PRE-SERVICE TEACHERS' PERCEPTIONS OF ARTIFICIAL INTELLIGENCE: AN EXPLORATORY STUDY ON CURRENT USES AND PROFESSIONAL PROJECTIONS

Martina Casillo[1]
University of Macerata
m.casillo@unimc.it

Ettore Melchionna
Suor Orsola Benincasa University
ettore.melchionna@studenti.unisob.na.it

Nadia Carlomagno
Suor Orsola Benincasa University
nadia.carlomagno@unisob.na.it

Double Blind Peer Review

Citation
Casillo, M., Melchionna, E., & Carlomagno, N. (2026). Pre-service teachers' perceptions of artificial intelligence: An exploratory study on current uses and professional projections. *Italian Journal of Health Education, Sport and Inclusive Didactics, 10*(3).

Doi: https://doi.org/10.32043/gsd.v1i3.1795

Copyright notice:
© 2023 this is an open access, peer-reviewed article published by Open Journal System and distributed under the terms of the Creative Commons Attribution 4.0 International, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

gsdjournal.it
ISSN: 3103-5744

ABSTRACT
The growing presence of Artificial Intelligence in university contexts is relevant for contemporary pedagogy (Floridi, 2022; Rivoltella, 2020), as it challenges the nature of the educational experience (Carlomagno, Vadalà & Ricciardi, 2026). This exploratory study investigates how *Scienze della Formazione Primaria* students perceive and use AI in their academic path, and to what extent they envisage its use in their future teaching practice. Specific attention is devoted to anxiety towards AI, articulated in the fear of professional replacement and in the concern of losing personal competencies. The study, conducted on a sample of university students, adopts mixed methods to examine AI use, projections and emotional aspects. Preliminary findings depict students' positioning, supporting pedagogical reflection on the education of future teachers, called to take an active role in the face of the transformations affecting contemporary educational systems.

KEYWORDS
Artificial intelligence; teacher education; anxiety; pre-service teachers; perceptions;

Received 2026-06-29
Accepted 2026-10-27
Published 2026-10-30

[1] Martina Casillo is the author of the paper. She wrote the Sect. "Theoretical Framework","Results","Discussion", "Limitations and future perspectives"; Ettore Melchionna is the co-author of the paper. He wrote the Sect. "Conclusions"; Nadia Carlomagno is the scientific coordinator of the project; she wrote the Sect. "Introduction", "Research design and methodology".

1. Introduction

The rapid spread of Artificial Intelligence (AI) technologies is redefining the ways in which individuals relate, communicate and learn. The educational environment, traditionally grounded in the relationship between teacher and learner (Rivoltella, 2017), is today immersed in complex digital ecosystems, in which algorithmic and generative tools (Panciroli & Rivoltella, 2023) increasingly accompany access to information, the production of content and the organisation of study. In this scenario, the introduction of AI questions the very nature of the educational experience (Carlomagno, Vadalà & Ricciardi, 2026).

Within this horizon, the condition of students of *Scienze della Formazione Primaria* takes on relevance: they encounter AI today in their academic path and, as future teachers, may deal with it tomorrow in teaching practice. This twofold condition, typical of a generation raised in a now fully post-medial society (Rivoltella, 2020), makes their perception an observatory of particular interest into the transformations affecting the teaching profession.

The present exploratory study takes this perspective as its centre of gravity: it investigates how future teachers perceive and use AI in their study path and, above all, to what extent they envisage its use in their future teaching practice and how they represent their professional role in relation to it. Specific attention is devoted to the anxiety they express towards AI, articulated, according to the AI Anxiety Scale (Wang & Wang, 2019), in the fear of a replacement of their professional role and the concern of losing personal competencies.

Through an exploratory mixed methods design, this first investigation aims to contribute to understanding the transformations under way, to identify emerging training needs and to outline possible directions for a teacher education capable of an active role within contemporary educational contexts, without losing sight of the centrality of the relationship and the human dimension of teaching.

2. Theoretical Framework

The study adopts the enactivist-interactionist paradigm as its interpretative lens, in continuity with related research on the relationship between teachers, future teachers and AI (Carlomagno, Vadalà & Ricciardi, 2026). This paradigm conceives knowledge not as a transfer of content, but as a process emerging from the situated and embodied interaction between subject and environment (Varela, Thompson & Rosch, 1991). It thus offers a key for interpreting the specificity of the educational relationship and for reading how future teachers represent the role of AI in relation to a profession deeply anchored to the relational and bodily dimension.

From this perspective, knowledge is generated in the dynamic encounter between organism and environment, and learning is the outcome of a continuous co-construction between those who teach and those who learn (Sibilio, 2020; Galdieri & Di Gennaro, 2022; Galdieri & Sibilio, 2022), in which the bodily and affective dimension is constitutive. It is precisely this experiential rootedness that future teachers perceive as non-delegable to an artificial system.

Two further references are added. The paradigm of complexity (Morin, 1993) invites us to move beyond reductionist models and read educational phenomena as interconnected dimensions, traversed by uncertainty and non-

linearity. The paradigm of simplexity (Sibilio, 2014, 2023; Sibilio & Zollo, 2016) offers in turn a key for understanding how educational actors face such complexity, selecting from time to time the possible alternatives in view of didactic action (Sibilio, 2015).

In this scenario AI can be read, in the light of Actor Network Theory (Latour, 2005), as a new non-human actant, capable of reorganising the networks of interaction and redefining roles, responsibilities and professional needs. Lacking a body and experience, it does not understand the world yet succeeds in tasks that in humans would require intelligence, since such success can do without understanding, awareness, semantics and experience. It operates in an infosphere, in which digital information permeates every dimension of human experience (Floridi, 2014) and takes the form of a new form of agency, not of intelligence (Floridi, 2022). Distinguishing between simulation and understanding becomes fundamental, since it clarifies the limits and possibilities of generative AI and brings back to the centre the teacher as mediator and guarantor of the educational relationship (Borsini & Giaconi, 2025), together with the need for a media ethics able to guide a responsible use of such technologies (Rivoltella, 2024).

To guide the analysis, the study adopts two constructs from the international literature. The first is AI literacy (Ng, Leung, Chu & Qiao, 2021), the competencies to know, understand, use and critically evaluate AI and to grasp its ethical implications (Long & Magerko, 2020; Casal-Otero, Catala, Fernández-Morante, Taboada, Cebreiro & Barro, 2023), later operationalised in instruments articulating its affective, behavioural, cognitive and ethical dimensions (Ng, Wu, Leung, Chiu & Chu, 2024). The second is AI anxiety (Wang & Wang, 2019), the emotional apprehension connected with such technologies, from anxiety about learning the tool to the fear of professional

replacement. From the two derive the questionnaire dimensions devoted to critical awareness in AI use and to anxiety towards it.

2.1 Artificial Intelligence (AI) in the education of future teachers

In education, AI opens up scenarios of support and personalisation of learning: it broadens study support through adaptive environments and individualised tutoring (Luckin, Holmes, Griffiths & Forcier, 2016), allows the design of pathways supported by feedback, scaffolding and adaptive tutoring (Holmes, Bialik & Fadel, 2019; Laurillard, 2014) and opens a ground for reflection on creativity, between generative possibilities and limits with respect to human divergent thinking (Creely, Henriksen & Henderson, 2023; Santoianni, 2024). Recent studies document how these possibilities are already widely experienced by university students, who turn to AI above all to clarify and deepen disciplinary concepts (von Garrel & Mayer, 2023).

Alongside these opportunities, research places equally relevant critical aspects, which weigh particularly when the subject is a future teacher. A poorly aware use of AI can foster cognitive offloading, with the risk of replacing functions of analysis, research, writing and interpretation and weakening autonomy of thought (Holmes, Bialik & Fadel, 2019; Wang, Yang & Han, 2026). The literature also signals the risk of cultural homogenisation and a flattening of creativity, and the limited reliability of content sometimes distorted or untrue, which makes uncritical use problematic and raises ethical questions in school contexts (Akgun & Greenhow, 2021). On the relational level, excessive technological mediation can reduce the space of human interaction, which remains central in educational processes (Borsini & Giaconi, 2025).

For future teachers, therefore, AI is not only a study tool but also the object of a professional projection that intertwines opportunities and fears. Many

recognise in AI a transformation capable of questioning consolidated teaching practices, professional confidence and the willingness to adapt teaching strategies (Agrati & Beri, 2025); at the same time, they feel the need to safeguard what they consider non-delegable, namely the educational relationship and the critical responsibility that accompanies it. The aware use of AI requires discernment, emotional regulation, responsibility and critical thinking, dimensions that AI can support but not take on, since they remain anchored to the educational responsibility and pedagogical intentionality proper to the teacher. The psychological condition with which future teachers approach these technologies, made of attitudes, expectations and fears, thus becomes a non-secondary factor of their education (Wang & Wang, 2019).

3. Research design and methodology

The research is configured as an exploratory, descriptive cross-sectional study, aimed at investigating the perceptions and attitudes of future teachers towards AI in the educational context, to identify emerging training needs and analyse the transformations perceived with respect to their future professional role.

The design adopted is a convergent, quantitatively prevalent mixed methods design. Quantitative data (closed Likert-scale items) and qualitative data (open-ended questions) were gathered through a single instrument administered in a single phase, then analysed separately and integrated at the interpretative stage (Trinchero & Robasto, 2019; Schoonenboom & Johnson, 2017). Integration was carried out section by section: for each thematic area the distributions of the closed items and the categories emerging from the corresponding open-ended question were compared, so that the qualitative material could specify, illustrate or qualify the trends observed in the quantitative component. Convergences and divergences between the two components are made explicit in the discussion, where they are treated as

complementary readings of the same dimension rather than as reciprocal validation.

The data were collected through an anonymous questionnaire administered via Google Forms. A total of 470 third-year students of the degree programme in *Scienze della Formazione Primaria* at the Università degli Studi Suor Orsola Benincasa of Naples took part.

The instrument, besides the request for informed consent and three demographic and contextual items (age, frequency of use of digital tools for study and self-assessment of digital competence), comprises forty-seven questions: forty-one closed-response items and six open-ended questions. The closed items are expressed mainly on a five-point Likert scale (1 = not at all in agreement, 5 = completely in agreement), with the exception of one dichotomous item and one multiple-choice item in the first section, and organised into five thematic sections: general use of AI; use of AI in study; the dimension of anxiety towards AI; perception of one's own professional future; perception of the role of AI in the relationship with future pupils. The six open-ended questions, placed at the end of each section and supplemented by a concluding question in the last, were all compulsory and gather the participants' motivations, experiences and representations. With the exception of the section on anxiety, described below, the items were formulated ad hoc for the present study, starting from the two reference constructs of AI literacy (Ng et al., 2021) and AI anxiety (Wang & Wang, 2019) and from the literature on the use of AI in higher education and in teacher education (von Garrel & Mayer, 2023; Chiu et al., 2024). Each thematic section was designed to explore a specific area of the research question, moving from everyday and academic uses to the emotional dimension and to professional projections. No

psychometric validation procedure was carried out on the instrument, in line with the exploratory and descriptive aims of the study.

The section devoted to anxiety was constructed by taking the Artificial Intelligence Anxiety Scale (Wang & Wang, 2019) as its theoretical reference, in an exploratory adaptation to the context of future teachers. Of the four factors of the original scale, two were retained as the conceptual basis for the first two groups of items: learning anxiety, which informed the three items on anxiety connected with learning the tool (D1, items 28-30), and job replacement anxiety, which informed the three items on the fear of professional replacement (D2, items 31-33), the last of which was reformulated with explicit reference to the future teaching role. The sociotechnical blindness factor was initially considered and subsequently set aside, whereas the AI configuration factor, which concerns humanoid and robotic AI, was excluded from the outset as conceptually peripheral to the experience of a sample oriented towards text-based conversational tools. The third group of items (D3, items 34-38), which concerns the perceived loss of personal competencies in autonomous writing, critical analysis, elaboration, concentration and creativity, does not derive from the original scale: it was formulated ad hoc for the present study in order to capture a concern specific to the educational context under investigation. The items were written in Italian and adapted in wording to the target population; neither a forward-backward translation procedure nor any psychometric verification was carried out. For this reason D1, D2 and D3 are to be understood as exploratory groupings of items, and not as validated sub-scales of the original instrument; accordingly, the results are reported at item level and are not aggregated into synthetic scores.

The quantitative data were subjected to descriptive statistical analysis. For each item the response frequencies were aggregated into three areas: disagreement

(values 1 and 2), the neutral position (value 3) and agreement (values 4 and 5); the percentages reported refer to this aggregation. In a subsequent descriptive phase, agreement frequencies for some items were examined by dividing the sample according to the intensity of AI use in study. This division was based on a single indicator, item 17 ("I regularly use Artificial Intelligence tools in my university studies"), rated on the same five-point Likert scale; no composite score was computed. The thresholds coincide with the points of the response scale: responses 1 and 2 define the low-intensity group (n = 112), response 3 the intermediate group (n = 195) and responses 4 and 5 the high-intensity group (n = 163), for a total of 470 cases with no missing data on this item. The three groups are therefore descriptive strata established a priori on the response scale, and not empirically derived clusters. No inferential analyses were carried out, owing to the exploratory and descriptive aims of the study.

The qualitative data were examined through a content analysis by thematic categories, following a deductive-inductive approach. Each open-ended question was treated as an autonomous textual corpus. All six open-ended questions were compulsory and each collected 470 responses; after excluding null or non-informative answers (for example "no", "nothing" or blank entries), the corpora subjected to analysis comprise 464 responses for item 16, 464 for item 27, 437 for item 39, 454 for item 45 and 459 for item 50. For the concluding question (item 51), which invited participants to add anything they considered relevant, the substantive responses number 258: the lower figure reflects the compulsory nature of the question, to which many participants replied that they had nothing to add. In a first deductive phase, the coding categories were anchored to the two reference constructs, AI literacy (Ng et al., 2021) and AI anxiety (Wang & Wang, 2019); in a second inductive phase the scheme was supplemented with categories emerging from the data. For each category, a

brief description and some representative examples are reported. Coding was carried out by the first author through repeated readings of each corpus, with progressive refinement of the category scheme, which was then discussed with the co-authors. Given the single-coder design, no inter-rater agreement index was computed: the quality criterion adopted is the transparency of the procedure, with the categories, their definitions and the corresponding examples reported in full in the tables. The examples were selected, for each category, on the basis of their representativeness of the formulations most frequently recurring in the corpus and of their clarity of expression; they are reported verbatim and translated into English.

3.1 Sample

The sample is composed of 470 third-year students of the degree programme in *Scienze della Formazione Primaria* at the Suor Orsola Benincasa University of Naples, who took part on a voluntary basis with prior informed consent. It is a young and age-homogeneous sample, with a mean age of 21.5 years and 84.9% of respondents in the 19-22 range, a profile corresponding to that of future teachers in an advanced phase of initial training. As for familiarity with the tools, 82.6% declare that they have an AI application installed on their smartphone; the most widely used are ChatGPT (86.6%) and Gemini (56.0%), followed at a distance by voice assistants (24.0%), while more specialised tools remain marginal. The sample thus appears widely exposed to a few widespread generative tools.

4. Results

The presentation of the results follows the five thematic sections of the questionnaire. For each section the quantitative data are reported first, as percentages of agreement, neutrality and disagreement and illustrated, where

pertinent, by the charts generated through Google Forms; the outcomes of the thematic analysis of the open-ended responses are then presented in tabular form.

4.1 General use of AI

The first section, composed of eleven closed items and one open-ended question, investigates the modes of interaction with AI in everyday life, the motivations for use and the perception of one's own relationship with such tools. The data outline a predominantly functional and task-oriented use. The most widely shared motivation is the rapid search for information (63.2%), followed by personal curiosity (43.0%) and creative activities (39.6%); use for entertainment is marginal, with 80.9% in disagreement. Only 22.3% consider that AI has become an integral part of their everyday life: use appears circumscribed and instrumental, rather than pervasive.

The thematic analysis of the open-ended question on the motivations for use (item 16) confirms this picture: the rapid search for information is the most recurrent motivation, followed by study support, advice and practicality in everyday activities and personal curiosity (Table 1).

Table 1: Motivations for the use of AI in everyday life (item 16).

Theme	Description	Examples of responses
Information search	Rapid and concise retrieval of information and answers.	*"For information" / "To search for information" / "For information"*

Study support	Recourse to AI to study, summarise and deepen topics.	*"For study reasons" / "To make summaries" / "Study and summaries"*
Advice and practicality	Help in everyday activities and request for practical advice.	*"for advice and information" / "to ask everyday questions" / "advice, recipes, practicality"*
Personal curiosity	Exploration of topics of personal interest.	*"For personal curiosities" / "Curiosity, searches" / "Out of curiosity"*

4.2 The use of AI in study

The second section, with ten closed items and one open-ended question, examines the use of AI in the university path, distinguishing frequency, specific functions and critical awareness. In study, AI is employed above all as a support to comprehension: 63.4% agree on using it to clarify difficult concepts or deepen examination topics (Chart 1) and 58.9% turn to it when they encounter difficulties in understanding content, in line with what has been observed on a wider scale among university students (von Garrel & Mayer, 2023).

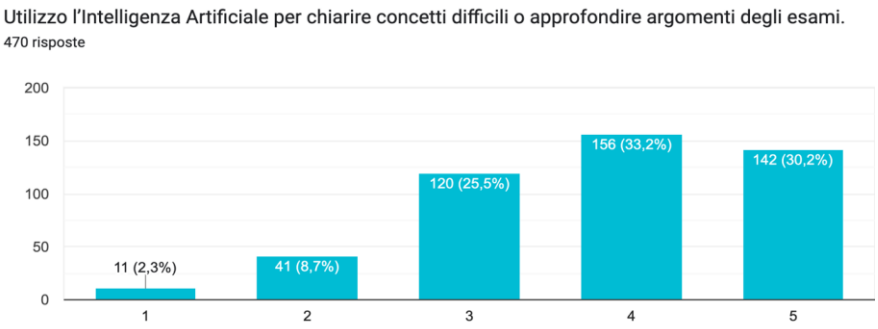


Chart 1. “I use AI to clarify difficult concepts or to deepen examination topics”.

Uses implying a more extensive delegation of cognitive work remain limited, such as support for writing papers (23.2% agreement) and the organisation of study (57.0% in disagreement). This selective use is accompanied by a self-reported critical stance: 68.9% state that they recognise the limits of the tools used and 59.8% declare that they consciously choose certain study activities for which they do not turn to AI. These are self-perceptions, which may be read as consistent with the dimensions of AI literacy relating to use and critical evaluation (Ng et al., 2021), here proposed as an interpretative reading rather than as a directly measured construct.

The thematic analysis of the open-ended question on AI use in examination preparation and the activities from which it is excluded (item 27) confirms the centrality of clarification and synthesis and brings out a share of students who delimit the use of AI, reserving activities such as memorisation and writing for autonomous study (Table 2).

Table 2: *Modes of use of AI in examination preparation (item 27).*

Theme	Description	Examples of responses
Clarification of concepts	Use of AI to have complex concepts explained, simplified and deepened.	*“to summarise and simplify concepts” / “To summarise or clarify concepts” / “Explanation of difficult concepts”*
Synthesis and outlining	Production of summaries, outlines and maps to support revision.	*“I make outlines” / “For summaries and maps” / “I use it to make summaries or outlines”*

Activities excluded from use	Activities deliberately carried out without recourse to AI.	*"I do not use it to prepare exams" / "I prefer not to use it for exercises or to write reports" / "I do not use it often because it is not reliable"*

4.3 The dimension of anxiety towards AI

The third section, constructed with reference to the Artificial Intelligence Anxiety Scale (Wang & Wang, 2019), comprises eleven closed items, organised into the three exploratory groupings already described, and one open-ended question. It returns the most differentiated picture of the study, since the three groupings show clearly distinct trends.

Anxiety connected with learning the tool (D1) is almost absent. For the item on anxiety about learning to interact effectively with an AI tool, 81.9% disagree and only 4.5% agree (Chart 2); analogous values are observed for learning to use new tools (4.7%) and understanding how they function (5.5%). For this generation, technical mastery of the tool does not represent a source of apprehension, in continuity with studies that place the AI literacy of future teachers on a plane broader than mere exposure to the tools, including critical evaluation, ethical use and educational responsibility (Ayanwale, Adelana, Molefi, Adeeko & Ishola, 2024).

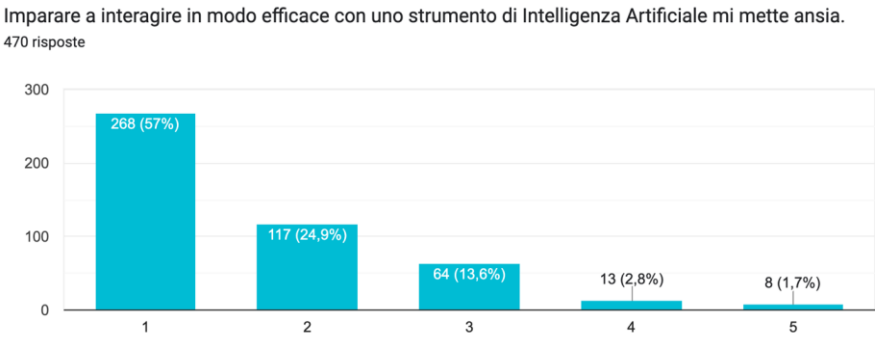


Chart 2. "Learning to interact effectively with an AI tool makes me anxious"

A different picture emerges for the fear of professional replacement (D2). This fear is high in general terms, since 57.9% fear that AI may take work away from certain professional categories and 49.1% that it may replace humans in many professions; it diminishes markedly when the question becomes personal, since only 22.1% fear that AI may put their own future role as a teacher at risk (Chart 3).

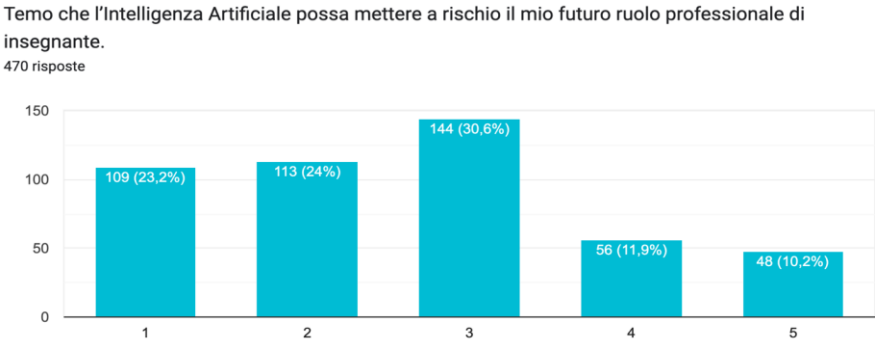


Chart 3. "I fear that AI may put my future professional role as a teacher at risk"

This gap between general fear and fear referred to one's own profession is one of the most significant elements of the survey: future teachers perceive their

own role as relatively protected against automation, implicitly recognising its relational, human and professional-judgement dimension, which the literature indicates as a condition to be preserved in teacher-AI collaboration (Biström & Mollwing, 2026; Borsini & Giaconi, 2025).

The concern relating to the loss of personal competencies (D3) is distributed in an intermediate, modulated way. The most widespread fear concerns autonomous writing skills (41.3%), followed by critical analysis and reasoning (31.9%; Chart 4) and personal creativity (31.5%); more limited are the fears for the elaboration and memorisation of content (26.4%) and concentration (26.4%). What emerges is an anxiety that does not concern the tool, but one's own cognitive and creative faculties.

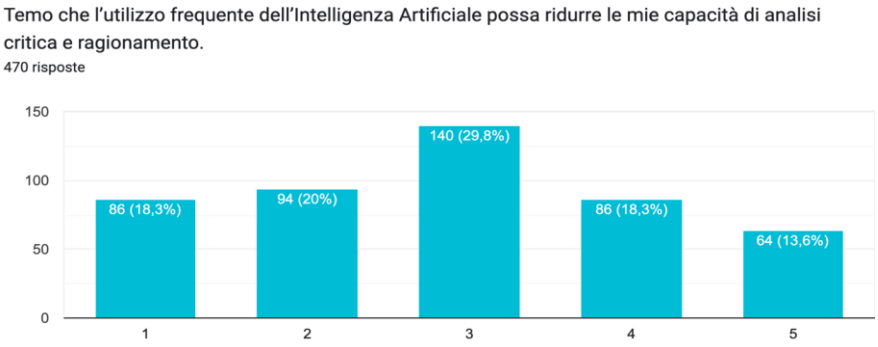


Chart 4. "I fear that the frequent use of AI may reduce my capacities for critical analysis and reasoning"

The thematic analysis of the open-ended question on the competencies perceived as at risk (item 39) confirms this hierarchy, with reasoning and critical-thinking skills among the most frequently mentioned, alongside creativity and autonomous writing (Table 3).

Theme	Description	Examples of responses
Reasoning and critical thinking	Fear of reducing the capacity to reason, analyse and maintain critical thinking.	*"critical thinking" / "critical capacity" / "Reasoning and analysis"*
Creativity	Fear of an impoverishment of personal creativity.	*"Creative capacity" / "creative skills" / "A bit of creativity"*
Autonomus writing	Fear of losing the capacity to write and compose one's own texts.	*"autonomous writing" / "writing skills" / "spontaneous writing"*

Table 3. Personal competencies perceived as at risk (item 39).

4.4 The perception of one's own professional future

The fourth section, with five closed items and one open-ended question, explores the perception of one's own future role as a primary school teacher with respect to the growing presence of AI, distinguishing the intention to use it in future practice from perceived preparedness and training needs. The intention of didactic use still appears uncertain: agreement on using AI to prepare teaching materials stands at 24.5% (Chart 5) and on designing classroom activities at 24.0% (Chart 6), both with a wide share of neutral positions (around 37-39%). Professional projection therefore appears located in an area of waiting, consistent with studies on teachers' readiness and intention to integrate AI into teaching (Ayanwale, Sanusi, Adelana, Aruleba & Oyelere, 2022) and with the distinction between literacy and competence in AI use (Chiu, Ahmad, Ismailov & Sanusi, 2024).

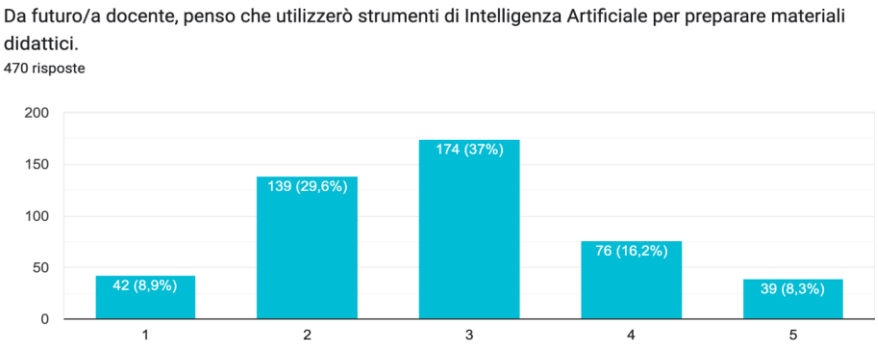


Chart 5. "As a future teacher, I think I will use AI tools to prepare teaching materials".

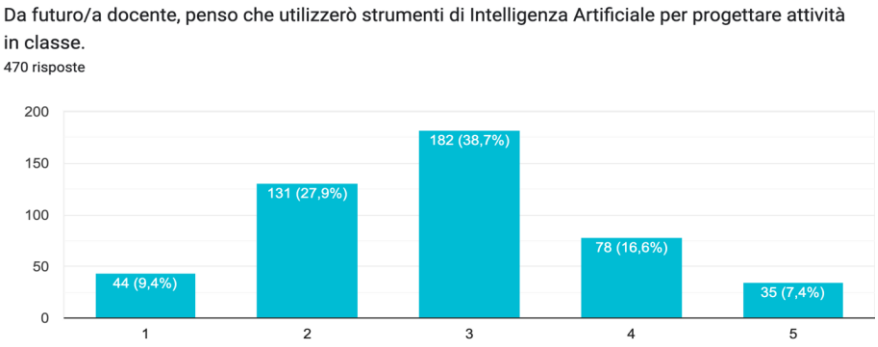


Chart 6. "As a future teacher, I think I will use AI tools to design classroom activities".

This operational uncertainty is accompanied by a more stable datum on the meaning of the profession: only 13.8% fear that AI may make their future profession less meaningful, against 58.5% in disagreement (Chart 7). Confidence in the value of one's own role thus remains firm, even when the concrete mode of integration is still to be defined, in dialogue with the reflection on the meaning of teaching work in the AI era (Biström & Mollwing, 2026) and with studies according to which the level of AI literacy may

differently modulate how its use affects future teachers' basic psychological needs (Wang, Yang & Han, 2026).

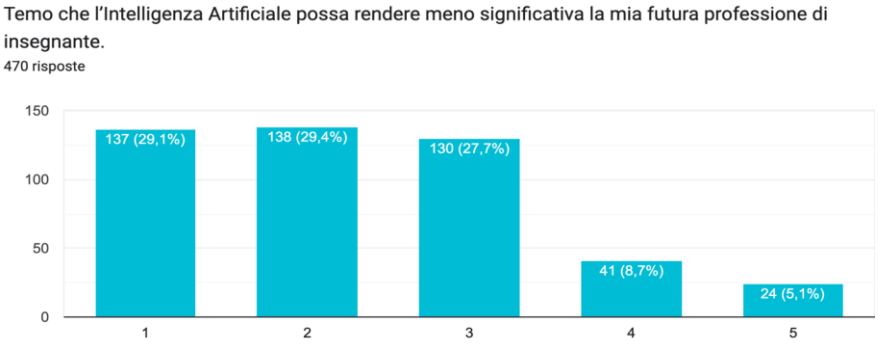


Chart 7."I fear that AI may make my future profession as a teacher less meaningful".

Consistently, and in line with the relevance the literature attributes to perceived self-efficacy towards AI (Morales-García, Sairitupa-Sanchez, Morales-García & Morales-García, 2024), only 17.7% declare that they already feel prepared to integrate AI into their future work, while 42.3% express the wish for specific training during the university path (Chart 8). The distance between willingness and perceived mastery clearly identifies a training need, consistent with studies showing how structured pathways and AI learning environments can strengthen competencies, confidence, readiness and engagement (Han, 2025; Ayanwale, Frimpong, Opesemowo & Sanusi, 2025).

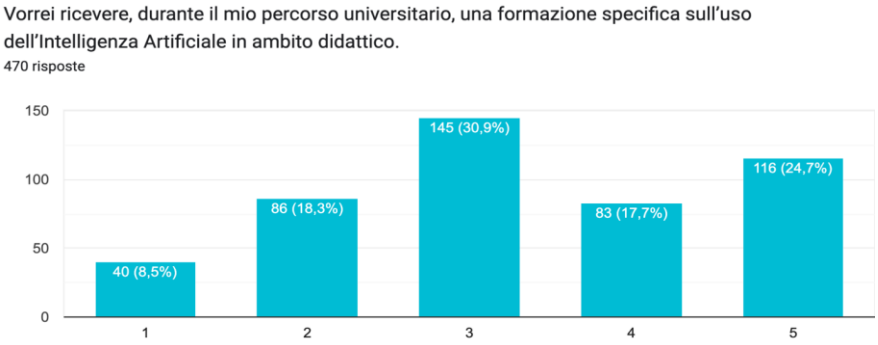


Chart 8."I would like to receive, during the university path, specific training on the use of AI in the teaching context".

The thematic analysis of the open-ended question on how future teachers imagine AI in their practice (item 45) returns a predominantly instrumental representation, oriented towards creating materials and designing activities, accompanied by an awareness of the competencies to be developed and by a more limited but significant attention to personalisation and inclusion (Table 4).

Table 4: AI in future teaching practice and competencies to be developed (item 45).

Theme	Description	Examples of responses
Creation of materials and activities	AI as support for preparing lessons and materials and designing activities.	*"To design activities" / "hands-on activities" / "To create teaching materials"*

Competencies to be developed	Awareness of the digital and critical competencies required.	*"Computer skills" / "knowing how to use such tools consciously" / "computer skills in general"*
Inclusion and personalisation	AI as support for personalisation and inclusion.	*"create personalised teaching materials" / "personalise teaching and create materials"*

4.5 The perception of the role of AI in the relationship with future pupils

The fifth section, composed of four closed items and two open-ended questions, investigates in a prospective way the relationship between future pupils and AI tools and the teacher's disposition to accompany them. It is the section most directly connected with the focus of the study, and its data outline a coherent educational stance. On the one hand a concern emerges, since 44.0% declare themselves concerned at the idea that their pupils use AI to study (Chart 9).

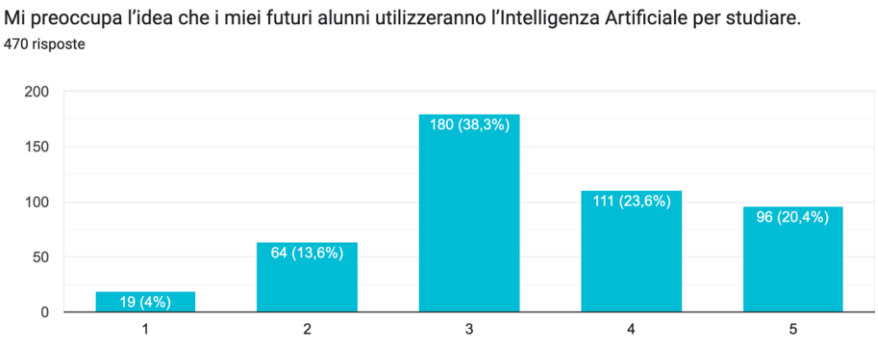


Chart 9."I am concerned by the idea that my future pupils will use AI to study".

On the other hand, this concern does not translate into closure but into the claim of a guiding role: 58.9% express a perceived self-efficacy in recognising an inappropriate use of AI by a pupil (Chart 10), 56.0% consider it a useful resource for pupils if well guided (Chart 11), and 60.4% want to accompany their pupils towards an aware and critical use (Chart 12).

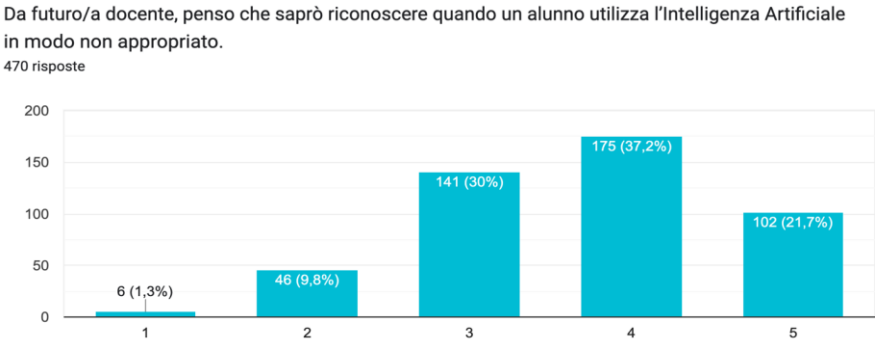


Chart 10. "As a future teacher, I think I will be able to recognise when a pupil uses AI in an inappropriate way".

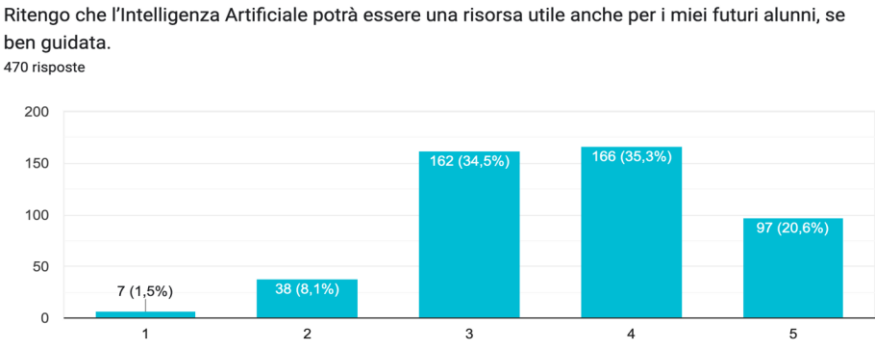


Chart 11."I consider that AI may be a useful resource also for my future pupils, if well guided".

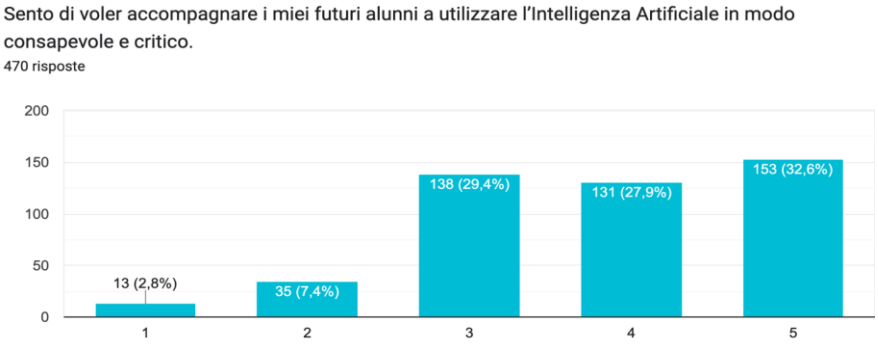


Chart 12."I feel that I want to accompany my future pupils towards an aware and critical use of AI".

What emerges is an educational stance that takes on the responsibility of mediation, placing the teacher as a figure who guides the use of technology rather than undergoing or prohibiting it (Borsini & Giaconi, 2025; Ng et al., 2021). The thematic analysis of the first open-ended question, on the greatest challenge that future teachers imagine they will face (item 50), confirms this reading, identifying four main cores (Table 5).

Table 5: The greatest challenge of the future teacher (item 50).

Theme	Description	Examples of responses
Aware and critical use	Educating pupils towards a correct, aware and critical use of AI.	*"use it consciously" / "promote critical thinking"*
Guiding role of the teacher	Guiding and mediating function of the teacher in the use of AI.	*"Guide them in its correct use" / "Teach how to use it in the right way"*

Prevention of dependence	Fear of dependence and need for a non-excessive use.	"not to depend too much" / "Not let them use it too much"
Safeguarding autonomy	Preserving pupils' autonomous reasoning, critical thinking and creativity.	*"Make them reason autonomously" / "develop their own thinking"*

The second open-ended question of the section (item 51) gathers further considerations on the relationship with AI. Despite their heterogeneity, some recurrent cores converge with the overall picture of the study: AI as a tool of support and not a substitute, the request for a balanced and aware use, the need for training, the fear for one's own skills and the assumption of a guiding teacher role (Table 6).

Table 5*: Supplementary considerations on the relationship with AI (item 51).*

Theme	Description	Examples of responses
Tool of support, not substitute	AI is described as a help to study and teaching that must not replace personal effort or human thought.	"*A useful help, but it must not replace personal effort"; "a means and never an end".*
Balanced and aware use	The idea recurs that the value of AI depends on a measured, responsible use accompanied by critical sense.	*"If used with balance and responsibility"; "its use must be monitored".*
Need for training and awareness	Several respondents express the wish to understand better how to employ AI, also in view of the profession.	"I would like first of all to have more awareness myself"; "to understand how to integrate it into an educational methodology".

Fear for one's own skills	The concern remains that excessive use may weaken skills and autonomy of thought.	*"I would not want it to make me lose my skills"; "it must not take over".*
Role of the teacher as guide	Some respondents link AI to their future task of accompanying pupils towards an aware use.	*"I will help them towards an aware use of it"; "to teach a responsible and ethical use".*

5. Discussion

The results return a coherent and articulated image of the relationship between future teachers and AI. On the level of use, an instrumental and selective profile emerges students turn to AI above all to search for information rapidly and to clarify difficult concepts, keeping their distance from uses that entail a more extensive delegation of cognitive work. Read together with the critical awareness expressed by the sample, this suggests an integration of AI as a circumscribed support, rather than as a habitual study environment (Ng et al., 2021; von Garrel & Mayer, 2023).

The most relevant contribution concerns the professional and emotional dimension. The clear differentiation between the three exploratory groupings of anxiety items shows that the apprehension of future teachers does not concern the technology, since anxiety towards learning the tool is almost absent, but its consequences on the cognitive and professional level. In particular, the gap between the general fear of professional replacement and the much more limited fear referred to one's own role signals an implicit representation of the teaching profession as anchored to a relational, human and professional-judgement dimension that educational AI configurations should preserve (Biström & Mollwing, 2026; Borsini & Giaconi, 2025). The concern thus shifts from the workplace to one's own faculties: the fear of losing

skills of writing, reasoning and creativity is the most deeply rooted form of anxiety (Wang & Wang, 2019).

The descriptive trends in relation to intensity of use enrich this picture. Dividing the sample into three groups by intensity of AI use in study, low (n = 112), intermediate (n = 195) and high (n = 163), in a purely descriptive comparison without inferential tests, two trends emerge. The fear of losing competencies increases as use grows, with agreement on the fear of losing autonomous writing skills rising from 32.1% to 35.9% and up to 54.0%: this apprehension appears compatible not with rejection or low familiarity, but with a reflective stance associated with greater use, here proposed as an interpretative reading rather than as a directly measured construct. Likewise, the intention to employ AI to prepare teaching materials rises from 9.8% to 13.8% and up to 47.2%, consistent with a professional projection in continuity with today's personal practices, so that the way today's student uses AI to study appears in continuity with how tomorrow's teacher imagines using it in class. An analogous link between AI literacy and intention of use is documented in the university context (Lan, Liu & Xia, 2025). These differences are descriptive trends observed in the distribution of responses: in the absence of inferential tests they cannot be read as statistically significant effects, nor in causal terms. Read through complexity (Morin, 1993) and simplexity (Sibilio, 2023), these outcomes describe future teachers moving between opportunities and fears, in search of a balance between the usefulness of the tool and the safeguarding of their own faculties and those of their pupils. In a position of aware meditation rather than uncritical adherence or rejection.

Finally, the broad request for specific training, against a limited perception of being already prepared, clearly identifies a training need. Future teachers report familiarity of use and a self-perceived critical stance but ask to transform

this disposition into structured pedagogical competencies, capable of guiding the integration of AI into future teaching contexts (Agrati & Beri, 2025; Holmes, Bialik & Fadel, 2019; Filiz, Kaya & Adiguzel, 2025).

6. Conclusions

The study has offered an initial picture of the positioning of future teachers with respect to AI, investigating its current uses, the emotional experiences and, above all, the professional projections. What emerges is a generation that employs AI in a functional and selective way, that does not fear the technology but questions its cognitive consequences, and that perceives its own future role as anchored to a non-delegable relational dimension.

Relevance is taken on by the specific nature of the anxiety expressed: not apprehension towards the tool, but concern for the possible erosion of personal competencies such as writing, reasoning and creativity, which is more frequent among those reporting a more intensive use and may be read as an indication of a reflective stance, here proposed as an interpretative reading rather than as a directly measured construct. This concern is accompanied by an educational stance already oriented towards responsibility: future teachers, though uncertain about the operational modes, represent themselves as figures called to accompany their pupils towards an aware and critical use of AI.

From this descends an indication of a formative character. Future teachers are not called to oppose technology, but to relocate their own role within a complex network of human and non-human interactions (Latour, 2005), maintaining the centrality of the educational dimension. The widespread request for training signals the urgency of accompanying them, already during initial training, towards a pedagogically grounded use of AI that integrates

technical competencies, critical capacity and relational awareness, in line with the challenges posed to teacher education by the transformation of contemporary educational systems (OECD, 2020).

7. Limitations and future perspectives

The study presents some limitations. The sample, although large, is not representative of the entire population of future teachers: coming from a single site and year of the course, it is characterised by high homogeneity of age, profile and academic phase, which limits its generalisability. Moreover, the predominant recourse to self-report instruments does not allow direct observation of the AI use practices declared by the students.

A further limitation concerns the absence of a broader methodological triangulation: the qualitative analysis was not supplemented by interviews or focus groups, which could have enriched the interpretative depth. Finally, AI is a rapidly evolving field, which makes some results provisional and tied to the moment of the survey.

Future research may broaden and diversify the sample, including students from different sites and years, and explore in greater depth, also with more articulated qualitative instruments, the emotional and relational dimensions of the relationship between future teachers and AI, in continuity with the embodied and enactive perspectives that place relationship and experience at the centre of learning.

References

Agrati, L. S., & Beri, A. (2025). Intelligenza artificiale e prassi didattica: Indagine esplorativa sugli atteggiamenti degli insegnanti. Research Trends in Humanities, 12. Sezione BEC Bio-Education & Cognition. ISSN 2284-0184.

Akgun, S., & Greenhow, C. (2021). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. AI and Ethics, 2, 431-440. https://doi.org/10.1007/s43681-021-00096-7

Ayanwale, M. A., Adelana, O. P., Molefi, R. R., Adeeko, O., & Ishola, A. M. (2024). Examining artificial intelligence literacy among pre-service teachers for future classrooms. Computers and Education Open, 6, 100179. https://doi.org/10.1016/j.caeo.2024.100179

Ayanwale, M. A., Frimpong, E. K., Opesemowo, O. A. G., & Sanusi, I. T. (2025). Exploring factors that support pre-service teachers' engagement in learning artificial intelligence. Journal for STEM Education Research, 8, 199-229. https://doi.org/10.1007/s41979-024-00121-4

Ayanwale, M. A., Sanusi, I. T., Adelana, O. P., Aruleba, K. D., & Oyelere, S. S. (2022). Teachers' readiness and intention to teach artificial intelligence in schools. Computers and Education: Artificial Intelligence, 3, 100099. https://doi.org/10.1016/j.caeai.2022.100099

Biström, E., & Mollwing, J. (2026). AI in education and the future of teachers' meaningful work. Frontiers in Education, 11, 1844085. https://doi.org/10.3389/feduc.2026.1844085

Borsini, L., & Giaconi, C. (2025). New challenges for Special Pedagogy: A study on training teachers' perceptions of the role of AI. Italian Journal of Special Education for Inclusion, 13(1), 34-46. https://doi.org/10.7346/sipes-01-2025-02

Carlomagno, N., Vadalà, V., & Ricciardi, A. (2026). AI and the Transformation of Teaching Functions: Teachers' Perceptions. Research Trends in Humanities, 13. Sezione BEC Bio-Education & Cognition. ISSN 2284-0184.

Casal-Otero, L., Catala, A., Fernández-Morante, C., Taboada, M., Cebreiro, B., & Barro, S. (2023). AI literacy in K-12: A systematic literature review. International Journal of STEM Education, 10, 29. https://doi.org/10.1186/s40594-023-00418-7

Chiu, T. K. F., Ahmad, Z., Ismailov, M., & Sanusi, I. T. (2024). What are artificial intelligence literacy and competency? A comprehensive framework to support them. Computers and Education Open, 6, 100171. https://doi.org/10.1016/j.caeo.2024.100171

Creely, E., Henriksen, D., & Henderson, M. (2023). Artificial intelligence, creativity, and education: Critical questions for researchers and educators. Computers and Education: Artificial Intelligence, 4, 100121. https://doi.org/10.1016/j.caeai.2023.100121

Filiz, O., Kaya, M. H., & Adiguzel, T. (2025). Teachers and AI: Understanding the factors influencing AI integration in K-12 education. Education and Information Technologies, 30, 17931-17967. https://doi.org/10.1007/s10639-025-13463-2

Floridi, L. (2014). The fourth revolution: How the infosphere is reshaping human reality. Oxford University Press.

Floridi, L. (2022). Etica dell'intelligenza artificiale: Sviluppi, opportunità, sfide. Raffaello Cortina Editore.

Galdieri, M., & Di Gennaro, D. C. (2022). Rethinking the didactic-educational space: Suggestions for promoting school inclusion. Form@re - Open Journal per la formazione in rete, 22(1), 308-321. https://doi.org/10.36253/form-12609

Galdieri, M., & Sibilio, M. (2022). Il potenziale corporeo nell'azione didattica. In Educazione degli Adulti: politiche, percorsi, prospettive (pp. 191-201). Firenze University Press. https://doi.org/10.36253/979-12-215-0006-6.16

Han, X. (2025). Improving pre-service teachers' AI competencies: A quasi-experimental study. Frontiers in Psychology, 16, 1642465. https://doi.org/10.3389/fpsyg.2025.1642465

Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. Center for Curriculum Redesign.

Lan, Y., Liu, S., & Xia, L. (2025). How mindfulness shapes AI competence: A structural equation modeling analysis of mindfulness, AI literacy and behavioral intention in Chinese media students. Frontiers in Psychology, 16, 1652934. https://doi.org/10.3389/fpsyg.2025.1652934

Latour, B. (2005). Reassembling the social: An introduction to Actor-Network-Theory. Oxford University Press.

Laurillard, D. (2014). Insegnamento come scienza della progettazione: Costruire modelli pedagogici per apprendere con le tecnologie. FrancoAngeli.

Long, D., & Magerko, B. (2020). What is AI literacy? Competencies and design considerations. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (pp. 1-16). ACM. https://doi.org/10.1145/3313831.3376727

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence unleashed: An argument for AI in education. Pearson.

Morales-García, W. C., Sairitupa-Sanchez, L. Z., Morales-García, S. B., & Morales-García, M. (2024). Adaptation and psychometric properties of a brief version of the general self-efficacy scale for use with artificial intelligence (GSE-6AI) among university students. Frontiers in Education, 9, 1293437. https://doi.org/10.3389/feduc.2024.1293437

Morin, E. (1993). Introduzione al pensiero complesso. Gli strumenti per affrontare la sfida della complessità (tr. it. di M. Corbani). Sperling & Kupfer.

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. Computers and Education: Artificial Intelligence, 2, 100041. https://doi.org/10.1016/j.caeai.2021.100041

Ng, D. T. K., Wu, W., Leung, J. K. L., Chiu, T. K. F., & Chu, S. K. W. (2024). Design and validation of the AI literacy questionnaire: The affective, behavioural, cognitive and ethical approach. British Journal of Educational Technology, 55(3), 1082-1104. https://doi.org/10.1111/bjet.13411

OECD (2020). Curriculum Analysis of the OECD Future of Education and Skills 2030: Technical Report. OECD Education Policy Perspectives. OECD Publishing. https://doi.org/10.1787/fec47a82-en

Panciroli, C., & Rivoltella, P. C. (2023). Pedagogia algoritmica. Per una riflessione educativa sull'Intelligenza Artificiale. Scholé.

Rivoltella, P. C. (2017). La comunicazione e le relazioni didattiche. In P. C. Rivoltella & P. G. Rossi (Eds.), L'agire didattico. Manuale per l'insegnante (2a ed., pp. 71-86). Els La Scuola.

Rivoltella, P. C. (2020). Nuovi alfabeti. Educazione e culture nella società post-mediale. Scholé-Morcelliana.

Rivoltella, P. C. (2024). Le virtù del digitale. Per un'etica dei media (Nuova ed. rivista e ampliata). Morcelliana.

Santoianni, F. (2024). Intelligenza artificiale in educazione: Intervista a ChatGPT 3.5. Research Trends in Humanities, 11. Sezione BEC Bio-Education & Cognition. ISSN 2284-0184.

Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. Kölner Zeitschrift für Soziologie und Sozialpsychologie, 69(Suppl 2), 107-131. https://doi.org/10.1007/s11577-017-0454-1

Sibilio, M. (2014). La didattica semplessa. Liguori.

Sibilio, M. (2015). Simplex didactics: A non-linear trajectory for research in education. Revue de synthèse, 6.

Sibilio, M. (2020). L'interazione didattica. Scholé.

Sibilio, M. (2023). La semplessità. Proprietà e principi per agire il cambiamento. Scholé.

Sibilio, M., & Zollo, I. (2016). The non-linear potential of didactic action. Education Sciences & Society, 7(2), 51-70. https://doi.org/10.3280/ess2-2016oa3947

Trinchero, R., & Robasto, D. (2019). *I mixed methods nella ricerca educativa*. Mondadori Education.

Varela, F. J., Thompson, E., & Rosch, E. (1991). The embodied mind: Cognitive science and human experience. MIT Press.

von Garrel, J., & Mayer, J. (2023). Artificial intelligence in studies—use of ChatGPT and AI-based tools among students in Germany. Humanities and Social Sciences Communications, 10, 799. https://doi.org/10.1057/s41599-023-02304-7

Wang, Y., Yang, K., & Han, D. (2026). The influence of AI literacy on pre-service teachers' learning motivation: The mediating role of basic psychological needs. Frontiers in Psychology, 17, 1831770. https://doi.org/10.3389/fpsyg.2026.1831770

Wang, Y. Y., & Wang, Y. S. (2019). Development and validation of an artificial intelligence anxiety scale: An initial application in predicting motivated learning behavior. Interactive Learning Environments, 30(4), 619-634. https://doi.org/10.1080/10494820.2019.1674887