Journal of Inclusive Methodology and Technology in Learning and Teaching
ISSN 2785-5104
Anno 6 n. 4 (2026)

EDIZIONI UNIVERSITARIE ROMANE
editoria scientifica dal 1952

Primary School Teachers' Perceptions of AI: Opportunities, Risks, and Relationships between AI Training, Professional Use, and Self-Perceived Knowledge and Competence

Corrado Petrucco [1] and Laura Carlotta Foschi [2,*]

[1] University of Padua; corrado.petrucco@unipd.it
[2] University of Trieste; lauracarlotta.foschi@units.it
* Correspondence: lauracarlotta.foschi@units.it

Abstract: Artificial intelligence (AI) is increasingly entering educational practice, raising questions about its perceived pedagogical value, associated risks, and the role of teacher preparation. This exploratory cross-sectional survey examined primary school teachers' perceptions of AI, differences according to previous AI training, and associations among self-perceived AI knowledge, professional use, openness to experimentation, and perceived competence. A convenience sample of 44 primary school teachers completed an online questionnaire. Descriptive analyses, Mann-Whitney *U* tests, and Spearman's rank-order correlations were conducted. Participants generally recognised AI's pedagogical potential, particularly for individualisation/personalisation and inclusion, while emphasising teacher supervision, ethical risks, and the need for specific training. Participants with previous AI training reported significantly higher scores across all six variables examined, with medium-to-large effect sizes. Self-perceived AI knowledge and current professional AI use were positively and significantly associated with openness to experimenting with new technologies and with all three indicators of perceived AI competence (ϱ = .51-.78, all ps < .001). Overall, the findings indicate a cautiously positive orientation towards AI, alongside strong endorsement of teacher supervision and training needs, and suggest that AI-related professional development may benefit from combining practical engagement with attention to the critical evaluation of AI tools and outputs.

Keywords: artificial intelligence; primary school teachers; teacher professional development

Copyright: © 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction[1]

Generative AI is increasingly becoming part of teachers' professional practice, with applications ranging from lesson preparation and feedback to assessment materials and instructional and organisational documentation. The most recent policy documents read this phenomenon in a specific way. Both the OECD (2026) and UNESCO (2024) consider AI in education first of all as a pedagogical and

[1] Although this paper is the result of a collaborative effort by both authors, Corrado Petrucco authored sections 1 Introduction and 4 Discussion, while Laura Carlotta Foschi authored sections 2 Materials and Methods and 3 Results, including their subsections.

ethical question, that is, as something that must remain under human oversight and that requires professional competences which cannot be reduced to a generic form of digital literacy. The European AI Act has made this principle explicit by asking those who deploy AI systems to ensure an adequate level of AI literacy among their staff (European Union, 2024, Art. 4), and in August 2025 the Italian Ministry of Education issued its first guidelines for the introduction of AI in schools (Ministero dell'Istruzione e del Merito, 2025). This issue is particularly salient in primary education, where the age of the learners places greater emphasis on adult guidance and on the teacher's mediating role in supporting pedagogically meaningful and safe AI use.

Research on this school level returns a picture that is both prudent and favourable. AI can support personalisation, inclusion and instructional design, but what seems to make the difference are teachers' beliefs, their ethical awareness and the opportunities they have for continuous professional growth (Arranz-García et al., 2025; Bagdonaitė & Dagienė, 2025; Kazmaci et al., 2025). Primary school teachers appear to recognise the usefulness of AI in designing learning activities, above all when they can count on guided experimentation and on collaborative forms of professional learning (Calleja & Camilleri, 2025). In a previous survey involving 1,223 teachers in the Veneto Region, we had already observed a widespread uncertainty about the possible educational uses of generative AI and, at the same time, a clear demand for training (Petrucco et al., 2024).

From an inclusive education perspective, AI is particularly relevant because it may support both the individualisation and personalisation of learning. AI tools can, for example, assist teachers in adapting texts, simplifying instructions, and preparing individualised education plans (PEI) and personalised learning plans (PDP) for pupils with special educational needs. At the same time, because such documents contain sensitive personal data, the use of AI in their preparation raises issues of privacy, data protection, and professional responsibility, for which teachers remain accountable. In this context, the professional competences required for AI use extend beyond general digital skills: teachers need to understand how AI systems work, use them in pedagogically meaningful ways, and critically evaluate both the tools and their outputs (Celik, 2023; Chiu et al., 2025; UNESCO, 2024). However, a substantial part of the available evidence, including our previous work (Petrucco et al., 2024), relies on self-perceived competence, which should not be assumed to reflect actual competence.

Despite the growing literature on teachers' perceptions of AI, evidence concerning primary school teachers remains limited, particularly in the Italian context. Against this background, the present study examines how primary school teachers within a single Italian school institution perceive AI opportunities and risks, and how previous training, professional use, and self-perceived knowledge relate to openness to experimentation and self-perceived competence. The findings point to a cautiously positive orientation towards AI and highlight the importance attributed to teacher supervision and training.

2. Materials and Methods

The study adopted an exploratory cross-sectional survey design.

2.1. Participants and procedure

The study involved a convenience sample of 44 primary school teachers working across five school sites belonging to a single public school institution in the province of Vicenza. The five sites shared the same school leadership and administrative structure. The institution was selected through convenience sampling because it was readily accessible for data collection. Participants accounted for approximately 70% of the primary school teaching staff across the five school sites. Participants represented a broad range of age groups: 13.6% were under 25 years old, 15.9% were aged 25-35, 13.6% were aged 36-45, 34.1% were aged 46-55, and 22.7% were over 55. Professional experience in primary education was also heterogeneous: 27.3% reported up to five years of service, 18.2% between six and 15 years, 27.3% between 16 and 25 years, and 27.3% more than 25 years.

Data were collected in April 2026 through an online questionnaire administered via Google Forms. Participation was voluntary and anonymous. For the purposes of the study, participants were informed that, in the questionnaire, Artificial Intelligence referred to generative AI-based digital tools, such as ChatGPT, Copilot, Gemini, or similar tools, that may be used to support teaching, organisational activities, or content production.

2.2. Instrument

The questionnaire was developed primarily ad hoc for the purposes of this exploratory study. It comprised 29 questions, of which two collected background information and the remaining questions were organised into five thematic areas: (1) knowledge of AI and previous training; (2) current and prospective use of AI in professional practice; (3) use of AI for inclusion and special educational needs; (4) perceived AI opportunities, risks, and critical issues; and (5) AI training needs and future perspectives.

The instrument included 16 items rated on five-point response scales, 7 single-choice questions, 4 multiple-response questions, and 2 open-ended questions. One single-choice question assessed the frequency of current professional AI use using an ordinal response format. The five-point items used different anchors according to the construct assessed. Self-perceived AI knowledge was rated from no perceived knowledge (1) to very in-depth perceived knowledge (5), while the perceived contribution of AI to teaching effectiveness ranged from no perceived contribution (1) to a substantial perceived contribution (5). The remaining five-point items assessed agreement with statements concerning, among other aspects, individualisation/personalisation, inclusion, teacher supervision, ethical risks, the educational relationship, competence in using AI in teaching practice, critical evaluation of AI responses and tools, and openness to experimentation, using response options from 1 (*strongly disagree*) to 5 (*strongly agree*). The multiple-response questions investigated sources of information about AI, current professional uses, areas of potential future use, and perceived risks associated with AI in primary education. The two open-ended questions asked participants to identify competences they considered priorities for responsible AI use and to describe how they envisaged primary education in relation to AI over the following five years. For

the present study, the analysis focused on the items and other closed-ended questions relevant to the three research questions outlined below.

2.3. Research questions

Within this exploratory and context-specific study, the following research questions were addressed:

RQ1. What pedagogical opportunities and risks do primary school teachers perceive in relation to AI use, and what conditions do they consider important for its use in primary schools?

RQ2. How do primary school teachers with and without previous AI training differ in their self-perceived AI knowledge, current professional use of AI tools, openness to experimenting with new technologies, and self-perceived competence in using and critically evaluating AI?

RQ3. How are primary school teachers' self-perceived AI knowledge and current professional use of AI tools associated with their openness to experimenting with new technologies and their self-perceived competence in using and critically evaluating AI?

2.4. Data analysis

Descriptive analyses were first conducted for all variables included in the study. Frequencies and percentages were used for categorical and multiple-response questions, whereas medians and quartiles were used for ordinal variables. For multiple-response questions, each response option was recoded as a separate dichotomous variable indicating whether or not it had been selected.

For RQ1, the analysis was primarily descriptive and focused on the distribution of responses concerning perceived pedagogical opportunities, risks, and conditions for AI use in primary schools. For the five-point items, particular attention was given to the proportion of respondents selecting the two highest response categories (scores of 4 or 5).

For RQ2, previous AI training was treated as a dichotomous grouping variable distinguishing teachers who reported having received some form of AI-related training from those who had not. Given the ordinal nature of the variables and the limited sample size, between-group differences across the six selected items were examined using Mann-Whitney *U* tests. Rank-biserial correlations (r_{rb}) were reported as measures of effect size and interpreted by reference to Cohen's (1988) conventional benchmarks for correlation coefficients.

For RQ3, Spearman's rank-order correlations (ϱ) were used to examine the associations of self-perceived AI knowledge and current professional AI use with openness to experimentation and the three items relating to self-perceived competences. Statistical significance was evaluated using a two-tailed α level of .05.

3. Results

3.1. Perceived opportunities, risks, and conditions for AI use (RQ1)

Regarding RQ1, teachers generally recognised the pedagogical potential of AI in primary schools (Table 1). The strongest endorsement concerned possibility that AI can facilitate the individualisation/personalisation of learning pathways, followed by its potential usefulness for students with special educational needs. AI as an opportunity for primary education and its potential contribution to teaching effectiveness also received relatively positive evaluations, whereas endorsement of workload reduction was lower.

Item	*Median [Q1-Q3]*	Scores 4-5, *n* (%)
AI can facilitate the individualisation/personalisation of learning pathways (PEI/PDP).	4 [3-4]	27 (61.4%)
AI can represent a useful tool for the inclusion of students with special educational needs.	4 [3-4]	24 (54.5%)
AI represents an opportunity for primary education.	4 [3-4]	23 (52.3%)
AI can promote teaching effectiveness.	4 [3-4]	23 (52.3%)
AI can reduce teachers' workload.	3 [3-4]	18 (40.9%)
The use of AI in primary schools should always be supervised by the teacher.	5 [4-5]	38 (86.4%)
Clear guidelines on the use of AI with students would be useful in primary schools.	3 [3-4.25]	21 (47.7%)
AI can entail significant ethical risks (privacy, misuse of data, etc.).	4 [3-5]	31 (70.5%)
The use of AI can reduce the centrality of the educational relationship.	3 [2-4]	14 (31.8%)
Without adequate training, AI risks being used superficially or inappropriately.	5 [4-5]	40 (90.9%)

Table 1. Descriptive statistics for the items included in RQ1.

Note. $N = 44$. Percentages refer to participants who selected scores of 4 or 5 on the five-point response scale. Q1 = first quartile; Q3 = third quartile.

Positive perceptions of AI's pedagogical potential coexisted with a strong emphasis on teacher supervision and substantial concern about ethical risks. In the multiple-response question on perceived risks, the most frequently selected concerns were improper use by students (79.5%), lack of competence for appropriate use (75%), protection of students' privacy and data (54.5%), and excessive dependence on technology (52.3%). Reduction of the educational relationship and replacement of the teacher's role were selected by 29.5% and 22.7% of respondents, respectively.

Regarding the conditions considered important for AI use, teacher supervision received strong endorsement, whereas responses concerning clear guidelines for AI use with students were more heterogeneous. Specific AI training was considered necessary by 90.9% of participants, consistent with the strong endorsement of the statement that, without adequate training, AI risks being used superficially or inappropriately. In addition, 72.7% expressed an interest in attending an AI training course.

EDIZIONI UNIVERSITARIE ROMANE
editoria scientifica dal 1952

Responses concerning the possible reduction of the centrality of the educational relationship were more evenly distributed across disagreement (scores 1-2; 36.4%), the midpoint (score 3; 31.8%), and agreement (scores 4-5; 31.8%), indicating no clear directional pattern.

Overall, within this sample, the findings suggest a cautiously positive orientation towards the use of AI in primary education, combined with a strong perceived need for teacher supervision and specific professional development, alongside concern about ethical and competence-related risks.

3.2. Differences according to previous AI training (RQ2)

Regarding RQ2, 16 teachers (36.4%) reported having received previous AI-related training (e.g., professional development courses, university training), whereas 28 (63.6%) had not. Mann-Whitney *U* tests indicated significantly higher scores among teachers with previous AI training across all six variables examined (all *p*s ≤ .011; Table 2). The largest difference concerned self-perceived AI knowledge (large effect). Teachers with previous training also reported higher self-perceived competence in using AI in their teaching practice (large effect), greater openness to experimenting with new technologies (large effect), and more frequent professional use of AI tools (large effect). Differences were also observed in the perceived competence to critically assess the reliability of AI tools (large effect) and in the perceived ability to critically verify the accuracy of AI-generated responses (medium effect). Overall, the differences associated with previous AI training were consistently medium to large in magnitude.

Variable	Previous training: Yes, *Median [Q1-Q3]*	Previous training: No, *Median [Q1-Q3]*	*U*	*p*	r_{rb}
Self-perceived AI knowledge	4 [3-4]	2 [2-3]	48.5	< .001	.78
Current professional use of AI tools	3 [3-3.25]	2 [1-3]	77.0	< .001	.66
Openness to experimenting with new technologies	5 [4-5]	3 [2-4]	70.5	< .001	.69
Perceived competence in using AI in teaching practice	4 [3-4]	2 [1-3]	67.0	< .001	.70
Perceived competence in critically assessing the reliability of AI tools	3 [2-4]	2 [1-3]	101.0	.002	.55
Perceived ability to critically verify the accuracy of AI-generated responses	3 [2-4]	2 [1-3]	123.0	.011	.45

Table 2. Mann-Whitney *U* comparisons of teachers with and without previous AI training across the variables included in RQ2.

Note. *N* = 44 (previous AI training: Yes, *n* = 16; No, *n* = 28). All variables were measured on five-point response scales, except current professional use of AI tools, which was assessed using a four-

EDIZIONI UNIVERSITARIE ROMANE
editoria scientifica dal 1952

category ordinal scale. U = Mann-Whitney U statistic; r_{rb} = rank-biserial correlation. Reported p values are unadjusted; all between-group differences remained statistically significant after applying the Holm correction for multiple comparisons.

3.3. Associations among AI knowledge, professional use, openness, and competence (RQ3)

Regarding RQ3, Spearman's rank-order correlations showed that both self-perceived AI knowledge and current professional use of AI tools were positively and significantly associated with openness to experimenting with new technologies and with all three indicators of self-perceived AI competence (all ps < .001; Table 3). Correlation coefficients ranged from ϱ = .51 to ϱ = .78. Self-perceived AI knowledge showed its strongest associations with the perceived ability to critically verify the accuracy of AI-generated responses and with perceived competence in critically assessing the reliability of AI tools. Current professional use of AI tools was most strongly associated with perceived competence in using AI in teaching practice and with openness to experimenting with new technologies. Overall, higher levels of both self-perceived AI knowledge and professional AI use were consistently associated with higher scores across the openness and competence indicators examined.

Variable	Self-perceived AI knowledge	Current professional use of AI tools
Openness to experimenting with new technologies	.570	.750
Perceived competence in using AI in teaching practice	.709	.764
Perceived ability to critically verify the accuracy of AI-generated responses	.778	.506
Perceived competence in critically assessing the reliability of AI tools	.754	.695

Table 3. Spearman's rank correlations for the variables included in RQ3.

Note. N = 44. Values are Spearman's ϱ. All correlations were statistically significant at p < .001.

4. Discussion

Overall, teachers in our sample showed a cautiously positive orientation towards AI. The most strongly endorsed pedagogical opportunities concerned the individualisation/personalisation of learning pathways and support for pupils with special educational needs, a pattern broadly consistent with recent research on AI in primary education (Arranz-García et al., 2025; Bagdonaitė & Dagienė, 2025; Calleja & Camilleri, 2025) and with our previous regional survey, in which adapting teaching and learning pathways to students' individual needs was among the most frequently selected potential benefits of AI (Petrucco et al., 2024). At the same time, these positive perceptions coexisted with substantial concern about ethical risks and with strong endorsement of teacher supervision. Concerns about privacy are particularly relevant to inclusive educational practices, since documents such as PEI and PDP may contain personal data requiring particular protection. The strong perceived need for training also echoes findings from our previous regional survey of 1,223 teachers across school levels, including 331 primary school teachers, which

identified limited self-reported AI knowledge and readiness, low previous use of AI in teaching, and a substantial demand for AI-related professional development (Petrucco et al., 2024).

Several response patterns warrant closer consideration. Teacher supervision received very strong endorsement, whereas responses concerning the usefulness of clear guidelines for AI use with students were more heterogeneous, with a median at the midpoint of the scale. This more heterogeneous pattern differs from that observed in our previous regional survey, in which teachers strongly endorsed the development of specific regulations on AI use by educational authorities (Petrucco et al., 2024), although the two studies addressed institutional guidance through differently worded items. The comparatively limited endorsement of workload reduction is also noteworthy, given emerging evidence that generative AI may produce productivity and time-saving benefits in some teacher tasks (OECD, 2026). This may partly reflect the relatively limited reported professional use of these tools, particularly among teachers without previous AI training, although this interpretation remains tentative. Finally, responses concerning the possible weakening of the educational relationship were almost evenly distributed, indicating that no clear consensus emerged on this issue.

Teachers with previous AI training consistently reported higher scores across all six variables examined, with large effect sizes for five variables and a medium effect for the perceived ability to critically verify AI-generated responses. The largest differences concerned self-perceived AI knowledge, perceived competence in using AI in teaching practice, openness to experimentation, and professional use, whereas the difference in the perceived ability to critically verify AI-generated responses was comparatively smaller. The correlational findings add nuance to this pattern. Current professional use was strongly associated with perceived competence in using AI and with openness to experimentation, but more weakly with the perceived ability to verify AI-generated responses. Conversely, self-perceived AI knowledge showed particularly strong associations with both indicators of critical evaluation. These patterns should not be interpreted causally, but they suggest that professional use and perceived knowledge may relate differently to perceived competence in using AI and to perceived competence in critically evaluating it. This distinction is consistent with conceptualisations of AI competence as encompassing technical, pedagogical and ethical dimensions (Celik, 2023; Chiu et al., 2025; Kazmaci et al., 2025). It is also consistent with participants' strong concern that, without adequate training, AI may be used superficially or inappropriately. From a professional development perspective, these findings suggest that opportunities for practical experimentation may need to be accompanied by explicit attention to the critical evaluation of AI tools and outputs.

These findings should be interpreted in light of several limitations. The study involved a relatively small convenience sample drawn from a single school institution, which limits the generalisability of the findings. Its cross-sectional design precludes causal inferences and conclusions about the temporal direction of the observed associations. In addition, the study relied on self-reported and self-perceived measures, which should not be interpreted as indicators of actual AI competence or behaviour. Previous AI training was recorded only in terms of its presence or absence, without information on its content, duration, or quality, and

self-selection cannot be excluded, as teachers already more interested in technology may also have been more likely to seek AI-related training. Finally, the questionnaire was developed primarily ad hoc for this exploratory study and was not formally validated. Future research should therefore involve larger and more heterogeneous samples, distinguish between different forms and intensities of AI-related training, and combine self-report measures with more direct assessments of AI competence. Longitudinal or intervention studies could also help clarify the direction of the relationships observed and examine how different forms of training relate to changes in teachers' practices over time.

Overall, this exploratory study provides a context-specific picture of cautious openness towards AI, accompanied by strong emphasis on teacher supervision, ethical considerations, and professional development. Previous AI training was consistently associated with higher self-perceived knowledge, professional use, openness, and competence. The findings suggest that AI-related professional development may benefit from combining practical engagement with explicit attention to the critical and ethical evaluation of AI tools and outputs.

References

Arranz-García, O., Romero García, M. del C., & Alonso-Secades, V. (2025). Perceptions, strategies, and challenges of teachers in the integration of artificial intelligence in primary education: A systematic review. *Journal of Information Technology Education: Research, 24*, Article 6. https://doi.org/10.28945/5458

Bagdonaitė, J., & Dagienė, V. (2025). Artificial intelligence in primary education: A systematic literature review 2020–2025. *Informatics in Education, 24*(4), 697–736. https://doi.org/10.15388/infedu.2025.24

Calleja, J., & Camilleri, P. (2025). Primary school teachers' perceptions towards the use of generative AI in teaching using lesson study. *International Journal for Lesson and Learning Studies, 14*(3), 237–252. https://doi.org/10.1108/IJLLS-11-2024-0268

Celik, I. (2023). Towards intelligent-TPACK: An empirical study on teachers' professional knowledge to ethically integrate AI-based tools into education. *Computers in Human Behavior, 138*, Article 107468. https://doi.org/10.1016/j.chb.2022.107468

Chiu, T. K. F., Ahmad, Z., & Çoban, M. (2025). Development and validation of teacher artificial intelligence (AI) competence self-efficacy (TAICS) scale. *Education and Information Technologies, 30*(5), 6667–6685. https://doi.org/10.1007/s10639-024-13094-z

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

European Union. (2024). *Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence (Artificial Intelligence Act). Official Journal of the European Union, L*, 2024/1689. http://data.europa.eu/eli/reg/2024/1689/oj

Kazmaci, A., Cek, K., Altinay, F., Altinay, Z., & Dagli, G. (2025). Influence of theoretical and practical artificial intelligence knowledge on the primary school teachers' sustainable AI integration ability: Mediating effects of beliefs and attitudes. *Frontiers in Psychology, 16*, Article 1628557. https://doi.org/10.3389/fpsyg.2025.1628557

Ministero dell'Istruzione e del Merito. (2025). *Linee guida per l'introduzione dell'intelligenza artificiale nelle istituzioni scolastiche [Guidelines for the introduction of artificial intelligence in schools]* (D.M. n. 166 del 9 agosto 2025).

OECD. (2026). *OECD digital education outlook 2026: Exploring effective uses of generative AI in education*. https://doi.org/10.1787/062a7394-en

Petrucco, C., Favino, F., & Conte, A. (2024). Teachers' perceptions on the introduction of generative AI in schools: A mixed-method study on the opinions of 1,223 teachers in the Veneto Region, Italy. *Education Sciences & Society, 15*(2), 17–37. https://doi.org/10.3280/ess2-2024oa18406

UNESCO. (2024). *AI competency framework for teachers*. https://doi.org/10.54675/ZJTE2084