NEW PEDAGOGICAL PARADIGMS AND EDUCATIONAL ECOSYSTEMS BETWEEN INNOVATION AND INCLUSION: AN EXPLORATORY STUDY

NUOVI PARADIGMI PEDAGOGICI ED ECOSISTEMI EDUCATIVI TRA INNOVAZIONE E INCLUSIONE: UNO STUDIO ESPLORATIVO

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ABSTRACT
This study investigates technology use in Italian schools through a survey of 1,394 teachers. While most recognize technology's benefits, infrastructural and training gaps persist, with younger teachers showing greater familiarity. Innovative methods like flipped classrooms remain underused. Teachers report increased student motivation but worry about excessive digitalization. Balancing innovation with relational teaching is key to sustainable, inclusive educational development.

Questo studio analizza l'uso delle tecnologie nelle scuole italiane attraverso un'indagine condotta su 1.394 docenti. Sebbene la maggior parte riconosca i benefici delle tecnologie, persistono carenze infrastrutturali e formative, con una maggiore familiarità mostrata dagli insegnanti più giovani. Metodologie innovative, come la flipped classroom, restano poco utilizzate. I docenti riportano un aumento della motivazione degli studenti, ma esprimono anche preoccupazioni per una digitalizzazione eccessiva.

KEYWORDS
Ecosystem, technology, learning
Ecosistema, tecnologia, apprendimento

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Introduction

The current educational landscape is marked by continuous transformation, driven by the rapid acceleration of technological innovation and the growing recognition of diverse learning styles. This shift necessitates the creation of learning environments that foster resilience and inclusion (Redecker, 2017). Digitalization and the introduction of new technologies are redefining the role of the teacher, from a mere transmitter of knowledge to a mediator and facilitator of learning, within a constructivist framework (Vygotsky, 1978; Mishra, Koehler & Henriksen, 2011).

Contemporary education is increasingly shaped by emerging technologies, which not only enable new forms of teaching and learning but also introduce innovative dimensions that revolutionize the very "core vocabulary" of education (Rivoltella, 2025). Artificial intelligence (AI), augmented reality (AR), and adaptive learning platforms are redefining educational methodologies, making them more interactive and personalized (Chaudhry & Kazim, 2022). However, the integration of technology into education also presents significant challenges. Infrastructural barriers, the digital divide, and the need for ongoing teacher training represent key obstacles that must be addressed through targeted policies and effective implementation strategies, in line with the principles of neuroeducation "to teach the brain that learns" (Rivoltella, 2024c).

This research stems from the need to explore the role of educational technologies and innovative teaching methodologies in the creation of adaptive educational ecosystems capable of effectively responding to the evolving needs of students (Lampou, 2023). An adaptive educational ecosystem is thus conceived not merely as a technologically advanced environment, but as a systemic and interconnected space that can adapt to the cognitive, emotional, and social specificities of learners (Pellegrini & Sebastiani, 2024a). In this context, the TPACK model (Technological Pedagogical Content Knowledge) has emerged as a key framework for understanding the effective integration of technology into teaching (Mishra, Koehler & Henriksen, 2011).

The ongoing transformations call for a rethinking of traditional pedagogical frameworks, replacing rigid paradigms with personalized and non-linear learning dynamics grounded in the interaction between emerging technologies, innovative teaching methodologies, and inclusive practices. The adoption of advanced digital tools, such as artificial intelligence, adaptive learning platforms, and augmented

reality, emerges within this context as one of the key drivers for the transformation of teaching and learning processes (Chaudhry & Kazim, 2022).

In summary, the concept of an adaptive educational ecosystem is rooted in well-established pedagogical theories and neuroscience. First and foremost, the constructivist approach emphasizes social mediation in the learning process and the critical role of the educational context. Kolb's experiential learning model (1984), which prioritizes active experimentation, aligns well with the use of interactive digital tools. In parallel, the Universal Design for Learning (UDL) framework advocates for a flexible educational architecture capable of addressing the needs of a diverse student population (CAST, 2018). Additionally, learning neuroscience has shown that neuroplasticity plays a key role in knowledge construction, underscoring the importance of stimulating learning environments (Bittencourt et al., 2023).

The analysis presented here is situated within the broader framework of international educational policies, which increasingly view the adoption of adaptive ecosystems as an opportunity to enhance learning processes and promote greater educational equity (UNESCO, 2011). Some school systems have already implemented digital platforms to personalize learning pathways, while others are experimenting with strategies based on immersive technologies or interdisciplinary learning approaches (OECD, 2019). Comparing these international experiences allows for the identification of effective models and the assessment of their transferability across diverse educational contexts.

However, the adoption of educational technologies raises critical issues related to accessibility, data protection, and the long-term sustainability of innovation. There is a significant risk of widening the digital divide (Rivoltella, 2024b) among students with differing levels of access and opportunity. Additionally, ensuring a balanced relationship between technological experiences and human interaction, as well as addressing the implications of personal data management, requires careful and ongoing reflection (Bah & Artaria, 2020). These concerns are central to preventing educational innovation from exacerbating inequalities rather than reducing them, thereby safeguarding the fundamental principle of equity (Fernández-Batanero et al., 2022).

The data collected suggest that, while the use of digital tools represents a valuable opportunity to enhance the effectiveness of learning pathways, significant infrastructural, training, and cultural barriers persist. Moreover, achieving a

balance between technological innovation and the relational dimension of teaching emerges as one of the key challenges for the school of the future.

In light of these findings, the present study aims to provide practical insights and strategic recommendations to promote the mindful and purposeful use of technology in education, within a framework of sustainable and inclusive development. The approach adopted not only offers an up-to-date snapshot of the current situation but also seeks to outline transformative trajectories that may guide future educational policies at both national and international levels.

1. Methodology and tools

This research arises from the need to gain a nuanced, evidence-based understanding of how digital technologies and innovative teaching methodologies are concretely integrated into the everyday realities of Italian schools. It is an empirical investigation carried out through the administration of a structured questionnaire, designed not only to capture the extent to which digital tools are used in educational practices, but also to give voice to the experiences, perceptions, and perspectives of the teachers who use them.

This study is situated within a theoretical framework that conceives education as a dynamic, interactive, and systemic process, in which the educational relationship is continuously renewed through the interplay of pedagogical knowledge, emerging technologies, and inclusive teaching approaches. From this perspective, the adoption of digital technologies is not seen as an end in itself, but rather as an enabling tool for the development of adaptive educational ecosystems, capable of responding flexibly and personally to the needs of an increasingly diverse student population (Pellegrini, 2024).

This investigation aims not only to assess how deeply technologies have entered school contexts, but also to understand how they are employed, what meaning they assume within teaching practices, and what methodological and relational effects they produce. Special attention is given to the perspective of teachers: understanding their attitudes, expectations, motivations, and resistances is essential to gaining deeper insight into both the opportunities and challenges associated with the digital transformation of education.

The analysis also aims to identify the main barriers, whether infrastructural, economic, organizational, or related to teacher training, that may hinder the effective integration of technologies into educational pathways. At the same time,

it seeks to highlight best practices and innovative strategies that support more inclusive, flexible, and learner-centered approaches to education.

Ultimately, the goal is to offer both a theoretical and empirical contribution to the development of educational policies and practical guidelines aimed at the mindful adoption of technologies, with a focus on equity, accessibility, and the sustainability of innovation. Rather than proposing predefined solutions, this research seeks to open a space for shared reflection, one in which the voices of teachers and the lived realities of Italian schools serve as the starting point for collectively reimagining the future of education.

In line with the critical and reflective approach that underpins the entire study, this research goes beyond merely describing the current state of digital technology integration in schools. It aims to offer a constructive contribution focused on identifying sustainable and replicable implementation strategies. The ultimate goal is to support a transformation that is not episodic or fragmented, but rather structural and systemic, one that can profoundly impact educational processes, enhancing both their quality and equity.

The introduction of technology-supported teaching methodologies is not merely a driver of instructional innovation, it is a necessary step in building dynamic, inclusive learning environments aimed at fostering the development of transversal skills. Among these, critical thinking, creativity, and adaptability emerge as central elements in preparing students to become informed, active citizens within a constantly evolving society.

The main instrument used in the quantitative phase of the research was a structured questionnaire, specifically designed based on a preliminary review of the scientific literature on educational innovation, educational technologies, and strategies for the personalization of learning pathways. The development of the questionnaire followed a rigorous process of internal validation, aimed at ensuring the consistency of the items, the clarity of the formulations, and the overall relevance of the questions in relation to the study's objectives.

The research followed a sequential explanatory design (Creswell & Plano Clark, 2018), which involved an initial quantitative phase, followed by a qualitative phase aimed at further exploration and interpretation. This approach enabled a richer and more nuanced understanding of the data through the triangulation of sources and the mitigation of potential biases that might arise from relying exclusively on a single data collection method.

The questionnaire was administered through an online platform (SurveyMonkey), a choice that enabled the research team to reach a large number of participants and streamline the processes of data collection and processing, while minimizing transcription errors. The validation of the instrument was further strengthened through a peer review phase conducted with experts in the fields of education and technology, who helped assess its theoretical robustness and scientific relevance, in alignment with the theoretical references identified (Redecker, 2017).

The structure of the questionnaire and its corresponding analytical dimensions is presented below:

Dimension	Description	Example Item
Sociodemographic profile	Collection of data related to age, gender, professional experience, and school context.	"What is your level of teaching experience?"
Digital competencies	Analysis of the level of familiarity with digital tools and the extent of training received.	"Have you ever attended a training course on educational technologies?"
Teaching methodologies adopted	Exploration of integrated teaching strategies, such as flipped classroom, gamification, and project-based learning.	"Which active teaching methodology do you use most frequently in your lessons?"
Types of technologies used	Identification of the digital tools employed, including educational software, augmented reality, and artificial intelligence.	"Indicate the technology you consider most useful for teaching"
Difficulties in adopting technologies	Identification of the main obstacles, such as resistance to change and lack of resources.	"What are the main barriers to integrating technology in the classroom?"
Perceived effectiveness of technologies	Assessment of the impact of technologies on motivation, learning, and inclusion.	"To what extent do you believe that technology enhances student learning?"

Table 1. Description of the analytical dimensions and example items included in the questionnaire

In designing the questionnaire, particular attention was given to balancing the quantitative and qualitative dimensions of the data collection process, with the aim of providing a nuanced and in-depth overview of the dynamics at play within educational settings. The questions were formulated using a variety of formats, each intended to capture different facets of the teaching experience.

The questionnaire included closed-ended questions, useful for collecting objective and immediately quantifiable data, as well as 5-point Likert scales designed to more precisely capture the intensity of perceptions related to specific areas, such as the use of digital technologies, perceived satisfaction with the effectiveness of the tools employed, and the perception of persisting structural and cultural barriers. These were complemented by open-ended questions, conceived as spaces for personal expression, where teachers could share observations, experiences, and individual reflections. These contributions enriched the quantitative analysis, allowing for a deeper and more nuanced interpretation of the data collected.

The questionnaire was administered to a total sample of 1.394 teachers from schools of all levels, distributed across the entire national territory. The study also involved students from the Tirocinio Formativo Attivo (TFA) program and the Bachelor's degree in Primary Education at Link Campus University, reflecting the direct engagement of future teaching professionals. The sample was selected using a proportional stratification criterion, aimed at ensuring balanced representation of the various types of educational institutions.

Participation in the study was voluntary, and the questionnaire was distributed entirely through digital channels, using institutional mailing lists and academic networks. This strategy facilitated high accessibility and enabled the collection of responses from a diverse pool of participants, ensuring broad and varied coverage of the national educational landscape.

Data collection was carried out through a dedicated digital platform, which enabled the automatic recording of responses and minimized transcription errors. To ensure data reliability, strict control criteria were applied: incomplete questionnaires and those containing clearly inconsistent responses were excluded from the analysis, in order to maintain the overall quality of the subsequent data processing.

The data analysis involved processing closed-ended and Likert-scale responses using descriptive statistical techniques, which were instrumental in identifying recurring trends, subgroup differences, and potential critical issues. Frequencies, means, percentages, and standard deviations were calculated to provide a detailed

quantitative overview of the educational context under investigation. Open-ended responses were analyzed using a qualitative content analysis approach, with the identification of recurring thematic clusters that complemented and enriched the interpretation of the numerical data (Krippendorff, 2018).

The study also took into account relevant independent variables, such as school level, experience with technology, and level of training. Analysis of Variance (ANOVA) was performed using SPSS software to ensure greater reliability of the results.

However, it is important to acknowledge certain methodological limitations. The use of self-reported questionnaires may have introduced social desirability bias, while the voluntary nature of participation may have led to the selection of a sample particularly interested in the topic of innovation, thus partially limiting the generalizability of the collected data.

Despite these limitations, the study offers a valuable contribution to the ongoing reflection on the evolution of the Italian educational system. The data collected provide concrete insights for the design of more targeted training initiatives and for the development of educational policies capable of effectively and sustainably supporting the integration of technologies in school settings. It is hoped that these findings will serve as a solid foundation for future actions in professional development and instructional innovation.

2. Results

The analysis of the data collected through the questionnaire provided a detailed and multifaceted overview of the integration of digital technologies into teaching practices, teachers' perceptions of educational innovation processes, and the challenges the school system must address to meet the demands of an ever-evolving society. The sample of teachers who participated in the study displayed a heterogeneous distribution in terms of age and professional experience, with a predominance of respondents in the 36–45 age group, followed by those aged 46–55, and younger teachers between 26 and 35. This demographic distribution offers a balanced representation of different teaching generations, allowing for the identification of intergenerational differences in the adoption of educational technologies (Figure 1).

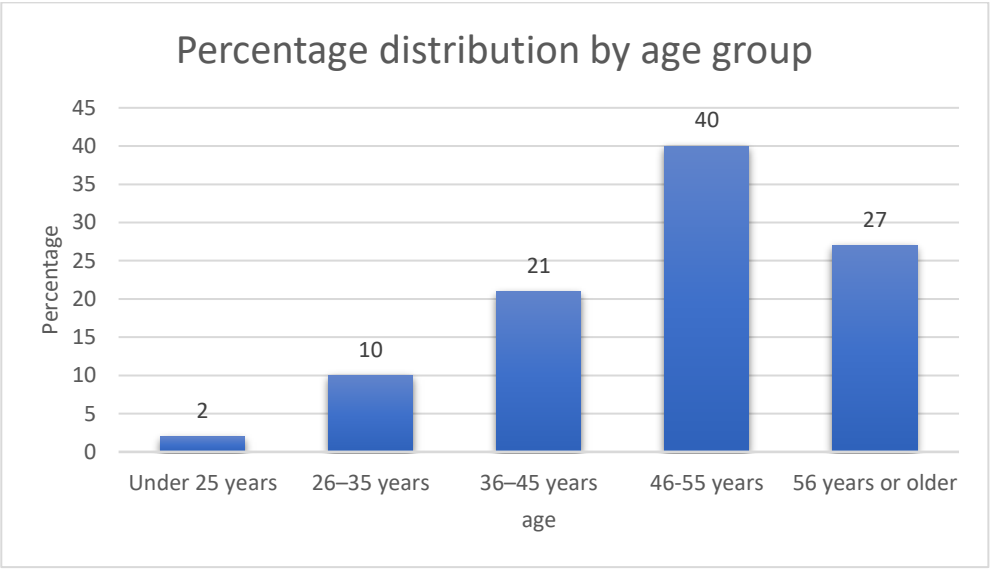

Figure 1. Percentage distribution by age group

The predominance of female respondents reflects an established trend within the education sector, accompanied by a significant presence of teachers with experience in special education. This indicates a widespread sensitivity toward issues of school inclusion (Figure 2).

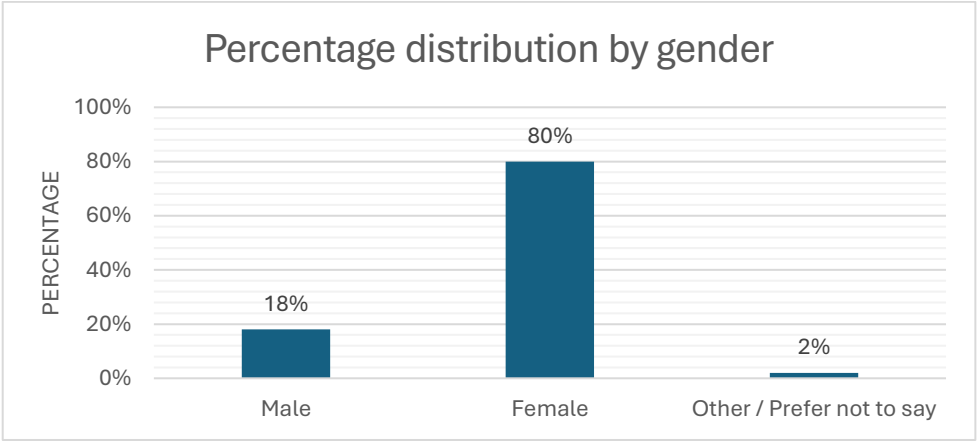

Figure 2. Percentage distribution by gender

The adoption of digital technologies in teaching is expressed through varied practices. While a substantial portion of the sample frequently uses digital tools to personalize instruction, a significant segment still demonstrates limited or occasional use (Figure 3).

The comparative analysis across age groups reveals that younger teachers tend to show a greater predisposition toward the use of digital technologies compared to their more experienced colleagues, indicating a correlation between generation and technological competence (Panciroli & Rivoltella, 2023). However, the data also suggest that continuous professional development may be a key factor in bridging the generational gap and fostering a more consistent adoption of digital resources across the teaching population (Laurillard, 2023).

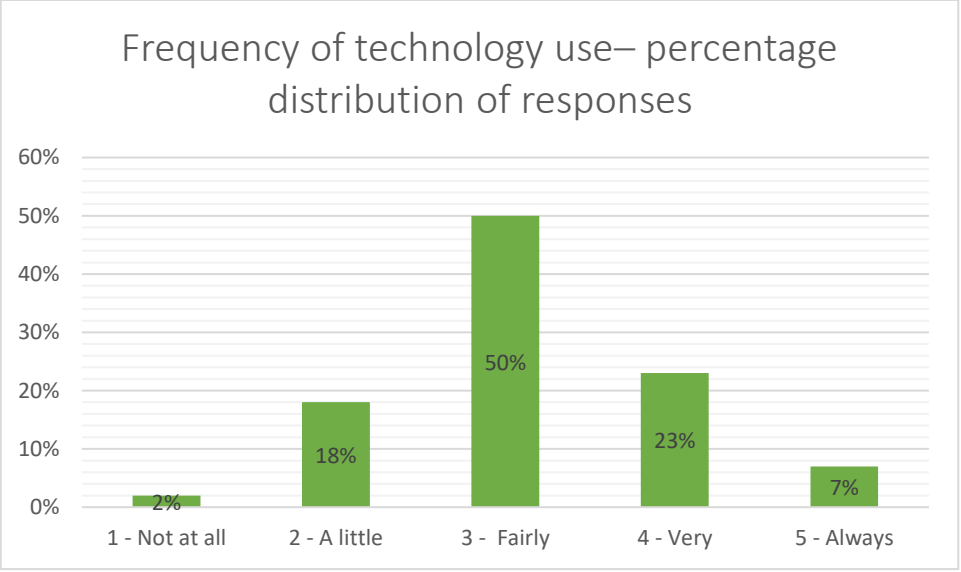

Figure 3. Frequency of technology use – percentage distribution of responses

Among the main challenges hindering the integration of emerging technologies in school settings, three predominant factors emerge: the lack of specific training, insufficient time to incorporate technologies into teaching practices, and the limited availability of resources in schools (Figure 4).

The first barrier is particularly relevant for less experienced teachers, who report the need for targeted training support to acquire more advanced digital competencies (De Rossi & Trevisan, 2021). The second barrier, related to infrastructural limitations, concerns the unequal access to technological resources across different educational institutions, with a disparity that disproportionately affects schools located in less developed areas (OECD, 2020). Finally, resistance to change emerges as a cultural obstacle, often stemming from a perception of technology as a complicating rather than a facilitating factor in teaching (Linn et al., 2023).

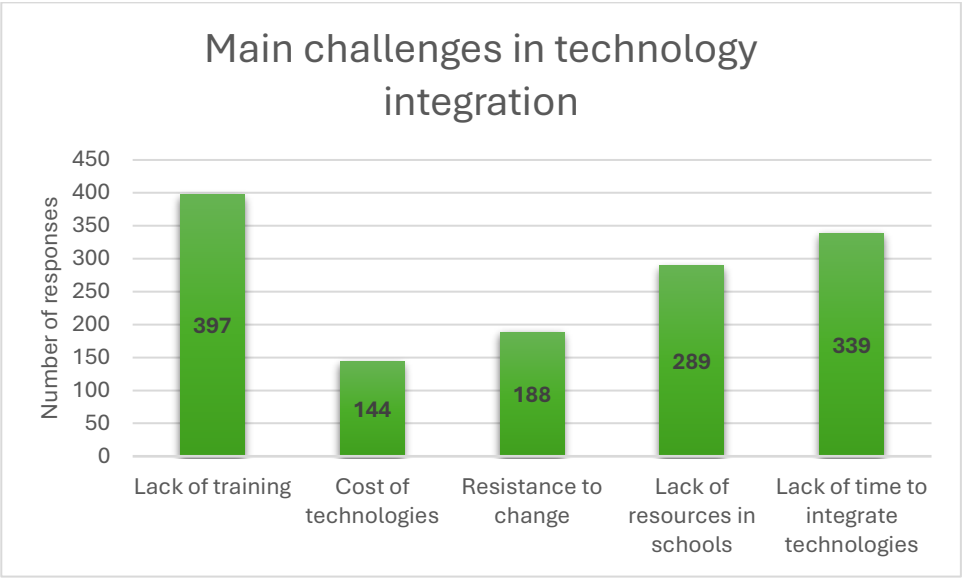

Figure 4. Main challenges in technology integration

A key finding of the study concerns the innovative teaching methodologies adopted by educators, including the flipped classroom, project-based learning (PBL), and gamification (Figure 5).

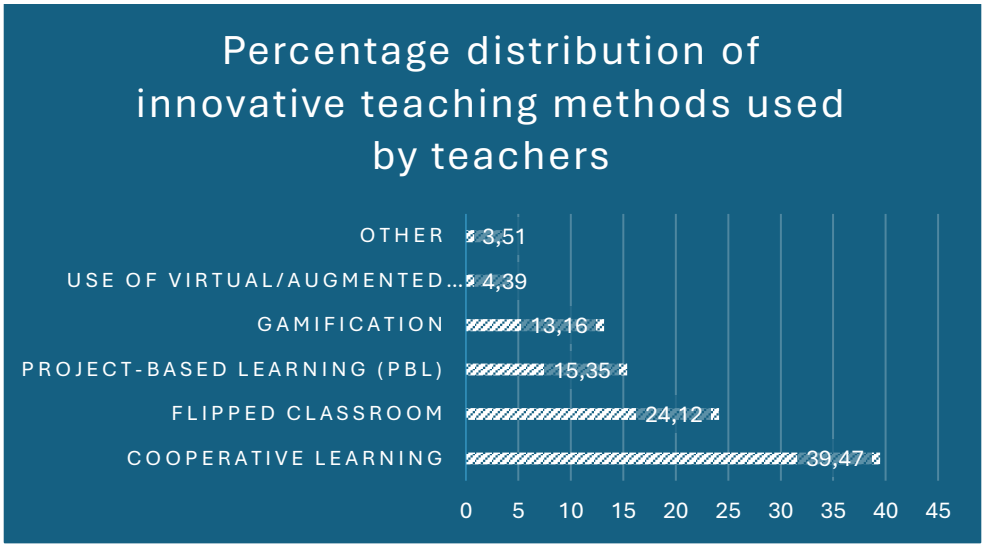

Figure 5. Percentage distribution of innovative teaching methods used by teachers

The combined use of these teaching strategies has been shown to have positive effects on student motivation, autonomy, and problem-solving skills (Pellegrini &

Sebastiani, 2024b). The survey results reveal that the implementation of innovative methodologies is closely linked to the use of digital technologies: teachers who frequently employ technological tools are also those who most actively adopt flexible and interactive teaching approaches (Rivoltella, 2024b). However, certain challenges emerge regarding the compatibility of these methodologies with traditional school curricula, which are often too rigid to systematically accommodate innovative teaching practices.

A particularly significant point concerns the evolving role of the teacher within an adaptive educational ecosystem. The vast majority of respondents agree that their role should shift toward that of a facilitator of learning, promoting the development of students' critical thinking and transversal skills (Baldacci, 2023). However, while the move toward a more dynamic teaching model is broadly endorsed, concerns arise regarding the sustainability of such a transformation in the absence of adequate institutional and professional support. Some teachers highlight the risk of an improvised transition, lacking a structured plan to ensure the effectiveness of the shift toward new modes of teaching (Cattaneo, 2021).

The analysis of the open-ended responses provided additional interpretative insights, particularly regarding the ideal characteristics of an adaptive educational ecosystem. Many teachers emphasized the importance of flexible learning environments, equipped with cutting-edge digital infrastructures and inclusive teaching methodologies. Moreover, a redefined vision of the teacher emerged, not as a one-way transmitter of knowledge, but as a facilitator who fosters discovery-based and self-directed learning. Several responses also underscored the need for more targeted and continuous professional development pathways, capable of supporting teachers in the transition toward more digitally integrated educational models. Finally, participants pointed out that the implementation of digital technologies should be accompanied by a broader reform of school curricula, in order to prevent educational innovation from remaining an isolated initiative.

In light of the findings, teachers suggest several key actions to make the school system more responsive to contemporary educational needs. Among the most frequently proposed measures are increased investment in digital infrastructure to ensure equitable access to technology across all educational institutions; the enhancement of continuous professional development through targeted training programs differentiated according to teachers' levels of technological competence; a revision of school curricula to allow for the structural, not episodic, integration of innovative methodologies; and greater institutional support for teachers, including

incentives and recognition for those who adopt innovative teaching approaches (Contini & Polese, 2023).

The comparative analysis of the data suggests that educational technologies constitute a strategic lever for the transformation of teaching; however, their widespread adoption is still hindered by structural, training, and cultural barriers. The relationship between professional experience, age, and willingness to use technology underscores the need for professional development plans that take into account the specific characteristics of different groups of teachers. The success of educational innovation does not rely solely on the availability of technological tools; rather, it requires a systemic approach that encompasses pedagogical, organizational, and institutional dimensions. For the educational ecosystem to truly become adaptive, a concerted effort is needed from institutions, educators, and the broader educational community (Sebastiani, 2024). The research presented here offers a significant contribution to the scientific discourse on educational transformation, providing insights and practical recommendations for building a more equitable, innovative, and resilient school system.

3. Discussion

The analysis of the data revealed a complex and nuanced picture, highlighting that the integration of digital technologies into educational processes should not be understood as a mere instrumental update, but rather as a profound transformation that affects structures, actors, and the very meaning of educational practice. Digitalizing education goes far beyond adding devices to the classroom. It involves rethinking educational processes, reconfiguring the teacher's role, redefining teacher-student relationships, and revisiting how knowledge is constructed and shared.

The teachers involved in the research generally show a positive attitude towards the use of technology, acknowledging its potential to increase interactivity, active participation, and personalized learning. However, alongside this openness, some important issues emerge, particularly regarding teacher training. Although professional development opportunities are widely available, many teachers report a structural gap, with training often limited to technical aspects and lacking deeper methodological insights. To achieve meaningful digital integration in education, it is important to support ongoing professional development that helps teachers not only use digital tools effectively but also design innovative and inclusive learning

environments where technology acts as a driver of pedagogical transformation (Ranieri, 2022).

In addition to teacher training, the study identifies significant challenges related to infrastructure and technical support, both of which are essential for the meaningful integration of technology in educational settings. The uneven distribution of devices and the varying quality of internet connectivity contribute to a digital divide that hinders equitable access to the opportunities offered by digital learning. This situation is further exacerbated by the lack of dedicated technical assistance, which often compels teachers to manage technological issues independently, with negative implications for instructional continuity and for their motivation to engage in innovation (Manzo, 2023).

Addressing these challenges requires structured interventions that combine infrastructural investments with the introduction of specialized professional roles focused on technical support and digital transition. At the same time, the analysis revealed that the use of technology in teaching remains largely tied to traditional, lecture-based practices, with more interactive and participatory methodologies often being overlooked. This finding underscores the need to accompany technological innovation with a substantial renewal of educational practices.

Despite the growing availability of advanced tools, genuinely transformative teaching practices, such as flipped classrooms, project-based learning, or the use of artificial intelligence for personalization, remain marginal. The use of digital technologies tends to remain confined within traditional models, reflecting a professional culture that is often rooted in established routines and pedagogical frameworks (Pagliara, Bonavolontà, and Mura, 2024).

This evidence calls for a transformation that is not only technological, but above all cultural and pedagogical. For innovation to have a meaningful impact on teaching and learning processes, it is essential to support teachers in engaging in critical reflection on their practices and to promote the adoption of methodologies aligned with a more inclusive, flexible, and future-oriented vision of education.

At the same time, the study highlighted that the effectiveness of technology in learning largely depends on its mindful and intentional use. While many teachers acknowledge its potential, there are also concerns about excessive or poorly integrated use, which can lead to distraction, reduce students' ability to concentrate, and hinder the development of critical thinking (Bates, 2022). These challenges point to the need for a pedagogically grounded use of digital resources,

ensuring that technology genuinely supports learning rather than becoming an obstacle to it.

Alongside these reflections, the issue of equity and digital inclusion emerges as a strategically important theme in contemporary educational discourse. When properly implemented, the digitalization of education can serve as a powerful lever for reducing inequality, ensuring that every student has access to personalized and inclusive learning pathways. However, the findings from this study reveal a still uneven landscape: access to technology is not consistent, and the digital divide continues to represent a tangible barrier to equal educational opportunities.

Schools located in socio-economically disadvantaged areas are often penalized by a lack of infrastructural and technological resources, with direct consequences for the quality of educational provision and for teachers' ability to adopt innovative methodologies. This asymmetry risks further deepening existing inequalities, particularly affecting those students who are most in need of support in their educational development (UNESCO, 2023).

In light of these considerations, there is an urgent need for targeted and structured educational policies capable of ensuring equitable access to digital technologies across the national territory. At the same time, it is essential to promote widespread digital literacy that involves not only students, but also teachers and families, so that technological innovation can truly become a tool for inclusion, participation, and educational equity.

The introduction of emerging technologies such as artificial intelligence and learning analytics tools opens up new and unprecedented scenarios, while also raising critical questions about the direction in which the digitalization of education is heading. These tools undoubtedly offer significant potential, particularly in terms of personalized learning pathways, progress tracking, and assessment support. However, alongside these opportunities, complex and sensitive challenges arise, requiring careful and thoughtful consideration.

In particular, the use of automated assessment systems, predictive algorithms, or monitoring platforms entails non-negligible risks, especially in relation to the protection of personal data, the transparency of decision-making processes, and educational equity. If not properly regulated, these tools may contribute to implicit forms of discrimination, oversimplify the complexity of learning, and reduce education to a set of numerical indicators (Panciroli and Rivoltella, 2023). The challenge, therefore, is not merely technical, but profoundly ethical and pedagogical.

In light of the findings that have emerged from this study, it becomes clear that digital innovation, in order to be truly effective and sustainable, cannot be reduced to the mere introduction of new technologies into school settings. A systemic and integrated approach is needed, one that considers the plurality of actors involved, the pedagogical specificities, and the structural conditions of each educational environment.

From this perspective, the continuous professional development of teachers plays a strategic role in fostering learning pathways that integrate technical and operational dimensions with methodological and pedagogical reflection. This requires moving beyond one-off training sessions and adopting models of professional development that are more participatory, context-sensitive, and practice-oriented. At the same time, it is essential to invest in the improvement of digital infrastructure and the strengthening of technical support, so that the use of technology is not perceived as an additional burden, but rather as a concrete opportunity to rethink and enhance the educational experience.

The future of educational digitalization will largely depend on the education system's ability to foster a culture of critical and informed innovation. Technology, in itself, does not guarantee improvement; rather, it is the way it is integrated, the context in which it is used, and the purposes for which it is employed that determine its educational value. The real challenge lies not simply in adopting new tools, but in building an educational ecosystem that harnesses the potential of digital technologies while preserving the human, relational, and reflective dimensions of teaching.

A balanced approach, capable of harmonizing tradition with innovation, pedagogy with technology, and efficiency with critical reflection, is essential for schools to face today’s transformations with awareness and to shape a more equitable, inclusive, and meaningful educational future.

Conclusions

The findings of this study confirm the increasingly central role of digital technologies in the evolution of educational processes. Far from being mere support tools, they represent structural and methodological drivers of transformation, with the potential to deeply influence teaching practices and the relational dynamics between teachers and students (Laurillard, 2023). The integration of digital tools should therefore not be seen as a simple technical

upgrade, but rather as an opportunity to rethink teaching in more inclusive, flexible, and future-oriented terms.

The analysis has highlighted that continuous teacher training is an essential condition for the effective use of technology in the classroom. Without a solid and methodologically informed preparation, there is a risk that innovation will remain a marginal experiment, unable to bring about meaningful changes in teaching paradigms (Ranieri, 2022). At the same time, a persistent digital divide continues to hinder educational equity: infrastructural disparities and differences in digital competencies among schools, regions, and stakeholders still limit equal access to resources.

The introduction of advanced tools such as artificial intelligence and adaptive learning platforms opens up new possibilities in terms of personalization, student monitoring, and support. However, these technologies raise important ethical and pedagogical questions. It is essential that their use be guided by a critical and informed perspective, one that avoids the standardization of educational processes and the reduction of learning to mere automation (Selwyn, 2023).

From this perspective, digital innovation cannot be imposed nor adopted uncritically; it requires a systemic approach, grounded in infrastructural investment, digital literacy initiatives for all educational stakeholders, and a rethinking of existing pedagogical models. For technology to become a genuine driver of improvement, it must be harmoniously integrated with the human dimension of education, supporting the development of skills, relationships, and critical thinking (Panciroli and Rivoltella, 2023). Only through coordinated and forward-thinking action can digital education become a true driver of cultural growth and social cohesion, rather than a temporary adjustment or, worse, a new source of inequality.

Author contributions

For the purposes of formal attribution, it should be noted that Riccardo Mancini is the primary author of “Introduction”, Sara Pellegrini is the primary author of Sections 4 “Discussion” and “Conclusions”, Riccardo Sebastiani is the primary author of Sections 1 “Methodology and Tools” and 2 “Results”.

References

Bah, Y. M., & Artaria, M. D. (2020). Corona virus (COVID-19) and education for all'achievement: Artificial intelligence and special education needs-achievements and challenges. International Journal of Counseling and Education, 5(2), 64-70.

Baldacci, M. (2023). Per un'idea di insegnante. Pedagogia più Didattica, 9(2), 30-50.

Bates, A. W. (2022). Teaching in a digital age: Guidelines for designing teaching and learning. OpenTextBC. Retrieved from https://opentextbc.ca/teachinginadigitalage/

Bittencourt, I. I., Chalco, G., Santos, J., Fernandes, S., Silva, J., Batista, N., & Isotani, S. (2023). Positive artificial intelligence in education (P-AIED): A roadmap. International Journal of Artificial Intelligence in Education.

CAST. (2018). Universal design for learning guidelines version 2.2.

Cattaneo, A. (2021). Come integrare le tecnologie digitali nell'insegnamento in modo efficace. SUPSI. Disponibile su: https://www.suffp.swiss/sites/default/files/2022-02/trendbericht_3_-18-21_cattaneo-_it.pdf

Chaudhry, M. A., & Kazim, E. (2022). Artificial intelligence in education (AIEd): A high-level academic and industry note 2021. AI and Ethics, 2(1), 157-165.

Contini, F., Polese, M. (2023). Artificial Intelligence and the Future of Inclusive Education in Italy: Case Studies From Italian Universities. Milano, Italy: Università degli Studi di Milano.

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research. SAGE Publications.

De Rossi, M., & Trevisan, O. (2021). Ripensare la didattica in periodo emergenziale: Progettualità e sostenibilità dell'integrazione delle tecnologie nella scuola. Formazione & Insegnamento, 19(1), 491-504.

Fernández-Batanero, J. M., Montenegro-Rueda, M., Fernández-Cerero, J., & García-Martínez, I. (2022). Digital competences for teacher professional development. European Journal of Teacher Education, 45(4), 513-531.

Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Englewood Cliffs, NJ: Prentice Hall.

Krippendorff, K. (2018). Content analysis: An introduction to its methodology. SAGE Publications.

Lampou, R. (2023). The integration of artificial intelligence in education: opportunities and challenges. Review of Artificial Intelligence in Education, 4(00), e015-e015.

Laurillard, D. (2023). Online learning futures: An evidence-based vision for global professional collaboration on sustainability. Routledge.

Linn M. C., Donnelly-Hermosillo D., & Gerard L. (2023), Synergies between learning technologies and learning sciences: Promoting equitable secondary school teaching. In Handbook of Research on Science Education. London, Routledge.

Manzo, G. (2023). L'intelligenza artificiale per la didattica speciale: Nuove forme di comunicazione. Anicia.

Mishra, P., Koehler, M. J., & Henriksen, D. (2011). The seven trans-disciplinary habits of mind: Extending the TPACK framework towards 21st-century learning. Educational Technology, 22-28.

OECD. (2019). TALIS 2018 results (Volume I): Teachers and school leaders as lifelong learners. OECD Publishing.

OECD. (2020). Education at a glance 2020: OECD indicators. OECD Publishing.

Pagliara, S. M., Bonavolontà, G., & Mura, A. (2024). Educating with artificial intelligence through an inclusive lens: New horizons for personalisation. Journal of Inclusive Methodology and Technology in Learning and Teaching, 4(1).

Panciroli, C., & Rivoltella, P. (2023). Pedagogia algoritmica per una riflessione educativa sull'intelligenza artificiale. Morcelliana.

Pellegrini, S. (2024). Biopedagogia e Intelligenza Artificiale. Nuovi scenari inclusivi per una pedagogia di precisione. QTimes - Journal of Education, Technology and Social Studies, 16(3), 635-643.

Pellegrini, S. Sebastiani, R. (2024a). Democrazia, equità e uguaglianza nei contesti di vita. Italian Journal of Special Education for Inclusion, 12(1), 148-161.

Pellegrini, S. Sebastiani, R. (2024b). L'integrazione di IA e tecnologia assistiva nella didattica speciale: un cambio di paradigma nella formazione degli insegnanti e nel supporto agli studenti. Italian Journal of Special Education for Inclusion, 12(2), 146-157.

Ranieri, M. (2022). Competenze digitali per insegnare. Carocci.

Redecker, C. (2017). European framework for the digital competence of educators: DigCompEdu. Publications Office of the European Union.

Redecker, C. (2017). European framework for the digital competence of educators: DigCompEdu. Publications Office of the European Union.

Rivoltella, P. C. (2024a). Intervento e competenze per le professioni educative nella condizione postmediale. In COO.DE: Cooperative Digital Education (pp. 33-39). Trento: Erickson.

Rivoltella, P. C. (2024b). Le virtù del digitale. Per un'etica dei media. Brescia: Morcelliana.

Rivoltella, P. C. (2024c). Neurodidattica. Insegnare al cervello che apprende. Milano: Raffaello Cortina.

Rivoltella, P. C. (2025). Dire la scuola. Lessico Minimo. Brescia: Scholè.

Sebastiani, R. (2024). Strategie didattiche: l'inclusione nell'età della globalizzazione. Q-Times - Journal of Education, Technology and Social Studies, 16(2), 45-58.

Selwyn, N. (2023). Should robots replace teachers? AI and the future of education. Polity Press.

UNESCO. (2011). UNESCO ICT competency framework for teachers.

UNESCO. (2023). Global education monitoring report 2023: L'uso della tecnologia nell'educazione globale. Retrieved from https://www.unesco.it/it/temi-in-evidenza/educazione/global-education-monitoring-report-2023-luso-della-tecnologia-nelleducazione-globale

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes (M. Cole, V. John-Steiner, S. Scribner & E. Souberman, Eds. & Trans.). Cambridge, MA: Harvard University Press.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. International Journal of Educational Technology in Higher Education, 16(39).