Education in the Age of Al: Perceptions, Challenges and Opportunities for Italian Teachers

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Abstract

This study explores the integration of artificial intelligence (AI) in Italian education, focusing on the perceptions of teachers involved in the European AI4T project. The analysis, based on a mixed approach, shows initial optimism towards the possibilities offered by AI, such as recognition of learning and automation of tasks. However, concerns also emerge about ethical issues such as privacy, responsibility for choices made and the impoverishment of interpersonal relationships. Despite the fact that AI is recognized as useful for simplifying administrative and teaching tasks, teachers consider it essential to maintain the human element in the educational process. The contribution invites reflection on the need for ethical regulation and ongoing literacy for responsible use of AI.

Key words: artificial intelligence, education, teachers, perceptions, ethics

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1. Introduction

We are experiencing a digital revolution, driven by Artificial Intelligence (AI), that is already transforming society and will continue to shape the future (Lijia Chen et al., 2020). AI is redefining the labour market, automating processes and adapting to user behaviour in real time (Cesaretti, 2021).

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However, this progress raises concerns such as unemployment, the need to retrain the workforce (Dahlin, 2019; Yang et al., 2021), the fear of exacerbating social inequalities (Zajko, 2022) and violating privacy (Elliott et al., 2022). Furthermore, AI brings relevant ethical issues related to transparency, algorithmic bias and accountability, pushing for stricter ethical regulations.

1.1 Artificial intelligence at school

AI is also transforming the world of education. Fahimirad and Kotamjani (2018) among the first to explore its use in educational contexts, hypothesise that AI will revolutionise teaching. A crucial aspect is its role in AIED (Artificial Intelligence in Education), which sees AI as a pedagogical ally to personalise learning and improve teaching interactions (Baker Ryan et al., 2021). Tapalova and Zhiyenbayeva (2022) highlighted how AI adapts to the needs of individual learners, fostering more effective learning. Personalised scaffolding and feedback systems (Albacete et al., 2019; Tarus et al., 2018) improve teachers' work, allowing them to monitor progress (Heffernan et al., 2014; Luckin, 2017). Tools that can be used in schools include intelligent tutoring systems, educational content processing and continuous monitoring, but these raise ethical issues, such as algorithmic fairness and bias (Holstein et al., 2019; Gardner et al., 2019). AI, due to its versatility, can act as a catalyst to improve education (Rios-Campos et al., 2023), however, Ranieri (2024) also pointed out the risks: privacy, reduced human interaction and difficulty in correctly interpreting operational contexts. Integrating AI requires not only the preparation of students, but also literacy, Artificial Intelligence Literacy - AIL, a concept that includes understanding its workings, ethical implications and social impact (Ranieri, 2024). Burgsteiner and Kandlhofer (2016) defined AIL as the ability to understand the principles of AI technologies.

Ranieri, Cuomo and Biagini (2024) offered suggestions for teaching AI to students, such as reflecting on the differences between human and artificial intelligence, developing computational thinking and fostering a critical and ethical understanding of generative AI.

The issue of integrating AI in education must inevitably involve all actors, with a special focus on teachers. Ferikoğlu, Akgün (2022) explored educators' perceptions of AI in professional contexts, highlighting the importance of teacher awareness and training on this issue. Their research emphasises the need to provide teachers with not only knowledge, but also specific skills to effectively navigate an educational landscape increasingly empowered by AI (Ferikoğlu, Akgün, 2022).

However, the adoption of AI in schools brings with it a number of challenges, including teachers' perceptions and concerns arising from its

integration. Recent studies have highlighted how AI-related anxiety among teachers is a complex phenomenon, reflecting the tension between the opportunities offered by new technologies and the uncertainties they entail. AI anxiety manifests itself as a concern about the potential negative outcomes and risks associated with the adoption of AI in various areas of society, with fears ranging from possible unemployment to privacy violations and threats to individual safety and autonomy (Li, Huang, 2020; Wang, Wang, 2022). This study takes an in-depth look at how some Italian teachers feel about this phenomenon, analysing their perceptions and attitudes through quantitative and qualitative data.

2. The Reference Context: the AI4T project

The rapid development of AI-based technologies has stimulated a debate on the implications for education. The Digital Education Action Plan 2021-2027 has highlighted the need to develop AI skills and provide ethical guidelines. The AI4T (Artificial Intelligence for and by Teachers) project, funded by Erasmus+, is part of this context with the aim of developing learning activities for teachers in five European countries, including Italy, with the collaboration of the Ministry of Education and Merit (MIM) and Indire, which managed the evaluation of the impact of the training in Italy.

The research carried out in the project, aimed at assessing the impact of the intervention, was divided into two phases: quantitative and qualitative. Through a MIM call for recruitment, 91 secondary schools were involved, with a total of 438 teachers, 56 school managers and 1590 students. In the quantitative phase, pre- and post-intervention questionnaires were administered to two groups of teachers (group T for the intervention and group C as control), students and school heads. The qualitative phase involved only the schools that received the training, through individual interviews with school leaders and group interviews with teachers. In Italy, this phase took place between March/May 2023, with a qualitative follow-up in May/June 2023.

3. The research design and objectives of the study

The aim of this study is to provide an overview of teachers' perceptions, pedagogical, ethical and practical considerations in relation to AI. The study is based on a sequential explanatory Mixed Methods approach (Creswell, Plano Clark, 2011), which involves an initial quantitative phase followed by a qualitative one. The data presented come from questionnaires administered to

teachers and group interviews conducted at the end of the AI4T training. The proposed analysis is descriptive in nature: the quantitative data provide a general view of teachers' behaviours and inclinations, while the qualitative data explore in depth emotions regarding the use of AI technologies in the classroom.

3.1 The sample

The sample of teachers consists of 275 individuals from the T (experimental) group who participated in the training and filled out the questionnaires correctly. The analysed data therefore refer to these participants. Of these, 56% teachers were in the STEM area (mathematics, science and computer science), 35.6% in foreign languages and the remaining 8.4% in other disciplines. 70.2% were female (193 teachers), 29.4% male (81 teachers), one participant preferred not to declare his gender (0.4%). The average age is 46.79 years, ranging from 30 to 62 years. The average teaching experience is 16.3 years, with a minimum of 2 years and a maximum of 36. With regard to schools, 56.4% were high schools, vocational institutes 36.7% and technical institutes 6.9%. The schools were distributed as follows: 47% in the south; 24% in the centre; 29% in the north.

For the qualitative phase, MIM, as envisaged by the project, randomly identified 10 schools throughout the country. In the end, only 7 institutes (3 Licei in the north, 1 Omnicomprensivo and 3 Professionali in the south of Italy) made themselves available for the qualitative phase. A total of 28 teachers were interviewed, an average of 4 per institute: 5 of Informatics, 10 of English, 3 of science and 10 of other subjects. Of these, 6 were men and 22 women.

3.2 Research Tools

The same survey instruments were used in all partner countries. For the teachers, the questionnaire was administered before and after the training. The first part of the instrument collected background data, while the next part focused on the dimensions identified in Davis' (1989) model, such as perceived ease of use of AI, usefulness and usage behaviour. Other sections explored satisfaction, anxiety towards AI (Wang, Wang, 2019), perceived risks (Schiff, 2021; Remian, 2019) and engagement in learning (Deng *et al.*, 2020). The questions were generally closed but some were open-ended for qualitative insights.

The group interviews, conducted at the end of the training, followed the themes of the questionnaire. Considering the objective of this study, the data

analysed were mainly derived from the sections of the questionnaires and group interviews, which related to the perception of AI.

3.3 Data Collection

The questionnaires were administered online in December 2022 and May/June 2023. The MIM e-mailed participants the link and individual codes for completion. The data were collected and processed anonymously, then, they were cleaned and a psychometric scale analysis was conducted, with Cronbach's alpha calculation for internal consistency and a factor analysis (Paris, A. *et al.*, 2023)¹.

The qualitative collection took place through interviews conducted by the Indire group on Teams, involving teachers from 7 schools. In order to understand teachers' perceptions of the key themes of the framework in a structured manner, the thematic qualitative analysis was conducted using a deductive or "top down" approach (Braun, Clarke, 2006). The analysis themes were in fact derived from the framework (see above, 3.2: perceived ease of use of AI, involvement in learning, usefulness and usage behaviour, satisfaction, perceived risks and anxiety). This approach made it possible to trace the participants' testimonies back to the predefined areas of investigation. Each significant segment of the transcripts was coded against the identified themes using Taguette software², thus ensuring precise alignment with the research objectives.

Tab. 1 - Topics and occurrences

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	Total Occurrences 128 180				
Professional learning experience	128				
Impact of the learning experience on ai	180				
Using apps	62				

The teachers' opinions were collected and categorised into the sub-themes proposed in the table 2:

¹ For more details on data cleaning and processing, please read the 'AI4T National Evaluation Report-France' at "AI4T National Evaluation Report-France" url: https://hal.science/hal-04556695/.

² www.taguette.it.

Tab. 2 - Categorisation and occurrences of sample teachers' statements on perceptions of Als

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

4. Analysis and discussion

The dimension of 'Emotions' towards artificial intelligence (AI) was investigated through a series of questions. The first explored what feelings it aroused in teachers, asking: "When you think of artificial intelligence, what emotions come to mind?" The answers were organised into the categories as shown in Tab. 3.

Tab. 3 – 'Emotions' dimension compared pre and post. Response percentages to the question: "When you think of artificial intelligence, what emotions come to mind?"

Emotion	No. (Pre)	% (Pre)	No (Post)	% (Post)	Deviation
apprehension towards artificial intelligence	122	30.27	66	24	-6.27
attraction towards artificial intelligence	246	61.04	149	54.2	-6.84
association of artificial intelligence with emotions of satisfaction	166	41.19	24	8.7	-32.49
questioning artificial intelligence	7	2.5	3	1.1	-1.4

The predominant emotion was attraction in both pre- (61.04%) and post-training (54.2%), which is indicative of continued interest in the topic despite the slight downturn. The participants' testimonies confirm the trend: 'I think there is a lot of potential' and 'Maybe I am a little too enthusiastic, I would like to be a little less enthusiastic, but I definitely am'. On the contrary, the association with emotions of satisfaction dropped from 41.19% to 24.87%, suggesting a greater critical awareness after the training, but the desire to try out these new avenues remains: "It will be a pleasure to implement what I have learnt in my lessons and to involve the young people in this exciting journey".

Perceptions of apprehension also decreased slightly (30.27% pre, 24% post), reflecting greater confidence in the use of AI. The slight reduction may indicate

that although teachers have become more confident in tackling AI challenges, they remain aware of the complexities and continue to harbour fears as some teachers point out "there is a kind of fear of exploiting AI because it is seen as something potentially harmful. In reality, this is not the case' and again 'we should not demonise the use of AI, but rather understand that it is a support tool that should not replace creativity, freedom and critical thinking' and finally: 'I believe that once you start to get to know it better, you can also learn how to manage it and deal with any concerns'.

The emotion dimension was also investigated with respect to positive perceptions regarding the use of AI in teaching practice. Emotions were organised into the four categories proposed in Tab. 4.

Tab. 4 - Dimension "Emotions" compared pre and post. Percentage answers to the question: "Do you agree with the following statements? In my job as a teacher"

Emotion	No. (Pre)	% (Pre)	No (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/is 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

Before the course, most teachers were enthusiastic about the use of AI in education, the consensus ranged from 92% to 94.5%. This enthusiasm is reflected in the interviews: 'Artificial intelligence is a challenge for us teachers. We have to constantly think of new ways to engage students" and "I would love to explore all possible apps ... to personalise teaching in a more individual way'. After the course, there was a slight decrease in consensus on all items, although the percentages remain high: 85.4% of teachers continue to find learning AI exciting and 90.2% find using AI tools stimulating. This decrease, along with the other values (between 3.5% and 6.6%), may reflect a more realistic understanding of the practical implications, as confirmed by some teachers: 'I recognise the need to upgrade and I am ready to explore new methodologies. There is still a lot to learn', 'The biggest risks are related to the misuse of artificial intelligence... we are still at too early a stage to know well'. One teacher proposes a balanced approach: 'Just lecturing with this tolls is not the solution.... you have to find the right measure'.

In addition to positive perceptions, the level of concern regarding the use of AI was also investigated. Teachers agreed or disagreed with several statements regarding anxiety in learning to use the tools or making mistakes in the classroom. The data in Tab. 5 indicate that the levels are stable, with 12%

feeling anxiety in learning to use AI before the course, and 13.4% after. The greatest concerns relate to use during lessons, with a slight increase in fear of making mistakes (from 25.1% to 28%) and for the correct functioning of the tools (27.3% pre, 26.2% post). There was a slight reduction in fears for conducting lessons with AI (from 14.5% to 12.7%) although not enough for a significant change. In general, concerns seem to be related to both the technical functionality of the tools and self-efficacy as educators. An attitude already noted in the literature: the technical complexity of AI and uncertainty about how to integrate it into teaching practice in fact contribute to teachers' insecurity (Huang, 2021; Ouyang *et al.*, 2022).

Tab. 5 – "Emotions" dimension compared pre and post. Response percentages to the question: "Do you agree with the following statements? In my job as a teacher..."

Emotion	No. (Pre)	% (Pre)	No (Post)	% (Post)	Deviation
Learning to use ai tools makes me/ would make me anxious	33	12.0	37	13.4	1.4
Using ai tools makes/makes me anxious	37	13.4	37	13.4	-
I am afraid of making mistakes if i use an ai tool	69	25.1	77	28.0	2.9
I am afraid that ai tools malfunction when i or my students use them	75	27.3	72	26.2	-1.1
Conducting class sessions in which my students use ai tools makes me/ would make me anxious	40	14.5	35	12.7	-1.8

Some interesting testimonies regarding these fears: "These tools should be used when possible, but it is crucial to have mastery and confidence in using them, the students are very skilled in this respect," and "I realised I knew very little about this aspect, but my curiosity is growing, pushing me to approach tools like Chat GPT. However, I understand that it is not something trivial".

With respect to 'Perceived Usefulness', teachers were asked to answer the following question: 'In general, do you agree that AI would be useful in your job as a teacher?'

In both pre- (61.04%) and post-training (62.%), teachers "agreed" and "strongly agreed" with the usefulness of AI, a positive attitude confirmed in the interviews, where the potential of AI as a support in one's own discipline emerges: "AI can be very supportive, especially with regard to two aspects that are often neglected in English teaching: listening and speaking". Another notes that: "It might be useful to incorporate AI into civic education."

Tab. 6 – Participants' agreement with the statement.	: "In general, do you agree that AI would be useful in
your job as a teacher?"	

Emotion	No. (Pre)	% (Pre)	No (Post)	% (Post)	Deviation
Strongly disagree	1	0.4	1	0.4	-
Disagreement	0	0	1	0.4	-
Quite disagree	2	0.7	2	0.7	-
Neither in agreement nor disagreement	31	11.3	31	11.3	-
Generally in agreement	72	26.2	95	34.5	8.3
Strongly disagree	1	0.4	1	0.4	-

Others expressed interest in using AI to personalise teaching: 'I would like to explore all the possible apps that can be used, even for programming, for example to personalise teaching in a more individualised way'. Another lecturer notes that: "AI can be very useful at the level of creating a customised course on the student in the sense that, what the teacher cannot do with a class now of 30 pupils, perhaps the system can do, such as creating exercises based on errors and allowing students to catch up". Some emphasise the usefulness of AI for improving efficiency in student assessment and self-assessment. "ChatGPT is a useful tool for teaching... it can be useful precisely for assessing students' skills and for self-assessment." Another notes the importance for "improving the efficiency of assessment, allowing me to focus more on direct interaction with students".

These reflections indicate that many teachers already see concrete applications of AI in specific areas, and in some, a proactive approach to integrating AI into teaching practices also emerges: 'If students are using ChatGPT, it is a resource at our disposal. Instead of resisting change, we try to make the best of it in the best possible way'.

This positivity is accompanied by a greater awareness of the challenges of using AI: 'We can use it in more and more areas, while trying to limit the risks over time', and again: 'A competent teacher must understand that it is not the copying that harms the student, but rather the student's use of the tool'.

The training also seems to have deepened understanding of the ethical and pedagogical implications of AI integration. Indeed, some teachers fear that AI may fail to capture the nuances of the educational relationship, especially in interactions that require human and empathic intervention, such as building relationships with students and adapting teaching to the unique needs of each of them (Ouyang *et al.*, 2022).

The dimension of 'perceived usefulness' was also explored in teachers' perceptions of the support that AI tools can offer in various school activities, both didactic and administrative. The data in Tab. 7 show that activities related to educational management, such as carrying out administrative tasks (checking

absences, processing reports and projects...), creating content, correcting exercises and monitoring student progress, receive very positive evaluations, with minimal pre- and post-training deviations. This suggests a good understanding of how AI can optimise these activities, reducing administrative workload and improving operational efficiency.

Tab. 7 – Participants' answers, pre and post comparison, to the question: 'Do you agree that AI tools can

help teachers in the following activities?".

Emotion	No. (Pre)	% (Pre)	No (Post)	% (Post)	Deviation
Identifying areas for improvement in their teaching	226	82.2	220	80.0	-2.2
Carrying out administrative tasks (checking absences, filling in evaluation sheets, etc.).	248	90.2	252	91.6	1.4
Creating content (lessons, exercises, homework, tests)	249	90.5	247	89.8	-0.7
Correcting (exercises, tasks, tests)	226	82.2	230	83.6	1.4
Answering students' questions	174	63.3	155	56.4	-6.9
Motivating and involving students	220	80.0	199	72.4	-7.6
Encouraging student collaboration	215	78.2	197	71.6	-6.6
Monitoring of students (work, learning progress, behaviour)	231	84.0	232	84.4	0.4
Diagnosis of student failures	229	83.3	227	82.5	-0.8
Offering students advice on choosing their orientation	177	64.4	181	65.8	1.4

The testimonies highlight the concrete benefits, noted by teachers: "I see the use of AI favourably, as it simplifies many tasks, including the gathering of information.". Another remarks: "AI serves to correct our mistakes as teachers: a historical analysis of my homework, the questions I ask and the mistakes can make me realise if there are recurring errors on the same subject". The observation highlights how AI can act as a continuous feedback tool, helping teachers to improve their intervention.

However, when examining activities related to the relationship with students, such as motivating them, answering questions, encouraging them, more caution emerges, the post-training data show a decline, suggesting a growing awareness among teachers of the limitations of AI in areas that require a greater relationship between individuals. This is confirmed by the reflections of some teachers: '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 ...".

"AI, it can help, but it cannot and should not replace the teacher. Then of course artificial intelligence is in millions of things, just look at Facebook, all the advertisements customised to our interests. We are immersed in something bigger than ourselves'.

In summary, while AI proves to be a valuable support for administrative and teaching activities, teachers recognise its limitations, emphasising the importance of the empathic dimension in education.

Perceived usefulness' was analysed through the 13 statements shown in Tab. 8.

Tab. 8 – Participants' agreement (pre and post comparison) with the thirteen proposed statements

Emotion	No.	% (Pre)	No (Post)	% (Post)	Deviation
	(Pre)				
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 learning ai	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
Relations between teachers and students will be impoverished	22	8.0	42	15.3	7.3
Teaching will be customised to the needs of each student	185	67.3	169	61.5	-5.8
Students' academic success will improve	131	47.6	120	43.6	-4.0
Education will be dehumanised	32	11.6	38	13.8	2.2
Private companies will have an 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 hacked and used at their expense	90	32.7	121	44.0	11.3

Six showed an increase, while seven decreased, indicating greater caution. There was a decrease in positive perceptions of AI, such as increased teaching quality (-9.5%), personalisation (-5.8%) and improved academic success (-4%). The hope that AI can reduce educational inequalities also fell slightly (-0.8%). The quotes reflect these trends. One teacher expressed doubts about the

reliability of AI models: "The accuracy of machine learning models is a key concern. Concern about privacy is also growing (+11.3%): 'One of the biggest risks is definitely related to the privacy of student data. It is crucial to ensure that personal information is handled securely'. Other fears include the impoverishment of teacher-student relationships (+7.3%), the devaluation of the teaching profession (+4%) and, to a lesser extent, the dehumanisation of education, increased surveillance and the influence of private companies. These increases reflect the fear that AI will undermine educational autonomy and the role of teachers. A fear that focuses on the potential replacement and impoverishment of the teacher's role (Nguyen et al., 2023; Wang et al., 2022). "The goal should be to use such tools in a conscious way, communicating to students that we are trying to integrate them into teaching without losing sight of the human element". Fears amplified by the regulatory vacuum and ethical issues related to the pervasiveness of AI: 'Tracking in malls and automated processing of what we do online scared me. The call for regulatory regulation is strong: 'The risk of data from the dark web, outside of regulatory control, is a critical issue that requires special attention. Another added: 'It is essential to address these ethical and regulatory challenges in the use of AI'. The quotes show a critical reflection on the impact of AI on teaching, privacy and relationships, highlighting the need for responsible and ethical use. In concluding the analysis, it is fair to point out some limitations of this study. With regard to the qualitative data, coding and thematic analysis were conducted in a systematic manner, but it is important to consider that the subjectivity of the researchers may have influenced the interpretation. Furthermore, the relatively small sample used for the group interviews may not be fully representative of the wider population of teachers, limiting the generalisability of the conclusions drawn. In spite of these limitations, the information from the quantitative and qualitative survey provides a snapshot of teachers' emotions and perceptions of AI in education.

5. Conclusions

Our study outlines a range of opinions from initial enthusiasm to more critical concerns, findings that can be used as a basis for further research in this field.

Positive perceptions were largely associated with pedagogical opportunities, such as personalised learning, simplified administration and improved teaching effectiveness.

As one teacher put it, "We are immersed in artificial intelligence, but now we can see it from a different perspective. We know what it is and we no longer believe in science fiction, like in the film '2001: A Space Odyssey'". However, this new reality brings with it challenges that require a deep understanding on the part of teachers.

Deep understanding of AI is crucial 'As teachers, we cannot prevent students' progress towards artificial intelligence. The right answer is to understand and comprehend this phenomenon. As with any new tool, it is necessary to fully understand it', and it is essential to prevent its distorted use by students'.

In order to prevent AI from becoming just a shortcut with no educational value, targeted education is essential, attentive to that Artificial Intelligence Literacy discussed at the beginning of this contribution. One lecturer emphasised the importance of "an education in the use of artificial intelligence, this is what we absolutely must make students understand that it must be a tool to help, and not a shortcut to get things done in the easiest way possible".

Negative perceptions, on the other hand, mainly concerned the ethical and social implications, with concerns about students' privacy, the risk of excessive dependence, and fears that AI may impoverish relationships between teachers and students. Indeed, it is essential to recognise that, despite the value of AI, it cannot replace the empathy that only a teacher can offer. "We have emphasised our uniqueness as teachers in understanding and interacting individually with students. While we recognise the value of AI as a support, it is important to balance its use while maintaining our capacity for empathy and personal understanding, aspects that AI cannot fully replicate."

In summary, AI is seen as a valuable tool to improve educational effectiveness, but doubts arise as to its ability to replace human interaction and ensure equitable and personalised education. Clear regulation and continuous training is needed to address emerging challenges. AI could facilitate teachers' work, but only if we consciously address the challenges associated with its use, overcoming the current widespread concerns in schools (Chounta *et al.*, 2022). As emphasised by Shum and Luckin (2019), to effectively address these concerns, it is necessary to engage all stakeholders – especially teachers, but also students, parents, trade unions and policy-makers – by confronting not only the benefits that AI can bring to education, but also by jointly addressing the potential risks and challenges.

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