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Personalizzazione didattica e intelligenza artificiale: impatti, sviluppi e criticità in educazione

Artificial intelligence and personalization of learning: experiences and perspectives of Italian teachers

Intelligenza artificiale e personalizzazione dell'apprendimento: esperienze e prospettive degli insegnanti italiani

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ABSTRACT

Artificial intelligence (AI) is emerging as a key tool for personalizing learning, as highlighted by the European Commission (2023) and UNESCO (Miao & Cukurova, 2024). Technologies such as intelligent tutoring systems, adaptive learning platforms, and learning analytics dashboards are transforming teaching practices and redefining the teacher's role (Tapalova & Zhiyenbayeva, 2022; Holmes et al., 2019; Hwang et al., 2020). This study explores the perceptions of teachers from 91 Italian schools involved in the European AI4T project (Artificial Intelligence for and by Teachers, Erasmus+), revealing both interest in the potential of AI and concerns about its implementation. The data show generally positive attitudes but also caution among educators, offering an empirical basis for understanding the role and impact of AI in schools and in the personalization of learning.

SINTESI

L'intelligenza artificiale (IA) si sta affermando quale strumento chiave per personalizzare l'apprendimento, come indicano la Commissione Europea (2023) e l'UNESCO (Miao & Cukurova, 2024). Tecnologie come *tutor* intelligenti, sistemi adattivi e *dashboard* stanno trasformando la didattica e ridefinendo il ruolo del docente (Tapalova & Zhiyenbayeva, 2022; Holmes et al., 2019; Hwang et al., 2020). Questo studio esplora la percezione degli insegnanti di 91 scuole italiane coinvolte nel progetto europeo AI4T (*Artificial Intelligence for and by Teachers*, *Erasmus+*), evidenziando sia interesse per le potenzialità dell'IA, sia accortezze legate alla sua applicazione. I dati rivelano opinioni favorevoli, ma anche cautele da parte degli insegnanti, offrendo una base empirica per comprendere il ruolo e l'impatto dell'IA nella scuola e nella personalizzazione dell'apprendimento.

KEYWORDS: artificial intelligence, personalization of learning, teacher perception

PAROLE CHIAVE: intelligenza artificiale, personalizzazione dell'apprendimento, percezione dei docenti

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Introduction

Artificial intelligence (AI) is emerging as one of the most significant innovations in the contemporary landscape. Its pervasiveness and transversality profoundly affect the ways of accessing knowledge, the dynamics of educational relationships, and the possibility of personalizing learning paths in previously unimaginable ways (Luckin et al., 2016; Holmes et al., 2022). Such a change is fueling growing interest in the scientific and pedagogical community, as highlighted by the pioneering studies of Fahimirad and Kotamjani (2018), who explored the multifaceted potential of AI to revolutionize teaching and learning, hypothesizing a central role for AI in the future educational ecosystem. Personalization of learning, understood as the intentional adaptation of contents, times, methodologies, and tools to the individual characteristics of students, constitutes a key objective in contemporary educational policies (Tomlinson, 2014; OECD, 2018) and finds a powerful ally in AI.

The use of generative AI today represents one of the most promising frontiers for the personalization of learning, contributing substantially to making education more inclusive, effective, and student-centered. This push towards increasingly tailor-made teaching is realized through various AI-based tools. Among these, adaptive environments stand out (Hwang et al., 2020), learning analytics tools for continuous and timely assessment of progress (Ifenthaler & Yau, 2020), and rapid response and evaluation systems (Popenici & Kerr, 2017). The artificial intelligence in education (AIED) approach is part of this direction, which considers AI not as a substitute for the teacher but as a pedagogical ally capable of strengthening the effectiveness of teaching by providing personalized resources, enhancing teaching interactions, and improving the quality of feedback, with a positive impact on students' motivation, engagement, and sense of self-efficacy (Baker et al., 2021). In addition to these features, one of the areas in which this technology shows the greatest impact is the modeling of the training experience (Mulyani et al., 2025). Adaptive learning environments powered by AI, in fact, dynamically adjust the pace, content, and teaching methodologies based on the progress and responses of students (Pesovski et al., 2024; Su & Yang, 2023). This technology, thanks to its ability to generate content in real time from learned models, allows us to dynamically adapt the training offer to the individual characteristics of students, responding promptly to their preferences, strengths, and specific difficulties (Tapalova & Zhiyenbayeva, 2022). With regard to direct support for students, research highlights how generative AI provides personalized and timely feedback, useful for filling gaps and improving performance (Dai et al., 2023), and effective scaffolding strategies for individual learning (Albacete et al., 2019; Tarus et al., 2018).

Similarly, generative AI is configured as a valuable support tool for teachers, facilitating the constant monitoring of student progress and the timely identification of emerging critical issues. It allows for receiving detailed diagnostic feedback and adapting teaching strategies in real time (Heffernan & Heffernan, 2014; Luckin, 2017). Furthermore, AI allows teachers to generate personalized teaching materials, calibrated to specific needs, supporting student understanding, engagement, and

motivation (Alasadi & Baiz, 2023; Chen, 2023). In this framework, as Rios-Campos and colleagues (2023) point out, the adoption of such technologies can really catalyze educational innovation aimed at building a more equitable and effective school, centered on the individual needs of students.

In his recent contribution, Ranieri (2024) proposed a useful classification of AI tools for education, dividing them into 4 main categories:

- intelligent tutoring systems provide personalized feedback, targeted suggestions, and extra resources based on student data;
- content recommendation systems suggest materials and activities aligned with students' interests and abilities;
- learning monitoring systems detect early learning difficulties through classroom data analysis;
- automated assessment systems evaluate student work, offering objective performance feedback.

This schematization helps to understand the variety of possible applications and their integration in educational contexts, placing the emphasis on different but complementary functions.

However, despite the many advantages, the adoption of AI tools in the educational context is not free of potential risks. These are widely recognized in the literature, where the issue of protecting the privacy of students' data, the possible reduction of significant human interactions within the educational context, and the importance of developing a critical reading of the educational contexts in which AI is applied emerge as crucial (Ranieri, 2024; Mulyani et al., 2025; Holmes et al., 2019; European Commission, 2022; Miao & Cukurova, 2024).

In the school context, the implications and critical issues that emerged with the introduction of AI take on particular relevance. Learning in these phases is profoundly influenced by cognitive and socio-emotional variables linked to student development. In this context, the teacher maintains a crucial role in managing the educational relationship and in cultural mediation, as already highlighted by Erikson's theory of psychosocial development (1968), which underlines the importance of significant relationships in growth and learning processes. The introduction of AI at these levels therefore requires accurate pedagogical planning and conscious ethical and formative reflection (Cardona et al., 2023; European Commission, 2022).

For AI adoption in schools to be effective and sustainable, it is essential to consider teachers' perceptions. According to the technology acceptance model (TAM) by Venkatesh and Davis (2000), the intention to use a technology depends on its perceived usefulness, ease of use, and cultural and professional factors. Despite a growing recognition of the transformative potential of AI, teachers remain concerned about the possible loss of the human role in the educational relationship and the need for continuous training to effectively integrate these technologies (Popenici & Kerr, 2017), as well as ethical questions related to data management, algorithm transparency, and privacy protection (Floridi et al., 2018; Ranieri, 2024). For this reason, the introduction of AI cannot be reduced to a mere instrumental

update: it must be part of a careful educational governance, which considers the ethical, organizational, and professional implications, and which promotes targeted training processes (European Commission, 2022).

The Digital Education Action Plan 2021–2027[2] has highlighted the crucial importance of improving teachers' skills in AI and establishing moral principles for its use. Through this plan, the European Union promotes a more digital, inclusive, and innovative school, indicating to member states the need to strengthen digital skills and educational infrastructures. In Italy, the Ministry of Education and Merit (MIM) has implemented the European indications through a broad training plan for school staff with specific attention to the educational use of AI.

Only through training actions dedicated to teachers can AI truly contribute to building more inclusive, personalized, and effective education.

1. Context of the study: the AI4T Project

In this scenario, the AI4T (Artificial Intelligence for and by Teachers) project, funded by Erasmus+, aims to develop teacher training modules in 5 European countries, including Italy. The MIM participated, with *INDIRE* evaluating the impact of the training nationally. The evaluation involved a two-phase survey: quantitative and qualitative. A total of 91 upper secondary schools were involved (50% high schools, 40% technical institutes, and 10% vocational schools) along with 438 teachers, 56 principals, and 1,590 students. In the quantitative phase, pre- and post-intervention questionnaires were administered to teachers and principals in both experimental and control groups (December 2022 and May/June 2023). The qualitative phase focused on schools that received the training, involving principals in interviews and teachers in focus groups. This phase took place between March and May 2023, with further analysis from May to June. The study aimed to assess the effectiveness of the AI-based training on teaching practices and school organization.

2. Methodology and research aims

This study examines teachers' opinions and their pedagogical, ethical, and practical reflections concerning AI and its use for the personalization of learning. An explanatory sequential design was utilized, commencing with a quantitative phase followed by a qualitative one[3]. Data were gathered through questionnaires administered to teachers and group interviews held after the AI4T training. The analytical approach is descriptive: the quantitative findings present a general view

[2] https://education.ec.europa.eu/focus-topics/digital-education/action-plan?utm_source=chatgpt.com.

[3] For an in-depth discussion of the methodology adopted and the data collection techniques, see Paris A., Labetoulle A., Chesné J. F., Bezjak S., Butler D., Cardoso-Leite P., ... and Mori, S. (2023). *AI4T National Evaluation Report-France* (Doctoral dissertation, Laboratoire Formation et Apprentissages Professionnels; Cnesco). https://hal.science/hal-04556695/.

of teachers' attitudes and behaviors, whereas the qualitative offer a detailed understanding of their emotions and perceptions related to the integration of AI-based technologies in educational settings and their role in supporting the personalization of learning.

2.1. The sample

The sample included 275 teachers from the experimental group who completed training and questionnaires. Among them, 56% taught STEM subjects, 35.6% foreign languages, and 8.4% other disciplines. Most were women (70.2%), with an average age of 46.8 years and 16.3 years of teaching experience. Participants mainly worked in high schools (56.4%) and vocational institutes (36.7%), with fewer from technical schools (6.9%). Geographically, schools were in southern (47%), central (24%), and northern Italy (29%). According to teachers, 27.6% of their students struggle to meet subject-specific learning goals.

The qualitative phase involved 28 teachers from 7 schools (3 high schools, in the north, 1 *istituto omnicomprensivo*[4], and 3 vocational institute, in the south), selected from an initial random sample of 10 by MIM. Interviews covered 5 teachers in informatics, 10 in English, 3 in science, and 10 in other subjects. The group included 6 men and 22 women.

2.2. Survey instruments and data collection

The research employed identical survey instruments across all partner countries. For teacher participants, the questionnaire was administered before and after the training. The initial section gathered demographic data, while the rest explored constructs from Davis' (1989) technology acceptance model: perceived ease of AI use, usefulness, and usage behavior. Additional sections examined satisfaction, AI-related anxiety (Wang & Wang, 2019), perceived risks (Schiff, 2021; Remian, 2019), and learning engagement (Deng et al., 2020). Most questions were closed-ended, with some open-ended items for qualitative insights. The focus group, conducted post-training, reflected the questionnaire's themes. This study focused on data concerning AI perception.

Data were collected anonymously, cleaned, and analyzed using psychometric tools, including Cronbach's alpha and factor analysis (Paris et al., 2023). Qualitative data were gathered via Teams interviews by the *INDIRE* team with teachers from 7 schools. A deductive thematic analysis (Braun & Clarke, 2006) explored perceptions of key themes: ease of AI use, learning involvement, usefulness, behavior, satisfaction, perceived risks, and anxiety. Interview transcripts were coded using Taguette[5] to align responses with study objectives (Table 1).

[4] In Italy, an *istituto omnicomprensivo* includes various levels and grades of schooling, from kindergarten to upper secondary school.

[5] Taguette is a free and open-source tool for qualitative research that allows users to import research materials, highlight and tag quotes, and export the results (https://www.taguette.org/).

Topics	Total occurrences
Professional learning experience.	128
Impact of the learning experience on AI.	180
Using impact.	62

TABLE 1 – TOPICS AND OCCURRENCES

The teachers' opinions were collected and categorized into the sub-themes proposed in Table 2.

Theme	Total occurrence	Sub-themes/tags	Occurrence
4. Perception of teachers' AI.	61	4.1 Positive (interest, confidence in teaching potential...).	24
		4.2 Negatives (fears/distrust/disinterest).	14
		4.3 With respect to pupils' lack of interest in AI.	2
		4.4 With respect to pupils' interest in AI.	21

TABLE 2 – CATEGORIZATION AND OCCURRENCES OF SAMPLE TEACHERS' STATEMENTS ON PERCEPTIONS OF AIS

3. Analysis and discussion

AI is quickly changing education by enabling personalized learning, automating tasks, and offering detailed student progress analysis, creating significant opportunities for better teaching. However, the adoption of AI in schools depends on the perception and preparation of teachers (Aghaziarati et al., 2020).

Teacher adoption saw positive shifts post-AI4T training. Generic AI tool use increased from 13.2% to 22.6% (weekly), while non-use dropped from 22.1% to 14.2%. This indicates a significant rise in AI tool use by teachers.

However, traditional digital technology use remains higher (58.9% weekly) compared to generic (16.7%) or AI-based teaching tools (11.3%). Post-training data suggests AI adoption is growing, but it is less established than familiar digital tools, perceived as innovative and less immediately integrable.

Student AI use also changed: non-use of educational AI decreased from 34.9% to 26.9% (weekly use increased from 18.6% to 25.5%), and generic AI non-use decreased from 21.3% to 16.7% (weekly use increased from 10.6% to 16.7%).

Beyond usage, the "Emotion" dimension of the questionnaire revealed favorable teacher perceptions towards AI in teaching practice, categorized in Table 3.

Emotion	n. (Pre)	% (Pre)	n. (Post)	% (Post)	Deviation
The challenge of learning AI is exciting.	253	92.0	235	85.4	-6.6

I would like to use AI tools.	257	93.4	247	89.9	-3.5
Using AI tools is/would be stimulating.	260	94.5	248	90.2	-4.3
I would like to conduct class sessions where my students use AI tools.	239	86.9	218	79.3	-7.6

TABLE 3 – "EMOTION" DIMENSION COMPARED PRE AND POST. PERCENTAGES OF RESPONSES TO THE QUESTION: "DO YOU AGREE WITH THE FOLLOWING STATEMENTS? IN MY WORK AS A TEACHER"

The initial enthusiasm of teachers for AI, highlighted by a 94.5% consensus, is also perceived in the statements of some teachers in the focus groups: "The challenge of learning AI is exciting" and "I would like to use AI tools," testimonies that clearly reflect attention to its potential. After the course, despite a slight decrease in consensus (-6.6%), interest remains at high percentage levels. This decline may reflect greater awareness of practical challenges, as highlighted by some participants: "I recognize the need to update, and I am ready to explore new methodologies… There is still a lot to learn." The desire to use AI to adapt teaching to individual student needs is proposed as a central theme, as seen in a teacher's comment: "I actually hadn't seen that it could be interesting in terms of personalizing teaching, this intrigued me."

The focus also highlights challenges and critical issues, such as the abuse of AI and the need for a balanced approach: "Just teaching with this equipment is not the solution... we need to find the right balance"; issues that, however, do not diminish the positive perception of the usefulness of AI by teachers (always over 87% when adding the responses between 'fairly agree' and 'strongly agree'), but underline the need for deeper reflection on how to integrate AI in school.

Teachers recognize the potential in personalization. A significant example comes from a teacher who expressed the desire to explore apps for personalized programming, stating: "I would like to explore all the possible apps that can be used, even for programming, in order to personalize teaching in a more individual way." Another teacher emphasized how AI can support the creation of learning paths tailored to each student: "AI can be very useful in creating a personalized path for the student in the sense that what the teacher is unable to do with a class of 30 students, perhaps the system can do, such as creating exercises based on errors and allowing students to recover" or to adapt to the characteristics and times of each individual: "Teaching is fundamental, because if you go too fast, you get lost; those who are, let's say, a little weaker, if you go too slowly, they get lost." Furthermore, many teachers see AI as a valid help to improve the efficiency of student assessment and self-assessment, as evidenced by the statements "ChatGPT is a useful tool for teaching… it can be useful precisely to assess student skills and for self-assessment"; a colleague also declares the usefulness of AI to "improve the efficiency of assessment, allowing me to focus more on direct interaction with students."

Such statements suggest that teachers are already identifying concrete applications of AI in specific teaching. The analysis of the perceived usefulness of AI tools focused on the support they offer teachers in specific activities. The

responses highlight how teachers recognize their potential in simplifying processes that, even indirectly, contribute to the personalization of learning.

As shown in Table 4, the activities that are considered to be most supported by AI, both before and after training, are content creation (90.5% pre-training, 89.8% post-training) and exercise correction (82.2% pre-training, 83.6% post-training). Similarly, activities related to educational and organizational management, such as carrying out administrative tasks, receive positive evaluations (90.2% pre-training, 91.6% post-training).

	n. (Pre)	**% (Pre)**	**n. (Post)**	**% (Post)**	**Deviation**
Identify areas for improvement in your teaching.	226	82.2	220	80.0	-2.2
Carry out administrative tasks (controlling absences, filling out evaluation forms, etc.).	248	90.2	252	91.6	1.4
Create content (lessons, exercises, assignments, tests...).	249	90.5	247	89.8	-0.7
Correct (exercises, homework, tests...).	226	82.2	230	83.6	1.4
Answering student questions.	174	63.3	155	56.4	-6.9
Motivate and engage students.	220	80.0	199	72.4	-7.6
Encourage student collaboration.	215	78.2	197	71.6	-6.6
Student monitoring (work, learning progress, behavior, etc.).	231	84.0	232	84.4	0.4
Diagnosing student failures.	229	83.3	227	82.5	-0.8
Offer students advice on choosing their major.	177	64.4	181	65.8	1.4

TABLE 4 – PARTICIPANTS' RESPONSES, PRE- AND POST-COMPARISON, TO THE QUESTION: "DO YOU AGREE THAT AI TOOLS CAN HELP TEACHERS IN THE FOLLOWING ACTIVITIES?"

After training, however, a decline in the perception of the usefulness of AI is observed with regard to particular aspects that are linked to the personalization of teaching, such as motivation and involvement of students (-7.6%), encouragement of collaboration (-6.6%), and the possibility of providing answers to students' questions (-6.9%).

On the contrary, in some cases it is possible to observe how the positive trend detected with respect to perceived usefulness is confirmed by actual use.

Activity	**Pre-training (%)**	**Post-training (%)**	**Change (%)**
Content creation/sharing.	65.4	82.9	17.5
Correction/evaluation.	28.4	25.5	-2.9
Student monitoring.	21.1	14.2	-6.9

Diagnosing student difficulties.	6.5	8	1.5

TABLE 5 - PARTICIPANTS' RESPONSES, PRE- AND POST-COMPARISON, TO THE QUESTION: "FOR WHICH ACTIVITIES DO YOU USE AI?"

This is the case of the use of these tools for content creation and sharing, which increases from 65.4% to 82.9%, a positive variation of 17.5%. The growth in actual use can be seen as a direct response to the need to simplify repetitive tasks, reduce time and effort in creating content, and allow more time for instructional planning.

For correction/evaluation activities, a decline in actual use is observed (from 28.4% to 25.5%, a negative variation of -2.9%), despite the high perceived usefulness in evaluation (82.2% pre-training, 83.6% post-training). This may indicate that, while the value of automated correction support is recognized, the actual use remains limited.

Regarding student monitoring, there is a decrease in actual use (from 21.1% to 14.2%, a negative variation of -6.9%) despite the stable perception of usefulness (84.0% pre-training, 84.4% post-training). Finally, in diagnosing students' difficulties, a slight increase in actual use is observed (from 6.5% to 8%, a positive variation of +1.5%), which partly reflects the perceived usefulness (83.3% pre-training, 82.5% post-training).

These data highlight a common trend: despite recognizing AI's potential in supporting educational activities, teachers show marked distrust in using it for tasks requiring significant human input. As the data shows, this distrust is evident in the decline of AI use for correction/evaluation, student monitoring, and diagnosis of difficulties.

Tasks requiring subjective interpretation and deep understanding seem to be the main reason for resistance to AI adoption. Correcting exercises and tests is not only about identifying errors but also about evaluating the learning process and providing personalized feedback. Similarly, monitoring students and diagnosing difficulties requires direct interaction and analysis beyond objective data, including emotional and social factors.

In summary, teachers recognize AI's value as a support tool, especially for repetitive tasks and large-scale data analysis. However, they see the human dimension of teaching, which involves understanding, interpreting, and responding to individual students' needs, as irreplaceable. Therefore, AI is seen as a complement, not a substitute, and is used in activities where the teacher-student relationship and learning personalization are not compromised.

In line with this trend, there is also a fear of a possible impoverishment of the relationship between teachers and students, as highlighted by the increase in concern, which goes from 8% to 15% (Table 5).

Firsthand accounts support this view; one teacher, for example, highlights how AI allows "many operations to be simplified, including information gathering," which "highlights the potential of these tools to provide a more detailed analytical picture of the progress of the class." However, the teacher himself acknowledges

that this analytical capacity cannot replace human interpretation and pedagogical understanding. Another teacher observes that "AI allows us to identify and correct recurring errors in teaching: a historical analysis of my homework, the questions I ask, and the errors can help me understand if there are recurring errors on the same topic." This highlights one of the main opportunities offered by AI: continuous improvement of teaching through data-driven feedback, which promotes a more personalized approach to teaching. However, data on actual use indicate that, probably for the reasons already highlighted, this opportunity does not automatically translate into full adoption.

Finally, the dimension of "Perceived usefulness" was investigated through the 13 most transversal statements which are reported in Table 6.

	n. (Pre)	**% (Pre)**	**n. (Post)**	**% (Post)**	**Deviation**
The teaching profession will be devalued.	27	9.8	38	13.8	4.0
The quality of teaching will increase.	190	69.1	164	59.6	-9.5
Teachers will be overwhelmed by AI learning.	57	20.7	39	14.2	-6.5
Teachers will have more time to focus on student learning.	131	47.6	124	45.1	-2.5
Teachers will be progressively replaced by AI.	22	8.0	20	7.3	-0.7
Relationships between teachers and students will be impoverished.	22	8.0	42	15.3	7.3
Teaching will be personalized according to the needs of each student.	185	67.3	169	61.5	-5.8
Student academic success will improve.	131	47.6	120	43.6	-4.0
Education will be dehumanized.	32	11.6	38	13.8	2.2
Private companies will have an ever-increasing influence on schools.	111	40.4	119	43.3	2.9
Surveillance in schools will increase.	82	29.8	90	32.7	2.9
Inequalities and discrimination will decrease.	64	23.3	62	22.5	-0.8
Students' personal information will be more at risk of being breached and used at their expense.	90	32.7	121	44.0	11.3

TABLE 6 – PARTICIPANTS' AGREEMENT (PRE- AND POST-COMPARISON) WITH THE 13 PROPOSED STATEMENTS

Here too, there is growing caution among teachers regarding the real impact of AI on personalized teaching. The initial optimism, with 67.3% of teachers confident in AI's ability to adapt teaching to individual needs, dropped to 61.5% in the post-test. A slight variation, perhaps indicative of greater awareness of practical difficulties in implementing adaptive systems. Training seems to have increased awareness of the ethical and educational implications of AI. Among the main concerns is the fear that AI will not grasp the nuances of the educational relationship, hindering personalization: "I firmly believe that AI should never

replace the teacher. Despite its ability to process large amounts of data, it will never be able to replace human logic." Another teacher said, "It is essential not to lose sight of the importance of human relationships in our work. There is a certain danger in this change, but at the same time it is interesting to discover the advantages offered by these tools." The collected testimonies highlight a fundamental aspect of personalization in education: the need for a deep understanding of individual needs. In this process, human interactions, empathy, and intuition are crucial. Although AI can analyze large amounts of data and adapt content, it faces limitations in fully replicating these intrinsically human dynamics. Consequently, personalization based solely on AI risks being incomplete or counterproductive if not integrated with a strong human element (Ouyang et al., 2022).

There is concern that the lack of empathy leads to standardized learning paths and that excessive reliance on AI compromises meaningful relationships (Wang et al., 2022). As one teacher states, "The goal should be to use these tools consciously, communicating to the kids that we are trying to integrate them into teaching without losing sight of the human element. This, I think, should be the key message, even if we recognize the challenges we may encounter in the process." The conscious integration of AI, as support and not as a substitute for human interaction, is essential to preserve the teacher's role and the quality of the educational relationship.

Conclusions

In concluding this analysis, it is important to acknowledge certain limitations of the study. Although the coding and thematic analysis of the qualitative data were carried out systematically, the researchers' subjectivity may have influenced the interpretation of the results. Furthermore, the relatively small sample used for the focus groups may not fully represent the entire teaching population, thereby limiting the generalizability of the conclusions. Nonetheless, the integration of quantitative and qualitative data has provided a detailed picture of teachers' perceptions and emotions regarding the use of AI in the context of personalization, highlighting both opportunities and challenges.

The data analysis reveals a dual perception of AI among teachers: on the one hand, they recognize it as an opportunity to innovate education by automating repetitive tasks such as assessment and grading, thereby optimizing time and resources (Luckin et al., 2016; Holmes et al., 2019). On the other hand, they express strong caution about delegating to AI those activities that involve the irreplaceable human dimension of teaching – such as understanding and interpreting the individual needs of students. Consequently, AI is seen as a support tool, not a substitute, with its use limited to contexts that do not compromise the teacher-student relationship or the personalization of learning.

There also remains a concern over the potential standardization of teaching and a reduction of the teacher's role to that of mere supervision. This concern is echoed

in the reflections of participants in the AI4T project, who emphasized that teaching should not be reduced to the mere transmission of content but must involve an educational relationship based on interaction and adaptation to the specific needs of each learner. As highlighted by Biesta (2019) and Selwyn (2019), excessive automation risks undermining the pedagogical relationship and human interaction, neglecting students' individual needs.

These reflections underline the need to strike a balance between the use of AI and the centrality of the human component in teaching. Although AI can support personalized learning through data analysis and the creation of adaptive pathways, its effectiveness ultimately depends on integration with the teacher's work, which remains essential for building meaningful educational experiences. The study also pointed out concrete challenges related to the implementation of AI in teaching: the difficulty in translating its theoretical potential into effective practices (Kim et al., 2022) and the need for specific teacher training.

The findings highlight the need to strengthen research and teacher training so that the integration of AI into educational contexts can occur in a conscious, critical, and pedagogically sound manner. At every level of the education system, it is essential to promote teaching strategies aligned with the real needs of schools, supported by the development of flexible technologies that can adapt to different contexts. In this perspective, equipping teachers with specific skills that enable the effective use of digital tools is crucial while keeping the relational dimension of teaching at the center. Artificial intelligence can indeed be a strategic resource for improving the quality of learning, provided that its use is aimed at enhancing the educational role of the teacher – in a perspective of personalization and inclusion – rather than replacing it. A balance between technological innovation and authentic educational relationships is the key to fully realizing the potential of AI while respecting the human dimension of the educational process.

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