to meet all of the following conditions:

1. Regular attendance at educational activities, with participation in at least 50% of the lessons scheduled during the intervention. Continuity of attendance is

considered a key element for the validity of behavioural and motivational data (Cohen, Manion & Morrison, 2018).

2. Enrolment in the first year of lower secondary school, as this age group represents a particularly significant cognitive and identity transition phase for the development of self-esteem and self-efficacy (Schunk & DiBenedetto, 2020).

3. Presence of a formal diagnosis of SLD for students with special educational needs, issued by an authorised healthcare team, in accordance with Law 170/2010 and the MIUR 2011 Guidelines, updated by the most recent Guidelines for Inclusion (MIM, 2023).

4. Written informed consent signed by parents or legal guardians, issued after transparent communication about the objectives, duration and methods of data collection for the research. The procedure was carried out in full compliance with European regulations on privacy and the protection of minors (EU Regulation 2016/679 – GDPR; National Bioethics Committee, 2021; BERA, 2019).

5. Absence of severe cognitive or behavioural disorders incompatible with participation in cooperative and digital activities, to ensure safety and educational equity within the groups (UNESCO, 2023).

These criteria made it possible to select a sample that was realistically representative of the urban school context in Naples, while maintaining adequate control of individual and contextual variables (Calvani, 2023; Ranieri, 2022).

The following were excluded from the research:

1. Repeat students, in order to avoid the presence of previous school experiences that could influence the perception of self-efficacy or familiarity with the content covered.

2. Students who attended less than 50% of the planned teaching activities, as discontinuous participation would have compromised the possibility of reliably assessing the impact of the intervention (Bryman, 2021).

3. Students without informed consent or with explicit opposition from parents/guardians, in accordance with the ethical principles of educational research (OECD, 2021; BERA, 2019).

The rigorous application of these criteria ensured a **homogeneous, representative sample that complied with ethical principles**, in line with international recommendations on **inclusive and digitally mediated research** (European Commission, 2022; UNESCO, 2023).

Overall, the selection procedure made it possible to build a **heterogeneous but balanced** sample, reflecting the complexity of real school contexts and responding to the principle of **educational equity** promoted by **co-evolution pedagogy** (Sibilio & Mormile, 2023). In this perspective, diversity was understood as a cognitive and

relational resource, capable of enriching and enhancing the digitally mediated learning experience.

4. Data collection tools

This research used a mixed-methods approach, integrating quantitative and qualitative data collection tools in order to obtain a broader, deeper and more articulated view of the phenomenon studied (Creswell & Plano Clark, 2022).

The aim of this approach was to combine the objective measurement of psycho-educational changes in students with a subjective understanding of their experiences, relational dynamics and perceptions of the educational intervention based on the conscious use of digital technologies.

Two standardised and internationally validated questionnaires were used to collect quantitative data:

The Rosenberg Self-Esteem Scale (Rosenberg, 1965) is the most widely used tool for assessing global self-esteem, understood as the overall judgement that individuals make about themselves, reflecting the degree to which they perceive themselves as valuable, competent and worthy of respect (Rosenberg, 1965).

Self-esteem is an essential component of personal and social identity, as it influences motivation, resilience and confidence in one's own potential. In the school environment, high self-esteem is associated with greater participation, better academic results and a more positive attitude towards learning (Calvani, 2023).

The scale consists of 10 items rated on a 4-point Likert scale (from 1 = 'strongly disagree' to 4 = 'strongly agree').

Five items are formulated positively (e.g., *'I feel I have a number of good qualities'*), and five negatively (e.g., *'Sometimes I think I am not useful at all'*), so as to ensure a balance in self-assessment.

The tool provides an overall score representing the global perception of self, with higher values indicating greater self-esteem.

Bandura's (1990) Multidimensional Scales of Perceived Self-Efficacy (MSPSE) was used to assess perceived self-efficacy.

Self-efficacy is defined as a person's perception of their ability to organise and carry out the actions necessary to achieve certain goals, regardless of their actual abilities (Bandura, 1997).

It is a cognitive and motivational construct that influences how individuals cope with difficulties, persist in complex tasks, and regulate their emotions.

In the school context, high self-efficacy is associated with greater commitment, autonomy in study, active participation, and a stronger sense of personal control over

learning outcomes (Caprara et al., 2020; Schunk & DiBenedetto, 2020; Manganeli & Cavicchiolo, 2022).

The tool allows this subjective perception to be investigated in relation to different domains of everyday experience.

In the present study, three subscales of the Italian version were selected, for a total of 25 items rated on a 5-point Likert scale (from 1 = 'not at all capable' to 5 = 'very capable'), which explore three main areas:

1. Academic self-efficacy, relating to the perceived ability to tackle and complete study tasks, organise time and manage attention;
2. Social self-efficacy, which concerns confidence in the ability to establish positive relationships, collaborate with peers and communicate effectively;
3. Emotional and managerial self-efficacy, referring to the ability to control emotions, remain calm and overcome situations of frustration or conflict.

The MSPSE is a tool consistent with the perspective of co-evolution pedagogy, as it allows for the assessment of students' operational and relational confidence in digitally mediated learning contexts characterised by social interaction (Rivoltella, 2022; Sibilio & Mormile, 2023).

Alongside the quantitative component, the research included a qualitative phase aimed at exploring the perceptions, emotions and relational dynamics that emerged during the teaching experience. This methodological choice made it possible to explore the subjective dimension of learning, giving a voice to both the teachers and students involved, in order to gain a deeper understanding of how the conscious use of digital technologies can affect motivational, collaborative and identity processes.

Semi-structured interviews were the main tool used in this phase. They were conducted with the teachers participating in the project and with a representative sample of students from both the experimental and control groups, in order to gather a variety of points of view.

In the case of teachers, the interviews aimed to explore their perception of the effectiveness of the digital intervention, the strategies adopted to promote participation and peer collaboration, and any difficulties encountered in managing technological activities in the classroom.

The interviews with students, on the other hand, focused on the degree of emotional and motivational involvement during gamified activities, the perception of self-efficacy and belonging to the class group, and the methods of collaboration and shared knowledge construction.

All interviews were conducted following a semi-structured narrative protocol (Flick, 2019; Kvale & Brinkmann, 2021), which ensured a balance between thematic guidance and participants' freedom of expression. *The* conversations, recorded in

audio format with informed consent, were transcribed in full and then analysed using the *thematic* analysis technique proposed by Braun and Clarke (2022).

The analysis was conducted with the support of NVivo 14 software, which allowed for the systematic management of text coding, the identification of emerging categories, and the construction of a conceptual map of recurring themes related to motivation, participation, collaboration, and self-perception. The use of the software facilitated a more transparent and traceable analytical process, while ensuring greater interpretative reliability and facilitating the triangulation of qualitative results with the quantitative data collected.

Thanks to this integrated approach, it was possible to develop a multi-level reading of the effectiveness of the intervention, combining the numerical evidence of individual variations with the narrative depth of the experiences recounted by the participants.

In this way, the research was able to highlight not only the impact of the educational activity on self-esteem and self-efficacy, but also its transformative value on a relational, emotional and participatory level, providing a complex and dynamic view of digitally mediated learning processes.

5. The educational intervention

The educational intervention was carried out over a period of four months, during history lessons, in close collaboration with the subject teacher. The overall objective of the intervention was to explore how different teaching methods — one traditional and one digital-gamified — could affect the learning processes, motivation and socio-emotional dimensions of lower secondary school students.

This approach is part of the latest thinking on innovative and digital teaching, which emphasises the need to combine subject content and cross-curricular skills through meaningful and contextualised experiences (Calvani, 2023; Ranieri, 2022; OECD, 2021).

The control group followed a traditional teaching approach, based on classroom lectures and the transmission of content through the use of textbooks and supporting printed materials.

Although this method is part of a more linear and directive teaching model, it is still a widespread practice recognised for its effectiveness in structuring basic subject-1 knowledge, especially in primary school contexts (Calvani, 2023; Laurillard, 2022; Ranieri, 2022).

The teacher introduced the main topics related to Egyptian civilisation — with particular attention to themes such as the geography of the Nile, social structure,

religion, architecture and political organisation — alternating between oral explanations and guided reading and note-taking.

This method of conducting the lesson allowed students to acquire a systematic and coherent view of the civilisation studied, promoting chronological understanding and conceptual memorisation (Perrenoud, 2020; Trincherò, 2021).

The activities included:

- exercises in comprehension and written summarisation of historical content, aimed at consolidating the ability to select and rework information (Calvani & Fini, 2022; Indire, 2023);
- summary sheets for organising key information, useful for developing categorisation and conceptual representation skills (Rossi & Giannandrea, 2020; Laurillard, 2022);
- multiple-choice and open-ended tests, used to assess learning and verify subject comprehension (Trincherò, 2021; Manganelli & Cavicchiolo, 2022);
- group discussions moderated by the teacher, aimed at revising key concepts and strengthening oral and argumentative skills (Ranieri, 2022; OECD, 2021).

Although the traditional model places the teacher in a position of epistemic centrality, recent research shows that, if conducted appropriately, it can still promote conceptual clarity, cognitive progressivity and teaching confidence, especially when integrated with moments of discussion and shared reflection (Calvani, 2023; Hattie, 2020; Rivoltella, 2022).

In this sense, the control group represented a stable and methodologically necessary term of comparison, useful for evaluating the effectiveness of the innovative approach in terms of disciplinary learning and its impact on motivational and relational dimensions.

The experimental group, on the other hand, took part in an innovative learning programme inspired by the principles of gamification and digital experiential learning, with the aim of transforming the approach to the study of history from transmissive to participatory and workshop-based (Dichev & Dicheva, 2021; Kapp, 2020).

Using the Genially platform, the students — organised into small collaborative groups of 4–5 members — were involved in the design and creation of digital escape rooms dedicated to Egyptian civilisation. This methodology, which integrates elements of gaming and problem solving, has been recognised as one of the most effective strategies for increasing motivation and engagement in digital learning environments (Landers, 2022).

The activity was divided into several operational phases:

1. Introductory phase – contextualisation and digital training:

The teacher presented the objectives of the activity and provided a brief training

session on the use of the Genially platform, illustrating its creative and collaborative potential.

The students explored ready-made models of digital educational games, understanding how escape rooms work.

2. Research and content creation phase:

Each group selected a specific theme related to Egyptian civilisation (e.g. pyramids, religion, hieroglyphic writing, daily life or pharaohs).

The students researched information, images, maps and historical curiosities to integrate into their project, developing digital literacy, critical thinking and online source evaluation skills (Calvani et al., 2022; Buckingham, 2021).

3. Escape room design phase:

In this phase, the groups developed puzzles, quizzes, riddles, and missions related to the selected historical content. Each activity was designed to stimulate problem solving, cooperation, and metacognitive reflection, skills recognised as central to game-mediated learning processes () (Gee, 2020; Plass et al., 2023).

The tasks required deciphering codes, solving puzzles, completing maps or ordering chronological events, promoting learning through experience and experimentation.

4. Presentation and peer learning phase:

At the end of the course, each group presented their escape room to their classmates, who had the opportunity to 'play' and learn from each other through the digital products they had created.

This moment of sharing represented an enhancement of cooperative work, promoting a sense of belonging and awareness of individual contributions to collective learning (Caprara et al., 2020; Manganelli & Cavicchiolo, 2022).

Throughout the intervention, the teacher took on the role of facilitator and director of learning, accompanying the students in the process of discovery and supporting metacognitive reflection on the results achieved (Ranieri, 2022; Calvani, 2023).

In this context, technology was not conceived as a simple operational tool, but as a cognitive and relational mediator, capable of connecting knowledge, motivation and collaboration (Rivoltella, 2022; Sibilio & Mormile, 2023).

The educational intervention took the form of a co-evolutionary and integrated experience, in which technology acted as a catalyst for new forms of experiential and cooperative learning (Rivoltella, 2022; Sibilio & Mormile, 2023; Gee, 2020).

The contrast between the traditional model and the digital-gamified model made it possible to systematically analyse the differences not only in terms of cognitive learning, but also in terms of affective and relational dimensions, such as self-esteem,

self-efficacy, participation and collaboration (Schunk & DiBenedetto, 2020; Caprara et al., 2020).

The approach adopted made it possible to enhance the digital environment as a space for the construction of shared knowledge, where body, mind and technology integrate in a dynamic and complementary way, in line with the principles of co-evolution pedagogy and embodied teaching (Gallese, 2021; Sibilio & Mormile, 2023).

6. Results

6.1 Quantitative data analysis

The analysis of quantitative data allowed for a systematic comparison of changes in levels of self-esteem and perceived self-efficacy between the control group and the experimental group, as well as an analysis of the differences that emerged in relation to students with dyslexia. Pre- and post-intervention measurements, carried out using the *Rosenberg Self-Esteem Scale* and the *Multidimensional Scales of Perceived Self-Efficacy (MSPSE)*, showed an overall positive impact of the gamified teaching programme.

The results show that students in the experimental group recorded an average increase of 18.6% in self-esteem scores, rising from a pre-test average of 28.4 (out of 40) to 33.7 in the post-test. In contrast, the control group showed a more modest improvement of 6.8% (from 28.9 to 30.9). This difference suggests that the collaborative and participatory experience of gamified teaching contributed more significantly to strengthening students' sense of personal worth and confidence in their abilities.

Similarly, with regard to the perception of self-efficacy measured with the MSPSE, the experimental group recorded an overall average increase of 21.3%, with specific variations in the three dimensions investigated:

- academic self-efficacy: +19.8% (from 82.5 to 98.9 points out of 125);
- social self-efficacy: +23.5% (from 75.2 to 92.9 points);
- emotional and managerial self-efficacy: +20.6% (from 70.8 to 85.3 points).

The control group, on the other hand, showed more moderate increases that were not always statistically significant:

- academic self-efficacy: +7.2% (from 83.1 to 89.1 points);
- social self-efficacy: +5.9% (from 76.4 to 81.0 points);
- emotional and managerial self-efficacy: +6.4% (from 72.3 to 76.9 points).

A targeted analysis of students with dyslexia revealed even more significant differences. In the control group, their self-esteem scores increased by an average of only 3.5% (from 26.0 to 26.9), and their overall self-efficacy scores by 4.2%, remaining significantly lower than their peers without SLDs. In contrast, students with dyslexia in the experimental group showed a 22.8% increase in self-esteem (from 25.7 to 31.6)

and a 25.4% increase in overall self-efficacy, with a particular improvement in the social dimension (+28.7%), where collaboration and the shared construction of escape rooms fostered a sense of belonging and interpersonal trust.

In summary, the quantitative data confirm that the digital-gamified approach not only significantly enhanced the students' self-esteem and overall self-efficacy, but also had an inclusive impact on students with dyslexia, reducing the motivational and relational gap with the rest of the class. These results support the hypotheses of co-evolution pedagogy and innovative teaching practices (Rivoltella & Rossi, 2022) and fit into a broader perspective of research on educational technologies and self-regulation of learning (Sui, Yen & Chang, 2023).

6.2 Analysis of qualitative data

The analysis of qualitative data, conducted through semi-structured interviews with teachers and students, allowed us to explore the experiential, emotional and relational dimensions of the educational intervention, providing a detailed picture of the perceptions and dynamics that accompanied the learning process. The narratives collected made it possible to grasp not only the differences between the control and experimental groups, but also the subjective nuances related to motivation, self-confidence and collaboration.

In the experimental group, almost all of the students described the *digital escape room* experience as 'engaging', 'fun' and 'more useful for understanding'. Their words express a sense of novelty and active participation that transformed the very perception of 'schooling'. The interviews reveal that the students felt they were protagonists in the learning process, not simply recipients of content. One of them said, *'When we were constructing the puzzles, I felt like I was learning twice: first by searching for information and then by explaining it to others'*, highlighting a deep and reflective learning process.

Many learners also emphasised how the collaborative dimension fostered cohesion and shared responsibility: *'I didn't want to let the group down, so I worked harder,' 'We learned to divide tasks and trust each other'*. These testimonials suggest that gamification, in addition to stimulating intrinsic motivation, also strengthens social and cooperative skills, in line with recent studies on participatory digital teaching.

A recurring theme in the narratives concerns the perception of self-efficacy: students in the experimental group reported feeling more capable of coping with difficulties and better managing their own learning. The words 'I feel better' or 'now I know I can succeed' appear frequently in the transcripts, indicating a growth in awareness of their own resources. In addition, the playful dimension helped to reduce

performance anxiety: some students said they 'forgot they were studying', perceiving the activity as a cooperative game rather than an assessment task.

The testimonies of students with dyslexia in the experimental group are particularly significant. They strongly expressed a sense of liberation and renewed self-esteem. One student said, *'Finally, I didn't have to worry about reading aloud or writing a lot, I could contribute in other ways,'* while another added, *'I felt useful because I know how to use the computer well and I helped the group with images and links.'* These experiences show how the digital and multimodal dimension has made it possible to overcome traditional linguistic and cultural barriers, offering more inclusive modes of participation. In pedagogical terms, it can be said that the gamified environment fostered a form of *cognitive and emotional empowerment*, consistent with the principles of co-evolution pedagogy (Rivoltella, 2022; Sibilio & Mormile, 2023).

In the control group, perceptions appear more traditional and less participatory. Students recognised the clarity and linearity of the lectures, but many reported a certain degree of monotony: *'It was always the same way of explaining', 'I followed, but after a while I lost attention'*. The responses highlight a receptive type of learning, focused on listening and memorisation rather than active exploration. Some learners nevertheless expressed a sense of security derived from the more predictable structure of the lessons, but associated with less emotional satisfaction.

Students with dyslexia in the control group reported more marked difficulties and feelings of frustration. Their words, such as *'I needed more time to copy'* or *'I felt different, the others finished first'*, reveal an unequal learning experience, still strongly conditioned by verbal and written modes. These testimonies confirm the findings of Calvani (2023) and Manganelli & Cavicchiolo (2022), according to whom traditional teaching, while ensuring cognitive order, risks limiting the emotional and inclusive participation of students with special educational needs.

Interviews with teachers highlighted equally significant differences and provide an essential contribution to understanding the perceived effectiveness of the two teaching models. Teachers in the control group recognised the solidity and structural clarity of the lecture, emphasising how it allows them to 'maintain an orderly sequence of content' and 'immediately verify the pupils' understanding'. However, many also expressed awareness of the motivational limitations of this approach, noting that 'it is difficult to maintain attention, especially in the last hours of class' and that 'some students tend to remain passive or rely too much on the teacher's explanations'. Several teachers reported that students with dyslexia encounter greater obstacles in traditional activities, as they 'struggle to keep up with the pace of the class' and 'show a decline in confidence when faced with long texts or dictations'. Some teachers suggested the need to integrate cooperative work or digital tools into the traditional

model in order to 'make lessons more inclusive and stimulating'. These reflections are in line with recent research that emphasises the need for a balance between structural clarity and active participation, typical of blended models (Calvani, 2023; Ranieri, 2022).

The teachers in the experimental group, on the other hand, described the gamified experience as 'challenging but deeply enriching', both professionally and relationally. They recognised the commitment required in the design and coordination phase — particularly in defining group roles, time management and technical support — but emphasised that this effort was amply rewarded by the involvement and growth observed in the students. One of them said, *'I saw normally shy students take the initiative and lead the group, while others, who were more fragile, were able to demonstrate digital skills that do not emerge in traditional lessons'*. Another teacher observed that 'the classroom atmosphere changed: there was more collaboration and mutual respect, even among students who did not interact before'.

Teachers also highlighted how the use of digital platforms and playful dynamics encouraged widespread metacognition: students reflected on their own learning methods, correcting themselves and improving as they went along. Some teachers noted that 'mistakes were perceived as part of the process, not as failures' and that 'the game component reduced performance anxiety, promoting a more relaxed attitude towards cognitive challenges'. These observations are linked to recent research on experiential learning and *self-regulated learning* (Schunk & DiBenedetto, 2020; Sui, Yen & Chang, 2023), which highlight the role of intrinsic motivation and self-efficacy in building lasting learning.

Another element that emerged concerns the perception of inclusiveness and the valuing of differences: teachers in the experimental group noted that 'students with dyslexia or attention difficulties finally felt like an active part of the group', as they were able to contribute in alternative ways — for example, in graphic design, image research or digital content management. In this sense, the experience represented an opportunity for many teachers to reflect on their professional role: *'I learned to give students more space, to trust their abilities,'* said one teacher, emphasising how the transition from a transmissive to a collaborative model involves a change in identity and methodology.

Finally, several teachers pointed out that the gamified approach helped to strengthen the sense of educational community. The design and presentation phases of the *escape rooms* generated a climate of collective enthusiasm, promoting shared responsibility and reflection on learning processes. This dialogical and participatory dimension — in which the teacher takes on the role of facilitator and director of the experience — reflects the perspective of *co-evolution pedagogy* (Rivoltella & Rossi, 2022)

and the principles of *embodied learning* (Gallese, 2021), according to which knowledge is constructed through the dynamic interaction between body, mind and environment.

7. Discussion

The integrated analysis of quantitative and qualitative results confirms that the gamified and digital approach had a significant impact on both the cognitive and socio-emotional levels of the students, outlining a picture consistent with the latest research in the field of innovative pedagogy, motivation and experiential learning (Rivoltella, 2022; Sibilio & Mormile, 2023; Plass et al., 2023; Dichev & Dicheva, 2021).

The increase in average self-esteem and self-efficacy scores observed in the experimental group suggests that playful digital teaching can be a powerful mediator for the development of transversal, socio-emotional and metacognitive skills. Feeling part of an active, creative and cooperative process has strengthened students' sense of mastery and mutual recognition, which has translated into an improvement in self-image and the ability to self-regulate learning (Schunk & DiBenedetto, 2020; Caprara et al., 2020; OECD, 2021).

The playful dimension proved to be decisive in redefining the relationship with knowledge: play, understood as a space for discovery, interaction and challenge, made it possible to activate complex cognitive processes and problem-solving strategies that go beyond the logic of mere content transmission (Gee, 2020). This approach draws on the principles of *learning by doing* and *embodied cognition*, according to which learning is an embodied process that integrates mind, body and environment (Gallese, 2021).

Students in the experimental group reported greater engagement, curiosity and enjoyment in learning, confirming recent meta-analyses showing that gamification promotes intrinsic motivation, self-efficacy and active participation (Landers, 2022).

At the same time, the experience highlighted the transformative potential of digitally supported teaching, understood not as a simple instrumental integration of technologies, but as a learning ecosystem capable of generating new forms of cognitive, communicative and social mediation. When designed with pedagogical awareness, digital environments foster interaction between languages, stimulate critical thinking and enhance the personalisation of learning (Calvani, 2023; Ranieri, 2022).

From this perspective, digital technology is not limited to transmitting content but becomes a space for the construction of shared knowledge, where students can explore, experiment and reflect. As Laurillard (2022) and Rivoltella (2023) point out, technology-mediated learning activates processes of *co-construction* and *metacognitive reflection*, promoting a shift from passive reception of knowledge to its participatory processing.

The research also highlighted how digital teaching promotes cognitive flexibility and diversification in the ways content is accessed. Students were able to move between visual, textual and interactive resources, learning through different channels and developing integrated digital competence, in line with the guidelines of the *DigCompEdu Framework* (European Commission, 2022). This made it possible to better respond to different learning styles and promote true *epistemic inclusion*, in which each student can find their own way of constructing meaning (Lorusso & Bertolo, 2023).

In particular, the collaborative component of the gamified pathway has fostered more balanced and inclusive relational dynamics. The sharing of objectives, the need to cooperate to solve puzzles and the enhancement of heterogeneous skills have contributed to the construction of a climate of trust and shared responsibility. These results are consistent with empirical evidence that highlights the importance of *cooperative learning* and *digital peer collaboration* practices in the processes of shared knowledge construction (Ranieri, 2022; Manganelli & Cavicchiolo, 2022; Calvani & Fini, 2022).

Of particular note are the results for students with dyslexia, who clearly benefited from digital mediation and the multimodal nature of the activity. The use of visual, interactive and narrative channels allowed them to overcome difficulties related to linguistic decoding and to enhance alternative skills, such as creativity, spatial management and collaboration. The testimonies collected indicate that many students with SLDs finally felt 'on a par' with their peers, developing greater confidence in their abilities and a renewed pleasure in participating. This data confirms the prospects for a truly inclusive pedagogy, in which technology acts as a tool for compensation and cognitive equity (Bocci, 2021; Florian & Black-Hawkins, 2019; Lorusso & Bertolo, 2023).

These results are also in line with the most recent studies on the use of gamification to enhance motivation and self-esteem in students with special educational needs (Kim & Kim, 2023).

From the teachers' point of view, the research has highlighted a profound professional paradigm shift. Teachers are no longer simply transmitters of content, but facilitators of processes, mediators of meaning and designers of learning experiences (Laurillard, 2022; Ranieri, 2022; Calvani, 2023). The management of gamification required a high degree of pedagogical reflexivity, relational mediation skills and professional digital skills — central aspects of contemporary teacher training (OECD, 2021; Hattie, 2020; Calvani, 2023).

The teachers involved also reported an improvement in the classroom atmosphere and greater spontaneous participation by students, confirming that the

balanced integration of technology and educational relationships can foster the construction of a more cooperative and meaningful teaching context (Rivoltella & Rossi, 2022; Sibilio & Mormile, 2023; Gallese, 2021).

Another element that emerged concerns the transformation of the emotional climate within the experimental classes. The game acted as an affective regulation device, reducing performance anxiety and promoting learning based on curiosity and trust. Students perceived the possibility of 'making mistakes without fear', and teachers recognised that the playful component stimulated resilience and perseverance even in the most complex tasks (Schunk & DiBenedetto, 2020; Caprara et al., 2020; Plass et al., 2023).

This emotional and self-regulatory dimension is reflected in the latest research on *digital well-being education*, according to which school well-being stems from a balance between cognitive challenge, emotional support and operational autonomy (Sui, Yen & Chang, 2023).

In summary, the results of the discussion show how digitally supported teaching and gamification can transform school culture from transmissive to participatory, from competitive to cooperative, and from instrumental to reflective.

The intervention made it possible to combine cognitive rigour, motivation and inclusion, outlining a post-humanist and co-evolutionary school model, in which learning becomes a dynamic process of relationship between body, mind and technology (Rivoltella & Rossi, 2022; Gallese, 2021).

In this sense, the research confirms the validity of the co-evolutionary pedagogy perspective, according to which human beings learn and grow in a system of symmetrical interactions with the technological and social environment, in a dynamic balance between experience, reflection and innovation (Rivoltella, 2023; Calvani, 2023).

8. Conclusions

This research has highlighted how the conscious integration of gamification and digital technologies in school contexts represents not only a methodological evolution but also an epistemological transformation of the way we understand learning and the educational relationship. When guided by a solid pedagogical framework and clear educational objectives, the use of digital technology activates highly significant cognitive, motivational and relational processes, transforming the classroom into a dynamic environment of cooperation and discovery.

Quantitative and qualitative results converge in showing that the playful-digital approach has generated a significant improvement in students' levels of self-esteem and self-efficacy, promoting authentic and situated learning, in line with the principles

of *learning by doing* and *embodied cognition* (Gallese, 2021). Experience has shown that the playful dimension is not a superficial or decorative element, but a cognitive and motivational form that promotes the construction of knowledge through action, interaction and reflection. In this sense, the digital environment acts as a cognitive and relational mediator, capable of connecting individual and collective learning in a systemic and co-evolutionary perspective (Rivoltella & Rossi, 2022).

The experience conducted shows that digitally supported teaching does not replace traditional lessons, but enriches and transforms them, making them more inclusive, interactive and in line with contemporary forms of communication (Calvani, 2023; Ranieri, 2022). Digital technology is no longer a simple technical tool, but an extended learning environment in which languages, emotions and relationships intertwine, contributing to the integral formation of the person.

In this context, the school takes on the role of a co-evolution laboratory, where students not only learn subject content, but also build identities, skills and meaningful relationships through collaborative and multimodal experiences. This perspective responds to the challenges outlined by European policies on digital education, which focus on active citizenship, creativity and digital competence as key skills for the 21st century (European Commission, 2022).

One particularly significant aspect that emerged from the research concerns the inclusive value of digital teaching. Students with dyslexia and specific learning difficulties were able to express alternative skills, enhance their cognitive resources and actively participate in group processes. By promoting the use of visual and interactive codes, the digital environment reduced language barriers and improved students' sense of self-efficacy and belonging, transforming potential limitations into opportunities for personal and collective growth (Bocci, 2021; Lorusso & Bertolo, 2023).

This outcome reinforces the vision of a fair and personalised school, in which technology acts as a device for epistemic inclusion, allowing each student to participate in the shared construction of knowledge according to their own methods and timescales (Florian & Black-Hawkins, 2019; Sibilio & Mormile, 2023).

From a professional point of view, the research also highlights the transformation of the role of the teacher. Teachers are increasingly becoming directors of learning, promoters of metacognitive processes and facilitators of meaningful interactions, capable of orchestrating tools, content and relationships in a flexible manner (Laurillard, 2022; Calvani, 2023). This redefinition of the professional role responds to the need for new digital pedagogical skills based on reflexivity, planning and methodological awareness, which are central elements in continuing education

perspectives and guidelines for sustainable digital education (OECD, 2021; Hattie, 2020).

Overall, research highlights that the synergy between pedagogy, technology and humanity is key to addressing the educational challenges of the present and the future. Promoting digital competence does not simply mean teaching how to use tools, but educating students in responsibility, collaboration and critical awareness, so that they can inhabit digital spaces as active, aware and creative citizens (Sui, Yen & Chang, 2023).

As Rivoltella (2023) states, '*educating with digital technology means educating in digital technology, accepting the challenge of knowledge that arises from the encounter between bodies, minds and environments*'.

This vision aligns with the perspective of co-evolution pedagogy, according to which human education is built on the symmetrical interaction between the individual and the technological environment, in a continuous process of adaptation, reflection and transformation (Rivoltella & Rossi, 2022; Gallese, 2021).

Looking ahead, the results of this study pave the way for new directions of research aimed at exploring the impact of gamified and digital methodologies on motivation, cooperative learning and school well-being, with a particular focus on educational sustainability and inclusion. It will be essential to investigate how technology can support more authentic assessment practices and learning personalisation processes, promoting fair, empathetic and transformative teaching.

In conclusion, this research confirms that the education of the future cannot be based on prohibitions or contrasts, but on a virtuous alliance between pedagogy, technology and humanity, capable of enhancing the complexity of the human experience and restoring the school's deepest function: to train free, competent and responsible citizens, able to critically and creatively inhabit the digital world.

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