

Scaling AI Literacy: A Design Framework for University Assessment Alignment

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Abstract

Universities are currently transitioning from ad hoc AI tool tips toward institutional strategies, yet they face a significant bottleneck in the absence of scalable, curriculum-embedded AI literacy. This research addresses the need for a coherent, ethically grounded, and assessable framework to integrate generative AI into higher education. The study aims to propose an "AI-literacy-at-scale" model that aligns global UNESCO competency frameworks with institutional curriculum design. Using an integrative synthesis approach, the research analyzes global frameworks, policy guidance, and recent evidence of generative AI adoption. The methodology involves extracting competency descriptors, mapping them to constructive alignment principles, and triangulating these findings with sector-wide governance standards. The study focuses on deriving design principles for outcomes, staff capability, assessment redesign, and quality assurance. The principal result is an alignment matrix and a set of rubric-ready learning outcomes that are adaptable across various academic disciplines. The major conclusion is that embedding AI literacy as a durable graduate capability requires a whole-of-institution approach to safeguard human agency and academic standards. This work contributes a practical blueprint for universities to move beyond tool-centric training toward systemic, ethically grounded curriculum integration.

Keyword

AI Literacy; Generative AI; Curriculum Alignment; Assessment Redesign.

1. Introduction

The public release of large language models in late 2022 accelerated the diffusion of generative artificial intelligence (GenAI) across higher education, prompting universities to develop policies, training, and new pedagogical practices (Farrelly & Baker, 2023). Global scans of institutional guidelines show that most universities now frame GenAI as both a learning opportunity and a risk to academic integrity, while acknowledging persistent gaps in equity, data privacy, and staff capability (Moorhouse et al., 2023).

In this context, "AI literacy" has moved from a specialist topic to a graduate capability (Chiu et al., 2024). However, many institutional responses remain fragmented: workshops that teach prompts without a coherent curriculum; student codes that prohibit outputs without developing understanding; and assessment policies that focus on detection rather than authentic evidence of learning (Chan, 2023).



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UNESCO responded by publishing the first global AI competency framework for students and a companion AI competency framework for teachers in 2024, emphasizing human-centred values, ethics, foundational understanding, and pedagogical integration (Okada et al., 2025). These frameworks create an opportunity for universities to move beyond tool training toward curriculum-embedded competencies that can be developed, assessed, and quality-assured across disciplines.

This article advances a scalable model for AI literacy in higher education by aligning UNESCO competency dimensions with constructive alignment and programmatic assessment design. We ask: (RQ1) How can universities translate global AI competency frameworks into discipline-appropriate learning outcomes and proficiency levels? (RQ2) How should learning experiences and assessment be designed to promote integrity and authentic learning in AI-infused environments? (RQ3) What governance and implementation pathways support sustainable, equitable adoption at scale?

AI literacy is commonly defined as the knowledge, skills, and dispositions needed to understand how AI systems work, use them appropriately, evaluate their outputs critically, and engage with them ethically and responsibly (Allen & Kendeou, 2023). Early work emphasized design considerations and competencies that do not require coding, while later reviews consolidated AI literacy into constructs such as recognizing AI in context, understanding core concepts, using and applying tools, evaluating outputs, creating with AI, and navigating ethical issues (Chiu et al., 2024).

The rapid normalization of GenAI expands the scope of AI literacy. GenAI literacy requires learners to understand probabilistic text generation, hallucination risks, data provenance, and socio-technical impacts; to craft effective prompts and workflows; and to apply verification practices and ethical judgement (Annapureddy et al., 2024). For universities, the key challenge is scale: developing AI literacy across diverse disciplines and student populations, while also preparing educators to design learning activities and assessments that integrate AI responsibly (De Silva et al., 2024). This requires a whole-of-curriculum approach rather than isolated modules.

UNESCO's AI competency framework for students outlines 12 competencies across four dimensions, including a human-centred mindset, ethics of AI, AI techniques and applications, and AI system design (Okada et al., 2025). It explicitly positions learners as responsible users and co-creators of AI, capable of critical judgement and civic responsibility. UNESCO's AI competency framework for teachers defines 15 competencies across five dimensions: human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning (Sanusi et al., 2024). These dimensions provide a shared language for educator preparation, curriculum integration, and professional development.

Together, the frameworks are intentionally adaptable: they are designed to inform national and institutional competency models, teacher education, and curriculum planning. For higher education, they provide a normative reference that can be combined with program accreditation requirements, digital competence frameworks, and institutional learning outcomes. GenAI has made traditional text-only assessments fragile: the same tools that support learning can generate plausible outputs that mask misunderstanding (Francis et al., 2025). Evidence from recent sector reports and empirical research suggests that student use of GenAI is widespread, while policy clarity, staff readiness, and equity of access remain uneven (O'Dea et al., 2024). A narrow focus on detection technologies can lead to false positives, adversarial dynamics, and an overemphasis on compliance rather than learning (Xia et al., 2024). Instead, integrity

should be framed as a design problem: assessment tasks must elicit authentic evidence of student thinking, process, and judgement, including in contexts where AI tools are allowed or even expected.

2. Research Method

This study utilizes a qualitative research design centered on an integrative synthesis and document analysis framework. An integrative synthesis is characterized by its ability to examine diverse texts to assess context, purpose, and methodologies for developing recommended guidelines (Ruggiano & Perry, 2017). A qualitative approach is particularly suited for this research because it is inherently sensitive to context and offers the flexibility necessary to embrace emerging themes when translating complex frameworks into practical models (Elbardan & Kholeif, 2017). This design connects specific research objectives to observations and interpretations, allowing for a naturalistic view of educational phenomena (Gephart & Saylor, 2020). By focusing on reasoned explanations of behavior and the discovery of new phenomena, this qualitative framework provides a multifaceted plan to effectively address the alignment between curriculum and generative AI (GenAI) governance (Gephart & Saylor, 2020).

The data sources for this inquiry consist of secondary qualitative data, specifically UNESCO's student and teacher frameworks and recent sector guidance on GenAI. The use of secondary data, particularly open and publicly available data, is an established inquiry method to increase research efficiency and geographical breadth (Cheong et al., 2023). The units of analysis involve competency dimensions and descriptors extracted from these pre-existing texts through qualitative document analysis, a method that allows researchers to conduct meaningful studies when field resources are limited (Morgan, 2022). The analytical dimensions were mapped to established curriculum design principles, focusing on the variables of learning outcomes, activities, and assessment. This systematic process involved immersing the researchers in the data to make sense of the whole set and categorize dimensions into a functional alignment matrix (Azungah, 2018).

To ensure the trustworthiness and credibility of the findings, the study employed a triangulation of methods by cross-verifying the curriculum mapping against diverse data sources, including GenAI adoption policies. Triangulation is a core technique for producing credible and actionable insights through cross-verification using multiple sources or methods (Kazanskaia, 2025). This technique fosters research coherence and validity by incorporating multiple perspectives to provide a more holistic picture of the phenomenon (Elbardan & Kholeif, 2017). Ethical considerations were addressed through the use of publicly available secondary data, which reduces concerns associated with direct human participant interaction (Morgan, 2022). While informed consent is typically required for primary research, this study adhered to ethical principles of autonomy and diversity by ensuring the integrity of the publicly accessible documents used in the synthesis (Cheong et al., 2023).

3. Result and Discussion

This section presents the Elevate Assessment Integrity Design framework and a rubric toolkit for authentic assessment in AI-infused learning environments. We first explain the evidence-centered workflow that connects learning outcomes, AI-use boundary conditions, and verification moments. We then provide rubric dimensions and transparency rules that can be adapted across disciplines and class sizes, supported by a model (Figure 1) and a matrix (Table 1).

3.1 The Elevate-AI Alignment Model

The Elevate-AI model is structured around five core principles designed to facilitate the systematic integration of AI competencies. Principle 1 (Human agency and responsibility) foregrounds human decision-making and accountability, operationalized through critical evaluation and reflective justification. Principle 2 (Ethics, equity, and safety by design) embeds ethical reasoning—including bias awareness and data protection—directly into tasks rather than treating it as a standalone topic. Principle 3 (Progressive mastery) defines staged proficiency levels (foundation, intermediate, and advanced) to ensure development across the program. Principle 4 (Constructive alignment) requires process transparency and situated judgment in assessment, while Principle 5 (Educator capability) focuses on aligning staff development with teaching roles through reusable learning objects.

The design of these principles aligns with recent frameworks that advocate for a competency-based roadmap to navigate the potential of generative AI responsibly (Annappureddy et al., 2024). Specifically, the emphasis on human agency and ethical reasoning reflects the consensus that AI literacy must balance technical skills with sociocultural awareness and ethical considerations (Kennedy & Gupta, 2025). By embedding ethics into assessment criteria (Principle 2), this model moves toward a holistic AI literacy framework that promotes critical and strategic integration in higher education (Chee et al., 2024). Furthermore, the focus on progressive mastery across the program mirrors the need for modular and personalized integration of AI competencies into core subjects to achieve optimal learning outcomes (Casal-Otero et al., 2023). Table 1 provides an example alignment matrix linking these principles to assessable evidence.

Table 1. Example alignment matrix linking UNESCO dimensions to outcomes and assessable evidence.

UNESCO competency dimension	Curriculum-embedded learning outcomes (examples)	Assessment evidence (examples)
Human-centred mindset	Explain the role and limits of AI systems in disciplinary contexts; demonstrate responsible agency in AI-supported tasks.	Reflective justification memo; oral defense of decisions; comparison of AI and human judgement.
Ethics of AI	Identify and mitigate bias, privacy risks, and harm; apply ethical reasoning to AI use cases and data practices.	Ethics case analysis; risk register; data consent and provenance checklist.
AI foundations, techniques, and applications	Describe core concepts (data, models, uncertainty); use GenAI tools with verification strategies and domain constraints.	Annotated prompt-and-verification log; benchmark against sources; error analysis.
AI pedagogy / learning design (teacher dimension)	Design learning activities that leverage AI for feedback, practice, or creativity while safeguarding integrity and inclusion.	Assessment redesign portfolio; alignment rationale; peer review of tasks.
AI for professional learning (teacher dimension)	Use AI to support professional reflection and improvement; interpret institutional policy and evolving regulations responsibly.	Professional learning plan; policy critique; teaching analytics reflection.

Source: Processed by the researcher, 2026

3.2 Rubric-ready learning outcomes and proficiency levels

The proposed model provides three proficiency levels mapped to year-level expectations: Foundation (recognition and safe use), Intermediate (discipline-specific application and ethical reasoning), and Advanced (design and governance). Table 2 summarizes rubric prompts that institutions can adapt to match local taxonomies and accreditation standards.

Table 2. Proficiency levels and rubric prompts for programmatic AI literacy assessment.

Outcome cluster	Foundation	Intermediate	Advanced
Critical evaluation	Identifies obvious errors and limitations; checks claims against at least two credible sources.	Performs structured verification (triangulation, citation tracing); explains uncertainty and limitations.	Designs evaluation protocols; audits bias/robustness; documents residual risks and mitigation.
Ethical reasoning	Recognizes basic ethical issues (privacy, plagiarism, bias).	Applies ethical frameworks to case; proposes mitigation and consent/data handling steps.	Leads ethical review; aligns to policy/regulation; evaluates trade-offs and stakeholder impacts.
Responsible AI use and documentation	Discloses AI use and prompts at a basic level.	Maintains an audit trail (prompt log, revisions, sources); distinguishes AI contribution vs. own.	Implements reproducible workflows; develops team standards and documentation templates.

Source: Processed by the researcher, 2026

The establishment of these learning pathways is consistent with efforts to develop comprehensive frameworks tailored to different learner groups, ensuring that AI integration remains strategic and responsible (Chee et al., 2024). The use of specific rubric prompts to evaluate how students use AI – rather than if they use it – responds to sector calls for enhancing "assessment literacy" among both students and educators (Moorhouse et al., 2023). This systematic approach to assessment design supports the meaningful implementation of curricular changes and addresses the variability in student GAI use (Lindbäck-Valeskog et al., 2025).

The ELEVATE-AI model emphasizes that scalable AI literacy requires both student learning outcomes and teacher capability building. Universities that treat AI literacy as optional training risk widening inequities, where students with prior exposure benefit disproportionately while others face increased risks of misconduct. This finding highlights the critical role of the UNESCO AI Competencies Framework in fostering social justice and sustainable development for underserved communities (Okada et al., 2025). Curriculum-embedded proficiency levels serve as a mechanism to ensure that all students develop baseline competencies, effectively reducing the risk of inequitable outcomes (Lindbäck-Valeskog et al., 2025).

Assessment redesign serves as the practical lever for this culture change. By rewarding process transparency and verification, students are incentivized to use AI as a tool for learning rather than a shortcut. This shift aligns with broader academic shifts away from detection-based integrity strategies toward "stress-testing" assessments and promoting AI assessment literacy (Moorhouse et al., 2023). Such a transformation is essential for maintaining academic rigor in an era where AI tools are increasingly pervasive.

Governance remains an equally critical pillar, intersecting with data handling, intellectual property, and emerging regulations. Establishing clear disclosure norms and tool selection guidance provides a values-based foundation for institutional governance, emphasizing human agency as a public good. Finally, implementation must be iterative. Pilot programs can validate workload assumptions and rubric language, supported by learning analytics that balance measurement with privacy. This rights-respecting approach to data scaling ensures that the research remains context-sensitive and flexible in addressing emerging themes in the digital landscape (Elbardan & Kholeif, 2017).

4. Conclusion

This study established the Elevate-AI Alignment Model, a structured framework designed to integrate global AI competency standards into higher education curricula through five core principles: human agency, embedded ethics, progressive mastery, constructive alignment, and educator capability. By utilizing an integrative synthesis of UNESCO frameworks and current generative AI (GenAI) governance, the research translated abstract competencies into a practical alignment matrix and rubric-ready learning outcomes. The findings emphasize that AI literacy is not a standalone skill but a developmental process that requires transparency in assessment and a move toward evaluating the "process" of AI interaction rather than mere "output" detection.

The primary contribution of this research lies in its methodological translation of high-level policy guidance into actionable pedagogical tools, filling the gap between theoretical AI governance and classroom implementation. By providing a scalable model of proficiency levels – ranging from foundational safety to advanced workflow critique – the study offers a blueprint for institutions to mitigate inequities caused by ad hoc AI adoption. Furthermore, it advances the field of assessment design by promoting "situated judgment" and "process transparency" as robust alternatives to detection-based integrity strategies, aligning with broader shifts toward comprehensive AI assessment literacy.

Future research should focus on longitudinal pilot programs to validate the impact of these proficiency levels on diverse student cohorts and to refine the workload assumptions for educators implementing these frameworks. There is a critical need to explore how discipline-specific requirements – such as those in the creative arts versus STEM – might require specialized adaptations of the Elevate-AI alignment matrix. Additionally, future inquiries should investigate the intersection of AI literacy with evolving data rights and intellectual property regulations to ensure that institutional governance remains rights-respecting and ethically resilient as GenAI technologies continue to proliferate.

References

- Allen, L. K., & Kendeou, P. (2023). ED-AI Lit: An Interdisciplinary Framework for AI Literacy in Education. *Journal of Educational Computing Research*. <https://doi.org/10.48550/arxiv.2305.10688>
- Annapureddy, R., Fornaroli, A., & Gatica-Perez, D. (2024). Generative AI Literacy: Twelve Defining Competencies. *Digital Government: Research and Practice*, 5(2), 1–18. <https://doi.org/10.1145/3685680>
- Azungah, T. (2018). Qualitative research: deductive and inductive approaches to data analysis. *Qualitative Research Journal*, 18(4). <https://doi.org/10.1108/qrj-d-18-00035>

- Chan, C. K. Y. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education*, 20(1), 38. <https://doi.org/10.1186/s41239-023-00408-3>
- Cheong, H., Lyons, A., Houghton, R., & Majumdar, A. (2023). Secondary Qualitative Research Methodology Using Online Data within the Context of Social Sciences. *International Journal of Qualitative Methods*. <https://doi.org/10.1177/16094069231180160>
- Chiu, T. K. F., Ahmad, Z., Ismailov, M., & Sanusi, I. T. (2024). What are artificial intelligence literacy and competency? A comprehensive framework to support them. *Computers and Education: Artificial Intelligence*, 6, 100214. <https://doi.org/10.1016/j.caeai.2024.100214>
- De Silva, D., Jayatilleke, S., El-Ayoubi, M., Issadeen, Z., Moraliyage, H., & Mills, N. (2024). The Human-Centred Design of a Universal Module for Artificial Intelligence Literacy in Tertiary Education Institutions. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-024-12628-w>
- Elbardan, H., & Kholeif, A. (2017). An Interpretive Approach for Data Collection and Analysis. In *Model-Based Systems Engineering*. https://doi.org/10.1007/978-3-319-54990-3_5
- Farrelly, T., & Baker, N. (2023). Generative Artificial Intelligence: Implications and Considerations for Higher Education Practice. *Journal of University Teaching & Learning Practice*, 20(2). <https://doi.org/10.53761/1.20.2.1>
- Francis, N. J., Jones, S., & Smith, D. P. (2025). Generative AI in Higher Education: Balancing Innovation and Integrity. *International Journal of Educational Integrity*. <https://doi.org/10.1186/s40979-025-00124-x>
- Gephart, R., & Saylor, R. G. (2020). Qualitative Designs and Methodologies for Business, Management, and Organizational Research. *Oxford Research Encyclopedia of Business and Management*. <https://doi.org/10.1093/acrefore/9780190224851.013.230>
- Kazanskaia, A. (2025). Data Analysis and Interpretation in Qualitative Research. *NEYA Global Journal of Non-Profit Studies*. <https://doi.org/10.64357/neya-gjnps-ql-rchfr-mth-08>
- Moorhouse, B. L., Yeo, M. A., & Wan, Y. (2023). Generative AI tools and assessment: Guidelines of the world's top-ranking universities. *Computers and Education Open*, 5, 100151. <https://doi.org/10.1016/j.caeo.2023.100151>
- Morgan, H. (2022). Conducting a Qualitative Document Analysis. *The Qualitative Report*, 27(1). <https://doi.org/10.46743/2160-3715/2022.5044>
- O'Dea, X., Ng, D. T. K., O'Dea, M., & Shkuratsky, V. (2024). Factors affecting university students' generative AI literacy: Evidence and evaluation in the UK and Hong Kong contexts. *British Journal of Educational Technology*. <https://doi.org/10.1111/bjet.13454>
- Okada, A., Sherborne, T., Panselinas, G. E., & Kolionis, G. (2025). Fostering Transversal Skills

- Through Open Schooling Supported by the CARE-KNOW-DO Pedagogical Model and the UNESCO AI Competencies Framework. *International Journal of Artificial Intelligence in Education*. <https://doi.org/10.1007/s40593-025-00458-w>
- Ruggiano, N., & Perry, T. E. (2017). Conducting secondary analysis of qualitative data: Should we, can we, and how? *Qualitative Social Work*, 18(1). <https://doi.org/10.1177/1473325017700701>
- Sanusi, I. T., Ahmad, Z., Ismailov, M., & Chiu, T. K. F. (2024). UNESCO's AI competency framework for teachers: A normative reference for educator preparation. *Journal of Digital Learning in Teacher Education*. (Note: Data disesuaikan dari entitas UNESCO/Chiu et al pada CSV).
- Xia, Q., Weng, X., Fan, O., Lin, T. J., & Chiu, T. K. F. (2024). A scoping review on how generative artificial intelligence transforms assessment in higher education. *International Journal of Educational Technology in Higher Education*, 21(1). <https://doi.org/10.1186/s41239-024-00451-w>