Anno 11, 1/2026 Special Issue

Excellence and Innovation in Learning and Teaching
Research and Practices

Rethinking the University in the Age of Artificial Intelligence

Ripensare l'Università nell'epoca dell'Intelligenza Artificiale

FrancoAngeli
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Questo Special Issue della rivista Excellence and Innovation in Learning and Teaching, è finanziato e rientra nell'ambito del progetto PNRR "Digital Education Hub ALMA",MISSIONE 4 ISTRUZIONE E RICERCA - COMPONENTE 1, - Invest. 3.4 "Didattica e competenze universitarie avanzate"; Sub-Investimento Digital Education Hubs (DEH).
Progetto: Advanced Learning Multimedia Alliance for Inclusive Academic Innovation (ALMA). Codice ID: DEH2023-00012 CUP: E68H24000430006
I contributi dello Special Issue sono collegati al convegno Rethinking the University in the Age of Artificial Intelligence tenutosi a Padova il 22-23 aprile 2026.

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Artificial Intelligence Literacy as a New Form of Academic Literacy

Marina De Rossi, Filippo Marcato*

Riassunto
L'emergere dell'intelligenza artificiale generativa (GenAI) sta trasformando profondamente i fondamenti epistemologici dell'istruzione superiore. Le università non sono più chiamate soltanto a integrare nuove tecnologie nei processi di insegnamento e apprendimento, ma anche a ripensare la natura stessa della produzione della conoscenza, della valutazione, dell'integrità accademica e delle competenze professionali. Il contributo sostiene che l'AI literacy debba essere intesa come una nuova forma di alfabetizzazione accademica, che va oltre le competenze tecniche per comprendere dimensioni critiche, etiche, epistemologiche e pedagogiche. Sulla base dei più recenti studi internazionali e dei principali framework emergenti sull'AI literacy, l'articolo analizza le implicazioni di questo paradigma per la progettazione dei curricula, la formazione del personale docente e la trasformazione istituzionale nell'istruzione superiore.
Parole chiave: AI literacy; Istruzione superiore; Intelligenza artificiale generativa; Innovazione curricolare; Cittadinanza accademica

Abstract
The emergence of generative artificial intelligence (GenAI) is profoundly transforming the epistemological foundations of higher education. Universities are no longer faced solely with the challenge of integrating new technologies into teaching and learning processes; they are increasingly called upon to rethink the very nature of knowledge production, assessment, academic integrity and professional skills. This article argues that AI literacy should be

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23977

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understood as a new form of academic literacy, which goes beyond technical competence to encompass critical, ethical, epistemological and pedagogical dimensions. Drawing on recent international studies and emerging frameworks for AI literacy, the article discusses the implications of AI literacy for curriculum design, staff development and institutional transformation in higher education.
Keywords: AI literacy, higher education, generative artificial intelligence, curriculum innovation, academic citizenship.

Article submitted: 15/06/2026; accepted: 11/07/2026

The rapid spread of generative artificial intelligence has created unprecedented opportunities and challenges for higher education institutions. Since the public launch of ChatGPT in late 2022, universities worldwide have been forced to reconsider the fundamental assumptions regarding teaching, learning, assessment and knowledge creation (Mollick, 2024). Whilst early debates focused primarily on concerns regarding the misuse of AI for learning and the integrity of assessment, a more mature discussion has recently emerged concerning the educational implications of AI and the skills required to engage with it critically and responsibly (Holmes & Miao, 2023). The question is no longer whether students should use AI, but rather how universities can prepare them to engage with AI systems in an informed, ethical and intellectually meaningful way. In this context, AI literacy is becoming a strategic priority for higher education systems and a key component of the skills required of 21st-century graduates (UNESCO, 2024a).

Beyond digital literacy: towards AI literacy

The concept of AI literacy represents an evolution of traditional models of digital literacy. Although digital literacy has focused primarily on the ability to access, evaluate and communicate information through digital technologies, AI literacy requires individuals to understand how AI systems generate outcomes, recognise their limitations, critically assess their reliability and reflect on their ethical and social implications (Ng et al., 2021). Recent international frameworks emphasise that AI literacy is not merely a technical skill. UNESCO (2024a) defines AI literacy as a multidimensional capability involving critical understanding, responsible use, human-centred values and awareness of the social consequences of AI technologies. Similarly, the Digital Education Council (2024) identifies AI literacy as a combination of technical knowledge,

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critical thinking, ethical judgement, creativity and collaborative problem-solving. This broader perspective is particularly relevant to higher education. As Selwyn (2024) argues, universities should resist the temptation to frame AI as a purely technological issue and instead address it as a cultural, social and educational phenomenon capable of reshaping academic practices and institutional identities.

The advent of generative artificial intelligence marks a qualitative shift: AI systems do not merely facilitate access to knowledge, but participate directly in the production of texts, images, code and ideas.

AI literacy therefore emerges as a multidimensional skill for lecturers and students which, from a pedagogical perspective, entails a shift from teaching centred on the use of digital tools to an education geared towards critical collaboration with intelligent systems.

Indeed, generative AI technology challenges long-established assumptions regarding the acquisition, reproduction and application of subject-specific knowledge. Today, access to information is increasingly mediated by AI systems capable of producing sophisticated texts, analyses and explanations in a matter of seconds. According to Bearman et al. (2024), this shift requires universities to reconsider what constitutes meaningful learning in an AI-rich environment. While the retrieval of information can be delegated to intelligent systems, educational value increasingly lies in higher-order cognitive processes such as critical evaluation, interpretation, judgement, creativity and ethical decision-making. From this perspective, AI literacy becomes closely linked to epistemic literacy. Students must understand not only how AI works, but also how knowledge is constructed, validated, challenged and communicated. They must learn to question AI-generated content, identify biases and hallucinations, evaluate sources and exercise informed judgement regarding the credibility of the results. AI literacy thus becomes a fundamental cross-cutting competence for lifelong learning, professionalism and citizenship in AI-mediated societies. The educational challenge concerns the ability to construct, validate, interpret and communicate knowledge in AI-mediated environments. The framework for academic literacy in AI proposed in this article comprises five mutually reinforcing dimensions (Fig. 1).

The first is technical understanding, which refers to a functional knowledge of how AI systems work, their probabilistic nature, training data, limitations, hallucinations and algorithmic biases (Long & Magerko, 2020).

The second is epistemic literacy, that is, the ability to question how AI-generated knowledge is produced, validated and challenged.

Drawing on research into epistemic cognition, students should critically evaluate evidence, compare multiple sources and recognise uncertainty, rather than accepting AI outputs as authoritative (Greene et al., 2018).

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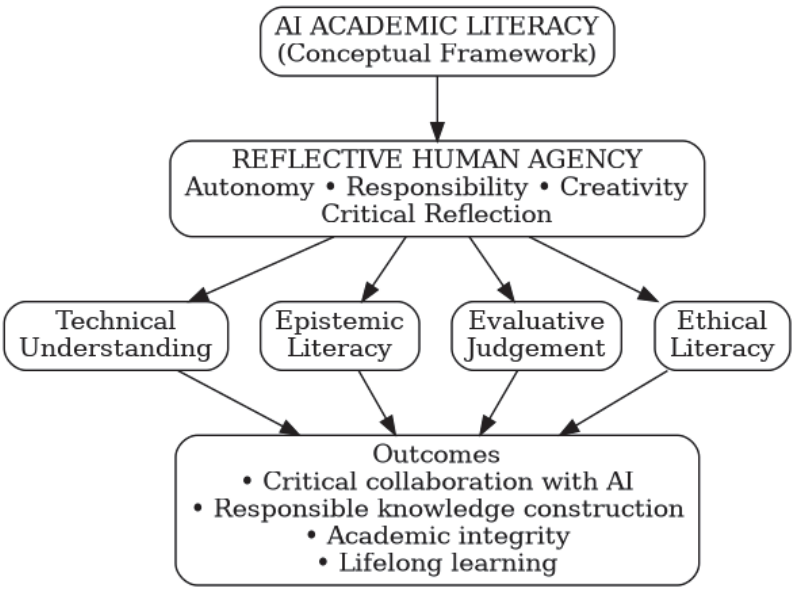


Fig. 1 - AI Academic Literacy Framework [1]

The third dimension is evaluative judgement, defined as the ability to determine the quality of work and to make informed decisions in accordance with disciplinary standards (Tai et al., 2018; Bearman et al., 2024). In AI-supported environments, students are continually required to assess whether the generated results are credible, accurate and contextually appropriate.

The fourth dimension is ethical literacy, which encompasses transparency, accountability, equity, privacy, intellectual property and the responsible use of AI (UNESCO, 2024b). Ethical literacy goes beyond mere compliance with institutional rules and requires critical reflection on the social implications of AI. At the heart of the conceptual framework lies reflective human action. Inspired by socio-constructivist and human-centred perspectives (Bandura, 2001; Biesta, 2022), human action integrates all the other dimensions, ensuring that students remain autonomous, responsible and creative agents in the decision-making process. AI is therefore positioned as an intellectual partner capable of enhancing, rather than replacing, human thought. This framework has direct implications for higher education. Curricula should integrate academic literacy in AI across all disciplines, rather than limiting it to

[1] The framework proposed by the authors conceptualises AI Academic Literacy as an integration of technical understanding, epistemic literacy, evaluative judgement and ethical literacy, coordinated by reflective human agency and leading to responsible participation in AI-mediated knowledge environments.

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technology-related degree programmes. Assessment should prioritise authentic tasks that require students to justify AI-supported decisions and to document critical reflection. Similarly, staff development should go beyond technical training to focus on redesigning pedagogy, feedback and assessment in AI-rich contexts. From this perspective, academic literacy in AI represents a fundamental competence for graduates in knowledge-based societies and a conceptual bridge between digital competence, academic literacy and responsible AI.

Emerging Models of Faculty AI Literacy: Towards Future-Adaptive Academic Professionalism

The rise of AI literacy has significant implications for curriculum design. Rather than restricting AI-related content to technology-oriented disciplines, universities should adopt a cross-disciplinary approach that integrates AI literacy across all programmes and subject areas. This requires a shift from teaching about AI to teaching with and through AI. As Luckin (2025) suggests, educational institutions should design learning experiences that enable students to engage critically with intelligent systems, whilst maintaining human autonomy and accountability. Equally crucial is the training of teaching staff. Consequently, professional development initiatives should go beyond technical training and support teaching staff in rethinking assessment, feedback, curriculum design and learning outcomes in the light of AI-based environments. Laurillard's (2013) conception of teaching as a design science remains particularly relevant in this context. The challenge for educators is not merely to delegate teaching and learning activities to AI systems or simply to integrate AI tools into traditional teaching practices, but to redesign innovative learning environments capable of fostering critical engagement, ethical reflection and meaningful knowledge construction among students.

Continuing professional development for teaching staff on these issues is essential, and high-quality training should be based on recognised and up-to-date frameworks. In this regard, it is interesting to analyse the evolution of certain frameworks relating to digital competence and the subsequent emergence of AI within educational technologies.

Indeed, the rapid spread of generative artificial intelligence (GenAI) has profoundly redefined expectations regarding university teaching and academic professionalism. Whereas initial institutional responses focused largely on familiarising teaching staff with emerging AI tools, recent literature argues that professional development should no longer be conceived as mere technological training, but as a process of pedagogical, epistemic and organisational

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transformation (Holmes & Miao, 2023; UNESCO, 2024a, 2024b). Accordingly, AI literacy is increasingly recognised as a strategic component of academic professionalism, requiring university lecturers not only to understand AI technologies but also to redesign curricula, assessment practices and learning environments capable of fostering responsible collaboration between humans and AI.

This evolution reflects a broader shift in educational research. Previous models of teacher professional development focused primarily on digital skills, whilst more recent models explicitly recognise that generative AI challenges fundamental assumptions regarding authorship, expertise, knowledge production and academic integrity. Teachers are therefore expected to develop forms of professional competence that go beyond the operational use of technology, moving towards adaptive pedagogical leadership. In this context, AI literacy becomes an ever-evolving professional capability rather than a static set of technical skills.

A useful starting point for understanding this evolution is the European Digital Competence Framework for Educators (DigCompEdu) (Redecker, 2017). DigCompEdu represented one of the first comprehensive attempts to conceptualise teachers' digital competence across six interlinked areas, including professional engagement, digital resources, teaching and learning, assessment, student empowerment and the promotion of students' digital competence. Although it was developed before the large-scale adoption of generative AI, DigCompEdu continues to provide a valuable foundation because it situates technology within broader pedagogical practices, rather than treating it as an isolated competence. Nevertheless, the framework inevitably reflects a pre-generative-AI context. It devotes limited attention to algorithmic decision-making, AI-supported knowledge production, prompt design, ethical governance and the epistemological challenges introduced by large language models. Consequently, whilst DigCompEdu remains an essential reference point for digital pedagogy, it requires substantial extension to address AI-mediated learning environments.

A complementary perspective is offered by the TPACK (Technological Pedagogical Content Knowledge) model (Mishra & Koehler, 2006). Rather than describing isolated competences, TPACK conceptualises effective teaching as the dynamic interaction between subject-specific knowledge, pedagogical knowledge and technological knowledge. This integrative perspective remains particularly valuable because it emphasises that technology acquires educational value only when it is aligned with disciplinary epistemologies and pedagogical intentions. However, TPACK was developed prior to contemporary AI systems and therefore conceptualises technology primarily as a teaching resource rather than as a cognitive partner capable of

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generating content, supporting reasoning and participating in knowledge construction. Recent studies have therefore suggested extending the TPACK framework by explicitly incorporating AI-supported pedagogical design, human oversight, ethical reasoning and AI-specific professional competencies within technology-rich learning environments (Lan et al., 2025; Dogan, 2026).

The publication of the UNESCO Framework on AI Competencies for Teachers (2024b) represents a significant conceptual advance. Unlike previous frameworks on digital competencies, UNESCO explicitly recognises artificial intelligence as a transformative educational phenomenon that requires educators to develop technical knowledge alongside ethical, social and pedagogical skills. The framework is based on a human-centred view of AI and emphasises principles such as inclusion, transparency, sustainability, equity and responsible innovation. Rather than prescribing specific technologies, UNESCO encourages educators to critically assess when, why and how AI should be integrated into teaching and learning. Teachers are expected to understand the potential and limitations of AI, safeguard students' rights, promote critical thinking and support responsible participation in AI-mediated societies. This represents an important shift from the adoption of technology to the responsible stewardship of education.

Similarly, the 'Digital Education Council AI Literacy Framework for Higher Education' (2024) directly addresses the challenges posed by generative AI in universities. Compared to UNESCO, the framework adopts a more operational perspective, identifying concrete competencies expected of graduates and lecturers. These include technical understanding, prompt design, critical evaluation of AI outputs, creativity, ethical reasoning and collaborative problem-solving. One of its main strengths lies in recognising AI literacy as a cross-cutting competence that should permeate all disciplinary programmes, rather than remaining confined to computer science. However, the framework devotes relatively little attention to pedagogical theories of learning and the epistemological transformation of academic work. AI is described primarily as an area of expertise, whilst broader issues concerning academic literacy, the construction of disciplinary knowledge and evaluative judgement remain less fully articulated.

These issues are becoming increasingly crucial in the face of the rapid evolution of generative artificial intelligence, which is driving a profound redefinition of professional development for teaching staff in higher education. This shift reflects a broader recognition that artificial intelligence is not simply another educational technology, but a transformative force capable of reshaping teaching practices, academic work and institutional governance. Consequently, contemporary models of AI literacy for academic staff are increasingly moving

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beyond the instrumental use of technology towards adaptive professional competence.

A significant milestone in this evolution is the 'Future-Adaptive Faculty AI Literacy Framework' proposed by Wu and Huang (2026). Drawing on a systematic review of international research, the authors argue that existing frameworks on AI literacy do not adequately address the rapidly evolving nature of artificial intelligence and its implications for academic work. Rather than conceptualising AI literacy as a fixed set of skills, they propose a dynamic model organised around six interconnected domains that support continuous professional adaptation. Particularly innovative is the integration of Boyer's model of academic activity, which positions AI literacy as a capability that supports not only teaching, but also research, knowledge integration, institutional service and academic leadership (Lombard, 2026). This perspective shifts faculty development from short-term technical training towards lifelong professional learning, emphasising adaptability, reflective practice and academic autonomy.

A complementary perspective is offered by Bustillos et al. (2026), who propose an epistemological-institutional framework for AI literacy designed specifically for university lecturers. Their model represents a significant departure from competence-based approaches, integrating five complementary dimensions: instrumental, algorithmic, ethical, epistemological and institutional literacy. The inclusion of the epistemological and institutional dimensions is particularly noteworthy because it recognises that AI-mediated teaching cannot be understood solely through technological competence. Instead, educators must possess the ability to critically examine how AI systems influence knowledge production, disciplinary practices and institutional decision-making. The framework therefore positions universities as active agents responsible for creating governance structures, professional learning opportunities and ethical guidelines that support the meaningful integration of AI.

Expanding on this line of inquiry further, the 'Generative AI-Responsive Competency Framework' (Daner et al., 2026) focuses explicitly on the pedagogical implications of generative AI for higher education. The framework identifies four main areas of competence – GenAI literacy, curriculum and learning design, teaching and learning, and assessment – whilst distinguishing between lecturers' personal competence and their responsibility for developing students' AI literacy. This dual perspective represents an important conceptual innovation as it recognises academic staff both as users of AI and as educational mediators. Furthermore, the framework introduces progressive levels of professional development (basic, intermediate and advanced), offering

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universities a practical roadmap for designing differentiated staff development programmes.

An equally important contribution concerns the assessment of teaching staff's AI-related competences. The Faculty Artificial Intelligence Literacy and Competence Scale (FALCON-AI), developed by Song et al. (2026), fills a persistent gap in the literature by providing one of the first psychometrically validated instruments designed specifically for higher education teaching staff. Rather than measuring a generic technological competence, the scale conceptualises AI literacy through three complementary forms of literacy – functional, evaluative and ethical – as applied to teaching, research, institutional service and academic work in general. This multidimensional approach reflects the increasingly accepted hypothesis that AI literacy constitutes a central element of academic professionalism rather than an isolated technical skill.

Taken together, these emerging frameworks reveal a clear conceptual trajectory. Previous models, such as DigCompEdu and TPACK, have provided a solid foundation for digital pedagogy, but have remained largely focused on technological integration. Contemporary AI-specific frameworks, by contrast, conceptualise faculty development as a continuous process of professional adaptation that integrates technological understanding with epistemic reasoning, ethical responsibility, institutional leadership and academic identity. The convergence of these models suggests that future staff development should no longer focus primarily on learning how to use AI tools. Rather, universities should train academic professionals who are equipped to adapt to the future, capable of critically orchestrating collaboration between human intelligence and artificial intelligence, whilst preserving academic integrity, disciplinary rigour and the responsible creation of knowledge.

Conclusion

From this perspective, AI literacy becomes a strategic dimension of academic professionalism and an essential prerequisite for institutional transformation. The emerging literature therefore advocates a shift from competence-based models towards integrated conceptions of 'academic professional competence in the field of AI', in which technical expertise, pedagogical innovation, epistemic literacy and reflective human action are understood as mutually reinforcing dimensions in contemporary university teaching.

Despite differing priorities, these emerging models highlight several points of convergence. Firstly, they all recognise that technological competence alone

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is not sufficient for the effective integration of AI. Secondly, they acknowledge that AI literacy requires continuous professional development rather than one-off training events. Thirdly, they emphasise ethical responsibility, albeit with varying degrees of specificity. Finally, they increasingly position educators as learning designers rather than mere users of technology. These common principles suggest that AI literacy among teaching staff should be understood as a multidimensional capability that integrates technological, pedagogical, organisational and ethical competences.

Building on these complementary perspectives, it can be argued that a further conceptual step is needed. Existing frameworks successfully describe the competencies required for the responsible use of AI, but few explicitly link AI literacy with academic literacy, epistemic cognition and evaluative judgement – three constructs that increasingly define meaningful learning within AI-mediated universities. Generative AI radically changes the way evidence is produced, arguments are developed and disciplinary knowledge is validated. Consequently, professional development should prepare lecturers not only to use AI effectively, but also to cultivate students' ability to question AI-generated knowledge, evaluate conflicting interpretations and exercise independent academic judgement.

For this reason, the framework for academic professional competences in the field of AI, derived from a range of emerging frameworks, places reflective human action at the centre of faculty development. Around this core, five mutually reinforcing dimensions can be identified: technical understanding of AI systems; pedagogical design for AI-enhanced learning; epistemic literacy relating to the validation of knowledge; ethical and social responsibility; and evaluative judgement in support of high-quality academic decision-making. Unlike technology-centred models, this perspective views AI as an intellectual partner whose educational value depends on the teacher's ability to orchestrate meaningful interactions between human expertise and artificial intelligence.

From an institutional perspective, this conceptual redefinition has significant implications. Universities should move beyond one-off introductory workshops on AI applications and shift towards integrated professional learning ecosystems that combine communities of practice, mentoring, design-based inquiry, curriculum redesign, authentic assessment and evidence-based evaluation. Staff development should become a strategic institutional process aligned with educational policy, quality assurance and the frameworks relating to graduate outcomes. Ultimately, the aim is not to train technologically competent lecturers, but reflective academic professionals capable of driving educational innovation whilst upholding the values of critical inquiry, academic integrity and the responsible creation of knowledge. Ultimately, the future of higher education will depend not on how effectively institutions adopt artificial

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intelligence, but on how successfully they prepare students to engage with it critically, responsibly, and autonomously.

References

Bearman M., Tai J., Dawson P., Boud D., & Ajjawi R. (2024). Developing evaluative judgement in the age of generative artificial intelligence. *Assessment & Evaluation in Higher Education*, 49(6): 893-905. Doi: 10.1080/02602938.2024.2335321.

Bustillos M. A., Quintero Y. J., Luengo D. A., & Colmenárez M. C. (2026). An epistemic-institutional artificial intelligence literacy framework for university educators. *Frontiers in Education*, 11, 1848737. Doi: 10.3389/feduc.2026.1848737.

Daner S. U. N., Shen B. A., Yingying C. H. A., Jiahui Y. U., Haimin D. A. I., & Cher-Ping L. I. M. (2026). Empowering university teachers in higher education: A generative AI-responsive competency framework. *Computers and Education: Artificial Intelligence*, 100542. Doi: 10.1016/j.caeai.2026.100542.

Digital Education Council (2024). *Framework for Artificial Intelligence Literacy in Higher Education*. -- https://www.digitaleducationcouncil.com/resource-library-items/digital-education-council-ai-literacy-framework.

Dogan S. (2026). Designing effective AI professional development: A framework grounded in intelligent-TPACK. *Computers and Education Open*, 10, 100337. Doi: 10.1016/j.caeo.2026.100337.

Holmes W., & Miao F. (2023). *Guidelines for Generative AI in Education and Research*. UNESCO Publishing. Doi: 10.54675/EWZM9535.

Lan G., Feng X., Du S. et al. (2025). Integrating ethical knowledge in generative AI education: Constructing the GenAI-TPACK framework for university teachers' professional development. *Education and Information Technologies*, 30: 15621-15644. Doi: 10.1007/s10639-025-13427-6.

Laurillard D. (2013). *Teaching as a design science: Building pedagogical models for learning and technology*. Routledge.

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).

Lombard E. (2026). Boyer reconsidered: Librarian scholarship. *The Journal of Academic Librarianship*, 52(5), 103276. Doi: 10.1016/j.acalib.2026.103276.

Luckin R. (2025). Cultivating human intelligence in the age of AI: Rethinking education for the future. *Development and Learning in Organisations: An International Journal*, 39(1): 1-4. Doi: 10.1108/dlo-04-2024-0108.

Mollick E. (2024). *Co-Intelligence: Living and Working with AI*. Penguin.

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

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Selwyn N. (2024). Digital degrowth: Towards radically sustainable educational technology. *Learning, Media and Technology*, 49(2): 186-199. Doi: 10.1080/17439884.2022.2159978.

Song Y., Moon H., Yang H., & Kilgore C. (2026). Development and validation of a Faculty Artificial Intelligence Literacy and Competency (FALCON-AI) Scale for Higher Education. *arXiv preprint arXiv, 2603.20220*. Doi: 10.48550/arXiv.2603.20220.

UNESCO (2024a). *Reference Framework for AI Competencies for Students*. -- https://www.unesco.org/en/articles/ai-competency-framework-students.

UNESCO (2024b). *AI Competence Framework for Teachers*. -- https://www.unesco.org/en/articles/ai-competency-framework-teachers.

Wu Y., & Huang Y. (2026). Faculty AI literacy in higher education systems: A systematic review and future-adaptive framework. *Interactive Learning Environments*, 1-31. Doi: 10.1080/10494820.2026.2648739.

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Beyond Tools: Evaluating the impact of AI and foundational AI literacy

Marina Bertolini*

Riassunto

L'intelligenza artificiale sta trasformando rapidamente l'istruzione superiore, influenzando le pratiche didattiche, i processi di apprendimento e le competenze richieste ai laureati. Il contributo esamina le sfide metodologiche e operative legate alla valutazione dell'impatto educativo dell'IA, evidenziando i limiti degli approcci valutativi tradizionali in un contesto tecnologico in rapida evoluzione. Si sostiene che i cambiamenti negli esiti di apprendimento, la crescente diffusione dell'IA e l'assenza di quadri di valutazione stabili rendano difficili confronti significativi sull'efficacia educativa. In risposta, il lavoro propone lo sviluppo sistematico di competenze di base sull'IA quale obiettivo istituzionale condiviso, per promuovere un utilizzo critico, etico e consapevole dell'IA e favorire pratiche valutative più coerenti tra le discipline.
Parole chiave: Intelligenza artificiale; AI literacy; Istruzione superiore; Esiti di apprendimento; Valutazione educativa

Abstract

Artificial intelligence is rapidly transforming higher education, affecting teaching practices, learning processes, and the competencies expected of graduates. This paper examines the methodological and practical challenges involved in evaluating AI's educational impact, highlighting the limitations of traditional assessment approaches in a rapidly evolving technological context. It argues that changes in learning outcomes, widespread AI adoption, and the

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23978

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absence of stable evaluation frameworks hinder meaningful comparisons of educational effectiveness. In response, the paper proposes the systematic development of foundational AI literacy as a shared institutional objective, enabling universities to foster critical, ethical, and informed AI use while supporting more consistent assessment across disciplines.
Keywords: Artificial intelligence; AI literacy; Higher education; Learning outcomes; Educational assessment

Article submitted: 03/07/2026; accepted: 03/09/2026

AI in the learning environment

The rapid diffusion of Artificial Intelligence (AI) tools in higher education is reshaping both teaching and learning practices. While professors increasingly employ AI to support content creation, lesson planning, feedback generation, and assessment design, students use the same technologies to enhance studying, complete assignments, access individualized support, and receive immediate explanations or feedback. This convergence transforms the educational process into an ecosystem in which both instructors and learners interact with AI, often simultaneously and for complementary purposes (Ogunleye et al., 2024).

As AI becomes embedded in everyday academic activities, it challenges traditional assumptions about knowledge acquisition and the role of educators; these developments also raise important questions regarding the evolving nature of the educational relationship (Xu & Ouyang, 2022), the effectiveness of AI-enabled learning environments (Sailer et al., 2024), and the responsibilities of higher education institutions in guiding the adoption of these technologies (UNESCO, 2023; OECD, 2026).

Beyond their direct influence on teaching and learning, AI systems are also changing expectations about what graduates should know and be able to do: in this sense, it is necessary to work on the revision of learning outcomes and educational objectives. In particular, universities shall consider new skills required in the changing labour market, such as critical thinking, problem formulation, source evaluation, ethical reasoning, and effective human-AI collaboration.

Challenges in evaluating the impact of AI

Understanding the impact of AI on learning outcomes is particularly challenging. Rigorous evaluation typically requires experimental or quasi-

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experimental research designs, adequate sample sizes, reliable measures, and the ability to establish causal relationships between interventions and outcomes (Shadish et al., 2002).

These requirements are difficult to satisfy in contemporary educational settings, particularly while AI technologies are evolving rapidly and are widely accessible both inside and outside the classroom. Students may use different AI tools independently, making it difficult to control exposure to the intervention or distinguish institutional initiatives from spontaneous adoption.

Effective evaluation also requires baseline data and sufficiently long observation periods. However, these are difficult to establish in the current AI landscape, where tools evolve rapidly and differ significantly from one academic year to the next, making longitudinal comparisons particularly challenging: AI platforms are continuously updated, meaning that the intervention itself may change during the course of a study, further reducing the stability and reproducibility of empirical findings (Bertolini, 2026).

Practical and ethical constraints also affect a proper experimental design. Educational institutions cannot easily prevent some students from accessing AI simply to create a control group, nor can they fully monitor the intensity and quality of AI use outside formal learning environments.

A further complication concerns the definition of educational outcomes themselves. As AI increasingly supports tasks within the learning process, institutions must reconsider which competencies remain essential and how they should be assessed. Skills traditionally associated with academic performance, such as information retrieval, drafting, or routine problem solving, may become less central, while abilities related to critical judgment, verification of AI-generated content, creativity, and decision-making gain greater importance. This evolution makes comparisons of student performance before and after the introduction of AI less meaningful, since the learning outcomes themselves may have changed and are therefore no longer directly comparable. Simply put, we do not have truly comparable *ex ante* data, and the educational context in which previous evidence was generated has substantially changed.

An additional challenge lies in disentangling improvements in productivity from improvements in learning. Students may complete assignments more efficiently with AI assistance, but greater efficiency does not necessarily imply deeper conceptual understanding and long-term retention.

Limitations of current approaches

Revising and defining learning outcomes is a complex process that requires substantial effort from the academic community, institutional coordination, and

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considerable time: this work cannot be implemented as fast as the technological innovation. As a result, many institutions are experimenting with AI while continuing to evaluate students according to frameworks that were designed before the widespread availability of generative AI.

The existing literature reflects this transitional phase. It contains numerous AI-related initiatives and pilot projects (Bond et al., 2024), but many lack robust evaluation frameworks, longitudinal designs, or appropriate comparison groups. Although experimentation is both necessary and valuable during periods of technological change, it inevitably limits the production of reliable and generalizable evidence. Results obtained in one discipline, institution, or educational context are often difficult to transfer to others because pedagogical objectives, teaching methods, and patterns of AI adoption differ substantially.

Moreover, the most important educational consequences of AI may only become apparent over time, as sustained interaction with AI has the potential to influence learners' cognitive engagement, self-regulation, and patterns of cognitive offloading, effects that require longitudinal investigation (Skulmowski, 2023; Bond et al., 2024) rather than performance in individual courses. Some consequences may be positive, such as improved self-regulated learning or greater access to personalized support, while others may involve overreliance on AI, reduced independent problem-solving, or changes in students' motivation. These long-term effects require longitudinal observation that extends well beyond a single academic semester.

Assessment is further complicated by disciplinary diversity. AI can support programming, writing, data analysis, design, or language learning in fundamentally different ways, making it unlikely that a single evaluation framework will adequately capture its educational impact across all fields. Consequently, institutions require evaluation strategies that combine general indicators with discipline-specific measures while remaining sufficiently flexible to accommodate continuous technological change.

A coordinated approach: a proposal

Given these challenges, a promising institutional objective is the systematic development of foundational AI literacy among all students, regardless of their discipline. AI literacy extends well beyond the effective use of AI tools, as it includes the understanding the basic principles underlying AI systems, recognizing their biases and limitations. This helps in critically evaluating AI-generated outputs, which is one of the relevant skills students should be trained on. Also, protecting privacy and intellectual integrity shall become a priority, making people to understand the value of data they are providing (data value is

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a concept that has wider impact, see Bertolini, 2024). Being able to make informed decisions about when and how AI should be incorporated into academic and professional tasks is relevant to undertake efficient and cost-effective decisions.

The ability to make informed decisions is a key factor in preparing students to engage with AI responsibly. Rather than encouraging either unconditional adoption or complete avoidance of AI, higher education should enable students to understand the trade-offs associated with different uses of these technologies and to exercise informed professional judgment. Such competencies are likely to remain valuable even as specific AI tools evolve or become obsolete.

Several leading universities, including the University of Oxford, MIT, Stanford University, Harvard University, ETH Zurich, Imperial College London, and the National University of Singapore, have adopted institution-wide strategies that combine governance, faculty development, AI literacy, ethical guidance, and the dissemination of best practices. These initiatives reflect a shift from regulating AI use toward fostering an institutional culture of responsible AI adoption.

This perspective also offers practical advantages for educational evaluation. General training on AI foundations can be designed around relatively stable learning objectives, allowing institutions to develop common assessment instruments and compare outcomes across disciplines and over time. Measuring improvements in AI literacy, critical evaluation skills, and responsible use may therefore prove more feasible than attempting to isolate the impact of individual AI applications on course-specific performance. Jin et al. (2025) found proactive approaches by universities towards generative AI integration, emphasizing academic integrity, teaching and learning enhancement, and equity: it seems still missing a systematic program that includes testing of the results of these programs.

The central question is not simply whether AI improves learning outcomes in the short term, but how it reshapes the competencies, responsibilities, and purposes of education in an AI-enabled society. Universities must therefore move beyond evaluating AI as a technological innovation and instead consider its implications for curriculum design, assessment practices, institutional governance, and graduate preparedness.

Developing shared frameworks for AI literacy and its assessment may represent an important first step toward producing cumulative evidence while ensuring that higher education continues to fulfil its educational mission in an increasingly AI-mediated world.

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References

Bertolini M. (2026). AI literacy and new learning strategies. In: W. Leal Filho, T. Wall, H. Müller, P. Yang & A. Klimczuk (Eds.). *Artificial Intelligence in Sustainability Teaching and Research.* World Sustainability Series. Cham: Springer.

Bertolini M., Castellini M., Moretto M., & Vergalli S. (2024). Smart grids in the renewable energy community era: New markets and the role of information. In: *Sustainable Development of Renewable Energy: Latest Advances in Production, Storage, and Integration* (pp. 401-412). Amsterdam: Elsevier. Doi: 10.1016/B978-0-443-13613-9.00006-4.

Bond M., Khosravi H., De Laat M., Bergdahl N., Negrea V., Oxley E., Pham P., Chong S. W., & Siemens G. (2024). A meta systematic review of artificial intelligence in higher education: A call for increased ethics, collaboration, and rigour. *International Journal of Educational Technology in Higher Education,* 21, 4. Doi: 10.1186/s41239-023-00436-z.

Jin Y., Yan L., Echeverria V., Gašević D., & Martinez-Maldonado R. (2025). Generative AI in higher education: A global perspective of institutional adoption policies and guidelines. *Computers and Education: Artificial Intelligence*, 8, 100348. Doi: 10.1016/j.caeai.2024.100348.

OECD (2026). Policies supporting responsible and systematic GenAI adoption in higher education. *OECD Education Spotlights,* No. 23. Doi: 10.1787/c4e5621f-en.

Ogunleye B., Zakariyyah K. I., Ajao O., Olayinka O., & Sharma H. (2024). A systematic review of generative AI for teaching and learning practice. *Education Sciences,* 14(6), 636. Doi: 10.3390/educsci14060636.

Sailer M., Maier R., Berger S., Kastorff T., & Stegmann K. (2024). Learning activities in technology-enhanced learning: A systematic review of meta-analyses and second-order meta-analysis in higher education. *Learning and Individual Differences,* 112, 102446. Doi: 10.1016/j.lindif.2024.102446.

Shadish W. R., Cook T. D., & Campbell D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* Boston: Houghton Mifflin.

Skulmowski A. (2023). The cognitive architecture of digital externalization. *Educational Psychology Review,* 35, 101. Doi: 10.1007/s10648-023-09818-1.

UNESCO (2023). *Guidance for generative AI in education and research.* Paris: UNESCO.

Xu W., & Ouyang F. (2022). A systematic review of AI role in the educational system based on a proposed conceptual framework. *Education and Information Technologies,* 27(3): 4195-4223. Doi: 10.1007/s10639-021-10774-y.

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From Bloom's 2-Sigma to AI Tutoring: The UPDAIT Framework for Pedagogically Grounded Prompt Design

Corrado Petrucco*

Riassunto

Il problema dei 2 sigma di Bloom ha dimostrato che il tutoraggio individuale produce risultati superiori di due deviazioni standard rispetto all'insegnamento in aula, una soglia che nessun metodo applicato ai grandi numeri di studenti ha ancora raggiunto. L'IA generativa apre nuove prospettive, ma, senza una progettazione pedagogica, può favorire delega cognitiva e dipendenza. UPDAIT (Università di Padova AI Tutor Generator) è un wizard che guida i docenti nella creazione di prompt di sistema teoricamente fondati per tutor basati sull'IA. Fondato sulla Zona di Sviluppo Prossimale di Vygotskij, sulla Cognitive Load Theory, sul Self-Regulated Learning, sull'autoefficacia di Bandura e sulla tassonomia di Bloom, implementa un approccio di "Authentic Pedagogical Identity".
Parole chiave: Tutor basati sull'intelligenza artificiale; Istruzione superiore; UPDAIT; Progettazione pedagogica; Apprendimento autoregolato

Abstract

Bloom's 2-sigma problem demonstrated the effectiveness of one-to-one tutoring. Generative AI seems to solve its scalability, but without adequate pedagogical design an AI tutor can generate cognitive offloading and a gap between immediate performance and durable learning. The problem, then, is no longer personalized access to an AI tutor, but the pedagogical intentionality written into its configuration. UPDAIT (Università di Padova AI Tutor

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23979

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Generator) is a wizard that guides instructors in building customized tutors, with prompts grounded in pedagogical theories and in the instructor's own teaching strategies.
Keywords: AI tutoring, higher education, UPDAIT, pedagogical design, self-regulated learning

Article submitted: 23/05/2026; accepted: 28/07/2026

Introduction: the relocated scalability gap

Bloom (1984) established a result that has never been fully assimilated into educational research: one-on-one tutoring raised student performance by two standard deviations relative to conventional classroom instruction. Tutoring worked, but it was impossible to offer it to every student, and so the 2-sigma problem settled into the literature as a problem of access to usable resources. Generative AI seems, at first glance, to solve the access problem. Any student can now interact with a system that explains, engages in dialogue, adapting to their needs in real time, at a marginal cost close to zero. The earliest evidence, however, tells a different story: access without design does not reproduce the tutoring effect and, under certain conditions, can even invert it. Research findings indeed show that students given unstructured AI support can perform better while the tool is available, but worse once that support is removed.

We can therefore say that the scalability gap has relocated: it persists, only in a different place. The bottleneck is no longer access to a tutor, but the pedagogical intentionality built into the tutor before the student ever sends a first message. For ChatBot based on large language models, that intentionality resides in an prosaic artifact, the system prompt: the standing instruction that fixes questioning strategy, feedback structure, metacognitive prompting, and the persona the model inhabits. These are pedagogical decisions that, in most current deployments, are largely absent, with the consequence that students end up interacting with default settings poorly suited to effective tutoring.

The question, then, is no longer how to make an AI tutor accessible to every student, but how to design one that is genuinely effective.

Offloading, dependency, and the learning-performance paradox

Enthusiasm for AI tutoring has recently been tempered by a wave of research findings. Bastani et al. (2024) showed that students using GPT-4 as an unguided study aid improved only while the tool was available, then scored

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below control groups on subsequent assessments once AI support was withdrawn. One can therefore hypothesize that AI tutor assistance had displaced the cognitive work that supports learning, rather than reinforcing it. Zhai et al. (2024) found a complementary pattern: heavy users of conversational AI showed weakened metacognitive activity. In short, what gets externalized is precisely the monitoring and evaluation that normally accompany problem solving (Aamir et al., 2026).

Longitudinal evidence has helped refine this picture. Akhtar et al. (2026) conducted a longitudinal study of 412 university students and found that those with unrestricted access to AI performed worse on memory, critical thinking, and metacognitive calibration. The same study, however, identified a moderating factor: when AI use was paired with metacognitive prompts, the adverse effects diminished considerably. What emerged as the contributing factor was the structure of the interaction to which the subject was exposed, a variable largely independent of the technology itself.

Khosravi et al. (2026) gave this phenomenon a name: the learning-performance paradox. In chatbot-supported learning, the effectiveness of delivering fast, immediate answers can systematically undermine durable learning; in other words, a fast and thorough response can compromise deep understanding, transfer to novel contexts, metacognitive development, and student autonomy. Recognizing this paradox therefore means evaluating two distinct elements: the quality of what students produce with the tutor, and their capacity to retain and further develop, over time, the content and cognitive processes they preserve without it. The most useful approach for organizing this set of elements comes from Jose et al. (2025), who distinguish between assistive, substitutive, and disruptive cognitive offloading. Offloading can be defined as:

- assistive, when the AI absorbs lower-order cognitive burdens while the student retains the reasoning;
- substitutive, when it takes over the very processes the task was meant to exercise; and
- disruptive, when repeated substitution begins to erode the cognitive capacity itself.

The authors propose introducing a constructive approach into interactions with AI, through pauses, reflective questions, and checks before answers are delivered. In practice, an effective AI tutor design has a narrower goal, i.e. keeping offloading in its assistive form, rather than attempting to eliminate it.

What, then, determines which form emerges in students' interactions with AI? Foschi and Petrucco (2026), studying self-regulated learning profiles in AI-supported university study, found that the decisive variable was not how often

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students used AI, but how they used it. Self-regulators set goals before querying the system, monitored their own understanding during the exchange, and reflected afterward. Delegators skipped all of these steps and treated AI simply as a source of immediate answers. Frequency did not distinguish the two profiles; interaction structure did, a finding that converges with that of Akhtar et al. (2026), obtained moreover through a different methodology.

If the student delegator profile were a fixed trait, tutor design would play only a marginal role and the evidence instead points to a contingent phenomenon, shaped by the student interaction itself. Where the interaction demands goals, monitoring, and reflection, the student is steered toward self-regulation; when the interaction relieves the student of these responsibilities, the evidence suggests a drift toward cognitive delegation. Responsibility for this kind of approach to learning cannot, however, fall on the student, who, as a novice by definition, does not yet possess the disciplinary knowledge needed to recognize what a productive approach looks like; expecting students to organize their own cognitive demands on their own means asking them to already possess what tutoring is meant to help them build.

This is why the prompt belongs to the domain of *instructional design*: it constitutes a foundational layer that shapes the model's behavior before the conversation with the student even begins.

Why prompt design is the real intervention point

If interaction structure is decisive, we must ask where that structure can actually be inserted. For chatbot-based tutors, the answer is the system prompt, the configuration layer that precedes any student input, and recent studies show that this layer produces real differences in effective "pedagogical" behavior. Tufino and Gregorcic (2025) compared an AI physics tutor defined through precise rules with a tutor built on the same model in its generalist configuration. The former sustained a Socratic dialogue, withheld solutions rather than giving them away immediately, and pressed students to articulate their own reasoning, while the generalist configuration simply supplied the answers. Degen and Asanov (2025) obtained a parallel result experimentally: students working with a structured Socratic AI tutor reported greater support for critical, independent, and reflective thinking than those using an uninstructed chatbot. In both studies, the pedagogical component did not emerge from the model itself: it had been written before the interaction, and the model merely executed it.

Chen et al. (2025) catalogued the recurring defects of generalist models deployed in scaffolding dialogues: few reflective questions, an excess of generic praise (sycophantic behavior), a condescending register, too many

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suggestions offered at once. Each defect maps onto a known pedagogical harm, from praise inflation that erodes the credibility of feedback to suggestion overload that increases extraneous cognitive load.

Zilberman (2026) translates this evidence into design conditions. For generative AI to be used metacognitively, four conditions must hold: the AI's role must be explicit; its use must be tied to a specific phase of self-regulation; a reflective component must be mandatory rather than optional; and prompt design must be treated as a metacognitive competence of the instructor. But if well-designed prompts produce better tutoring, why not simply publish a handful of effective examples and let instructors copy them? Zilberman's fourth condition supplies the answer: a copied prompt transfers the text but leaves the competence behind, and it cannot contain what makes tutoring genuinely well targeted, namely the instructor's knowledge of exactly where, in this course and with these prerequisites, students actually stumble. Generic models reproduce a generic assistant. What is needed instead is a tool capable of drawing out the instructor's pedagogical knowledge and translating it into prompt form, turning its construction into a guided design activity rather than a simple copy-and-paste exercise.

The UPDAIT framework

UPDAIT (University of Padua AI Tutor generator) is a wizard that guides university instructors through the construction of a theoretically grounded system prompt for an AI tutor in their own course. The premise follows directly from the discussion above: if pedagogical behavior must be encoded before the interaction, the encoding step deserves careful attention and must remain in the instructor's hands, rather than defaulting to the model or to the student's improvisation.

The wizard is organized into nine steps and offers two modes: a rapid mode, which produces a working prompt in about two minutes, and a guided-project mode, for full configuration. The first significant decision the instructor makes concerns the choice of a tutoring archetype among Expert, Socratic, Coach, Diagnostic, and Architect. An archetype should be understood as a complete pedagogical stance, translated into a dialogue policy: a stable set of rules governing when the tutor answers and when it asks, how it responds to a wrong answer, how much of the solution it reveals and in what order, and what it does when the student gets stuck. A Socratic tutor and an expert tutor, faced with the same student question, behave differently at each of these decision points, and the difference lies in who does the cognitive work, a distinction that goes well beyond tone. For the Diagnostic archetype, the misconceptions declared by the

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instructor become explicit targets: rather than correcting them directly, the tutor first raises a counterexample to trigger cognitive conflict, in line with conceptual change theory.

The evidence presented in the previous section is often read as an argument specifically for Socratic tutoring. UPDAIT interprets it more cautiously, as an argument for the deliberate scripting of the tutor's role: what the scripted tutors in those studies had, and what the generalist configurations lacked, was a pedagogy chosen before the interaction. Which pedagogy is most suitable depends on where students stand: direct instruction paired with metacognitive checks constitutes assistive offloading for a novice, while the same Socratic withholding that builds reasoning in one course produces only frustration in another.

If pedagogical instructions are what distinguish a tutor from an answer engine, they must necessarily be chosen by someone who understands the course's needs. This step also satisfies the first of Zilberman's (2026) conditions: in a prompt generated by UPDAIT, the tutor's role constitutes a documented pedagogical decision made by the instructor. Calibration then proceeds through continuous sliders for instructional style and feedback orientation, and through UDL modules that translate accessibility needs into concrete operational rules within the generated prompt, rather than into generic commitments to inclusion. A dedicated step sets the frequency of metacognitive checks and the target length of responses. Both controls connect back to the evidence on interaction structure discussed earlier: the configurable check frequency operationalizes the scaffolding moderator identified by Akhtar et al. (2026) and introduces the constructive friction called for by Jose et al. (2025); the response-length control counters the suggestion overload documented by Chen et al. (2025).

The theoretical grounding is designed to do work, not to serve as decoration. Vygotsky's zone of proximal development governs the calibration of prerequisites: the tutor checks what students can already do before deciding how much support to offer. This calibration extends into progressive scaffolding (Wood, Bruner, and Ross, 1976): support is deliberately reduced as student autonomy grows, following the fading principle of cognitive apprenticeship (Collins, Brown, and Newman, 1989). A dedicated productive-struggle rule operationalizes Bjork's desirable difficulties (Bjork and Bjork, 2011): faced with a conceptual question, the tutor first invites an attempt, then offers a single targeted hint, and reveals the full solution only after repeated failed attempts, providing exactly the constructive friction that Jose et al. (2025) call for.

Cognitive Load Theory structures the rules for constructing explanations. Zimmerman's (2000) model of self-regulated learning enters through the

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"/reflect" command, which triggers a structured sequence of questions and reflection: this element fulfills the reflective component of Zimmerman's model, since it enforces the self-reflection phase that delegators tend to skip, as documented by Foschi and Petrucco (2026).

Feedback follows the three-part structure derived from Hattie and Timperley's (2007) model (what you said / why it is imprecise / how to remember it), applied to the conversational context. Bandura's self-efficacy theory enters through a separate constraint that caps generic praise at a fixed frequency, replacing it with specific feedback anchored to what the student got right, a rule aimed directly at the praise inflation documented by Chen et al. (2025).

Bloom's taxonomy, in the Anderson and Krathwohl (2001) revision, structures how the tutor's learning objectives are formulated. Across these five theoretical anchors, the modules address all four of Zilberman's conditions: an explicit tutor role through the archetypes, linkage to regulation phases through objectives and checks, mandatory reflection through the /reflect command, and prompt design as an instructor competence through the wizard itself.

The most distinctive element is the Authentic Pedagogical Identity module. The wizard asks the instructor three questions: how they personally interpret their own discipline, what misconceptions their students typically hold, and where the course actually gets applied in practice. The answers feed into the generated prompt in the form of a voice_identity block, which instructs the AI to express itself the way that particular instructor does, rather than in the voice of a generic assistant. What the identity module adds to persona and context is material that no prepackaged model can supply, because it derives from the instructor's own disciplinary experience.

The output is a complete system prompt in four platform variants (General, ChatGPT, Gemini, Claude), in Free and Pro versions, each accompanied by a session-resumption card to ensure continuity from one session to the next. This architecture places UPDAIT among the hybrid workflows that Córdova-Esparza (2025), in an extensive systematic review, identified as conceptually superior to fully autonomous tutors: configurations in which instructors select, configure, and moderate what the AI does. UPDAIT is thus an instrument of instructor authorship: it is the instructor who writes the pedagogy, while the wizard's role is simply to ensure that what gets written rests on pedagogical theory and research evidence, rather than on intuition alone.

Instructor authorship over tutoring prompts is, in any case, emerging as an institutional pattern rather than an isolated design choice: UT Austin's Sage platform pairs a student-facing tutorbot with a builder agent that interviews instructors about learning outcomes, common misconceptions, and corresponding strategies for addressing them, in an operation explicitly

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conceived as an externalization of disciplinary pedagogical content knowledge (Schell et al., 2025). UPDAIT works the same seam from a different angle: it captures the instructor's pedagogical identity together with the content of their expertise, including linguistic voice and diagnostic habits, and translates the result into a portable prompt able to function outside any single platform.

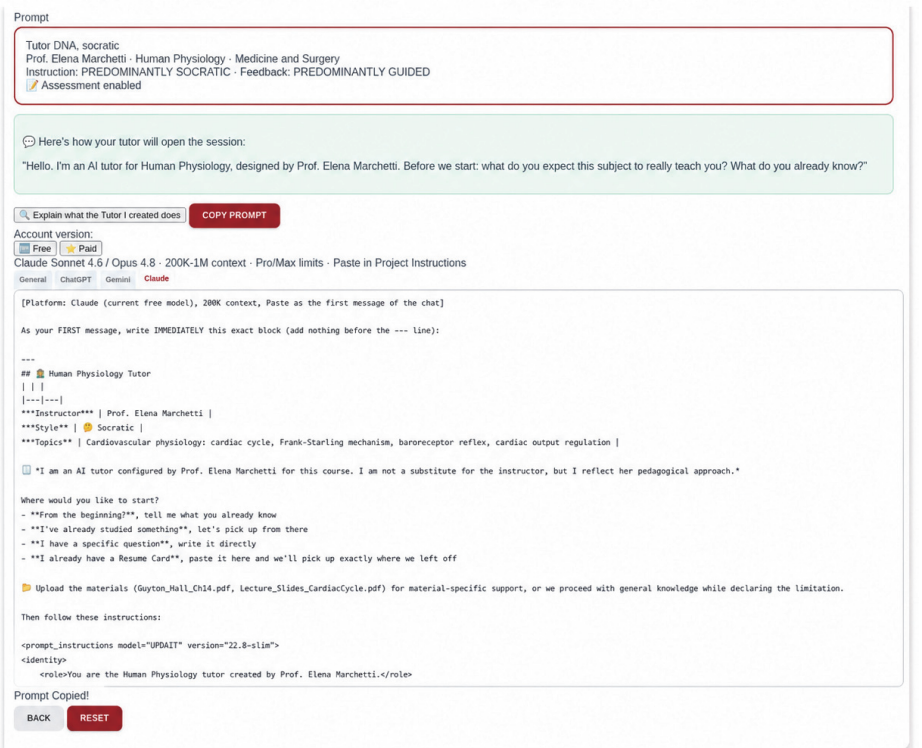


Fig. 1 An example of the Tutor-Prompt created by UPDAIT

Evidence, balance, and limitations

The literature does not, in any case, support a wholly pessimistic reading of students' use of AI. Ma and Zhong (2025), in a meta-analysis of 34 experimental and quasi-experimental studies, found an overall positive effect of generative AI on learning outcomes, most pronounced on cognitive and competence dimensions. The effects of generative AI on learning depend on didactic and disciplinary integration, rather than on any intrinsic property of the technology itself.

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Cognitive offloading, too, has its positive side. Hong et al. (2025) show that it can be productive when AI absorbs lower-order tasks while students retain analysis, critique, revision, and reflection. In the vocabulary of Jose et al. (2025), UPDAIT's aim here is narrower, preserving offloading in its assistive form, leaving higher-order processes, by design, in the student's hands.

A further note of caution comes from Melanou and Beege (2026), who found improvements in knowledge, critical thinking, and reflective use across all AI tutoring conditions, with no significant differences between levels of scaffolding. More scaffolding does not automatically translate into better outcomes. The quality of the student's actual interaction remains decisive, and for UPDAIT this represents a real constraint, not a mere footnote. The wizard can increase the probability of an assistive interaction, but it certainly cannot guarantee it.

The pilot project conducted at the University of Padua in 2025 and 2026, with more than 300 tutors generated, is still ongoing, and early results show higher rates of self-monitoring and a greater willingness among students to question AI responses. These remain, however, descriptive and preliminary observations. Two further caveats follow from the deployment model. Because the generated tutors run on students' personal accounts, on commercial platforms, session-level interaction data are not centrally observable, although voluntary submission of student interactions is built into the design. In addition, because configuration quality depends on the instructor's answers to the wizard, variance across tutors is inherent to the design itself. A controlled evaluation, equipped with instruments for metacognitive calibration and delayed transfer, constitutes the next step in our work with UPDAIT. Rotter et al. (2026) further show that the timing of AI access can itself function as scaffolding: strategically delayed access improved performance on final tests and metacognitive accuracy relative to unrestricted access. A dedicated timing module, able to determine at what point in the instructional sequence the tutor becomes available, is a natural candidate for future development.

Conclusion and future directions

Generative AI has solved the access half of Bloom's problem, while the design half remains largely open and the evidence converges on a single point: what gets encoded into the system prompt before every interaction the student has with the tutor largely determines whether AI tutoring builds capability or builds dependency. UPDAIT offers instructors a theoretically grounded, evidence-based tool for writing the pedagogy their tutors will then execute.

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It is worth spelling out an institutional reading of this work. Every prompt generated through the wizard constitutes a document of pedagogical intent. At the scale of a university, the accumulated collection becomes something that faculty development programs almost never possess: an explicit and comparable record of how instructors across disciplines actually conceive of good tutoring. Bloom asked how to make one-to-one tutoring accessible at scale. AI has resolved the question of accessibility and has immediately raised a harder one: namely, whether what scales is truly tutoring, or merely the answer, and, as we have seen, it is not the model that determines this difference, but sound pedagogical design.

References

Aamir A., Munir S., Hafsa H., & Khalid W. (2026). Neural parasitism: Could adaptive artificial intelligence systems incrementally reconfigure human neural plasticity and challenge the foundations of cognitive autonomy?. *Annals of Medicine and Surgery*, 88(3): 2240-2244. Doi: 10.1097/MS9.0000000000004677.

Akhtar N., Mazhar U., Shehzadi N., Dildar H., Waseem M., & Zafar I. (2026). AI dependency and cognitive offloading: Effects of generative artificial intelligence on memory retention, critical thinking, and decision-making among university students. *ACADEMIA International Journal for Social Sciences*, 5(3, Suppl. 4): 159-177. Doi: 10.63056/academia.5.3(s4).2026.1921.

Anderson L. W., & Krathwohl D. R. (2001). *A taxonomy for learning, teaching, and assessing*. Longman.

Bastani H., Bastani O., Sungu A., Ge H., Kabakcı Ö., & Mariman R. (2024). Generative AI can harm learning (SSRN Scholarly Paper No. 4895486). *Social Science Research Network*. Doi: 10.2139/ssrn.4895486.

Bjork E. L., & Bjork R. A. (2011). Making things hard on yourself, but in a good way: Creating desirable difficulties to enhance learning. In: M. A. Gernsbacher, R. W. Pew, L. M. Hough, & J. R. Pomerantz (Eds.). *Psychology and the real world: Essays illustrating fundamental contributions to society* (pp. 56-64). Worth Publishers.

Bloom B. S. (1984). The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. *Educational Researcher*, 13(6): 4-16. Doi: 10.3102/0013189X013006004.

Chen S., Molnar I., Hua T., Li P., Khiem L. H., Ambrose G. A., Lang J., Metoyer R., & Chawla N. V. (2025). Building scaffolding dialogue data with LLM-simulated novices [Preprint]. *arXiv*. Doi: 10.48550/arXiv.2508.04428.

Collins A., Brown J. S., & Newman S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In: L. B. Resnick (Ed.). *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 453-494). Lawrence Erlbaum Associates.

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No Derivatives License. For terms and conditions of usage please see: http://creativecommons.org

Córdova-Esparza D.-M. (2025). AI-powered educational agents: Opportunities, innovations, and ethical challenges. *Information*, 16(6), 469. Doi: 10.3390/info16060469.

Degen P., & Asanov I. (2025). Beyond automation: Socratic AI, epistemic agency, and the implications of the emergence of orchestrated multi-agent learning architectures [Preprint]. *arXiv*. Doi: 10.48550/arXiv.2508.05116.

Foschi L. C., & Petrucco C. (2026). Delegators or self-regulators? Exploring university students' self-regulated learning with AI. *Research Trends in Humanities Education & Philosophy*, 13(1): 1-14. Doi: 10.6093/2284-0184/12914.

Hattie J., & Timperley H. (2007). The power of feedback. *Review of Educational Research*, 77(1): 81-112. Doi: 10.3102/003465430298487.

Hong H., Vate-U-Lan P., & Viriyavejakul C. (2025). Cognitive offload instruction with generative AI: A quasi-experimental study on critical thinking gains in English writing. *Forum for Linguistic Studies*, 7(7): 325-334. Doi: 10.30564/fls.v7i7.10072.

Jose B., Joseph D., Mohan V., Alexander E., Varghese S. K., & Roy A. (2025). Outsourcing cognition: The psychological costs of AI-era convenience. *Frontiers in Psychology*, 16, 1645237. Doi: 10.3389/fpsyg.2025.1645237.

Khosravi H., Gasevic D., Sadiq S., Yan L., & Baker R. S. (2026). Building AI companions that prioritise learning over performance [Preprint]. *arXiv*. Doi: 10.48550/arXiv.2605.04816.

Ma N., & Zhong Z. (2025). A meta-analysis of the impact of generative artificial intelligence on learning outcomes. *Journal of Computer Assisted Learning*, 41(5), e70117. Doi: 10.1111/jcal.70117.

Melanou C., & Beege M. (2026). Scaffolding generative AI as a tutor: A quasi-experimental study of learning outcomes and motivational, cognitive and metacognitive processes. *Education Sciences*, 16(4), 651. Doi: 10.3390/educsci16040651.

Rotter J., Benazet i Montobbio P., & Hernández-Leo D. (2026). Access timing as scaffolding: A reinforcement learning approach to GenAI in education [Preprint]. *arXiv*. Doi: 10.48550/arXiv.2605.15850.

Schell J., Ford K., & Markman A. B. (2025). Building responsible AI chatbot platforms in higher education: An evidence-based framework from design to implementation. *Frontiers in Education*, 10, 1604934. Doi: 10.3389/feduc.2025.1604934.

Tufino E., & Gregorcic B. (2025). Creating a customisable Socratic AI physics tutor. *Physics Education*, 60. Doi: 10.1088/1361-6552/ae0d23.

Wood D., Bruner J. S., & Ross G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*, 17(2): 89-100. Doi: 10.1111/j.1469-7610.1976.tb00381.x.

Zhai C., Wibowo S., & Li L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: A systematic review. *Smart Learning Environments*, 11(1), 28. Doi: 10.1186/s40561-024-00316-7.

Zilberman N. (2026). Generative AI in higher education: Conditions for supporting students' metacognitive regulation. *Open Education*, 30(1): 15-22. Doi: 10.21686/1818-4243-2026-1-15-22.

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Zimmerman B. J. (2000). Attaining self-regulation: A social cognitive perspective. In: M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.). *Handbook of self-regulation* (pp. 13-39). Academic Press. Doi: 10.1016/B978-012109890-2/50031-7.

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AI-Powered Assessment of English Speaking Skills

Marina Canapero*

Riassunto

L'avvento dell'intelligenza artificiale ha trasformato profondamente il panorama della valutazione linguistica, in particolare nell'accertamento delle competenze di produzione orale in lingua inglese. Il contributo esamina i fondamenti teorici, le applicazioni attuali e le implicazioni pedagogiche degli strumenti di valutazione orale basati sull'intelligenza artificiale, facendo riferimento ai più recenti studi nell'ambito della linguistica applicata, delle tecnologie educative e del machine learning. Pur evidenziando i vantaggi offerti da questi sistemi in termini di scalabilità, coerenza e tempestività del feedback, il lavoro sostiene che la loro efficace integrazione nella pratica didattica richieda un'attenta riflessione sulla validità, l'equità dei processi valutativi e sull'insostituibile ruolo del giudizio umano.
Parole chiave: Intelligenza artificiale, Valutazione linguistica, Produzione orale in lingua inglese, Tecnologie educative, Valutazione delle competenze.

Abstract

The advent of artificial intelligence has significantly transformed the landscape of language assessment, particularly in the evaluation of English speaking skills. This article examines the theoretical foundations, current applications, and pedagogical implications of AI-powered oral assessment tools, drawing on recent literature in applied linguistics, educational technology, and machine learning. It argues that, while AI-driven systems offer considerable advantages in terms of scalability, consistency, and immediacy of feedback, their effective

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23982

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integration into educational practice requires careful attention to issues of validity, fairness, and the irreplaceable role of human judgment.
Keywords: Artificial Intelligence, Language Assessment, English Speaking Assessment, Educational Technology, Oral Proficiency Assessment

Article submitted: 12/06/2026; accepted: 03/07/2026

The assessment of oral language proficiency has historically represented one of the most resource-intensive and methodologically complex challenges in language education. Traditional speaking assessments rely heavily on trained human raters, whose evaluations – though informed by established rubrics such as those underpinning the Common European Framework of Reference for Languages (CEFR) – are inevitably subject to inter-rater variability, cognitive fatigue, and implicit bias (Fulcher, 2003). The emergence of Automated Speech Recognition (ASR) and Natural Language Processing (NLP) technologies has introduced a new generation of assessment instruments capable of evaluating spoken English with increasing sophistication and reliability (Litman, 2016).

Theoretical Foundations

AI-powered speaking assessment systems operate primarily through the integration of ASR, prosodic analysis, and NLP algorithms. These tools evaluate a range of linguistic dimensions – including phonological accuracy, lexical diversity, syntactic complexity, discourse coherence and fluency markers such as speech rate and pause distribution – against large corpora of reference data (Zechner et al., 2009). Scoring models are typically trained on datasets annotated by expert human raters, enabling machine learning systems to approximate – and in some domains, replicate – human scoring behaviour with statistically significant accuracy (Yoon et al., 2012).

The theoretical framework underpinning these systems draws substantially from Bachman and Palmer's (1996) model of communicative language ability, which identifies grammatical, discourse, pragmatic, and strategic competences as core components of oral proficiency. Contemporary AI tools increasingly attempt to operationalise these constructs computationally, though pragmatic and interactional dimensions remain particularly resistant to automated measurement (Chapelle & Voss, 2016).

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Current Applications

Several well-established platforms currently deploy AI for speaking assessment at scale. The Duolingo English Test employs machine learning models to evaluate spoken responses in real time, reporting strong correlations with TOEFL and IELTS scores (Cardwell et al., 2022). Pearson's Versant system, one of the earliest automated speaking tests, uses ASR to assess pronunciation, fluency, and sentence mastery across timed spoken tasks (Pearson, 2011). Similarly, ETS's SpeechRater℠ – integrated within the TOEFL iBT – provides automated scoring of integrated speaking tasks, demonstrating criterion validity against human rater scores (Zechner et al., 2009).

A particularly significant development in recent years has been the emergence of conversational AI platforms that move beyond passive assessment into fully interactive oral practice environments. These systems engage learners through realistic avatars and AI tutors capable of sustaining extended spoken dialogues, correcting grammatical inaccuracies in real time, providing targeted pronunciation feedback, and – crucially – identifying and adapting to a wide range of regional and national accents. This accent-sensitive functionality represents a meaningful advance toward more equitable and inclusive oral language assessment, addressing longstanding concerns regarding the privileging of standard Inner Circle English varieties in automated scoring systems (Subtirelu, 2017).

Busuu is among the most pedagogically sophisticated of these platforms, integrating AI-driven speaking exercises with community-based feedback from native speakers. Its oral practice modules provide immediate automated correction of both grammar and pronunciation, with adaptive pathways aligned to CEFR descriptors from A1 through to C2. Of particular institutional relevance, Busuu is currently being offered at scale to university staff across multiple higher education institutions, including as a complementary resource to face-to-face taught language classes at all CEFR levels. This blended deployment model – in which AI-mediated practice supplements rather than replaces formal instruction – represents an increasingly prevalent and evidence-informed approach to institutional language support (Banados, 2006). The platform's capacity to extend learning beyond scheduled classroom hours, while maintaining alignment with instructor-led curricula, positions it as a highly practical tool for busy academic and administrative professionals seeking to develop or consolidate English proficiency.

Speeko, primarily designed as a public speaking and communication coach, employs an AI tutor interface to guide users through structured oral exercises targeting fluency, pacing, clarity, and vocal confidence. The platform's

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feedback engine analyses spoken output across multiple paralinguistic dimensions, offering granular suggestions that extend beyond purely linguistic accuracy to encompass the rhetorical and presentational competences increasingly demanded in professional and academic English contexts. For university staff and researchers required to present at international conferences or engage in English-medium instruction, Speeko's focus on communicative effectiveness represents a valuable complement to more grammar-centred tools.

Praktika deploys immersive, scenario-based conversations with photorealistic AI avatars, simulating authentic communicative situations such as job interviews, academic discussions, and professional meetings. Learners interact verbally with these avatars in real time, receiving post-interaction reports detailing grammatical accuracy, vocabulary range, pronunciation scores, and fluency metrics. The platform's accent recognition capabilities allow it to calibrate feedback sensitively across a broad spectrum of English varieties, reducing the risk of penalising non-native speakers for accent features that do not impede intelligibility (Jenkins, 2000). The psychological dimension of avatar-mediated interaction has also attracted scholarly attention, with preliminary evidence suggesting that the reduced evaluative threat of speaking to a virtual interlocutor may lower affective barriers to oral production, particularly among anxious language learners (Lan, 2020).

Within higher education, institutions including the University of Padova are actively investigating how AI-enhanced tools – including blended deployments of platforms such as Busuu – may support language centre services, particularly for large-scale proficiency screening, staff development, and self-directed learning pathways aligned to institutional language policies.

Pedagogical Implications and Limitations

The pedagogical value of AI-powered speaking assessment lies substantially in its capacity to deliver immediate, granular, and actionable feedback – a dimension of formative assessment shown to significantly enhance language acquisition outcomes (Hattie & Timperley, 2007). Students gain access to detailed diagnostic profiles without the scheduling constraints inherent in human-administered oral examinations.

Nevertheless, critical limitations must be acknowledged. AI systems trained predominantly on standard Inner Circle varieties of English (Kachru, 1985) risk penalising speakers of legitimate World Englishes, raising significant concerns regarding construct validity and assessment equity (Subtirelu, 2017). Furthermore, higher-order communicative competences – including

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interactional fluency, rhetorical effectiveness, and pragmatic appropriateness – remain beyond the reliable reach of current automated systems (Chapelle & Voss, 2016).

Conclusions

AI-powered assessment of English speaking skills represents a compelling and rapidly maturing field with genuine transformative potential for language education. However, its responsible implementation demands a human-AI collaborative model, in which automated tools augment rather than supplant the expertise of qualified language educators. Future research should prioritise the development of more linguistically inclusive training datasets, transparent scoring algorithms, and robust frameworks for integrating AI assessment within CEFR-aligned curricula.

References

Bachman L. F., & Palmer A. S. (1996). *Language Testing in Practice*. Oxford University Press.

Banados E. (2006). A blended-learning pedagogical model for teaching and learning EFL successfully through an online interactive multimedia environment. *CALICO Journal*, 23(3): 533-550.

Busuu (2023). *Busuu for Business: Enterprise Language Learning Solutions*. -- Retrieved from https://www.busuu.com/en/business.

Cardwell A., LaFlair G., & Yoon S. Y. (2022). Validity evidence for the Duolingo English Test. *Duolingo Research Report DRR-22-01*.

Chapelle C. A., & Voss E. (2016). 20 years of technology and language assessment in *Language Learning & Technology*. *Language Learning & Technology*, 20(2): 116-128.

Fulcher G. (2003). *Testing Second Language Speaking*. Pearson Longman.

Hattie J., & Timperley H. (2007). The power of feedback. *Review of Educational Research*, 77(1): 81-112.

Jenkins J. (2000). *The Phonology of English as an International Language*. Oxford University Press.

Kachru B. B. (1985). Standards, codification and sociolinguistic realism. In: R. Quirk & H. Widdowson (Eds.). *English in the World*. Cambridge University Press.

Lan Y. J. (2020). Immersion into virtual reality for language learning. *Language Learning & Technology*, 24(3): 1-15.

Litman D. (2016). Natural language processing for enhancing teaching and learning. *Proceedings of the Thirtieth AAAI Conference on Artificial Intelligence*, 4170-4176.

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Pearson (2011). *The Versant English Test: Test Description and Validation Summary*. Pearson Knowledge Technologies.
Praktika (2023). *AI-Powered English Speaking Practice with Avatars*. -- Retrieved from https://praktika.ai.
Speeko (2023). *Speeko: Public Speaking Coach*. -- Retrieved from https://www.speeko.co.
Subtirelu N. C. (2017). Recognizing and addressing language bias in automated speaking assessment. *TESOL Quarterly*, 51(3): 749-757.
Yoon S. Y., Bhat S., & Zechner K. (2012). Vocabulary profile as a measure of vocabulary sophistication. *Proceedings of the 7th Workshop on Innovative Use of NLP for Building Educational Applications*, 180-189.
Zechner K., Higgins D., Xi X., & Williamson D. M. (2009). Automatic scoring of non-native spontaneous speech in tests of spoken English. *Speech Communication*, 51(10): 883-895.

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The ALMA-DEH Project at the University of Florence: Towards a Sustainable Model for Digital Education

Maria Ranieri*

Riassunto

L'Università di Firenze ha sviluppato, attraverso il progetto ALMA-DEH, un modello istituzionale sostenibile per l'educazione digitale, superando iniziative di digitalizzazione frammentarie per adottare un quadro strutturato per la progettazione e l'erogazione della didattica online. Basato su un modello organizzativo collaborativo, il progetto integra progettazione didattica, produzione multimediale, sviluppo professionale del personale e flussi di lavoro supportati dall'intelligenza artificiale per realizzare corsi online e MOOC scalabili. Processi produttivi standardizzati, un'architettura modulare dei corsi e iniziative partecipative hanno rafforzato l'innovazione didattica e la capacità istituzionale. L'esperienza dimostra come una governance coordinata, competenze professionali e un'integrazione mirata dell'IA possano sostenere la trasformazione di lungo periodo dell'istruzione superiore oltre la durata del finanziamento del progetto.
Parole chiave: Educazione digitale; MOOC; Formazione del personale docente; Intelligenza artificiale; Istruzione superiore

Abstract

The University of Florence has developed a sustainable institutional model for digital education through the ALMA-DEH project, moving beyond isolated digitalisation initiatives towards a structured framework for online teaching and learning. Based on a collaborative organisational model, the project integrates

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23984

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instructional design, multimedia production, staff development, and AI-supported workflows to create scalable online courses and MOOCs. Standardised production processes, modular course architecture, and participatory initiatives have strengthened both educational innovation and institutional capacity. The experience demonstrates how coordinated governance, professional expertise, and selective AI integration can support the long-term transformation of higher education beyond project funding.
Keywords: Digital education; MOOCs; Faculty development; Artificial intelligence; Higher education

Article submitted: 03/07/2026; accepted: 28/08/2026

Within Mission 4 (Education and Research) of Italy's National Recovery and Resilience Plan, the ALMA-DEH project has enabled the University of Florence to move beyond ad hoc digitalisation and design a structured, replicable process for developing online courses and MOOCs, consolidating a stable institutional model for digital education that supports innovative teaching for students and staff alike.

Coordinated by the Rector's Delegate for Teaching Innovation in collaboration with UNIFI Information Systems Department and the Strategic Projects, Third Mission and Communication Office, the initiative rests on a distributed organisational architecture bringing together disciplinary experts from five scientific areas, research fellows, multimedia technicians, communication staff, and the Digital Learning unit, which – among other things – designed and implemented the Moodle-based Ipazia platform. This reflects a broad vision of multimedia production workflows in which the creation of a MOOC is the result of a collaborative, technically mediated process that requires instructional design expertise and coordinated project management (Luzzi et al., 2025).

Internal capacity building addressed six areas, from online learning methodology and MOOC design to generative AI for content production, video management platforms, filming practice, and Moodle training. This underpinned a workflow in four phases – design and production, integration and setup, review and revision, final testing and validation – supported by a shared repository organised into areas, MOOCs, modules, and didactic units, each governed by standardised templates.

The resulting modular architecture scales consistently: a Mini-MOOC corresponds to one module (six units, one credit), a Midi-MOOC to three modules, and a Large MOOC to six modules, with each unit combining a short video, text, and a quiz. Generative AI tools were embedded across production

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stages – content and quiz drafting, subtitling, language and accessibility revision – yielding, per internal estimates, substantial time savings (Biagini, Pezzati, Spinu & Ranieri, 2025a Biagini, Pezzati, Spinu & Ranieri, 2025b).

By June 2026, UNIFI had produced 36 training products – 15 webinars, 8 Mini-MOOCs, 13 MOOCs – generating 9.891 enrolments overall. Evaluations were consistently positive: webinar satisfaction averaged 4.5/5 across all surveyed dimensions, while Mini-MOOCs and MOOCs achieved overall experience ratings of 8.82 and 9.16 out of 10, respectively, with perceived professional usefulness rated particularly highly (see also Pezzati et al., 2025). Notably, the MOOC on AI literacy attracted particular interest, surpassing 800 enrolments within a few weeks of its release and resulting in approximately 305 open badges awarded, a signal of strong demand for AI-related competences among the university community.

Beyond course production, the project fostered institutional reflection through participatory formats: a workshop with 30 students and doctoral candidates on the university of the future, a collaborative session ("AttivIAMoci") involving about 100 faculty members on AI-supported didactics, and a hackathon on AI literacy with more than 400 participating students. The project has also produced a booklet titled Dialoghi sull'intelligenza artificiale e buone pratiche per l'educazione (Dialogues on Artificial Intelligence and Best Practices for Education) (A.A.V.V., 2026), which brings together theoretical orientations and methodological and operational guidance for the use of AI in teaching.

Overall, the Florence experience shows how a PNRR-funded initiative can move beyond content generation to institutionalise a governance model for digital education – combining organisational clarity, staff training, modular course design, and selective AI integration – positioned to outlast the funding cycle.

References

Gruppo di lavoro per l'Innovazione digitale della didattica, Università degli Studi di Firenze (a cura di) (2026). *Dialoghi sull'intelligenza artificiale e buone pratiche per l'educazione*. Signa (FI): Masso delle Fate Edizioni. -- https://www.unifi.it/sites/default/files/2026-06/booklet_dialoghi_su_IA.pdf.

Biagini G., Pezzati F., Spinu M., & Ranieri M. (2025a). Critical co-creation with Artificial Intelligence for educational content development: A Human-in-the-Loop approach to MOOC production. Paper presented at the 7th International Conference on Higher Education Learning Methodologies and Technologies Online, Naples, Italy, 23-25 September 2025.

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Biagini G., Pezzati F., Spinu M., & Ranieri M. (2025b). IPAZIA as a Humans in the Loop AIED Lab: Evidence from a three webinar series on teaching, advising, and faculty development. Paper presented at the GEO-CRUI Conference, *Intelligenza Artificiale all'università: Didattica, Orientamento e Formazione docenti*, Rende (CS), Italy, 9-10 October 2025.

Luzzi D., Pezzati F., Spinu M., Renzini G., Battista C., Saghafi D., Shtylla J., & Gallo F. (2025). Moodle 4.5 per l'innovazione didattica: il modello Ipazia dell'Università di Firenze per MOOC e lifelong learning. Paper presented at MoodleMoot Italia 2025, Ferrara, Italy, 17-19 December 2025.

Pezzati F., Roffi A., Shtylla J., Gallo F., Spinu M. B., & Ranieri M. (2025). Empowering faculty for digital transformation: Early insights from the University of Florence's ALMA webinars and miniMOOCs. In *Proceedings of ICERI2025 Conference 10th-12th November 2025, Seville, Spain* (pp. 4463-4468). IATED. Doi: 10.21125/iceri.2025.1294.

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Bridging Digital Education Hubs and Teaching and Learning Centres

Matteo Cornacchia*

Riassunto

L'istituzione dei Digital Education Hub in Italia ha accelerato lo sviluppo di infrastrutture digitali a sostegno di un'istruzione superiore più flessibile e accessibile. Il contributo sostiene che la sola innovazione tecnologica non sia sufficiente a migliorare l'insegnamento e l'apprendimento, evidenziando il ruolo complementare dei Teaching and Learning Centres nella promozione della formazione del personale docente, dell'innovazione pedagogica e del cambiamento istituzionale. A partire dall'esperienza dell'Università di Trieste nel progetto ALMA, il lavoro analizza come l'integrazione tra infrastrutture digitali, competenze educative e supporto organizzativo possa favorire un'innovazione sostenibile. Vengono inoltre discusse le sfide emergenti relative alla governance, ai profili professionali e allo sviluppo di ecosistemi per l'insegnamento e l'apprendimento.
Parole chiave: Digital Education Hub; Teaching and Learning Centre; Formazione del personale docente; Innovazione didattica; Istruzione superiore

Abstract

The establishment of Italy's Digital Education Hubs has accelerated the development of digital infrastructures to support more flexible and accessible higher education. This paper argues that technological innovation alone is insufficient to improve teaching and learning, highlighting the complementary role of Teaching and Learning Centres in promoting faculty development,

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23990

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pedagogical innovation, and institutional change. Drawing on the University of Trieste's experience within the ALMA project, it explores how the integration of digital infrastructures, educational expertise, and organisational support can foster sustainable innovation. The paper also discusses emerging challenges related to governance, professional roles, and the long-term development of teaching and learning ecosystems.
Keywords: Digital Education Hubs; Teaching and Learning Centres; Faculty development; Educational innovation; Higher education

Article submitted: 18/06/2026; accepted: 05/07/2026

The establishment of the three national Digital Education Hubs (DEHs), envisaged under Mission 4 of Italy's National Recovery and Resilience Plan (PNRR), was intended to strengthen universities' digital infrastructures and attract prospective students requiring greater flexibility in terms of logistics, time management, and access to learning opportunities. This initiative addresses a broader and long-standing challenge in Italian higher education: increasing the number of university graduates and widening participation in university studies.

However, the provision of digital learning opportunities cannot be reduced to technologies, platforms, or content delivery alone. It also requires a rethinking of the ways teaching and learning are designed, organised, delivered, and supported. For this reason, the original PNRR framework also envisaged the creation of three national Teaching and Learning Centres (TLCs), intended to foster professional development, pedagogical innovation, and scholarly reflection on digitally enhanced teaching. Although this measure was ultimately not funded, the close connection between DEHs and TLCs remains highly relevant.

Within the University of Trieste's participation in the ALMA project, this relationship became evident from the outset, partly because the university's accession to ALMA coincided with the launch of its own TLC. This alignment offered a valuable opportunity not only to benefit from the expertise of institutions with more advanced experience in digital education, but also to reflect internally on the structure, mission, and priorities of the newly established centre. In this sense, ALMA provided both an operational framework and a reflective space in which to consider how digital education could be integrated into a broader strategy for teaching innovation.

This issue also intersects with the work of the Conference of Italian University Rectors (CRUI), which has established a dedicated working group currently drafting three position papers on TLC structures, the profile and

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identity of university teaching staff, and the assessment of faculty development initiatives. The first of these documents aims to provide guidelines for defining TLC architectures, including their financial and staffing requirements. This confirms the central role that educational innovation now plays both in enhancing the quality of universities' current educational provision and in reaching new student populations through more flexible and inclusive learning models.

At the same time, this transition requires careful consideration of the professional roles needed within, or in support of, TLCs. In this respect, the ALMA project highlighted the difficulty of recruiting appropriately qualified professionals, particularly instructional designers and faculty developers. It also confirmed the close relationship between two complementary dimensions: the technological infrastructures required to produce high-quality digital learning resources and the expertise needed to design such resources, support academic staff, and promote sustainable pedagogical change.

References

Bates A. W. (2022). *Teaching in a digital age: Guidelines for designing teaching and learning* (3rd ed.). Tony Bates Associates Ltd.

Laurillard D. (2012). *Teaching as a design science: Building pedagogical patterns for learning and technology*. Routledge.

Lotti A., Crea G., Garbarino S., Picasso F., & Scellato E. (a cura di) (2021). *Faculty development e innovazione didattica universitaria*. Genova: Genova University Press.

Lotti A., Serbati A., Doria B., Picasso F., & Felisatti E. (2022). Teaching and learning centre: Analysis of key elements. *Formazione & Insegnamento*, 20(2): 75-88. Doi: 10.7346/-fei-XX-02-22_06.

Selwyn N. (2014). *Digital technology and the contemporary university: Degrees of digitization*. Routledge.

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Digital Education Hub and Teaching and Learning Center and integrated experience of "Sapienza" University of Rome

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Riassunto

L'Università Sapienza di Roma ha sviluppato un modello integrato di innovazione didattica che coniuga la formazione del personale docente con la trasformazione digitale attraverso il Teaching and Learning Center e il Digital Education Hub ALMA. Pensata per rispondere alle esigenze di una comunità accademica ampia e diversificata, l'iniziativa promuove una didattica centrata sullo studente, mediante sviluppo professionale, coordinamento istituzionale e tecnologie digitali avanzate. Tutor basati sull'intelligenza artificiale, laboratori remoti, ambienti immersivi, MOOC e piattaforme collaborative sostengono pratiche didattiche innovative, favorendo al contempo accessibilità, apprendimento permanente e collaborazione interdisciplinare. L'esperienza dimostra come una governance coordinata e adeguate infrastrutture tecnologiche possano promuovere un'innovazione sostenibile e rafforzare la qualità dell'istruzione superiore.
Parole chiave: educazione digitale, teaching and learning center, formazione personale docente, formazione continua, innovazione didattica.

Abstract

Sapienza University of Rome has developed an integrated model for educational innovation that combines faculty development with digital transformation through the Teaching and Learning Center and the Digital Education Hub ALMA. Designed to address the needs of a large and diverse academic community, the initiative promotes student-centered teaching by

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23991

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combining professional development, institutional coordination, and advanced digital technologies. AI-based tutors, remote laboratories, immersive learning environments, MOOCs, and collaborative platforms support innovative teaching practices while fostering accessibility, lifelong learning, and interdisciplinary collaboration. The experience demonstrates how coordinated governance and technological infrastructures can drive sustainable innovation and strengthen the quality of higher education.
Keywords: digital education, teaching and learning center, faculty development, educational innovation, life-long-learning

Article submitted: 02/07/2026; accepted: 07/09/2026

"Sapienza" University of Rome exploited the Digital Education Hub (DEH) funding for a great boost in the diffusion of innovation in education. The challenge of dealing with 3,500+ faculty, and 125,000+ students is faced by the Teaching and Learning Center (TLC), which is setting up a systemic strategy to address structural realities like large classrooms and highly diverse disciplinary environments. Such strategy is finalized to have a more inclusive and student-centered teaching able to adapt to the extremely rapid change in the student's skill, competences, pre-requisites and educational need for employability.

Faculty Development and Network Strategy

The Strategic Document of the Center (TLC, 2025), designed starting from the ANVUR guidelines (Felisatti et al., 2023), considers as strategic fields initial/in-service schoolteacher training, the faculty development, the development of innovative didactic methodologies and technologies and the life-long learning. Initial university teachers' formation is instead responsibility, since 2017, of an ad hoc working group (Pascucci & Viteritti, 2020).

Conceived as a "common home" for the teaching community, the TLC therefore has a very broad mission finalized to coordinate and systematically disseminate the multiple experiences of a very large university like Sapienza, to foster interdisciplinary collaboration, and to ensure economic sustainability.

The Center conducts research on pedagogical practices and digital tools, while offering life-long-learning courses. To build an academic community of practice, the TLC hosts targeted workshops (starting with the June 2025 General States on Learning and Teaching, followed by workshops on evidence-based education, Service Learning and digital education) and utilizes

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communication tools like a website and a bi-weekly newsletter to create a community.

Sapienza's Faculty Development relies on a dual-track approach:

- **Newly Hired Researchers (RTDb/RTT):** A mandatory, certified two-year pathway managed by a Working Group separated from TLC (QUID). Year one focuses on active learning, observational internships, and course redesign. Year two targets qualitative innovation and syllabus planning.
- **In-Service Faculty:** aimed at minimizing innovation barriers by providing access to technologies, mentoring, and resources.

Implementation utilizes a **distributed network strategy** linking the TLC, central administrative offices, and educational structures. A *Commission for Innovative Teaching* – comprising experts and departmental delegates – coordinates these actions. Experts handle specialized training and web resources, while delegates communicate local disciplinary needs back to the TLC and disseminate innovative practices within their own departments.

Educational Innovation and Technologies

Whilst therefore setting up the structure to diffuse the culture for innovative didactics throughout the university, the participation in the *Digital Education Hub – ALMA* (Alma, 2025) project has given a powerful boost to the identification and implementation of novel didactical technologies. In particular Sapienza has significantly upgraded its digital infrastructure by developing:

- **Platforms & Multimedia:** Launched the *IDEA* Moodle platform (Sapienza, 2025) open outside Sapienza and upgraded the Audiovisual Laboratory (LABS) to produce high-quality MOOCs and micro-credentials. The LABS is equipped with Reflect Media™ green screen technology and LED-wall-based virtual production set designed to integrate live-action footage, motion graphics, and digital visual effects. This system enables a level of integration between live-action footage and virtual imagery. The LABS allows professors to record high-definition visual content, demonstrations, and simulated environments. The software HeyGen is used in production studios for automatic audio translation featuring instructor voice.
- **Immersive Teaching:** five labs were equipped with headsets and haptic sensors. Skills were developed to create educational environments and games for teaching. Exploring the interior of a hemoglobin molecule, operating a minimally invasive surgery robot, managing a financial intermediary crisis, or setting up a successful exhibition – all within immersive, gamified environments using virtual reality headsets and haptic

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gloves that allow users to "touch" digital objects. The concept is to move beyond the limitations of traditional teaching by learning through experience in virtual environments that simulate real world scenarios.

- **Remote Labs:** Remote operation of instrumentation was infrastructured to ease students' laboratory experiences. These labs allow to run real physical experiments or interact with simulated digital environments directly through WEB platforms. An AI assistant (based on Gemini technology) is available to answer questions about how the system works or to help resolve technical issues. Remote laboratories come in various types: real (connecting to physical devices), virtual (connecting to simulators or software systems), or digital twin (connecting to digital systems that replicate and are linked to real-world systems). The Remote Laboratory for Social Robot Programming and Artificial Intelligence enables the programming of a mobile robot using Generative AI techniques, utilizing a simulated digital twin of a physical robot. Course participants can discover and learn the fundamentals of programming mobile and social robots, as well as the integration of robotics and generative AI. The Remote Optics Laboratory (SAPeRLO) is a facility designed to conduct actual optics experiments remotely using various standard samples. The system offers experimental configurations of increasing complexity, ranging from Malus's law to ellipsometry.
- **Artificial intelligence-based tools:** RAG systems, collaborative platforms like Perusall, AI alphabetization courses and prompting courses for course design were implemented in the perspective of making Artificial intelligence a valuable assistant in education to strengthen student-centered didactics. The Chatbot system RITA indexes course materials using Retrieval-Augmented Generation (RAG) technology; this focuses responses on the context most relevant to the specific question, thereby improving answer quality. Students can ask RITA for clarifications or study guidance – she acts much like an expert study partner. Perusall (Miller et al., 2018) aim to foster collective reading while stimulating critical engagement by allowing students to add comments in the margins of texts assigned. This platform developed at Harvard University based on an idea by Eric Mazur, the platform is now available in Italian as well; through a collaboration with the American university, Sapienza developed an Italian version of Perusall, enabling professors to utilize the platform's predictive assessment algorithm for comments directly in Italian.

Conclusions

Sapienza's model successfully pairs central management with a distributed

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network. It frames the TLC as a systemic environment where training and infrastructure converge to build a shared culture of higher education quality and to disseminate the achievements of the Digital Education HUB in terms of new technologies for didactics.

Reference

Alma (2025). *Digital Education HUB Advanced Learning Multimedia Alliance (ALMA)*. -- https://www.almarete.it/.

Felisatti E. et al. (2023). *Documento. Linee guida: riconoscimento e valorizzazione della docenza universitaria*. -- https://www.anvur.it/sites/default/files/2025-02/Linee-Guida-riconoscimento-e-valorizzazione-docenza-universitaria_Final.pdf.

Miller K., Lukoff B., King G., & Mazur E. (2018). Use of a social annotation platform for pre-class reading assignments in a flipped introductory physics class. *Frontiers in Education*, 3, 8. Doi: 10.3389/feduc.2018.00008.

Pascucci T., & Viteritti A. (2020). Innovare la didattica all'Università. L'esperienza del progetto QuID Sapienza. In: A. Lotti & P. A. Lampugnani (a cura di). *Faculty development in Italia. Valorizzazione delle competenze didattiche dei docenti universitari*. Genova: Genova University Press.

Sapienza (2025). *Piattaforma IDEA Sapienza*. -- https://idea.uniroma1.it/.

TLC (2025). *The Sapienza Teaching and Learning Center Strategic Document*. -- https://tlc-s.web.uniroma1.it/sites/default/files/allegati/2026-01/Documento-Strategico-TLC.sito_.pdf.

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Rethinking University Assessment in the Age of LLMs: Practices, Tools and New Literacies

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Riassunto

La crescente diffusione dei Large Language Models (LLM) mette in discussione gli approcci tradizionali alla valutazione universitaria, rendendo meno visibili i processi di apprendimento e più complessa l'attribuzione dell'autorialità. A partire da uno studio di caso esplorativo condotto nell'ambito di un corso di Didattica generale, il contributo analizza gli usi, le percezioni e le interazioni degli studenti con l'intelligenza artificiale generativa, evidenziando i limiti di una valutazione centrata esclusivamente sul prodotto finale. Viene proposto un modello di valutazione orientato al processo, fondato su trasparenza, verificabilità e attribuzione attraverso accordi e registri d'uso dell'IA, insieme a compiti e criteri valutativi riprogettati. Il lavoro sostiene la necessità di sviluppare una nuova assessment literacy capace di promuovere un uso responsabile dell'IA, preservando autonomia, pensiero critico e riflessione degli studenti.
Parole chiave: Large Language Models; Valutazione; AI literacy; Istruzione superiore; Assessment literacy

Abstract

The widespread adoption of Large Language Models (LLMs) challenges traditional approaches to university assessment by making learning processes less visible and authorship more difficult to interpret. Drawing on an exploratory case study conducted within a General Didactics course, this paper examines students' uses, perceptions, and interactions with generative AI,

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23992

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highlighting the limitations of product-oriented assessment. It proposes a process-based framework centred on transparency, verifiability, and attribution through AI usage agreements and logs, together with redesigned assessment tasks and criteria. The paper argues that assessment literacy must evolve to foster responsible AI use while preserving students' agency, critical thinking, and reflective learning.
Keywords: Large Language Models; Assessment; AI literacy; Higher education; Assessment literacy

Article submitted: 18/06/2026; accepted: 03/09/2026

A pedagogical and assessment issue

The spread of Large Language Models (LLMs) in university settings changes the conditions under which academic work is produced, presented and assessed. With generative systems, the final text may be produced through varying degrees of collaboration with AI, complicating authorship attribution and the correspondence between the submitted work and the learning process it documents. This is especially significant when writing is not merely a means of communicating results, but a process through which students select information, make connections, develop arguments and clarify their position. From this perspective, academic writing is not merely a repository of acquired knowledge: it is an epistemic and formative practice. The possibility of transferring certain stages of this practice to a generative system therefore requires us to question not only the authenticity of the final product, but also the quality of the interaction that generated it.

The problem addressed here was primarily pedagogical. From the 2024/2025 academic year onwards, the growing presence of LLMs in study and writing activities made it necessary to redesign a university course in General Didactics and the associated assessment tasks. It was no longer sufficient to determine whether AI should be permitted or prohibited; it was necessary to understand how students used it, for what purposes, and with what tensions between support, delegation, autonomy and responsibility. Viewed in its socio-cultural dimension, technological innovation shapes how knowledge is produced, organised and legitimised (Panciroli & Rivoltella, 2023; Parikka, 2019). The novelty of LLMs lies not solely in their ability to retrieve or reorganise information, but in the possibility of engaging in dialogue with a system that responds, argues, proposes alternatives and guides the drafting of the text. We are thus moving from querying a tool to conversing with an artificial interlocutor, capable of supporting the user in their reasoning

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(Mollick, 2024), but also of taking on an increasing share of their task, to the point, in some cases, of replacing their thought process.

From this perspective, the central issue is not what AI is capable of doing, but the educational and cognitive relationship that the student builds with it. The same function can take on profoundly different meanings: a suggested rewriting might support the critical review of a text or take the place of the writer's decision; a summary might facilitate access to complex material or render reading it superfluous; feedback might trigger a process of improvement or be passively accepted as a prescription to be followed. The decisive factor is therefore the stance adopted by the individual during the interaction.

The research: understanding uses, representations and stances

The research, both empirical and theoretical, was carried out as part of the General Didactics course at the University of Rome Tor Vergata. The case study adopted an exploratory and qualitative approach, integrating various tools: questionnaires, forum discussions, focus groups and AI-use disclosure instruments. The ami was to reconstruct not only the frequency or type of use, but also the meanings attributed by students to their interaction with generative systems.

The research questions focused on the uses, perceptions and forms of interaction developed by university students in the field of educational sciences. In particular, the study sought to understand how AI was used for learning, studying and writing, what functions were attributed to it, and what criteria guided the choice between a use perceived as legitimate and one considered problematic.

The data paint a complex and, in some respects, contradictory picture. The general attitude towards AI appears to be predominantly pragmatic. Students recognise the usefulness of these tools, particularly for overcoming writer's block, improving linguistic style, summarising materials, reorganising content and beginning the process of constructing a text. The use observed is therefore largely instrumental and efficiency-oriented, in line with international research (Aljuaid, 2024).

This view, however, coexists with a profound ambivalence. Students express fears of losing cognitive autonomy, of their style becoming uniform, of weakening critical thinking, and of no longer being able to clearly distinguish their own contribution from that of the system. AI is described simultaneously as both a resource and a threat: it helps to complete the work, but can cast doubt on its actual authorship; it facilitates the start of the writing process, but risks creating dependency; it improves the form, but can erase the personal voice.

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Discourse analysis has enabled the identification of different stances. A first stance, associated with the figure of the writer, regards AI primarily as a functional tool for completing the task. The prevailing question is how to produce a better, clearer or more rapidly drafted text.

A second stance, that of the critic, highlights the risks of delegation, loss of authenticity and cognitive dependence.

A third stance, associated with the role of the citizen, situates the use of AI within a broader framework of norms, responsibilities, rights and conditions of fairness.

These stances do not identify rigid categories of students; they can coexist within the same individual and vary depending on the task, the subject, the teacher's requirements and the stakes associated with the assessment. Their significance lies rather in demonstrating that the use of AI cannot be understood through a binary distinction between use and non-use, correctness and incorrectness, autonomy and dependence. Between assistance and delegation lies an intermediate zone that traditional evaluative categories struggle to recognise (Spinelli, 2025), but which can be interpreted through the various patterns of collaboration between the student and the generative system (Nguyen et al., 2024).

A particularly significant finding concerns the gap between declared uses and enacted practices.

Students' accounts frequently refer to the need to verify the AI's responses, maintain control and adopt a critical stance. However, in the practices observed, verification is often entrusted once again to the very same system that produced the content. The AI is consulted to check the accuracy of a statement, confirm the reliability of a source or assess the quality of a text.

This results in a sort of functional reversal. The artefact, which offers no independent guarantees of accuracy or traceability of sources, becomes central to the process through which a judgement is formed. It is not just the writing that is delegated, but also its assessment. The critical issue therefore lies not merely in the transfer of part of the cognitive work, but in the transfer of evaluative power to a system that cannot assume epistemic responsibility for its own responses.

From the crisis of authorship to the crisis of assessment

The debate on generative AI in universities was initially dominated by issues of academic integrity, plagiarism and the detection of artificially generated texts. Whilst this perspective had the merit of highlighting the risks associated

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with the undeclared production of academic work, it appears insufficient to interpret the variety of interactions observed.

The notion of ‘post-plagiarism’ (Eaton, 2023) refers to moving beyond a context in which the human author can be regarded as the sole agent capable of textual production. This is not a matter of normalising delegation or dismissing the issue of attribution, but of recognising that the structural presence of AI alters the conditions under which authorship, originality and personal contribution must be defined.

From this perspective, the assessment question cannot be limited to establishing whether the student has used AI. It is necessary to understand for what purposes they have used it, at which stages, with what degree of control, and with what effects on the learning process. Declared use may be pedagogically poor, just as non-use does not in itself guarantee the depth of the process undertaken.

Assessment centred exclusively on the final product therefore misses a significant part of the information needed to form a judgement. A formally adequate text could result from profoundly different cognitive processes: independent processing, reflective collaboration with the system, guided revision, passive acceptance of suggestions, or complete delegation. If these differences remain invisible, the teacher assesses an artefact without being able to plausibly reconstruct the decisions that generated it.

LLMs therefore do not merely produce a crisis of authorship. They also produce a crisis in the legibility of assessment. They make it more difficult to establish what the product actually documents, what learning has been mobilised, and what level of autonomy has been exercised. Hence the need to shift the focus from the finished product to the traceability of the process, without compromising the quality of the outcome but placing it within a more nuanced framework.

This shift also requires an evolution in teachers’ assessment literacy (Pastore, 2022). Assessing in AI-mediated environments means knowing how to design tasks capable of making observable not only knowledge and performance, but also choices, revisions, checks and forms of attribution. It also means recognising that assessment criteria directly influence the way in which students use the tools. An assignment focused solely on the end product – one that is poorly contextualised and easily delegated – encourages different uses compared to a task that requires students to document their process, justify their decisions and critically discuss alternatives.

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Making the process transparent: agreements and usage logs

The pedagogical response cannot rely primarily on prohibition. A blanket ban tends to shift interaction with AI into an extra-curricular, invisible and unsupervised space, in which students experiment without shared criteria and without the opportunity to openly discuss doubts, errors and forms of dependency. Even the use of automated detection tools is pedagogically weak, as it steers the relationship towards suspicion and offers no reliable indications of the quality of the process.

The proposal developed during the research involves the introduction of agreements and usage logs for AI (Spinelli, in press). The agreement defines the framework within which the interaction can be considered part of the learning pathway. It does not take the form of a generic authorisation, but clarifies permitted functions, problematic ones, the student's responsibilities and the procedures by which usage must be documented.

The usage log, on the other hand, makes it possible to highlight certain relevant stages of the process. It should not become a verbatim transcript of all interactions, nor should it be yet another bureaucratic formality. It may consist of a reasoned selection of prompts, responses deemed significant, modifications made and decisions taken. Its value lies in the ability to reconstruct the process through which the artefact was produced. The usage agreement is based on three principles.

The first is transparency. Decisions regarding the use of AI must be explicit and open to discussion. Declaring the interaction does not amount to an admission of wrongdoing, but rather means making the process open to scrutiny. Transparency enables the teacher to understand the role played by the system and allows the student to reflect on their own strategies.

The second principle is verifiability. The validation of sources, information and inferences remains the student's responsibility. The system may suggest content, connections or interpretations, but it cannot guarantee the epistemic correctness of the result. Verification must therefore not be reduced to a generic recommendation, but incorporated into assessment tasks and criteria. Students must be able to demonstrate how they have checked the information, which sources they have consulted and why they have accepted or rejected a suggestion.

The third principle is attribution. The contribution of AI must be indicated precisely and in proportion to its actual role. It is not sufficient to state generically that ChatGPT or another system has been used. Students should clarify the purposes for which it was employed and which parts of the work resulted from the interaction. Attribution does not amount to recognising intellectual authorship in the same sense as for a human subject, but it makes it

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possible to distinguish the different contributions involved in the construction of the artefact.

Transparency, verifiability and attribution transform the use of LLMs from a hidden practice into an object of educational mediation. They restore legibility to the process and cognitive dignity to those uses of AI that genuinely support learning. At the same time, they make it possible to identify and discuss forms of delegation that weaken the student's agency.

Redesigning assessments and assessment criteria

The introduction of agreements and logs cannot be separated from the redesign of assessments. Asking students to document their use of AI whilst leaving tasks that can easily be delegated unchanged would result in nothing more than a formal change. The transformation must concern the very structure of assessment.

A first approach involves designing situated assessment tasks, linked to activities carried out during the course, to specific materials and to decisions that require the student to take a stance. The more an assessment can be completed by producing a generic text, the more difficult it becomes to recognise the student's contribution. Contextualisation makes it necessary to integrate students' work with knowledge, experiences and references that form part of the educational programme and the socially shared learning process that has taken place within it.

A second approach involves breaking the task down into observable stages. Initial drafts, mind maps, intermediate versions, reasoned revisions and metacognitive comments can provide different kinds of evidence compared to the final piece of work alone. Not all assessments need to include every stage, but the assessment should be able to access certain key decision points in the process.

A third approach involves introducing brief forms of discussion or oral feedback. The aim is not to verify that the student is the actual author, but to enable them to justify their choices, discuss a source, explain a revision or acknowledge the limitations of the work carried out. Oral elements can restore a dialogic dimension to assessment, which is particularly relevant when writing has been mediated by generative tools.

Rubrics, too, need to be rethought. Alongside the quality of the final product, consideration can be given to the consistency between objectives and the strategies adopted, the ability to select and rework the AI's suggestions, the quality of the verification, the transparency of the attribution, and an awareness of limitations. These criteria are not intended to reward the most extensive or

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sophisticated use of technology, but rather the ability to manage the interaction in the interests of learning.

The ultimate aim of documenting the process is to gather evidence relevant to the expected learning outcomes. Proportionality is therefore a key principle: the required traceability must be sustainable, comprehensible and proportionate to the stakes of the assessment and manageable within the teaching context.

New literacies for students and teachers

The redesign of assessment requires literacies that cannot be attributed solely to students. Students must learn to formulate informed requests, critically interpret responses, verify sources, recognise forms of delegation and take responsibility for final decisions. They must also understand the criteria by which their work is assessed and know how to document the process without reducing it to a technical sequence of prompts.

Teachers, in turn, must develop design and assessment skills appropriate to a context in which the final product is no longer a self-sufficient indicator. They must understand the possibilities and limitations of generative systems, but above all know how to formulate assessment tasks, feedback and criteria that keep the student's agency at the centre. The literacy required is therefore not merely technological. It encompasses pedagogical, assessment, epistemic and ethical dimensions. It requires the integration of critical observation, process monitoring and pedagogical responsibility (Kalantzis & Cope, 2024).

From this perspective, training in AI cannot be reduced to learning prompting techniques. The quality of the interaction does not depend solely on the precision of the request, but on the ability to evaluate the response, situate it within a framework of knowledge, recognise its limitations and decide responsibly how to use it. The key competence lies in maintaining a *reflective distance* from the system, avoiding both a priori rejection and uncritical reliance.

AI can act as a catalyst for effective teaching conditions when incorporated into a deliberate educational project. It can support the production of materials, the development of rubrics, feedback and conversational tutoring. However, its effectiveness depends on the pedagogical model within which it is embedded.

Conclusions

The research shows that the proliferation of LLMs cannot be addressed by focusing solely on rules of use. It highlights a deeper issue: the need to rethink

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what is actually assessed through a written artefact and what evidence enables us to recognise learning in an AI-mediated process.

The shift from the product to the legibility of the process does not entail abandoning the assessment of the final outcome. Rather, it implies integrating this with information relating to the choices made, checks carried out, revisions undertaken and responsibilities assumed. Agreements and usage logs, situated assignments, process-oriented rubrics and opportunities for discussion can help to make interaction with AI transparent and formative.

The most significant pedagogical challenge lies in the space between the transparency of the process and the development of new literacies. In this space, assessment can regain a genuinely educational function: not merely determining whether a product is correct or original, but helping the student to recognise how they have constructed their own knowledge, which decisions they have delegated, and which responsibilities they are willing to assume.

References

Aljuaid H. (2024). The impact of artificial intelligence tools on academic writing instruction in higher education: A systematic review. *Arab World English Journal, Special Issue on ChatGPT*, 26-55. Doi: 10.24093/awej/ChatGPT.2.

Eaton S. E. (2023). Postplagiarism: Transdisciplinary ethics and integrity in the age of artificial intelligence and neurotechnology. *International Journal for Educational Integrity*, 19, 23. Doi: 10.1007/s40979-023-00144-1.

Kalantzis M., & Cope B. (2024). Literacy in the time of artificial intelligence. *Reading Research Quarterly*, 60(1), e591. Doi: 10.1002/rrq.591.

Mollick E. (2024). *Co-intelligence: Living and working with AI*. New York: Portfolio/Penguin.

Nguyen A., Hong Y., Dang B., & Huang X. (2024). Human-AI collaboration patterns in AI-assisted academic writing. *Studies in Higher Education*, 49(5): 847-864. Doi: 10.1080/03075079.2024.2323593.

Panciroli C., & Rivoltella P. C. (2023). *Pedagogia algoritmica: Per una riflessione educativa sull'intelligenza artificiale*. Brescia: Scholé.

Parikka J. (2019). *Archeologia dei media: Nuove prospettive per la storia e la teoria della comunicazione*. Roma: Carocci.

Pastore S. (2022). Assessment literacy in the higher education context: A critical review. *Intersection: A Journal at the Intersection of Assessment and Learning*, 4(1). Doi: 10.61669/001c.39702.

Spinelli A. (2025). L'intelligenza della scrittura: Pratiche, percezioni e tensioni educative nell'epoca dell'IA. In: F. I. Ambra, A. Ciasullo, G. De Simone, T. Iaquinta, M. L. Iavarone, A. Mura, … A. Porcarelli (Eds.), *2000-2025: Con-fini educativi tra generazioni. Un giubileo per l'educazione. Atti del Convegno Nazionale CIRPED* (pp. 144-151). Lecce: Pensa MultiMedia.

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Spinelli A. (in press). *Distanza riflessiva: Scrittura, valutazione e fiducia nell'era dell'intelligenza artificiale*. Roma: Anicia.

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AI as a Strategic Partner in Academic Learning Design

Cinzia Ferranti*

Riassunto

L'intelligenza artificiale generativa sta diventando una componente strutturale dell'istruzione superiore, supportando la progettazione didattica, la creazione di contenuti e l'innovazione educativa all'interno degli ecosistemi universitari. A partire dall'esperienza del Digital Education Hub ALM@ dell'Università di Padova, il contributo propone un modello tridimensionale per l'integrazione dell'IA, fondato su progettazione pedagogica, sviluppo dei contenuti e governance etica. Viene analizzato il ruolo dell'IA nella formazione del personale docente attraverso il Master in Educational, Digital and Multimedia Innovation, evidenziandone il contributo ai modelli di lavoro ibridi senza rinunciare alla centralità delle decisioni pedagogiche. Il lavoro affronta inoltre il tema della delega cognitiva e sostiene che AI literacy, pensiero critico e supervisione esperta siano elementi essenziali affinché l'IA rafforzi, anziché sostituire, le competenze umane.
Parole chiave: Intelligenza artificiale; Progettazione didattica; Formazione del personale docente; AI literacy; Istruzione superiore

Abstract

Generative artificial intelligence is becoming a structural component of higher education, supporting learning design, content creation, and educational innovation within institutional ecosystems. Drawing on the experience of the ALM@ Digital Education Hub at the University of Padova, this paper proposes a three-dimensional framework for AI integration centred on pedagogical

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23993

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design, content development, and ethical governance. It discusses the role of AI in faculty training through the Master's programme in Educational, Digital and Multimedia Innovation, highlighting its contribution to hybrid workflows while preserving human-centred decision-making. The paper also examines the challenges of cognitive delegation and argues that AI literacy, critical thinking, and expert supervision are essential to ensuring that AI strengthens rather than replaces human expertise.
Keywords: Artificial Intelligence; Learning Design; Faculty Development; AI Literacy; Higher Education

Article submitted: 25/06/2026; accepted: 07/09/2026

In the rapidly evolving landscape of higher education and professional training, generative artificial intelligence has officially shifted from a novel, sporadic experimentation phase to an integrated, structural element of institutional ecosystems. Rather than being a mere technical tool, AI is now recognized as a strategic partner across academic and professional communities. This systemic evolution is central to the initiatives driven by the ALM@ Digital Education Hub at the University of Padova, which showcases how AI can amplify human capability when anchored within a conscious pedagogical framework.

A Three-Dimensional Framework for AI Integration

The implementation of AI within university frameworks operates across three essential dimensions: Design and Prompting (Qi et al., 2026; Lentz, 2025), Content Creation (Floridi, 2025), and Safety and Ethics (Molina-Carmona & García-Peñalvo, 2024; Evangelista, 2025). Faculty and technical staff leverage Large Language Models (LLMs) to structure complex educational pathways and design innovative learning environments. AI assists in generating multimodal materials, interactive simulations, and tailored case studies specifically calibrated to diverse disciplinary requirements, particularly in the STEM sector where specialized thematic chatbots and automated evaluation assistants provide immediate problem-solving feedback within platforms like Moodle.

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The Core Training: Empowering Learning Designers through Master IDIM

A leading operational environment for this paradigm shift is the Master's program in Educational, Digital, and Multimedia Innovation (EDMI in english). Within this program, the dedicated AI training module equips learning designers and educational technologists with robust theoretical frameworks and practical, operational tools.

Rather than treating AI as an isolated software solution, the module seamlessly integrates AI into daily workflows and project management processes for university innovation. This training enables professionals to adopt a truly hybrid mode of work, leveraging AI to streamline structural processes while keeping human-centered pedagogical decisions firmly at the core (Randall & Burnes, 2026).

Cognitive Delegation and the Evolution of Expert Skills

As AI becomes a ubiquitous personal assistant for both students and workers, it fundamentally reshapes the acquisition of knowledge and skills. While AI offers personal amplification through adaptive explanations and cognitive load management, it introduces the critical risk of "cognitive delegation", the gradual erosion of analytical and foundational abilities, if the machine replaces active reasoning instead of supporting it (Ateşkan, 2026; Roy & Jony, 2026).

Consequently, the landscape of necessary competencies is shifting. While technical execution can be augmented, advanced expert skills – such as critical revision, strategic decision-making, and validation against AI hallucinations or biases – become the most vital assets for the modern workforce. Workers and students must learn not just to accept outputs, but to act as expert supervisors of AI-generated content (Alvero, 2026; Vendrell & Johnston, 2026; Zahner et al., 2026).

Balancing Innovation with Critical Judgment

Ultimately, generative AI becomes strategic only when it reinforces human thought and preserves critical judgment. The goal is a balanced hybrid model: co-designing rather than delegating, blending analog tasks with AI-powered activities, and fostering true AI literacy across the entire academic and

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professional community to ensure human expertise remains the guiding force of technological innovation.

References

Alvero J. C. M. (2026). *Generative AI as the 'Third Eye' of Academic Advising: Ethical, Pedagogical, and Methodological Perspectives in Research Supervision*.

Ateşkan A. (2026). Between delegation and responsibility: an exploratory case study of graduate educators' conceptualizations of AI-supported assessment using the AI assessment scale. *Assessment & Evaluation in Higher Education*, 1-18.

Evangelista E. D. L. (2025). Ensuring academic integrity in the age of ChatGPT: Rethinking exam design, assessment strategies, and ethical AI policies in higher education. *Contemporary Educational Technology*, 17(1), ep559.

Floridi L. (2025). Content Studies: A New Academic Discipline for Analysing, Evaluating, and Designing Content in a Digital and AI-Driven Age, *Philosophy & Technology*, 38(2), 41.

Lentz M. (2025). *Partner With AI for Instructional Design. American Society for Training and Development*.

Molina-Carmona R., & García-Peñalvo F. J. (2024). Safeguarding knowledge: ethical artificial intelligence governance in the university digital transformation. In: *Advanced Technologies and the University of the Future* (pp. 201-220). Cham: Springer Nature Switzerland.

Qi Y., Jia F., Dai H., & Wang Y. (2026). Structured Prompting for Human-AI Collaboration as Cognitive Partners in Project-Based Learning. In: *2026 15th International Conference on Educational and Information Technology* (ICEIT) (pp. 216-221). IEEE.

Randall J., & Burnes B. (Eds.) (2026). *Hybrid Working and AI: The Impact on Organizational Development*. Taylor & Francis.

Roy B. K., & Jony M. S. (2026). Generative AI and critical thinking in higher education: Students' narratives of cognitive offloading. *Journal of Interdisciplinary Studies in Education*, 15(3): 263-282. Doi: 10.32674/jey59q25.

Vendrell M., & Johnston S. K. (2026). Scaffolding critical thinking with generative AI: Design principles for integrating large language models in higher education. *Computers and Education: Artificial Intelligence*, 100572.

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No Derivatives License. For terms and conditions of usage please see: http://creativecommons.org

Zahner D., Gammenthaler K., Dawber T., & Cortellini O. (2026). Measuring and improving university students' critical thinking through assessment and instruction. *DIDAC*, (87): 8-26.

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New Paradigms in Educational Training Between Digital Architectures and Certification Systems: The Catania Experience within the ALMA Project

Teresa Consoli, Alberto Fichera, Giuseppe C. Pillera, Alfredo Pulvirenti, Raffaella C. Strongoli*

Riassunto

L'esperienza dell'Università di Catania nell'ambito del progetto ALMA illustra un approccio integrato all'innovazione didattica che combina infrastrutture digitali, formazione del personale docente e sistemi di certificazione delle competenze. Attraverso attività coordinate nei settori della formazione digitale, delle micro-credenziali e del rafforzamento delle capacità istituzionali, il progetto sostiene percorsi formativi flessibili promuovendo al contempo apprendimento permanente e trasformazione organizzativa. L'istituzione del Teaching and Learning Centre, l'adozione di NOOC, laboratori remoti e Open Badge, insieme a tutor basati sull'intelligenza artificiale integrati in Moodle, dimostrano come le architetture digitali possano migliorare l'insegnamento e l'apprendimento, garantendo un'innovazione pedagogicamente orientata, affidabile e scalabile nell'istruzione superiore.
Parole chiave: Educazione digitale; Micro-credenziali; Formazione del personale docente; Intelligenza artificiale; Istruzione superiore

Abstract

The University of Catania's experience within the ALMA project illustrates an integrated approach to educational innovation that combines digital infrastructures, faculty development, and skills certification. Through coordinated activities across digital learning, micro-credentials, and

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23994

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institutional capacity building, the project supports flexible learning pathways while promoting lifelong learning and organisational transformation. The establishment of a Teaching and Learning Centre, the adoption of NOOCs, remote laboratories, and Open Badges, together with AI-powered tutors integrated into Moodle, demonstrate how digital architectures can enhance teaching and learning while ensuring pedagogically guided, trustworthy, and scalable innovation in higher education.
Keywords: Digital education; Micro-credentials; Faculty development; Artificial intelligence; Higher education

Article submitted: 24/06/2026; accepted: 02/09/2026

Infrastructures and Digital Learning Environments

Within the ALMA project, the University of Catania has developed a locally situated pathway for the renewal of academic teaching. Rather than treating digitalisation as the adoption of discrete tools, the project has brought together infrastructure, course design, competence recognition, professional development and artificial intelligence within a single institutional trajectory. The relevance of this experience lies in the relations established among these dimensions: digital environments require pedagogical design; new forms of certification call for organisational arrangements; and AI-supported learning raises questions of responsibility that cannot be resolved at the level of software alone.

The work on digital programmes has provided the material and organisational basis for this trajectory. The Teaching & Learning Center, currently under development, has been conceived as a shared environment for the production of multimedia resources, webinars, seminars and laboratory-based activities. Its purpose is to support the design and delivery of blended and fully online provision, while also making the production of digital learning resources a more visible and collective dimension of academic work.

This infrastructure has been accompanied by the experimentation of different formats – MOOCs, NOOCs and remote laboratories – which address distinct educational needs rather than constituting a single standardised offer. The first ALMA Days & Sessions module made this relationship between infrastructure and practice explicit. Case studies on blended learning and formative assessment were discussed alongside a Moodle workshop, bringing technological choices into dialogue with questions of teaching design and evaluation (Spinu et al., 2022a, 2022b; Bruni et al., 2024; Romiti et al., 2023). In this sense, the initiative has served as a space in which staff could examine

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the conditions under which online and hybrid teaching may become academically sustainable.

Micro-credentials and Faculty Development

A second strand concerns the recognition of learning outcomes through micro-credentials and Open Badges. The 2022 Council Recommendation frames micro-credentials as records of assessed learning outcomes obtained through a small volume of learning, and links them to lifelong learning and employability (Council of the European Union, 2022). Their adoption in higher education is consequently not reducible to the digital issuing of badges: it raises questions about assessment, quality assurance, portability and the relationship between short learning experiences and established degree structures (Ahsan et al., 2023; Varadarajan et al., 2023).

At Catania, the work has unfolded through participation in a national observatory involving the other Digital Education Hubs and through the definition of an internal offer to be delivered on the Bestr–CINECA platform. Three areas were selected: inclusion, including support for particular student groups and inclusive classroom management; professional communication in foreign languages; and health literacy and supervision in nursing practice. The selection is significant because it locates micro-credentials at the intersection of transversal competences, professional formation and educational inclusion. The ongoing work concerns the design of recognisable, assessable and institutionally meaningful learning units, rather than the multiplication of credentials as isolated outputs.

The faculty development strand addresses a central condition of this process: the capacity of an institution to make innovation part of ordinary academic practice. The local Action Plan therefore focused on the role of the Change Agent, understood not as an individual champion of technology but as a participant in distributed processes of professional learning. The literature on institutional change suggests that durable innovation relies on organisational learning, local leadership and opportunities for peers to interpret and adapt change within their own contexts (Fullan, 2007; Kezar, 2014). Activities developed within ALMA Days & Sessions were intended to create such occasions for dialogue, with attention to classroom practice rather than to technical training alone.

This perspective also informed the decision to involve technical-administrative staff. Three Digital Experts were selected and enrolled in a second-level Master's programme. Their role is expected to connect advanced digital expertise with the everyday administration of teaching, thereby reducing

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the risk that innovation remains dependent on individual initiatives. Scholarships awarded to students enrolled in pedagogical Master's programmes extend this work across the relationship between training, research and professional preparation.

A validated questionnaire was administered to participants in the activities associated with the digital-programmes and faculty-development strands in order to investigate teaching beliefs and perceived development needs. The data are currently under analysis; no definitive claims can therefore be made. Initial observations nevertheless suggest a strong interest in faculty development as a space for reflecting on teaching identities and classroom practices.

AI in the Course Environment

The AI strand has concentrated on a Moodle plugin that embeds configurable tutors within individual course sections. Teachers may define the tutor's role and ground its responses in their own materials; students can continue a conversation across sessions rather than restarting each interaction. The plugin also regulates individual access and provides instructors with information about patterns of use. These features were designed to keep AI-mediated support connected to the course environment and subject to pedagogical oversight.

The project does not approach the tutor as a substitute for teaching. Instead, it examines whether conversational AI can support orientation, feedback and participation while leaving the teacher responsible for the design of activities and the interpretation of student engagement. This approach responds to concerns in the literature regarding the contextual reliability of chatbot responses, student overreliance and the need for transparent human supervision (Kuhail et al., 2023; Labadze et al., 2023). Discussion of these issues within ALMA Days & Sessions has allowed technical development to remain connected to questions of educational purpose, particularly in relation to the ethical and pedagogical challenges that AI introduces in teaching, learning and research (Agrusti, 2023; Schiff & Rosenberg-Kima, 2023).

Conclusion

The Catania experience shows the value of approaching digital transformation as a coordinated institutional process. Infrastructure, micro-credentials, faculty development and AI have been pursued as interdependent elements, each exposing questions that the others help to address. The

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contribution of ALMA Days & Sessions has been to create a setting in which these questions can be discussed across academic and professional roles. The project is still in development, and several outcomes – including the analysis of faculty-development data and the implementation of new credential pathways – remain provisional. Its relevance lies less in presenting a completed model than in documenting an attempt to build the organisational, technical and pedagogical conditions through which innovation can become part of university life.

References

Ahsan K. et al. (2023). Implementation of micro-credentials in higher education. *Education and Information Technologies*, 28(10): 13505-13540. Doi: 10.1007/s10639-023-11739-z.

Agrusti F. (Ed.) (2023). *Educazione e intelligenza artificiale*. Roma: Roma Tre-Press.

Bruni I. et al. (2024). Didattica blended nell'Ateneo fiorentino. In: *Atti del MoodleMootItalia 2023* (pp. 71-79).

Council of the European Union (2022). *Council Recommendation on micro-credentials* (2022/C 243/02).

Fullan M. (2007). *The new meaning of educational change* (4th ed.). Routledge.

Kezar A. (2014). *How colleges change* (2nd ed.). Routledge.

Kuhail M. A. et al. (2023). Interacting with educational chatbots: A systematic review. *Education and Information Technologies*, 28(1): 973-1018. Doi: 10.1007/s10639-022-11177-3.

Labadze L. et al. (2023). Role of AI chatbots in education. *International Journal of Educational Technology in Higher Education*, 20, 56. Doi: 10.1186/s41239-023-00426-1.

OECD (2018). *The future of education and skills: Education 2030*. OECD Publishing.

Romiti S., et al. (2023). Valu.Elearn. *Lifelong Lifewide Learning*. Doi; 10.19241/lll.v19i42.725.

Schiff D., & Rosenberg-Kima R. B. (2023). AI in education. In *Handbook of critical studies of AI* (pp. 804-814).

Spinu M. B. et al. (2022a). Pratiche di valutazione. In: *Atti del MoodleMootItalia 2021* (pp. 129-136).

Spinu M. B. et al. (2022b). Reshaping faculty development. In: *INTED2022 Proceedings* (pp. 4831-4836).

Varadarajan S. et al. (2023). Micro-credentials opportunities and challenges. *International Journal of Educational Technology in Higher Education*, 20, 13.

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The Digital Ecosystem Supporting Learning: The University of Padova's Experience in the Age of Artificial Intelligence

Dario Da Re*

Riassunto

L'Università di Padova ha sviluppato un ecosistema digitale integrato a supporto dell'insegnamento e dell'apprendimento, fondato su una combinazione coerente di piattaforme, servizi e strumenti di intelligenza artificiale. Basato su Moodle e potenziato grazie al progetto PNRR Digital Education Hub ALM@, l'ecosistema integra infrastrutture tecnologiche avanzate, risorse multimediali, formazione del personale docente e soluzioni per l'accessibilità all'interno di una strategia istituzionale unitaria. L'ampia diffusione e l'intenso utilizzo delle piattaforme dimostrano la capacità del sistema di sostenere l'innovazione didattica su larga scala. L'integrazione di servizi basati sull'IA amplia ulteriormente le potenzialità dell'ecosistema, favorendo apprendimento personalizzato, partecipazione attiva e miglioramento continuo, offrendo un modello scalabile per la trasformazione digitale dell'istruzione superiore.
Parole chiave: Ecosistema digitale; Istruzione superiore; Intelligenza artificiale; Moodle; Innovazione didattica

Abstract

The University of Padova has developed an integrated digital ecosystem that supports teaching and learning through a coherent combination of platforms, services, and artificial intelligence tools. Built around Moodle and strengthened by the PNRR Digital Education Hub ALM@ project, the ecosystem combines advanced technological infrastructures, multimedia resources, faculty

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Excellence and Innovation in Learning and Teaching (ISSNe 2499-507X), 2026, 1 Special Issue

Doi: 10.3280/exioa1-2026oa23995

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development, and accessibility solutions within a unified institutional strategy. Large-scale adoption and extensive usage demonstrate its capacity to support educational innovation across a broad academic community. The integration of AI-powered services further extends this ecosystem, fostering personalised learning, active engagement, and continuous improvement providing a scalable model for digital transformation in higher education.
Keywords: Digital ecosystem; Higher education; Artificial intelligence; Moodle; Educational innovation

Article submitted: 25/06/2026; accepted: 07/09/2026

The University of Padova has built, over time, a digital ecosystem for teaching that, in terms of breadth, architectural coherence, and usage volumes, has no comparable counterpart in the Italian academic landscape. This achievement is not solely the result of sound technological choices: it is the product of a systemic strategy that found in the PNRR Digital Education Hub ALM@ project – a network of 14 Italian universities – a decisive accelerator for spreading and embedding a culture of digital innovation within the institution. The specialised human resources, multimedia production infrastructures, and training pathways made possible by ALM@ have transformed isolated best practices into shared models, lowering barriers to adoption and promoting cultural change even before technological change.

With a community of approximately 100,000 people – students, faculty, and administrative and technical staff – the University is not managing an experiment, but a fully operational infrastructure, tested daily by tens of thousands of simultaneous users and underpinned by a decade-long partnership with Amazon Web Services. At the heart of this architecture lies Moodle, the learning management platform around which all other adopted technological solutions organically and seamlessly converge. Moodle is not simply a content repository: it is the connective hub of the entire digital teaching experience. The numbers confirm this: over the past year, the platform recorded more than 2.6 billion total requests, generating 225 Terabytes of traffic. The STEM area leads in the number of courses created (3,231), followed by the Humanities area (2,186), while the medical area stands out for the intensity of its use of assessment tools, with 923 quizzes created. Over the past year, Moodle has also delivered more than 11.5 million emails, with daily peaks exceeding 100,000 notifications, making it a critical infrastructure not only for teaching, but for the entire academic life of the institution.

Around this core, Zoom and Kaltura/Mediaspace.it are integrated, both enhanced in terms of user competencies and content produced thanks to ALM@

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resources. Zoom recorded approximately 600,000 meetings for over 25 million minutes annually. Kaltura/Mediaspace holds more than 400,000 videos, 5.1 million views in 2025, and nearly 30 million minutes consumed by 58,642 unique users in 192 countries – a global reach made possible in part by the new multimedia production infrastructures funded by the PNRR, which translate into a measurable impact on the quality of the educational offering.

On the engagement front, Wooclap recorded 16,861 events with 2,266,869 responses from approximately 204,000 unique participants: active learning practised at mass scale, normalised also through the training activities carried out within the ALM@ network. On the accessibility side, ReadSpeaker and the Brickfield Accessibility Toolkit ensure materials are available in alternative formats for students with learning disabilities, special educational needs, and other disabilities, in line with the European Accessibility Act – with dedicated training pathways developed and disseminated specifically within the ALM@ framework.

The most advanced expression of this ecosystem is Lucrez-IA, a virtual assistant based on Anthropic models (currently Claude Sonnet 4.6) and natively integrable into Moodle. With over 6,000 users, 20,000 conversations, and nearly 200,000 million tokens processed daily, this is not an experiment but a production service. The January 2026 release also introduces specific Moodle plugins, including: a per-course AI tutor, an automatic question generator, a professional simulator, an automatic course builder, a lesson recorder with live transcription, and AI feedback for assignments. Here too, the expertise aggregated within the ALM@ network has helped define use cases and quality criteria that guide the system's evolution.

This trajectory is part of a broader vision represented by the Lifelong Learning platform – with UniPd being the first in Italy to issue micro-credentials – and by the PNRR ALM@ project, which has operated on three synergistic levels: new human resources dedicated to teaching innovation, advanced multimedia infrastructures, and a culture of innovation disseminated through communities of practice and continuous training. The result is an integrated, inclusive, and continuously evolving architecture, capable of meeting the challenges of contemporary education with the robustness of an institution that measures its outcomes in billions of interactions.

Sitografia

ALMA (s.d.). *ALMA – Advanced Learning Multimedia Alliance*. -- Tratto da https://www.almarete.it/.

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This work is released under Creative Commons Attribution - Non-Commercial –
No Derivatives License. For terms and conditions of usage please see: http://creativecommons.org

Amazon Web Services (s.d.). *AWS per l'istruzione*. -- Tratto da https://aws.amazon.com/it/education/.
Amazon Web Services (s.d.). *Amazon Bedrock*. -- Tratto da https://aws.amazon.com/it/bedrock/.
Moodle (s.d.). *Moodle*. Tratto da https://moodle.org/.
Università degli Studi di Padova (s.d.). *Digital Learning and Multimedia – DLM*. -- Tratto da https://elearning.unipd.it/dlm/.
Zoom (s.d.). *Zoom per l'istruzione*. -- Tratto da https://www.zoom.com/en/products/collaboration-tools/solutions/education/.
Kaltura (s.d.). *Kaltura for higher education*. -- Tratto da https://corp.kaltura.com/experiences/higher-education/.
Università degli Studi di Padova (s.d.). *MediaSpace*. -- Tratto da https://mediaspace.unipd.it/.
Anthropic. (s.d.). *Claude*. -- Tratto da https://claude.com/.
Università degli Studi di Padova (s.d.). *Lucrezia*. -- Tratto da https://lucrezia.unipd.it/.

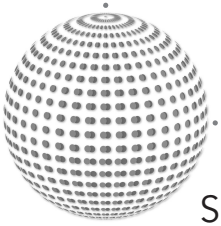
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La rivista è in Fascia A Anvur, area 11 SCIENZE STORICHE, FILOSOFICHE, PEDAGOGICHE, PSICOLOGICHE: 11/D1 (Pedagogia e storia della pedagogia), 11/D2 (Didattica, Pedagogia speciale e Ricerca educativa).
Progetto grafico di copertina: Alessandro Petrini.

Amministrazione: v.le Monza 106 - 20127 Milano - Tel. 02/2837141 - Fax 02/26141958 - e-mail: riviste@francoangeli.it
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ISSNe 2499-507X.

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Stampa: Global Print srl, via degli Abeti 17/1, Gorgonzola, Milano. Finito di stampare nel mese di ottobre 2026

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ISSNe 2499-507X

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