

ARTIFICIAL INTELLIGENCE (AI) AND TEACHING. BEYOND THE 'SPONTANEOUS EPISTEMOLOGY'. LITERACY AND AGENTIVITY: A SURVEY AMONG UNIVERSITY TEACHER

INTELLIGENZA ARTIFICIALE E DIDATTICA (IA). OLTRE 'L'EPISTEMOLOGIA SPONTANEA'. LITERACY E AGENTIVITA': UN'INDAGINE TRA I DOCENTI UNIVERSITARI

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ABSTRACT

What is the literacy and agency of the university lecturer on IAG in teaching and assessment? Answering this question, detecting training needs, is the rationale of the survey on 118 Univaq teachers. 56.8% of them formulate anthropomorphic attributions, 41.2% are not prepared for the use of AI. The results on the use of docimological indicators/tests - 52% unstructured - predictive, in our hypothesis, of the ability to formulate prompts, indicate that training is urgent.

Quale è la literacy e l'agentività del docente universitario sull'IAG nella didattica e valutazione? Rispondere a questa domanda, rilevare i bisogni formativi, è la ratio dell'indagine sui 118 docenti Univaq. Il 56,8% di essi formula attribuzioni antropomorfiche sull'AI, il 41,2% non è preparato all'utilizzo. I risultati sull'uso di indicatori docimologici/prove - 52% non strutturate- predittivi nella nostra ipotesi della capacità di formulare prompt, indicano come urgente la formazione.

KEYWORDS

AI, teaching, literacy/agentivity, training university teachers
IA, didattica, literacy/agentività, formazione docenti universitari

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Introduction

AI and education: a Multifaceted Perspective

In today's rapidly evolving society, technology serves as a catalyst for transformation across all sectors, both public and private (Galaz, 2021; Pokrivcakova, 2019). Information technology has become deeply embedded in our daily lives, not only reshaping teaching and learning methodologies at all educational levels but also influencing educators' pedagogical approaches to adapt to the digital age. The integration of technological systems within educational and training environments fosters the collaborative development of innovative tools, facilitating active engagement across various digital platforms. The Beijing Consensus on Artificial Intelligence (UNESCO, 2019) aims to address the opportunities and challenges posed by AI in education by presenting recommendations categorized into various areas, including the integration of AI into educational policies, management, teaching support, learning assessment, skill development for the AI era, lifelong learning opportunities, equitable use of AI, gender equality, and the ethical use of educational data and algorithms. Further insights on these aspects can be found in "Artificial Intelligence and Education: A guide for policymakers" (UNESCO, 2021), which highlights the intricate and multifaceted relationship between AI and education. The latest reports on education and generative artificial intelligence (GAI) - European Digital Education Hub's Squad on Artificial Intelligence in Education 2024, the Digital Learning Week UNESCO 2024, and the European Parliament Resolution 2020-2027 - recommend a 'responsible' implementation of such systems (Machine Learning, Deep Learning, Natural Language Processing, and Computer Vision), to ensure the protection of the rights and interests of students at all levels of education, including higher education, and advocate for the training of teachers, primarily university professors, to enable the fruitful integration of AI into their disciplinary and interdisciplinary teaching approaches, fostering learning processes (Digital Education Action Plan 2021-2027).

Educators are increasingly seeking innovative, accessible, adaptable, and customizable teaching materials to enhance their teaching methodologies (Tapalova & Zhiyenbayeva, 2022). AI simulates human listening (machine translation, speech recognition), speech (speech synthesis, human-computer dialogue), observation (computer vision, image recognition, text recognition), thinking (theorem proving), learning (machine learning, intelligent adaptive learning), and action (robotics) (Huang et al., 2021). Important characteristics of these technologies include process automation, which serves to automate repetitive tasks to increase efficiency and reduce response time (Yang et al., 2023),

and decision making, which allows for responding to dynamic situations in real-time. In general, these characteristics make platforms and intelligent agents valuable tools in a variety of applications, from customer service to supply chain management. Among other characteristics, usability, interactivity, accessibility, didactics, adaptability, and personalization are the most relevant. Additionally: Flexibility, Scalability, Ubiquity, Functionality (Ramirez & Fuentes, 2024). The importance of AI in personalizing teaching towards sustainability and inclusivity is evident (Jung, 2024). However, there is a risk that educators may develop educational practices lacking scientific evidence regarding AI; therefore, it is important to emphasize competence in data literacy along with information management (Thongprasit & Wannapiroon, 2022). The adoption of AI technology as a teaching and learning tool underscores the need for ongoing teacher training to effectively use AI technologies. DigCompEdu outlines six domains, with a particular focus on developing educators' pedagogical competencies in digital resources, teaching and learning, assessment, and student empowerment. Experiences and research (Rienties et al., 2023) convergently highlight the importance of fully and structurally including AI in curriculum planning with an approach that allows understanding, mastering, and using it consciously (The Future of Education and Skills: Education 2030). Consequently, educators must be equipped to seek, exchange, and create digital content, as well as manage and organize technology appropriately in teaching and learning processes. Moreover, technology offers digital strategies to improve assessment, serving as a tool to foster inclusion and student engagement in their educational journey (Redecker & Punie, 2017). AI chatbots could act as assistants to help teachers make dynamic assessments of each student (Jeon, 2022), reducing teachers' workload, burden, and pressure. Due to their potential, AI chatbots have been widely used in various academic disciplines such as mathematics (Yin et al., 2024), psychology (Lin & Chang, 2020), medicine (Lee et al., 2022), and language (Kim, 2021). Conversely, evidence showed that AI chatbots could promote students' academic performance, inspire learning interest, and boost learning motivation (Chien et al., 2022), engagement, and learning self-efficacy. The need for continuous teacher learning extends to all educational levels, from compulsory education to higher education. The AI4T (Artificial Intelligence for and by Teachers) project represents a pioneering initiative in the field of teacher training and learning processes, funded by Erasmus+ and supported by the European Commission as part of the aforementioned European Digital Education Action Plan 2021-2027. In particular, the advancements of OpenAI in generative AI, including models like ChatGPT and DALL·E2, along with progress in machine learning and deep learning, represent the forefront of research and innovation in this field.

1. The Survey

Based on these brief premises, an exploratory study was conducted to investigate the attitudes, knowledge, and agency of teachers at the University of L'Aquila (Univaq) towards generative models and AI applications in higher education. The purpose of this research is to assess teachers' awareness regarding the use of generative systems in the higher education sector. Therefore, the aim is to answer some questions:

- does a conscious epistemological conception exist, beyond being empirical or spontaneous, among teachers regarding the use of AI in teaching and promoting learning processes in general?
- Do teachers know which didactic methodologies, exploiting AI, can improve teaching and student learning, and facilitate the evaluation of these processes (Big Data and Small Data)?
- What applications do they use and what experience do they have with such use?

In this regard, the docimological, didactic, and evaluative competencies possessed by teachers are also important, as they are prerequisites for the use of certain AI functions. Regarding this last point, the hypothesis is that the use of evaluative teaching homologous to the learning functions we want to measure, therefore the use of descriptors consistent with the same functions, is descriptive of knowledge and predictive of the ability to use AI applications for some purposes (e.g., the formulation of targeted prompts and especially for docimological teaching).

It is clear that identifying these training needs allows for the formulation of training proposals and the delineation of good teaching practices in universities.

To this end, we have:

- Detected the teachers' knowledge of AI functions and applications;
- Detected the declared use in teaching;
- Measured the knowledge and use of the main assessment methods and tools (structured, semi-structured, and unstructured) and the congruence with the learning functions.

2. Materials and methods

The survey, conducted during the academic year 2023-2024, involved the administration of a structured self-assessment questionnaire with 21 items distributed via Google Forms among university colleagues. The sample consists of 118 teachers, 43% female and 56% male, with ages ranging from 38 to 60 years old. The questionnaire consists of four sections:

Section 1: Descriptive Data: gender, age, type of degree, department of affiliation, etc.

Section 2: Impact of AI on Daily Life: beliefs and attitudes towards AI.

Section 3: Impact of AI on Education and Instruction: teachers' ideas about the possible effects, strengths and weaknesses (personalization of interventions, educational programming, educational policies, etc.) (information literacy).

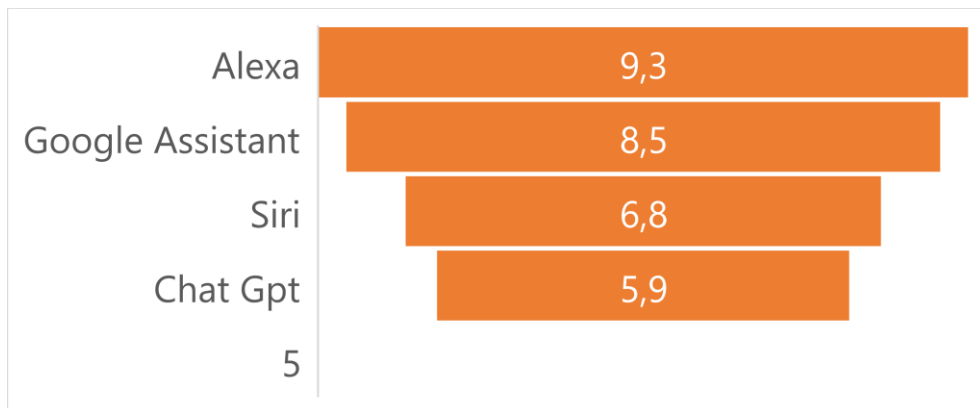
Section 4: Teaching and Evaluation Activities: possible curricular applications and uses of digital technology in teaching and in their disciplinary groups along with evaluative attitudes towards student written productions. This is considered a potential prerequisite for the formulation, for example, of correct prompts (data literacy).

3. Results and Discussion

The largest segment of the sample that participated in the survey (University of L'Aquila) is represented by individuals with a degree in scientific fields (79%). Regarding departmental affiliation, 39% were affiliated with Engineering departments (DICEA/DISM/DIIIE), followed by 12% with Humanities (DSU). Other affiliations included 19% with Physical Sciences, 28% with Biotechnology and Medicine, and MESVA/DISCAB. The 29% of the sample consists of Full Professors, 36% are Associate Professors, and 17% are researchers. Researchers constituted the smallest respondent group, with medical and biotechnological departments notably underrepresented. This is surprising given the importance of AI in healthcare professions and the assumption that younger researchers would have a greater interest in AI issues, especially considering their familiarity with such systems.

In the following *Section 2 of the questionnaire*, attention was focused on the *attitudes of teachers and their perception of the impact that AI can have on life*. In our sample, 9.3% reported frequently using Alexa in their daily lives, followed by

8.5% using Google Assistant, 6.8% using Siri, and 5.9% using ChatGPT, which was indicated as being used very often in 0.8% of cases (Graph. 1).



Graph. 2 (Individual use AI in everyday life)

Interestingly, *none reported using such systems in teaching*. In the national or international context, 26.27% of teachers reported using AI applications, while 55% did not use voice synthesis tools in everyday contexts (Mateos-Blanco, 2024).

Equally significant is the dimension related to the social, cultural, economic, and political risks associated with AI. In this perspective, our sample has indicated that these risks affect various areas. Indeed, 65.25% of respondents highlighted risks related to the automation of cognitive functions, followed by 55.08% concerned with privacy and data security, and 53.38% mentioning manipulation. Moreover, respondents noted positive impacts of AI in industrial automation (59.32%), healthcare (53.38%), transportation (48.30%), and industry (40.67%).

In Italy the AI market is poised for substantial growth, estimated at 27%. Globally, AI adoption is primarily driven by product and service development, particularly in high technology and telecommunications, which collectively represent 45% of AI utilization. Significantly study underscores the pervasive use of AI in education, accounting for 50% of cases where AI is deployed to enhance learning experiences. Findings from the 'Future Health Index 2023' by Philips shed light on Italy's robust investment in AI within the healthcare sector. A remarkable 74% of Italian leaders are actively investing in AI, surpassing the global average of 59% and aligning closely with the European average of 77%. These figures underscore Italy's proactive stance in aligning with other European nations in leveraging AI to transform healthcare delivery. Italy's AI landscape reflects a dynamic trajectory, with significant investments and adoption across key sectors such as education and

healthcare. These trends signify Italy's commitment to harnessing AI's transformative potential to drive innovation and improve societal outcomes.

Moving to *Section 3 of the questionnaire*, which pertains to *the effects of AI on higher education and instruction*, two interesting dimensions require attention (Churi, 2022; Conrad, 2023). The first dimension concerns opinions on policy and the impact of AI on the macrodimensions of higher education. The second dimension relates to attributions regarding the anthropological characteristics of AI, defined as a system of open intelligence akin to that of human beings (Kong et al., 2023; Long & Magerko, 2020).

Regarding the first aspect, *teachers declared themselves not adequately prepared for the use of AI in teaching* (41.2%), yet they affirm that open intelligence can help *identify weaknesses in the didactic programming of courses* (39.1%) and can be useful in *preventing university dropout by acting on orientation* (38.1%).

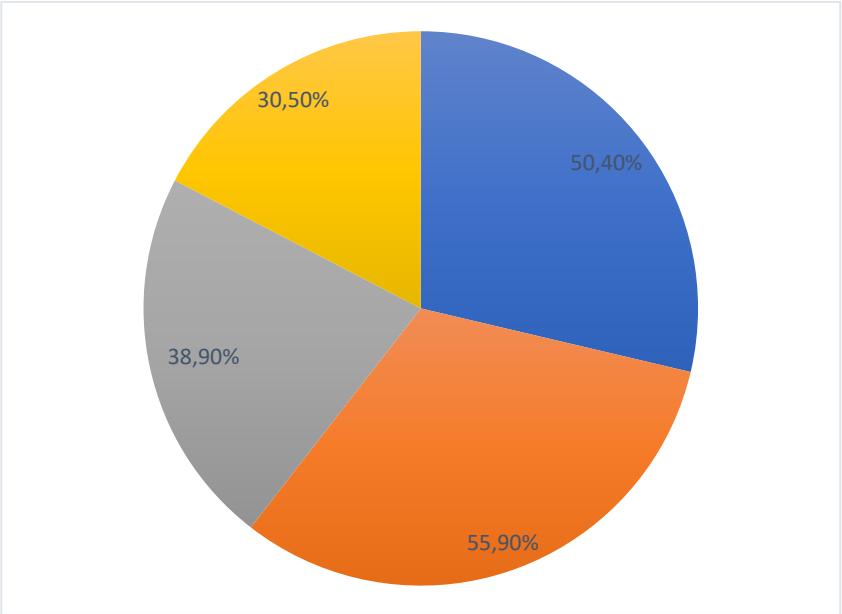
About the second aspect concerning the *anthropological attributions* directed towards AI, 56.8% of the sample asserts that such systems are capable of modifying responses based on past experience, 46.6% attribute to them the ability to acquire information and knowledge, even in an interpretive direction, as asserted by 42.4%, and finally, 36.4% indicate the ability to produce a set of rules (anthropocentric attributions) (Tab. 1).

Ability to modify answers following previous experience	56,8%
Acquisition of Information and Knowledge	46,6%

Convergent Thinking	42,4%
Respect for the Rules	36,4%

Tab.1 (Generative intelligence and anthropocentric attributions)

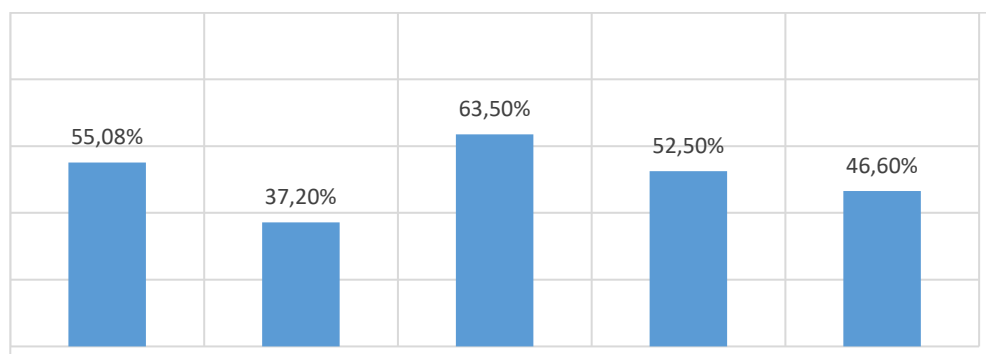
Still on the topic of the influence of AI on education and didactics, in our sample, 58.5% of the subjects agree that AI can support the personalization of educational and didactic programs, followed by 51.3% who see its added value in automating the assessment of written texts produced by students, and 50.4% who see AI as adding value to facilitate improvements in student task execution. Referring back to educational activities, it is also highlighted that AI can be functional in promoting learning processes. The 55.9% of our sample declares this functionality for information retrieval, followed by 38.9% for problem-solving and finally 30.5% for formulating responses to questions (Graph. 2).



Graph. 2 (AI and learning function)

- 50.4% improvements in student task execution
- 55.9% information retrieval
- 38.9% problem-solving
- 30.5% responses to questions

In *Section 4 of the questionnaire*, attention was focused on the uses and applications of AI in university teaching activities. Notably, no respondents reported using generative intelligence (e.g. ChatGPT) during lectures. Regarding the type of instructions and guidelines provided to students engaged in written assessment tasks (e.g., essays, exercises, midterms), the 75% of the sample declares providing information not so much on the content or execution methods as on the descriptors that will be used for evaluating the submissions. Evaluative practices, particularly the use of descriptive taxonomies, hold significance in preparing students for AI-mediated assessments (Loshbaugh, 2024). The 55.08% of our sample considers text completeness particularly functional among such descriptors, while an equal percentage indicates the definition of the text's objective as equally important. This is followed by 46.6% who emphasize clarity, and finally, 37.2% prioritize congruence with the contents proposed by the student. The 63.5% indicate that the presence of connections between the main conceptual nodes expressed verbally as an essential factor in evaluating correctness and communicative effectiveness, while the 52.5% indicate the ability to explain connections (Graph. 3).



Graph. 3 (Taxnomic descriptors)

- 55.08% text's objective
- 37.2% congruence
- 63.5% connections between the main conceptual nodes
- 52.5% explain connections
- 46.6% clarity

On the premise that 52% of our sample uses unstructured evaluation consisting of an interview, it is important to clarify that the descriptors are not indicated differentially depending on the written or oral tests used. This does not suggest a favorable understanding of them.

Conclusions

It is essential to incorporate interdisciplinary research into the understanding of learning processes and the design of AI technology used in education and training. That being said, our study highlights several crucial findings regarding AI adoption and its implications, particularly in the fields of research and education. The data underscores the need for greater awareness and training of university teachers, especially regarding the risks associated with improper AI use. It emphasizes the urgency of identifying guidelines and best practices to be systematized and highlights, from an educational perspective, the need to establish ethical codes, which are still not widely spread, for the use of AI by both teachers and students within educational institutions. The analysis of teachers' evaluative practices reveals inconsistencies related to the use of indicators and the choice of assessment tests that do not align with the learning function intended to be measured. Prioritizing teacher training in the field of evaluation is crucial to promote an understanding of the main functions of AI and thus improve the quality of teaching. This is based on the verified hypothesis of a correlation between knowledge mastery of docimological indicators and the formulation of effective prompts. Furthermore, the widespread use of generative AI tools like ChatGPT among students necessitates a reevaluation of traditional teaching and learning paradigms, with particular attention to the dimension of agency as well as the usability of these products. It also calls for a political educational focus on digital literacy among young people, also monitored in informal and non-formal situations. The university must also pay attention to this in its research, project, and training activities.

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