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Teachers and the Challenges of Generative Artificial Intelligence (AI): A Survey in Primary and Secondary Schools

Gli insegnanti e le sfide dell'Intelligenza Artificiale Generativa (AI): un'indagine nelle Scuole Primarie e Secondarie

Call

AI presenting innovative solutions to improve the student learning process and increase the effectiveness of teaching (AiEd). The objective is to promote the development of adaptive learning environments and develop flexible, teaching mediators (OECD, 2024). The training of teachers is essential starting from an analysis of their training needs and their knowledge and skills. In our sample – 396 teachers, primary and secondary schools of Abruzzo Region – the 43.4% maintain that AI can favor teaching, 47.1% indicate it is useful for the personalization of teaching and 40.2% talk about support for study activities. Faced with this, 35.1% of our sample declared that they did not have the right preparation for the use of AI, 66.9% said that they did not have a good knowledge of Machine Learning. Contradictions emerge which indicate that teachers not only are not clear about the applications of AI but not even about the distinction between the main types of it (ML; DL; NLP; CV). Priority is given to the urgency of improving education through teacher training courses.

Keywords: AI | knowledge | skills | teachers training

L'IA presenta soluzioni innovative per migliorare il processo di apprendimento degli studenti e aumentare l'efficacia dell'insegnamento (AiEd). L'obiettivo è promuovere lo sviluppo di ambienti di apprendimento adattivi e sviluppare mediatori didattici flessibili (OCSE, 2024). La formazione degli insegnanti è essenziale a partire da un'analisi dei loro bisogni formativi e delle loro conoscenze e competenze. Nel nostro campione - 396 insegnanti delle scuole primarie e secondarie della Regione Abruzzo - il 43,4% sostiene che l'IA può favorire la didattica, il 47,1% indica che è utile per la personalizzazione dell'insegnamento e il 40,2% parla di supporto alle attività di studio. A fronte di ciò, il 35,1% del nostro campione dichiara di non avere la giusta preparazione per l'utilizzo dell'IA, mentre il 66,9% afferma di non avere una buona conoscenza del Machine Learning. Emergono contraddizioni che indicano che gli insegnanti non solo non hanno chiare le applicazioni dell'IA, ma nemmeno la distinzione tra i principali tipi di IA (ML; DL; NLP; CV). Viene data priorità all'urgenza di migliorare l'istruzione attraverso corsi di formazione per insegnanti.

Parole chiave: IA | conoscenze | competenze | formazione degli insegnanti

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1. Introduction

Different definitions have been made about artificial intelligence: in general terms, it can be expressed as the skills that require intelligence specific to humans that machines can also perform. This expression includes artificial intelligence collecting information, interpreting it, expressing it with data, performing new learning in the light of this data, and successfully fulfilling the assigned tasks. In another definition, artificial intelligence is machine learning. However, machine learning is just one component of artificial intelligence (Blumenthal, 2017). But in wanting to be more precise, AI systems are referred to by terms like machine learning (deep/reinforcement learning), natural language processing (e.g. chatbots), and automated and robotic technologies (Jarrahi, 2018). Depending on their functions, AI systems fall into four main categories: conversational (capable of engaging in human-like conversations, both voice and text-based such as repetitive client queries or chatbots), biometric (those systems that can capture people's fingerprints, facial images, retinas, or hand geometry as well as their behavioral traits like the use of voice or gestures), algorithmic (capable of making decisions and executing actions by processing a pre-defined set of instructions and large volumes of data, mostly via machine/deep learning), and robotic (physical robots that can assist people to perform complex or automated tasks (Benbya et al., 2020). AI is also currently used to enhance the capacity of statistical analysis through allowing more complex data mining. AI-enhanced predictive modeling and big data analytics have become two prominent types of these data-mining systems. Predictive modeling as a subset of AI refers to the machine learning capacity to predict the likelihood of certain outcomes depending on past and present data. Big data analytics, on the other hand, refers to AI-based systems that 'allow the collection, management, and analysis of data sets that are too large for conventional database systems' (Santana & Díaz-Fernández, 2023). Today, artificial intelligence manifests itself in almost every field and can be used usefully with field-specific tools. Teachers can effectively integrate artificial intelligence to improve teaching and learning without seeing it as a replacement of traditional teaching (Martinez & Brown, 2023). In this regard, studies on the implementation of AI have explored various forms of AI use in the classroom, emphasizing the advantages they offer for student learning (Kim & Kim, 2023). Indeed, natural language processing-guided tutoring systems based on dialogue can be used to facilitate co-creation of knowledge by developing language learning platforms. The rationale of today's studies on the impact of AI, relating to education and instruction, can be summarized in two points: the impact it can have on the role and function of teachers in education and teaching; the opportunities and challenges in terms of risks rather than added value, for learning and teaching. This is based on the premise of coexistence and collaboration with new, constantly evolving technologies. Artificial intelligence is extensively used in education for various purposes. This includes creating personalized learning systems to help students improve their skills, implementing automatic assessment systems to aid teachers in analyzing student knowledge and streamlining evaluations. Teachers are increasingly turning to AI-assisted teaching strategies (Mendoza et al., 2020). AI-based teaching and learning solutions, such as Serious Games and simulations, can provide students with more engaging and effective learning methods. Teachers are therefore aware of the advantages given by AI, but at the same time the need for adequate training is highlighted. The debate on the introduction of new technologies into teaching practices is increasingly heated, and with the introduction of open AI systems, the figure of the teacher has been affected by significant changes that require adequate training (Pitrella et al., 2023). As highlighted by recent literature, Generative AI tools, like ChatGPT, will have a significant impact on teachers, educators, and students, offering not only challenges but also opportunities to support equity, sustainability, greater efficiency, and a new understanding of the digital (Anderson and Jackson; Chen & Wang; Garcia & Nguyen, 2024). ChatGPT is the output of artificial intelligence that has reached the most comprehensive end-user base today. The emergence of artificial intelligence, such as ChatGPT, can improve the effectiveness and quality of learning and advance the distribution of educational resources and the supervision of academic quality (Linn et al., 2023; Zhai, 2021).

About the dissemination of generative intelligence, the OECD 2023/2024 report 'Equity And Inclusion in Education: Finding Strength Through Diversity' and OECD 'Recommendation of the Council on Legal



Instruments Artificial Intelligence’, emphasizes the need to develop skills among teachers and school administrators. These skills aim to enhance innovative and original learning environments while promoting ethical, inclusive, and innovative use of AI. This approach appears to redefine how such systems operate in educational settings. The document ‘Guidance for generative AI in education and research’ GenIA (UNESCO, 2023), is one of the recent Guides for the use of Generative Artificial Intelligence. It aims to support countries in implementing, planning, and developing a proper use of AI tools to truly help teachers, school leaders, and students. The Action “Using GenAI creatively in education and research” has analysed the possibilities of creatively using GenAI in curriculum design, teaching, learning, and research by presenting some practical examples of how these applications can enrich and personalize the educational experience, promote cultural and linguistic diversity, stimulate creativity and innovation, and strengthen artificial intelligence skills.

Starting from our brief premise, a study was conducted on the educational-didactic attitude of teachers of all levels of education (preschool, primary, lower secondary, and upper secondary schools) in the schools of the Abruzzo Region (engaged – during the 2023/2024 school year – in training and specialization paths on inclusion and Special Educational Needs, SEN) towards generative models and applications of artificial intelligence (AI). The study also aimed to analyze the actual application of AI systems in classroom teaching, and teachers’ skills in this regard. The purpose of the research is twofold: to detect teachers’ awareness of knowledge about generative AI systems and awareness of real usage competencies; to provide the Abruzzo Regional Office of the Ministry of Education with evidence about the training needs of teachers to plan a training action in collaboration with UNIVAQ from a multidisciplinary perspective.

2. Survey

- *Materials and Methods*

The sample of our survey – Conducted during the year 2023-24 – involved 396 teachers as mentioned above. Of these, 85.9% are female and the remaining 14.1% are male, with an average age of 43 years. The survey, involved administering a structured self-assessment questionnaire with 46 items, divided into 3 sections and distributed via Google Forms. A link to the Google form containing the informed consent and details of ethical considerations was provided for the participants before they proceeded to the survey questions.

The sections are:

Section 1. Descriptive data: this section consists of a series of items aimed at collecting gender, age group, education, and school level. Its exclusive function is to describe the sample participating in the study.

Section 2. Impact of AI on education and instruction: this section of the questionnaire aims to analyze teachers’ ideas about the possible effects/implications of AI, particularly on education and teaching.

Section 3. Use of AI systems in teaching and assessment: this section of the questionnaire aims to identify the congruence between teachers’ attitudes towards AI and the actual didactic application of open intelligence systems. Thus, the skills and knowledge regarding the educational use of new AI tools.

- *Results and Discussion*

Most teachers who participated in the survey hold a bachelor’s degree (77.8%), particularly in the Humanities field (56.1%), followed by a degree in the Scientific field (23%). Regarding the possession of any title attesting to technological skills in our sample, 51.3% of respondents do not possess any title. Regarding teaching commitment in various school grades, 12.9% teach in preschool, 28.3% in primary school, 28.5% in lower secondary school, and finally, 30.3% of teachers teach in upper secondary school (Tab 1). On average they have a length of service of 7 years.



Preschool	12,9%
Primary School	28,3%
Lower Secondary School	28,5%
Upper Secondary School	30,3%

Tab 1: School grades.

With reference to educational and training contexts, it is increasingly evident how nowadays teachers and students are grappling with technological innovation implemented by AI in educational institutions (Halaweh, 2023). In fact, the report “Generative AI has Arrived” (2023), aimed at providing an overview of how AI has impacted educational and higher education institutions, including universities, highlights the urgency of teacher training considering the widespread use of these AI systems by students (Sundberg and Holmström, 2024). In the report, 42% of the interviewed students reported using them. However, from section 2 of the questionnaire, there still emerges what we could define as an ‘anthropocentric’ interpretation provided by teachers regarding AI, especially generative Chat Pretrained Transformer (Chat Gpt) that provide real-time responses to user queries using natural language. It is therefore a reading subject to interpretative distortions of generative systems and in any case not knowledge based on scientific evidence. In fact, our teachers tend to attribute ‘human-like characteristics’ to generative systems. The 15.9% attribute to generative systems a capacity for Divergent thinking, 31.1% believe they can modify responses based on past experiences, 43.4% think they can generate knowledge and information, and finally, 30.8% associate them with rigor and adherence to rules (Tab 2).

AI and ‘human-like characteristics’	%
Divergent Thinking	15,9%
Ability to modify responses based on past experience	31,1%
Generate knowledge	43,4
Rigor and adherence to rules	30,8%

Tab 2: IA and Anthropocentric Attributions

Also, in our sample, 43.4% of teachers agree that AI can improve teaching strategies in education, followed by 47.1% who consider the use of AI it to personalize educational programs, and 40.2% who view these systems as support for study activities. In this regard, tools like Google Translate can provide translations in over 100 languages, while Siri, Alexa, and Google Assistant allow people to ask questions and get effective answers. Recently, tools like ChatGPT can perform tasks such as answering any question, explaining, providing examples, writing poetry or stories, and summarizing texts (Aktay and Kocman, 2022).

In section 3 of our questionnaire, to assess congruence between attitudes toward AI and the actual application of open intelligence systems, we analysed the level of preparation and knowledge among teachers regarding new AI tools. It is important to raise awareness among teachers about the correct use of AI in educational settings (Ferikoğlu and Akgün, 2022). But in our sample, we are rather far from achieving this goal, in line with what has been highlighted above. The 35.1% of teachers stated that they do not have the right preparation to use AI tools in teaching activities and in ongoing and final evaluation of the educational process. Firstly, what emerges from our study is a superficial, and therefore confusing, knowledge of the distinctive aspects of various information, communication, and AI technologies. In contrast to the previous data, 66.9% of our sample claims to have a good understanding of Machine Learning, confusing it with Deep Learning, followed by 50.3% who claim to use and understand Computer Vision. Regarding actual application in teaching, and thus skills, 67.7% of our sample claimed not to use the va-



rious applications of AI (Tab 3). There is therefore a contradiction. Equally significant is the lack of knowledge of new AI tools, such as Tensorflow and Cloud Server GPU, which 57% of our sample claims not to use.

AI Tools Knowledge	%
Machine Learning	66,9%
Computer Vision	50,3%
No use of applications	67.7%

Tab 3: AI Tools Knowledge

The heterogeneity and complexity of interpreting the data require a systematic reflection on the spread of a culture of artificial intelligence, which is currently still lacking among teachers and students. Overall, from the data, there is a sense of significant variation in levels of knowledge among old and new AI tools. Our results are in line with national trends where today not all training actions aimed at enhancing teachers' teaching skills are able to offer them sufficient preparation and knowledge of technological tools, but especially of AI, to be used within educational institutions (Deng and Yu, 2023).

3. Conclusion

Potentially, digital technology fosters education and learning, it can ensure access to quality education in an equitable direction, and it promotes the dissemination of technological skills, and the development of transversal skills. Looking to the future, the potential applications of AI in education, are bound to expand, becoming more refined and deeply integrated into the very core of educational practices (Bozkurt, 2023). This evolution promises not only to enhance existing methodologies but also to innovate new paradigms that will redefine the open and distance learning experience, highlighting AI's transformative potential in contributing to the future of personalized education for all. By leveraging AI-powered learning platforms and other AI solutions, educational institutions can utilize data-driven insights to create a more personalized learning journey for each of their students. For instance, AI can analyze student performance data to identify learning gaps, subsequently adapting course material in real time to better fit individual learning styles and paces. Moreover, the use of Chatbots for student inquiries and assistance can add a personalized support layer, providing instant, tailored responses and tracking student progress, which not only lessens the administrative burden on faculty but also enhances learner engagement and performance (Santandreu et al., 2023). But it is worrying how, to date, the teacher training system is not able to offer teachers a preparation in line with what are probably the skills possessed by students and young people in general. This can lead to not only non-propulsive but also potentially incorrect and inappropriate uses of AI. In any case, to mention one of the ongoing intervention actions, recently the "TACCLE AI" Project (2023) was presented, funded under the Erasmus+ program, with the support of the European Commission, aimed at improving teachers' skills and competencies in the era of artificial intelligence. To fully exploit the opportunities offered by new technologies, joint efforts between institutions, companies, and individuals are necessary to promote innovation and competitiveness. The above will allow us to build a more inclusive and sustainable society ready to face the commitments of the near future (Fichten, 2021).



References

- Anderson, J., & Jackson, M. (2024). Teacher Professional Development in the Era of AI: Challenges and Strategies. *Teaching and Teacher Education*, 98, 104-115.
- Aktay, S. and Kocman, M.S. (2022). The usability of Images Generated by Artificial Intelligence (AI) in Education. *International Technology and Education Journal*, 6, 2.
- Benbya, H., Davenport, T. H., & Pachidi, S. (2020) Artificial intelligence in organizations: current state and future opportunities. *Quarterly Executive* 19(4), 1–15.
- Bozkurt, A. (2023). Unleashing the potential of generative AI, conversational agents and chatbots in educational praxis: A systematic review and bibliometric analysis of GenAI in education. *Open Praxis*, 15(4), 261–270
- Blumenthal, D. (2017). Data Withholding in the Age of Digital Health. *Milbank Quarterly*, 95(1), 15–18.
- Chen, C., & Wang, L. (2024). Enhancing Classroom Learning with AI: A Review of Current Applications and Future Directions. *Educational Research Review*, 18, 112-128.
- Deng, X., & Yu, Z. (2023). A meta-analysis and systematic review of the effect of Chatbot technology use in sustainable education. *Sustainability*, 15(4), Article 2940.
- Ferikoğlu, D., & Akgün, E. (2022). An Investigation of Teachers' Artificial Intelligence Awareness: A Scale Development Study. *Malaysian Online Journal of Educational Technology*, 10(3), 215-231.
- Fichten, C., Pickup, D., Asuncion, J., Jorgensen, M., Vo, C., Legault, A., Libman, E. (2021). State of the research on artificial intelligence based apps for post-secondary students with disabilities. *Exceptionality Education International*, 31(1), 62-76.
- Garcia, M., & Nguyen, T. (2024). Exploring the Role of AI in Personalized Learning: Opportunities and Challenges. *Educational Psychology Review*, 26(1), 87-103.
- Halaweh, M. (2023). ChatGPT in education: Strategies for responsible implementation. *Contemporary Educational Technology*, 15(2), 1-11.
- Jarrahi M. (2018). Artificial intelligence and the future of work: human-AI symbiosis in organizational decision making. *Business Horizons*, 61(4), 577-586.
- Kim, J. & Kim, M.K. (2023). Teacher's Perceptions of Using an Artificial Intelligence-Based Educational Tool for Scientific Writing Nam. *Frontiers in Education*, 7, 1-13.
- Linn, M. C., Gerard, L., Ryoo, K., McElhaney, K., Liu, O. L., & Rafferty, A. N. (2014). Computer-guided inquiry to improve science learning. *Science*, 344(6180), 155-156.
- Martinez, L., & Brown, R. (2023). Implementing AI in Teacher Education Programs: Challenges and Strategies. *Computers in Human Behavior*, 103, 215-230.
- Mendoza, S., Hernández-León, M., Sánchez-Adame, L. M., Rodríguez, J., Decouchant, D., & Meneses-Viveros, A. (2020). *Supporting student-teacher interaction through a chatbot*. International Conference on Human-Computer Interaction, (pp. 93–107). Cham: Springer. AL/0449.
- Miao, F., Holmes, W. (2023) Guidance for generative AI in education and research. UNESCO (United Nations Educational, Scientific and Cultural Organization): Paris, France.
- OECD. *Recommendation of the Council on OECD Legal Instruments Artificial Intelligence*. OECD/LEGn (2024).
- Pitrella, V., Gentile, M., Città, G., Re, A., Tosto, C., & Perna S. (2023). La percezione dell'utilizzo dell'intelligenza artificiale nello svolgimento dei compiti a casa in un campione di insegnanti italiani. *Annali online della Didattica e della Formazione Docente*, 15, 26, 300-318.
- Santana, M., & Díaz-Fernández, M. (2023). Competencies for the artificial intelligence age: visualisation of the state of the art and future perspectives. *Review of Managerial Science*, 17(6), 1971-2004.
- Santandreu, D. C., Smail, L., & Kamalov, F. (2023). Enough of the chit-chat: A comparative analysis of four AI chatbots for calculus and statistics. *Journal of Applied Learning and Teaching*, 6(2), 187–201.
- Sundberg, L., & Holmström, J. (2024). Teaching Tip: Using No-Code AI to Teach Machine Learning in Higher Education. *Journal of Information Systems Education*, 35(1), 56-66.
- Tackle AI - Erasmus+ programme (KA2 - Cooperation for innovation and the exchange of good practices KA202) - Strategic partnerships for education and vocational training
- Zhai, X., Yin, Y., Pellegrino, J. W., Haudek, K. C., & Shi, L. (2020). Applying machine learning in science assessment: a systematic review. *Studies in Science Education*, 56(1), 111-151.