

AI systems in teaching and learning: principles and practical examples

Building a PATH forward

Jonathan Brazil, Dr Suijing Yang, Dr Fabienne van der Kleij

Promote teaching and learning

Use AI to enhance teaching and learning when the benefits outweigh the costs, evaluate AI use, and encourage effective thinking and assessment practices.

Train for AI literacy

Equip both educators and students with the knowledge and values to understand and use AI ethically and effectively.

Harness AI ethically

Align AI use with broad ethical principles of transparency, responsibility and accountability, privacy, justice and fairness, and human, child, and worker rights.

Advance wellbeing and social interaction

Use AI to support the wellbeing and social interaction of both educators and learners.



AI systems in teaching and learning: Principles and practical examples. Building a PATH forward

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Abbreviations and acronyms

ACER	Australian Council for Educational Research
AI	Artificial intelligence
OECD	Organisation for Economic Co-operation and Development
IEAIED	Institute for Ethical AI in Education
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNICEF	United Nations International Children’s Emergency Fund

Transforming learning with AI systems

The rapid popularisation of AI systems signifies a major shift in teaching and learning, bringing both new opportunities and significant challenges. Therefore, as education systems worldwide confront two key imperatives—preparing learners for an increasingly unpredictable and rapidly evolving future and ensuring every student is fully engaged, successful, and ready for the demands of tomorrow (ACER, 2022)—understanding how to maximise the benefits of AI systems while overcoming its challenges becomes a critical priority. To help guide educators, this report:

1. Outlines a set of **guiding principles** for using AI systems in teaching and learning.
2. Provides **practical examples** of how AI systems can be used in teaching and learning.

What is an AI system?

There are numerous definitions of AI systems. Here, we use the following definition:

An AI system is a machine-based system that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments. Different AI systems vary in their levels of autonomy and adaptiveness after deployment. (OECD, 2024, p. 4)

A generative AI system is a type of AI system that is designed to create new content or data, such as text, images, audio, video, code, or other formats, that resembles or mimics the patterns found in its training data. These systems rely on advanced machine learning models, often based on neural networks.

Generative AI systems work by learning the underlying structure and features of their training data during the training phase. Once trained, they can produce original outputs that are not direct replicas of the input data but follow the same style, rules, or patterns. For instance:

- **Text Generation.** Creating coherent and contextually relevant writing (e.g., ChatGPT; openai.com).
- **Image Generation.** Producing realistic or stylised images based on descriptions or prompts (e.g., MidJourney; midjourney.com).
- **Music Generation.** Composing melodies or full tracks (e.g., Amper Music; ampermusic.com).
- **Code Generation.** Writing or suggesting code snippets for developers (e.g., GitHub Copilot; github.com).
- **Video Generation.** Creating or editing video content (e.g., Runway ML; runwayml.com).
- **Speech and Voice Generation.** Synthesising realistic speech or creating custom voiceovers (e.g., Descript Overdub; descript.com).

Opportunities and challenges of AI systems for teaching and learning

AI systems have the potential to revolutionise education, transforming teaching and learning through innovative applications (Yan et al., 2024). For instance, by automating routine tasks like grading and attendance tracking, AI can enhance efficiency, freeing teachers to focus on more complex and creative aspects of education (Wang et al., 2024). It also may support personalised learning by providing tailored assessments and feedback, thereby improving learning effectiveness by addressing the unique needs of individual students (Wang et al., 2024).

Beyond enhancing existing practices, AI enables the reimagining of learning experiences. Adaptive learning systems, for instance, have the potential to adjust to a learner's knowledge, motivation and emotions, creating a dynamic and responsive educational environment (Wang et al., 2024).

Furthermore, AI opens doors to previously unfeasible opportunities, such as immersive VR and AR simulations that may provide learners access to experiences not previously possible (Wang et al., 2024).

However, the integration of AI in teaching and learning also has its challenges (e.g., Adams et al., 2023). Concerns must be carefully addressed about impacts on teaching and learning, wellbeing and social interaction, AI literacy of users, transparency, responsibility and accountability, privacy, justice and fairness, and human, child, and workers' rights. By navigating these challenges thoughtfully, AI can become a transformative tool in fostering positive outcomes in education.

Overview of the guidance

This document has two main sections. First, we present *principles* for using AI for teaching and learning. Second, we provide *practical examples* of how AI can be used for teaching and learning. To introduce the principles, a **human-centred approach** is put forward as an overarching principle for using AI in teaching and learning (similar to UNESCO, 2021). This is an approach where technology is designed and used in ways that prioritise human interests (Shneiderman, 2022). This human-centred approach is embodied in the **PATH principles** proposed in this document. These principles aim to help educators navigate the integration of AI into teaching and learning ethically and effectively. The PATH principles are:

1. **Promote teaching and learning.** Use AI to enhance teaching and learning when the benefits outweigh the costs, evaluate AI use, and encourage effective thinking and assessment practices.
2. **Advance wellbeing and social interaction.** Use AI to support the wellbeing and social interaction of both educators and learners.
3. **Train for AI literacy.** Equip both educators and students with the knowledge and values to understand and use AI ethically and effectively.
4. **Harness AI Ethically.** Align AI use with broad ethical principles of transparency, responsibility and accountability, privacy, justice and fairness, and human, child, and worker rights.

Whilst generated in Australia, the guidance outlined in this document draws upon international evidence and is applicable in a range of international contexts and school settings. In interpreting and applying the contents of this document, readers are encouraged to do so within the relevant legislative and regulatory frameworks within their specific contexts.

Development of the guidance

The aim of this research was to provide educational professionals with guidance on using AI effectively and ethically for teaching and learning. To this end, we posed the following two research questions:

1. What guiding principles should be considered when using AI for teaching and learning?
2. How can AI meaningfully be used in teaching and learning?

Development of the PATH principles

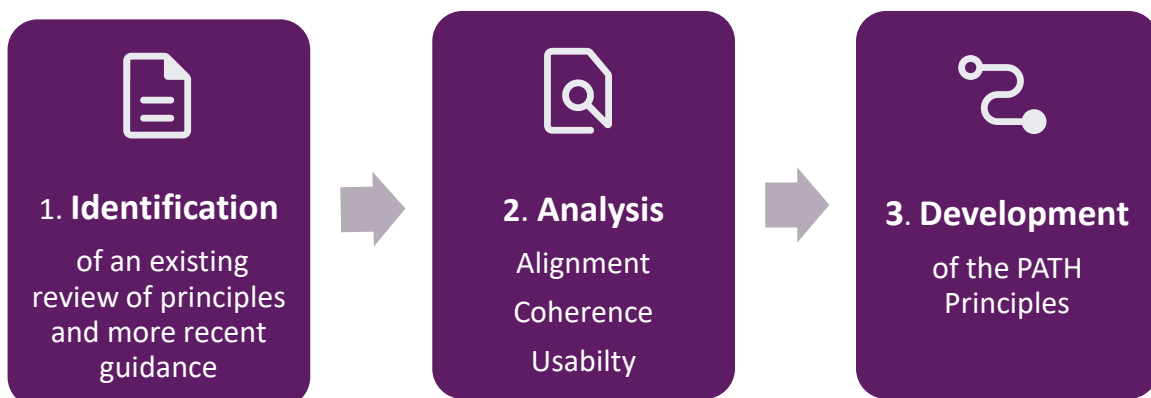
To answer the first research question, the initial strategy was to conduct a rapid review. During this process, existing reviews were explored, leading to the identification of a synthesis of AI principles in education as per Adams et al. (2023) (see Figure 1, step 1). Adams et al.'s principles extend the work of Jobin et al.'s (2019) review of 85 ethical frameworks for AI use by synthesising education-specific guidance from The World Economic Forum (2019), The Institute for Ethical AI in Education (IEAIE) (2021), UNESCO (2021), and UNICEF (2021).

Although Adams et al.'s (2023) framework offers guidance for using AI in teaching and learning, it presents several limitations for broader application:

1. The framework focuses on K-12 education, potentially overlooking principles related to tertiary education.
2. The documents reviewed may not have specifically addressed the unique opportunities and challenges posed by *generative AI*.
3. The analysis does not incorporate more recent guidance, which could offer updated insights.
4. The principles lack coherence, as some principles overlap significantly.
5. The presentation and articulation of the principles could be refined to enhance their clarity and applicability for educators.

Therefore, additional documents were analysed by the first author to evaluate how well Adams et al.'s framework aligns with more recent guidelines, as well as its coherence and usability (Figure 1, Step 2). This resulted in the development of a more comprehensive, up-to-date, coherent, and potentially more practical set of principles (see Figure 1, Step 3).

Figure 1. Steps in the development of the PATH Principles for using AI in teaching and learning



To identify more recent guidance (Figure 1, Step 1), a literature search was conducted using both traditional academic databases and multinational institutional libraries, such as the OECD, as traditional academic database searches overlooked these materials (Adams et al., 2023). General web searches were also conducted to locate additional guidelines in line with Adams et al. (2023). This approach led to the identification of four high-quality sources not included in Adams et al.'s synthesis (see Table 1). These documents were used to provide further elaboration and broader evidence for the set of principles identified by Adams et al. (2023) for the use of AI in teaching and learning.

Table 1. Additional guidance used to inform the PATH principles beyond those used by Adams et al. (2023)

Title	Year	Creator and link
Australian Framework for Generative Artificial Intelligence in Schools	2023	Commonwealth of Australia https://www.education.gov.au/schooling/resources/australian-framework-generative-artificial-intelligence-ai-schools
AI Guidance for Schools Toolkit	2023	Code.org, Consortium for School Networking, Digital Promise, European EdTech Alliance, Larimore, J., & Policy Analysis for California Education https://www.teachai.org/toolkit-principles
Opportunities, Guidelines and Guardrails for Effective and Equitable Use of AI in Education	2023	OECD https://doi.org/10.1787/2b39e98b-en
Generative AI in Higher Education: A Global Perspective of Institutional Adoption Policies and Guidelines	2024	Jin, Y., Yan, L., Echeverria, V., Gašević, D., & Martinez-Maldonado, R. https://doi.org/10.48550/arXiv.2405.11800

After reviewing the additional guidance, an analysis was conducted to evaluate its alignment with the principles established by Adams et al. (2023). Overall, there was substantial alignment between Adams et al.'s principles and the more recent guidance. However, the newer guidance offered further elaboration and introduced additional considerations. For example, the newer guidance led to:

- **Expanded principles.** For instance, Adams et al.'s principle of 'Teacher wellbeing' was broadened to include the wellbeing of students and other stakeholders; the principle on 'Children's Rights' was extended to incorporate 'Human and Worker Rights'.
- **New additions and sub-components.** For instance, 'Thinking' was added as a sub-component under 'Promote teaching and learning', and 'Academic integrity' was incorporated as a sub-component of 'Transparency'. Further, the principle of 'Responsibility and accountability' was broken down into the sub-components of 'Oversight and human agency', 'Contestability and remedy', 'Protection, empowerment, and human Support', and 'Evaluation'.

In considering the coherence and usability of Adams et al.'s principles for educators, it was concluded that improvements could be achieved by consolidating overlapping principles and grouping broadly applicable ethical principles under a single overarching principle—'Harness AI Ethically'—for greater clarity. This approach helped distinguish education-specific ethical principles from those applicable outside of education settings while also reducing the overall number of principles to a more manageable and memorable set. The principles of 'Beneficence,' 'Non-maleficence,' and 'Freedom and Autonomy' from Adams et al. were found to overlap with the principles of 'Advancing wellbeing and social interaction' and 'Responsibility and accountability' proposed here. Therefore, these principles were consolidated. Furthermore, to increase engagement and memorability of the principles for educational professionals, the acronym 'PATH' and infographic were created. Clearer and more actionable labels were also introduced to enhance usability. In other words, the principles presented in this document are consistent with those of Adams et al. (2023) but elaborated upon and presented in an arguably more coherent and useable manner for educators. Additionally, the alignment of recent guidelines with these principles ensures greater relevance.

Development of the practical examples

To provide practical examples of how AI for teaching and learning, existing literature and work from credible education-related sources were analysed. This included academic reviews, empirical and conceptual studies, and guidelines from reputable organisations such as UNESCO. These sources provided a solid foundation for understanding how AI has been and can be applied to enhance teaching and learning practices. By leveraging previous work from credible sources, the examples are grounded in evidence and aligned with current advancements in AI, ensuring that the guidance provided is both relevant and actionable for educators.

The remainder of this document outlines the PATH principles in detail, followed by practical examples of AI for teaching and learning.

Principles for using AI in teaching and learning

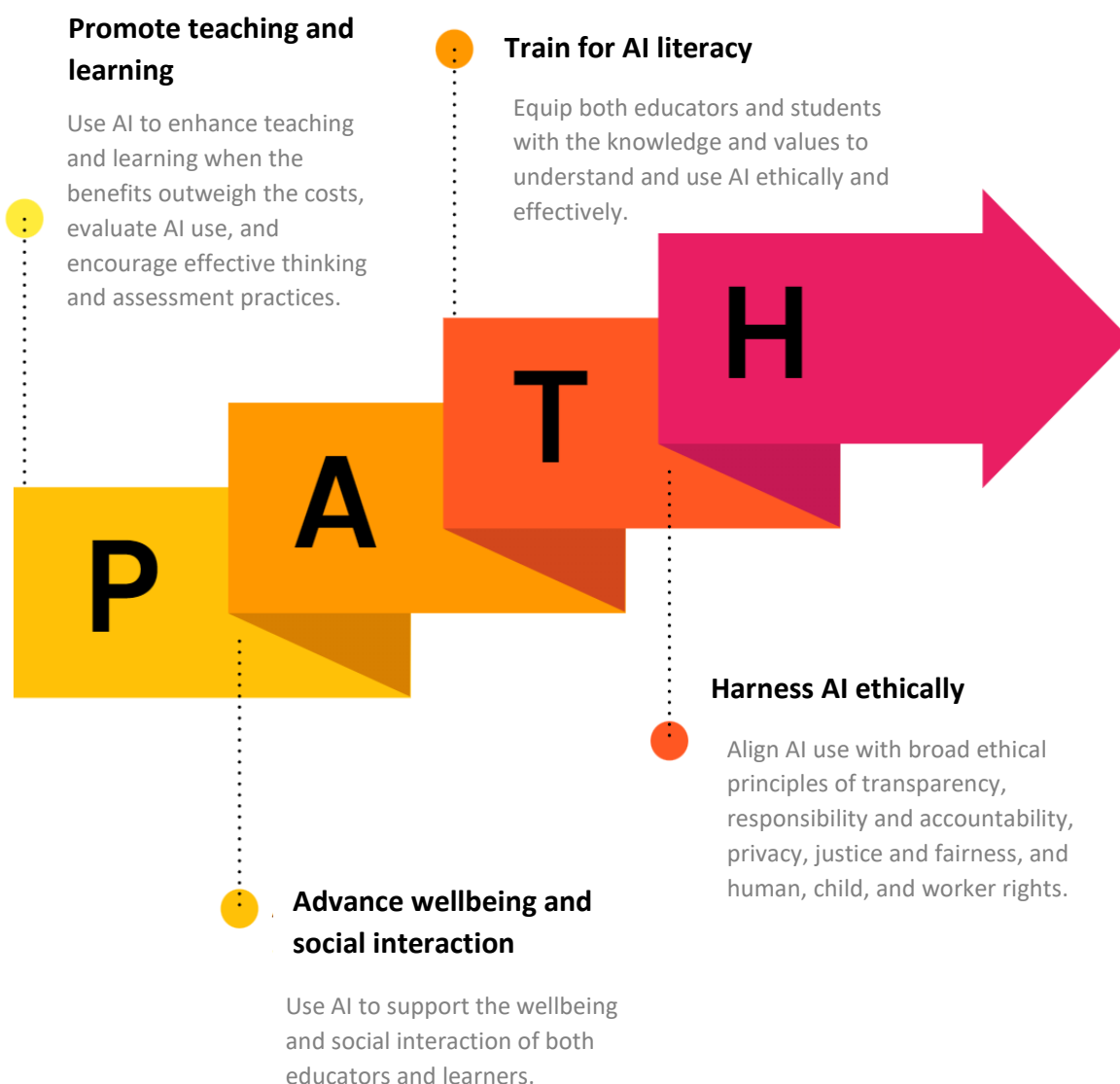


Overview of the principles

This section outlines the four PATH principles for using AI in teaching and learning. At its core, these principles strive for a human-centred or humanistic approach when using AI. This is an approach where technology is designed and used in ways that prioritise human interests (Shneiderman, 2022).

The following sections detail the four PATH principles, which are visualised in Figure 2. Each principle begins with an explanation that was synthesised from the reviewed documents. To substantiate this synthesis and illustrate how different documents relate to each principle, relevant quotes from the original documents are included after each section or in the Appendix.

Figure 2. The PATH principles for using AI in teaching and learning



1. Promote teaching and learning

Due to the affordances provided by AI systems, their use in teaching and learning should be considered. However, as the guidelines reviewed make clear, AI should not be used haphazardly. Instead of using AI due to hype, it is essential to ensure its use promotes teaching and learning, which has three essential components:

1. **Benefit.** The use of AI should be considered when the benefits outweigh the costs.
2. **Evaluation.** The evaluation of AI should be considered to ensure it effectively enhances the educational experience.
3. **Thinking.** To effectively encourage and evaluate learning, educators should consider designing work that AI cannot complete, encouraging higher-order thinking, creativity, and critical analysis of AI, and providing clear guidance regarding how students can use AI in their work, such as during assessments.

As highlighted in the creation of many of the documents and in some of their guidance, co-creation should be considered when designing and evaluating AI. For instance, in consultation with various stakeholders during the creation of the guidelines reviewed, it was highlighted that while there is much excitement that AI systems may provide more access to personalised learning pathways tailored to each student's unique needs, there are concerns. One major challenge stakeholders discussed was the potential reduction in student-teacher relations (see IEAIED, 2021b), which are vital for learning and engagement (Roorda et al., 2011). Therefore, when deciding to implement an AI system that offers personalised learning pathways, educators should carefully evaluate if the benefit of the system outweighs any costs, such as loss of social interaction. Additionally, it is important to consider strategies for mitigating these costs, regularly assess the AI system's overall impact and fit, and consider co-creating AI solutions and evidence with numerous stakeholders.

Another aspect of prioritising learning is to consider designing work for students that AI cannot complete and encouraging higher-order thinking, creativity, and critical thinking. For instance, educators can use oral presentations or invigilated assessments to assess students' ability to apply and evaluate information and think critically, ensuring the work reflects their own thinking, knowledge, and capabilities. Additionally, educators can use collaborative projects, where students work together to solve complex, open-ended problems that encourage innovation, teamwork, and adaptability.

The second section of this report provides some practical examples of using of AI systems for teaching and learning. Some potential considerations when evaluating AI systems and their use are:

- **Effectiveness.** Does AI use achieve the intended goal? Are the benefits worth the costs? (i.e., Does the use of AI align with 'Principle 1. Promoting Teaching and Learning'?)
- **Efficiency.** Does AI use achieve the intended goal in a timely manner?
- **Wellbeing and social interaction.** What is the impact of AI on student and/or teacher wellbeing and social interaction? (see 'Principle 2. Advance wellbeing and social interaction')
- **AI literacy.** Do users have appropriate levels of AI literacy, such as how to use the system effectively and ethically? (see 'Principle 3. Train for AI literacy')
- **Ethics.** Does the use of AI align with broad ethical principles for AI use, such as justice and fairness, privacy, and transparency? (see 'Principle 4. Harness AI ethically')

The Institute for Ethical AI in Education (2021a) has provided further evaluation criteria that can be used during pre-procurement, procurement, monitoring and evaluation, and implementation phases of AI systems. Code.org et al. (2023, pp. 16-20) lists further benefits, risks, and mitigation strategies when employing AI systems. Table 2 summarises how the reviewed documents address the themes of benefit, evaluation, and thinking in the context of promoting teaching and learning. Table 5 in the Appendix includes further details.

Table 2. References to ‘Benefit’, ‘Evaluation’, and ‘Thinking’ in the reviewed documents

Source	Benefit	Evaluation	Thinking
Institute for Ethical AI in Education (2021a)	✓	✓	
UNESCO (2021)	✓	✓	
UNICEF (2021)	✓		
World Economic Forum (2019)	✓	✓	
Commonwealth of Australia (2023)	✓	✓	✓
Code.org et al. (2023)	✓	✓	
OECD (2023)		✓	
Jin et al. (2024)	✓	✓	✓

Note. A tick (✓) indicates that the document references the corresponding theme of benefit, evaluation, or thinking. See Table 5 in the Appendix for further details.

2. Advance wellbeing and social interaction

When using AI in education, it is important to prioritise the wellbeing of teachers, students, and other stakeholders and foster meaningful social interactions.

At a minimum, it is important to consider if AI is safe and harm-free¹. Moreover, AI use ideally attempts to enhance—rather than replace—human teaching and crucial human social connections, such as those between students and teachers or among students and their peers. The use of AI should be considered to reduce teachers’ workloads and stressors, thereby increasing their capacity to focus on core teaching activities. Additionally, teachers’ expertise should be considered, with AI used in a way that respects and augments their human decision-making. Teachers’ rights and working conditions are important considerations as well.

Student wellbeing is also paramount. AI tools should aim to support a balanced academic experience. Preserving students’ digital and non-digital activities such as play and leisure time, social interactions, and school breaks is important. Rather than increasing pressure around homework and assessments, AI should be considered to help alleviate these stressors. Finally, AI systems focused on enhancing wellbeing should also be considered; for example, systems that can identify when students or teachers may require mental health support can assist in providing targeted support as required.

This principle also intersects with other principles, such as AI literacy, as having knowledge of how to use AI can prevent unnecessary stress and workload for teachers as they navigate AI integration in their classrooms. Ensuring teachers are equipped with the necessary skills to evaluate AI tools fosters a balanced and informed approach to technology adoption in education. Elements of evaluation and co-design discussed in the previous section are relevant here as well; part of evaluating AI is to weigh up the benefits or costs associated with *wellbeing*. Including teachers and students in the design and feedback processes of AI tools is also helpful for ensuring that these tools align with advancing end-user wellbeing. Box 1 outlines how advancing wellbeing and social interaction are discussed in the reviewed guidance.

¹ While some of the reviewed documents emphasise AI should not cause harm, it may be more accurate to state that AI should not cause “foreseeable or unintentional” harm (Deutsche Telekom, 2018; Federal Ministry of Transport and Digital Infrastructure, 2017; High-Level Expert Group on AI, 2019; Personal Data Protection Commission Singapore, 2018; Japanese Society for Artificial Intelligence, 2017; Google AI, 2019 as cited in Jobin et al., 2019, p.394). This distinction underscores the importance of balancing potential harm to wellbeing with overall benefits; for example, a minor impact on wellbeing might be considered acceptable if it leads to significant advancements in other teaching and learning outcomes.

Box 1. References to advancing wellbeing and social interaction in the reviewed guidance

- The Institute for Ethical AI in Education (2021a) emphasises wellbeing under the principle of “Administration and Workload,” stating that “AI should increase the capacity of organisations whilst respecting human relationships” (The Ethical Framework for AI in Education).
- UNESCO (2021) advocates to “Ensure that AI is used to empower teachers” (p. 36) Their recommendations underscore protecting students’ social interactions, play, leisure time, and school breaks. They highlight that AI tools should alleviate rather than intensify pressures related to homework and exams. Furthermore, the impact of AI on student wellbeing should be regularly assessed through co-creation and feedback processes, ensuring AI enhances rather than replaces essential teacher functions.
- The World Economic Forum (2019), participants discussed that policy should “prescribe steps to mitigate potential harms” (p. 15)
- UNICEF (2021) include a recommended requirement to “Support children’s development and well-being” (p. 32). They recommended the following: “Prioritize how AI systems can benefit children, particularly in AI policies and strategies,” “Develop and apply a design for a child rights approach,” “Leverage AI systems to support and increase environmental sustainability,” and “Integrate metrics and processes to support children’s well-being in the use of AI.”
- The Commonwealth of Australia (2023) includes the principle of “Human and Social Wellbeing,” asserting that “Generative AI tools are used to benefit school community” (p. 6).
- Code.org et al.’s (2023) “Balance” principle mentions: “While generative AI presents useful assistance to amplify teachers’ capabilities and reduce teacher workload, these technologies should be a supporting tool to augment human judgment, not replace it” (p. 16).
- OECD (2023) has a principle of “Student and teacher wellbeing” (p. 9), stating that the use of AI-enabled technology should prioritise mental health and balance digital and non-digital activities. It emphasises that the social and relational experience of learning should be communicated, that AI systems have the potential to support wellbeing, and that it is important to foster AI literacy to ensure safe and conducive learning.

3. Train for AI literacy

As AI becomes ubiquitous in learning, teaching, and working, it is crucial for both teachers and students to understand what AI is, how it works, how to use it effectively and ethically and hold appropriate values and attitudes around its use (UNESCO, 2024b). These aspects—known as AI literacy—are essential to foster to prepare students for the future and ensure that they are equipped for the demands of an ever-changing society. Being an AI-literate educator is important for understanding and implementing the other PATH principles.

Fostering AI literacy offers numerous benefits for teaching and learning. For example, for educators, it enhances readiness to make informed and responsible decisions on when and how to teach about AI, helps them teach about AI's ethical and societal implications, and supports their ongoing professional growth (UNESCO, 2024b). For students, AI literacy is important for “Fostering a critical approach to AI”, which “Prioritizes human-centered interactions with AI systems,” and contributes to “Encouraging environmentally sustainable AI” (UNESCO, 2024a, pp. 14–15).

Numerous institutions and researchers have developed specific guidance on training in AI literacy for both teachers and students (see Table 3). Box 2 outlines how training in AI literacy is discussed in the reviewed guidance.

Table 3. Guidance for training AI literacy

Source	Overview
UNESCO. (2024a). <i>AI competency framework for students</i> . UNESCO. https://doi.org/10.54675/JKJB9835	This framework presents five aspects of competencies for AI literacy in <i>students</i> —human-centred mindset, ethics of AI, AI techniques and applications, and AI system design. Each competency aspect is broken down into three progression levels.
UNESCO. (2024b). <i>AI competency framework for teachers</i> . https://doi.org/10.54675/ZJTE2084	This framework presents five aspects of competencies for AI literacy in <i>teachers</i> —human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional development. Each competency aspect is broken down into three progression levels.

Box 2. Reference to training in AI literacy in the reviewed guidance

- The Institute for Ethical AI in Education (2021a) addresses AI literacy under “Informed Participation,” stating that “Learners, educators and other relevant practitioners should have a reasonable understanding of artificial intelligence and its implications” (The Ethical Framework for AI in Education).
- UNESCO (2021) advocates to “integrate AI-related skills into school curricula and technical and vocational education and training (TVET) qualifications” (p. 36).
- UNICEF (2021) highlights “Preparing children for present and future AI developments” (p. 31).
- The World Economic Forum (2019) brings attention to AI literacy under “Public Education” (p. 10), emphasising promoting positive messages about AI to young people and parents.
- The Commonwealth of Australia (2023) emphasises AI literacy under the guiding statement “Instruction: schools engage students in learning about generative AI tools and how they work, including their potential limitations and biases, and deepen this learning as student usage increases” (p. 6).
- Code.org et al. (2023) provide the principle “Promote AI Literacy” (p. 13).
- OECD-(2023) incorporates AI literacy into “Teacher agency and professional learning” (p. 6) and “Student and teacher wellbeing” (p. 9).
- Jin et al. (2024) found that generative AI adoption strategies across 40 global higher education institutions highlight the importance of training in AI literacy.

4. Harness AI ethically

AI systems and their use should be guided by broad ethical principles that extend beyond education. These include transparency in how AI operates and is employed, responsibility and accountability for its outcomes, protecting privacy, upholding justice and fairness, and respect for the rights of humans, children, and workers. Each principle warrants careful consideration and is further outlined below.

Transparency

Strive to be transparent when integrating AI into teaching and learning. This has three aspects:

- **Disclosure.** Ensure that the use of AI (and policies surrounding its use) are communicated openly, allowing students, educators, and caregivers to be fully aware of their personal responsibilities, when AI systems are being used, and what role AI systems play in educational settings.
- **Understanding.** Clarify how AI systems work so that users can accurately assess and judge the outputs. This requires explaining AI processes in ways that are accessible to all, fostering an informed understanding of the limitations of AI output.
- **Academic integrity and copyright.** Students are supported to attribute AI appropriately, and when AI is used, it should adhere to copyright.

Box 3 outlines how transparency is discussed in the reviewed guidance.

Box 3. Reference to transparency in the reviewed guidance

- The World Economic Forum (2019) emphasises the importance of algorithmic accountability in policy guidance, recommending that organisations “establish transparency measures that document how algorithms are designed and used to create accountability in decision-making” (p. 10).
- The Institute for Ethical AI in Education (2021a) includes the principle of “Transparency and Accountability,” stating that “humans are ultimately responsible for educational outcomes and should therefore have an appropriate level of oversight of how AI systems operate” (The Ethical Framework for AI in Education).
- UNESCO (2021) addresses transparency within its overarching principles for AI, specifically advising that AI applications be designed in a “transparent” manner (p. 36).
- UNICEF (2021) highlights the need to “provide transparency, explainability, and accountability for children,” suggesting that organisations should address children directly, use age-appropriate language, and ensure AI systems are transparent enough for children and caregivers to understand (p. 38).
- The Commonwealth of Australia (2023) includes a transparency principle, outlining that “School communities understand how generative AI tools work, how they can be used, and when and how these tools are impacting them” (p. 6). Guiding statements on information and support, disclosure, explainability, academic integrity and copyright are relevant.
- Code.org et al. (2023) mention transparency under their compliance principle (p. 11), and their integrity principle states that educators should “promote academic integrity” (p. 21).

- OECD (2023) highlights the principles of “Transparency, explainability and negotiation,” detailing that “educational jurisdictions should be transparent about the objectives and processes by which algorithms reach their recommendations” (p. 13).
- Jin et al. (2024) identified common themes in higher education policies, including “Transparency and Privacy”, “Policy Communication”, and “Academic Integrity and Ethical use of AI” (pp. 5-6).

Responsibility and accountability

When integrating AI into teaching and learning, consider responsible and accountable practices, adhering to:

- **Oversight and human agency.** Educators are encouraged to retain decision-making authority and approve AI decisions, using AI as a supportive tool rather than replacing human judgment. This ensures that AI enhances, rather than overrides, the expertise and insight educators offer. It also ensures that educators are responsible and accountable for decisions.
- **Contestability and remedy.** Education stakeholders ought to have the opportunity to question and challenge AI use and decisions, as well as to seek remedies when appropriate.
- **Protection, empowerment, and human support.** AI systems should aim to protect and empower users, incorporating safeguards that encourage safe and positive engagement with the digital world. It is recommended that human support be available to provide assistance when needed. Furthermore, it may be worth exploring the possibility of offering human alternatives to AI systems where appropriate.
- **Evaluation.** As mentioned in other principles, it is important to consider assessing AI before, during, and after its deployment to ensure it effectively serves its intended purpose and that any potential issues are managed appropriately.

Box 4 outlines how responsibility and accountability are discussed in the reviewed guidance.

Box 4. Reference to responsibility and accountability in the reviewed guidance

- The Institute for Ethical AI in Education (2021a) includes the principle of “Transparency and *Accountability*,” [emphasis added] stating that “humans are ultimately responsible for educational outcomes and should therefore have an appropriate level of oversight of how AI systems operate” (The Ethical Framework for AI in Education).
- UNESCO (2021) addresses responsibility and accountability within its overarching principles for AI, specifically advising that policymakers “ensure that AI is human-controlled and centred on serving people” and that policymakers should “foster broad corporate and civic responsibility for addressing the critical societal issues raised by AI technologies” (p. 32).
- UNICEF (2021) highlights the need to “provide transparency, explainability, and *accountability* for children,” [emphasis added] suggesting that organisations should “Develop AI systems so that they protect and empower child users according to legal and policy frameworks, regardless of children’s understandings of the system” and “Establish AI oversight bodies compliant with principles and regulations and set up support mechanisms for redress” (p. 38).
- The World Economic Forum (2019) mentions “devising policy that focuses on promoting a child’s healthy engagement with the digitized world” (p. 11).
- The Commonwealth of Australia (2023) lists “Accountability” as a principle, outlining that “Generative AI tools are used in ways that are open to challenge and retain human agency and

accountability for decisions” (p. 7). The principle is divided into four guiding statements covering human responsibility, reliability, monitoring, and contestability.

- OECD-(2023) highlights the principles of “Human support and human alternatives,” explaining that “jurisdictions should ensure that learners, teachers, and other education stakeholders, can receive timely human support when they face a problem, and, when appropriate, a human alternative to the AI-enabled tool” (p. 14).
- Code.org et al. (2023) outline the principle of “Agency: Maintain human decision-making when using AI,” emphasising that making decisions with AI “ultimately relies on human approval processes” (p. 24). They also put forward the principle of “Evaluation”, which states, “Regularly assess the impacts of AI” (p. 25).
- Jin et al. (2024) identified higher education policies on generative AI that were related to “Critical Evaluation and Human-Centric Perspectives and Competencies,” “Continuous Evaluation,” and “Ongoing Monitoring” (pp. 5-6).

Privacy

When integrating AI into teaching and learning, strive to balance privacy with educational goals.

Ethical data use should enhance learning while protecting students from commercial exploitation and respecting privacy rights. A responsible approach to data protection includes adhering to local and international laws and ethics, considering data ownership, and ensuring transparency through visible, traceable and auditable data practices for teachers, students, and parents. Institutions should consider limiting data collection, avoiding unnecessary data retention, preventing commercialisation and distribution of data, and ensuring cybersecurity. Box 5 outlines how privacy is discussed in the reviewed guidance.

Box 5. Reference to privacy in the reviewed guidance

- The Institute for Ethical AI in Education (2021a) includes the principle of “Privacy,” stating that “a balance should be struck between privacy and the legitimate use of data for achieving well-defined and desirable educational goals” (The Ethical Framework for AI in Education).
- UNESCO (2021) states that policymakers should “establish data protection laws which make educational data collection and analysis visible, traceable, and auditable by teachers, students, and parents” (p. 32).
- UNICEF (2021) include the principle “protect children’s data and privacy,” highlighting “follow a responsible data approach for the handling of data for and about children,” “promote children’s data agency,” “adopt a privacy-by-design approach,” and “consider protections at the group level. (p. 35).
- The World Economic Forum (2019, p. 11) section on privacy discusses balancing the trade-offs of privacy with other interests, considering parents and data privacy, and limiting exposure to commercial advertising.
- The Commonwealth of Australia (2023) lists the principle of “Privacy, Security, and Safety: Students and others using generative AI tools have their privacy and data protected” (p. 7), with relevant guiding statements that cover privacy and data protection, privacy disclosure, protection of students’ inputs, and cyber-security and resilience.

- OECD-(2023) discusses privacy in their principle of “Ethics, safety and data protection”. They elaborate by saying, “Data protection policies should ensure that the collection of data contributes to securing effectiveness and equity in education while protecting students’ and teachers’ privacy” (p. 7).
- Code.org et al. (2023) outline privacy as a concern under their principle of “Compliance: Reaffirm adherence to existing policies.” Detailing, “When implementing AI systems, the key areas of technology policy to comply with are *privacy* [emphasis added], data security, student safety, data transfer and ownership, and child and youth protection” (p. 11).
- Jin et al. (2024) identified key themes in higher education policies regarding generative AI, including “Information Security and Data Privacy” and “Transparency and Privacy” (p. 5).

Justice and fairness

When integrating AI into teaching and learning, strive for just and fair practices, which includes consideration of four main aspects:

- **Promoting and upholding fairness.** AI use should prioritise promoting and upholding fairness, ensuring that all individuals, communities and groups are provided greater opportunities and are not unfairly discriminated against—especially those from diverse, disadvantaged, geographically varied and marginalised backgrounds and statuses. This includes respecting cultural rights and creating opportunities for personalised learning tailored to individual needs. AI use should present diverse viewpoints and prevent reinforcements of bias.
- **Equitable access.** To achieve equitable access to AI systems, educational institutions should provide affordable, high-quality internet connectivity, devices, digital skills, and high-quality digital learning resources and tools. These should be available both in and out of school to learners and educators, with a consideration for regional, rural and remote communities and students with disabilities. To do this, robust physical and digital infrastructures will be required. Blanket AI bans should be avoided to prevent increasing the digital divide.
- **Designing AI tools.** In designing AI tools, reducing biases, such as gender bias, is critical to prevent long-term negative effects on users. This involves using diverse, non-biased, representative training data and adopting inclusive design approaches that reflect various perspectives. Designers should understand the impact their design will have.
- **Evaluation.** When evaluating AI systems, their impact on vulnerable and marginalised groups should be explicitly included, as well as the measurement of diversity, inclusion, and equality, with educators playing an active role in evaluating AI's accuracy, cultural awareness, and inclusiveness to ensure all students are supported equitably. Safeguards and oversight are also essential to mitigate potential risks associated with AI use in educational settings.

There should be an aim for diversity amongst teams that design, evaluate, and implement AI systems. Box 6 outlines how justice and fairness are discussed in the reviewed guidance.

Box 6. Reference to justice and fairness in the reviewed guidance

- The Institute for Ethical AI in Education (2021a) emphasises "Equity" in The Ethical Framework for AI in Education, stating that “AI should promote equity among learners and avoid discrimination”. The principle of “Ethical design” in their framework adds that AI should be created by those who understand its impact (The Ethical Framework for AI in Education).
- UNESCO (2021) reference justice and fairness under “Policies and regulations for equitable, inclusive, and ethical use of AI,” suggests that policymakers should “set out

cross-cutting strategic objectives, and plan regulations and programs, to ensure the equitable and inclusive use of AI in education” (p. 32).

- UNICEF (2021) include the principle “Ensure inclusion of and for children” (p. 35), stating that there should be a goal for diversity amongst AI-related roles, inclusive design for children, and meaningful child participation.
- World Economic Forum (2019) refers to justice and fairness under “Accounting for marginalized groups” (p. 11) and “Ensuring fairness in machine learning” (p. 12).
- The Commonwealth of Australia (2023) includes the principles of “Fairness,” which state that “Generative AI tools are used in ways that are accessible, fair, and respectful.” Guiding statements are included around accessibility and inclusivity, equity and access, non-discrimination, cultural and intellectual property and diversity of perspectives” (p. 7).
- OECD-(2023) have two relevant principles: “Equitable access to affordable, high quality connectivity” and “Equitable access to and equitable use of digital learning resources” (pp. 6-7).
- Code.org et al. (2023) emphasise “Addressing equity”, stating, “Using AI tools to promote equity in education requires both access and thoughtful implementation” (p. 11).
- Jin et al. (2024) identified a key theme in higher education policies—“Support for Diverse Educational Needs and Equity. This theme encompasses personalised learning, support for students with disabilities, and ensuring equitable access to educational tools” (p. 5).

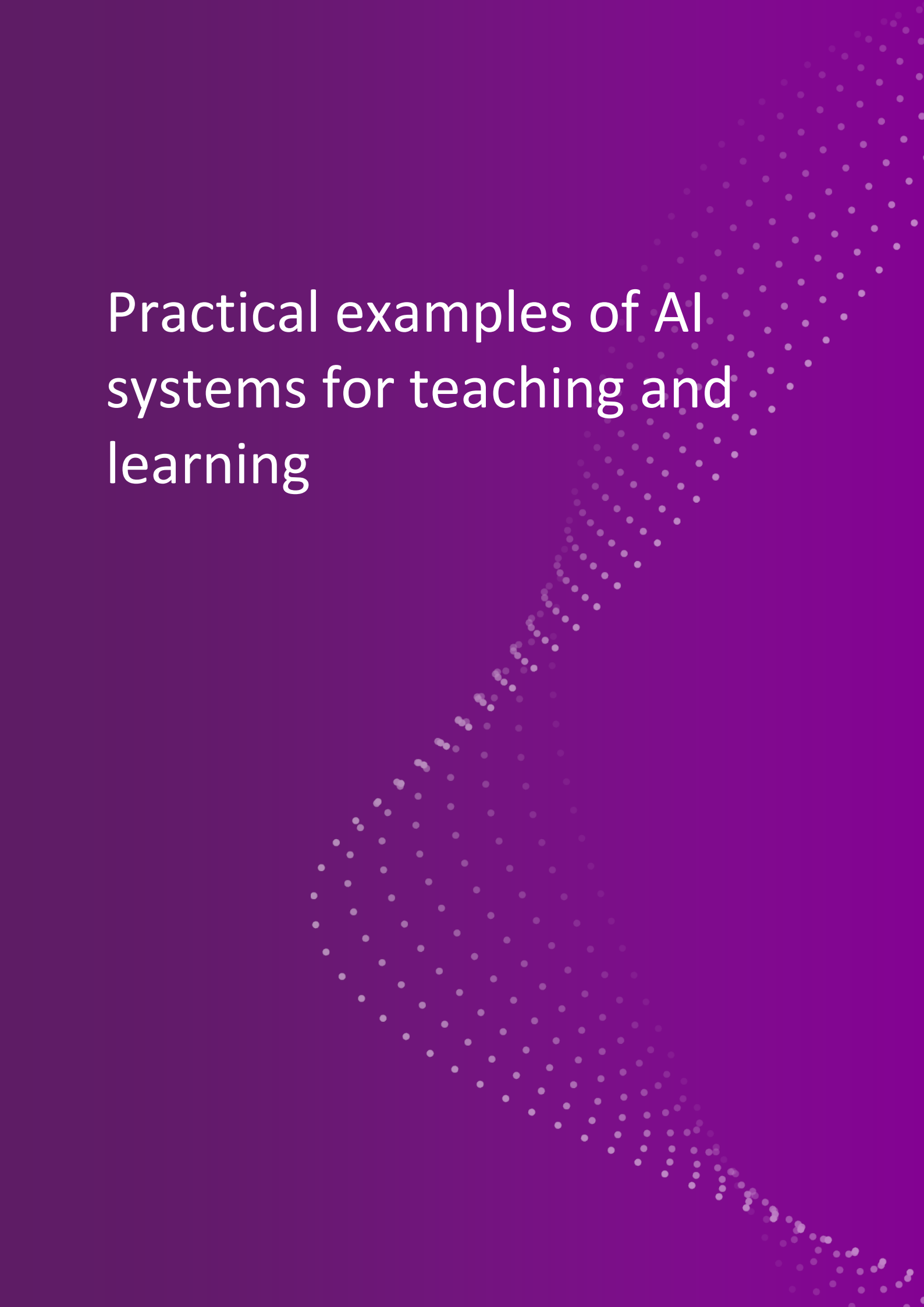
Human, child, and worker rights

When integrating AI into teaching and learning, strive to respect and promote the rights of humans, children, and workers. In enacting this principle, it is vital to consider relevant legislation and regulations.

When considering human rights, for example, it is important to address the right to privacy and recognise the risks of algorithmic bias, which could result in discriminatory outcomes based on factors such as gender, age, or race. Similarly, with children's rights, it is important to ensure they have access to remedies when their rights are violated and allow them to freely express their views on matters that affect them. Regarding the rights of teachers and workers, for example, AI should not be used to exploit educators, undermine their professional autonomy, or increase their workload without adequate support. Box 7 outlines how this sub-principle is discussed in the reviewed guidance.

Box 7. Reference to human, child and worker rights in the reviewed guidance

- The World Economic Forum (2019, pp. 11, 14–15) discusses child rights, covering aspects such as leveraging developmental windows of opportunity, ensuring algorithmic accountability and creating context for policymaking.
- UNESCO (2021) addresses this principle in numerous places, such as in their “Overarching Principle for AI,” stating, “Steer AI-and-education policy development and practices towards protecting *human rights* [emphasis added]” (p. 32). Additionally, they reproduce the Beijing Consensus on Artificial Intelligence and Education, which asserts, “Be aware that teachers cannot be displaced by machines, and ensure that their rights and working conditions are protected” (as cited in UNESCO, 2021, p. 27).
- The principles outlined by UNICEF (2021) are based on the Convention on the Rights of the Child (United Nations, 1989). For example, they include the principle “Empower governments and businesses with knowledge of AI and children’s rights,” stating that it is essential to “ensure capacity-building on AI and child rights for policymakers, top management, and AI system developers” to “capitalize on customer demand for trusted and transparent AI solutions for children,” and to “commit to child-centred AI and implement mechanisms to realise this in practice” (p. 40).
- The Commonwealth of Australia (2023), under their principle of “Human and Social Wellbeing”, includes the guiding statement, “Human rights: generative AI tools are used in ways that respect human and worker rights, including individual autonomy and dignity” (p. 7).



Practical examples of AI systems for teaching and learning

A diverse range of AI systems are available to enhance teaching and learning, each offering distinct functionalities and benefits. This section is divided into two parts: the first explores education-specific AI systems designed to address particular pedagogical needs, while the second examines the potential applications of generative AI systems, such as ChatGPT, for teaching and learning.

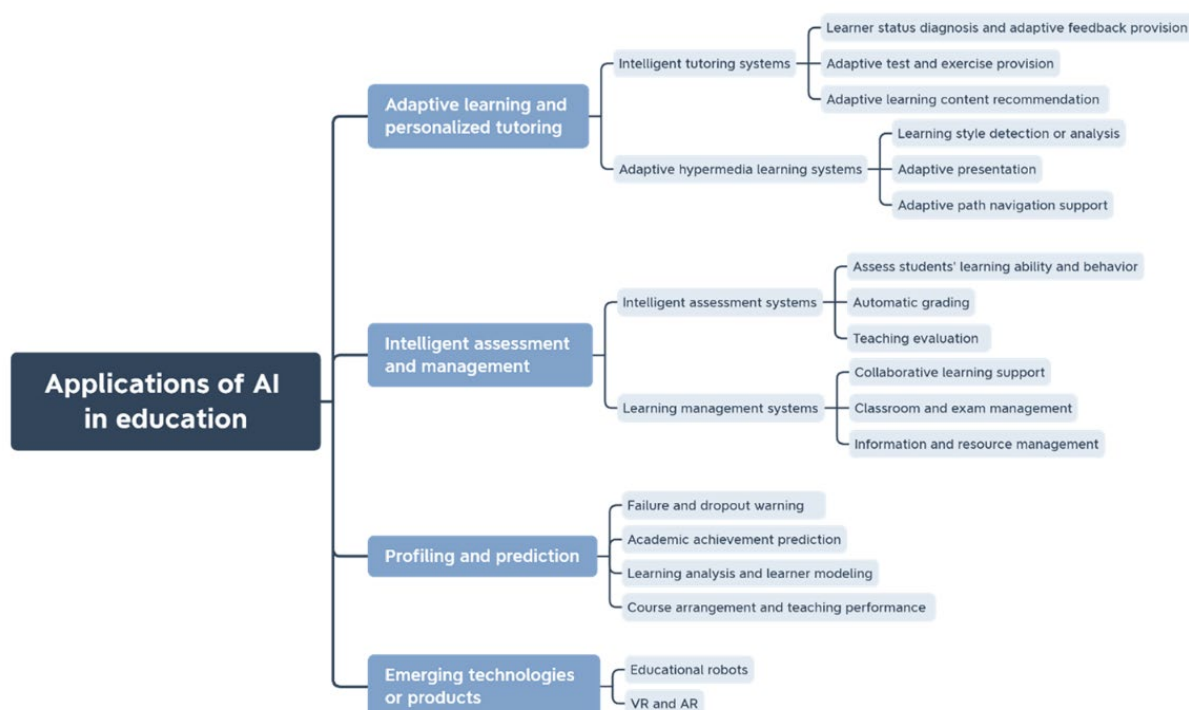
Education-specific AI systems

There is a diverse range of ways of using AI to promote teaching and learning. In terms of existing applications or programs, these can be grouped into four primary categories, excluding generative AI and applications focused on advancing wellbeing and social interaction (see Wang et al., 2024, for a review):

1. **Adaptive learning and personalised tutoring.** Systems designed to personalise the learning process and create an adaptive environment tailored to learner’s knowledge, emotional, or interest states.
2. **Intelligent assessment and management.** Systems designed for tracking and recording students’ learning progress and providing timely evaluation by automating grading, supporting collaborative learning, and managing educational resources
3. **Profiling and prediction.** Systems that analyse educational data to identify learner characteristics, predict academic outcomes, foster student autonomy, and help educators identify and support at-risk students.
4. **Emerging technologies or products.** Systems involving emerging technologies and products, such as educational robots, virtual reality (VR), and augmented reality (AR) applications.

Each category can be further broken into further systems (see Figure 3).

Figure 3. Types of AI in education applications



Note. Figure 10, p. 11 from Wang et al. (2024). Artificial Intelligence in education: A systematic literature review, licensed [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/).

Generative AI tools like ChatGPT are often highlighted in discussions on teaching and learning due to their accessibility and low cost. However, other specialised AI systems, such as those indicated in Figure 3, should not be overlooked. While these systems may require more resources, they can offer unique advantages that complement more readily available tools.

Firstly, these specialised AI applications may often deliver deeper integration with curriculum needs, institutional data, and targeted support for specific educational contexts than current generative AI systems. Unlike general tools, they can be tailored to meet the nuanced requirements of various subjects or learner groups, enhancing the quality of instruction and potentially leading to better educational outcomes.

Secondly, while these systems may have higher upfront costs, their long-term benefits could offset the initial investment. By automating administrative tasks, enabling timelier and more targeted interventions, and fostering of engagement through advanced analytics, these tools can contribute to efficiency gains and provide value over time.

Additionally, these tools can address educational equity by supporting a range of learning needs that may go unaddressed by more generalised AI systems. Specialised AI applications can, for example, offer enhanced support for students with disability or language barriers, bridging gaps that free tools alone may not fill.

Another key consideration is data privacy and security. Many free generative AI tools come with privacy concerns related to data handling, which can be problematic in educational environments. The systems in Figure 3 may have been designed with stronger privacy protections and compliance features, making it more likely that they align with institutional standards for student data security.

Finally, these specialised tools can complement free AI tools rather than replace them. Using advanced systems from Figure 3 in tandem with generative AI can create a balanced, effective educational ecosystem where each tool serves its purpose optimally, supporting both the immediate needs of educators and the broader goals of educational institutions.

It is important to note that the synthesis by Wang et al. (2024) did not include AI systems explicitly designed to enhance wellbeing and social interaction. However, as highlighted in Principle 2, which emphasises the advancement of wellbeing and social interaction, educators should also consider the potential of such AI systems. For instance, AI-driven chatbots like Tess (X2AI.com) and Woebot (Woebotehealth.com), which are specifically designed to support mental health, have demonstrated benefits in promoting wellbeing, including reductions in depression and anxiety (e.g. Fitzpatrick et al., 2017).

Generative AI

In addition to education-specific AI systems, such as bespoke adaptive learning platforms, generative AI systems offer significant potential for enhancing teaching and learning. Tools like ChatGPT can perform various functions, including generating text, images, videos, voice recordings, presentations, and podcasts. They can also assist in analysing and visualising data, as well as simulating higher-order cognitive processes. As such, trying to enumerate all possible use cases for generative AI for teaching and learning would be overwhelming. Perhaps an all-encompassing piece of advice is to query generative AI on how it might be helpful in a particular situation. For example, a teacher preparing a unit on poetry might ask, “List 10 ways generative AI can help me prepare a unit on poetry”? Likewise, a student struggling to organise their thoughts for an essay could ask, “List 10 ways that generative AI can assist me with my essay on climate change?” Boxes 8 and 9 show responses provided by ChatGPT 4o.

Box 8. ChatGPT’s response to “List 10 ways generative AI can help me prepare a unit on poetry”

1. **Lesson Planning:** Crafting tailored lesson plans for specific learning objectives.
2. **Writing Prompts:** Generating unique, creativity-sparking prompts and exercises.
3. **Textual Analysis:** Providing annotated analyses of poems, clarifying metaphor, tone, and symbolism.
4. **Model Poems:** Producing example poems to illustrate different poetic forms and styles.
5. **Creative Suggestions:** Recommending alternative words, rhymes, and phrasing to support experimentation.
6. **Visual Prompts:** Generating images or multimedia content that aligns with poetry themes for inspiration.
7. **Digital Projects:** Supporting multimedia poetry projects that integrate audio, text, and visuals.
8. **Student Feedback:** Offering personalised feedback on student poems to highlight strengths and areas for improvement.
9. **Assessment Tools:** Creating rubrics, quizzes, and self-assessment forms to evaluate poetry skills.
10. **Progress Tracking:** Helping track student progress by assessing skills in language use, creativity, and thematic understanding

Box 9. ChatGPT’s response to “List 10 ways that generative AI can assist me with my essay on climate change?”

1. **Outline Creation:** Use AI to generate a structured outline for your essay, highlighting key points like causes, impacts, and solutions for climate change.
2. **Research Summaries:** AI can help summarise extensive research articles and reports on climate change, making it easier to gather information and spot the main arguments and data points.
3. **Content Generation for Specific Topics:** Generate ideas or introductory content for sections, such as the effects of global warming on ecosystems, economic impacts, and renewable energy alternatives.

4. **Drafting and Expanding Content:** AI can expand your ideas into well-developed paragraphs, helping you articulate complex climate change concepts clearly and concisely.
5. **Fact-Checking and Data Retrieval:** Generate or verify data and statistics relevant to climate change, like CO₂ emission trends or renewable energy adoption rates.
6. **Examples and Case Studies:** AI can provide real-world examples and case studies, such as cities with successful carbon reduction policies, which add depth to your arguments.
7. **Argument and Counterargument Generation:** Use AI to formulate both sides of climate-related debates, such as fossil fuel reliance versus renewable energy, to strengthen persuasive sections.
8. **Editing and Grammar Checking:** Improve the flow, grammar, and syntax of your essay drafts, ensuring your ideas are communicated professionally.
9. **Visuals and Infographics Suggestions:** Generate ideas for visuals like charts or infographics that could help illustrate data on climate trends or impacts, making the essay more engaging.
10. **Title and Summary Suggestions:** Use AI to brainstorm impactful titles and concise summaries, which help make your essay more appealing and give it a professional finish.

Some additional examples of how teachers and students can use generative AI are provided in Table 4, inspired by self-regulated learning theories (Pintrich, 2000; Zimmerman & Moylan, 2009).

Table 4. Some additional examples of using generative AI in Teaching and Learning

Area Aspect	Teaching examples	Learning examples
Cognition Learning about strategies	Use AI to learn about what teaching strategies might be effective, when/why, and how to use them for the current task or target goal.	Use AI to learn about which learning strategies might be effective, when/why, and how to use them for the current task or target goal.
Monitoring	Use AI to help evaluate learning content and lesson plans.	Use AI to provide real-time comprehension checks by generating practice questions on the material and/or providing feedback on practice questions.

Performance	Use AI to help develop standard or personalised learning content (e.g., quizzes, example essays, and images). Use AI to create feedback and lesson plans and help write communications to students, parents, and careers. Use AI for data entry and analysis.	Use AI to create summaries, mnemonics, and practice questions, as well as help elaborate and organise the learning content. Use AI to write or improve drafts.
Reflecting on performance	Use AI to understand possible alternative reasons for a performance outcome.	
Motivation and Emotions		
Monitoring	Use AI to prompt evaluating motivation and emotions.	
Managing motivation and emotions	Use AI to provide motivational or emotional support (e.g., asking AI to provide encouragement or help with goal setting), help make content more interesting and personal, help understand the value of the task, and understand different motivational and emotional management strategies.	
Reflection on emotional reactions	Use AI to understand possible alternative reasons for an emotional reaction.	
Behaviour	Use AI to help prioritise and break down tasks.	Use AI to help create a study plan.
Time and effort planning		
Monitoring of effort	Use AI to prompt evaluating effort, time use and need for help.	
Help-seeking	Use AI to help solve a problem.	
Context		
Task requirements and grading practices	Use AI to improve the clarity of the task requirements and grading practices (e.g., creating contrasting exemplars).	
Managing context	Use AI to help design a conducive learning environment.	
Evaluating context	Use AI to help understand what is and isn't working.	

When using generative AI, it is important to note that it can have numerous limitations, such as:

- inaccurate and unreliable outputs;
- limitations in simulating critical and problem-solving thinking;
- ethical, legal, and privacy concerns, such as issues with academic integrity, distinguishing human-generated versus machine-generated content, copyright infringement, and potential bias in responses;
- potential adverse effects on users' learning and development, including issues with overreliance, risks of bias, knowledge limitations, reliance on biased datasets, and weakening of personal agency and responsibility; and
- technical constraints in input and output, such as difficulties with using technical signs and symbols, prompting, question complexity, and word limits (Cong-Lem et al., 2024).

Additional information

Resources and examples

- [OpenAI](#) provides prompts for generating lesson plans, creating effective explanations, examples, and analogies, learning by teaching, and creating an AI tutor.
- [A UNESCO report by Liu et al. \(2023\)](#) includes 10 possible roles that generative AI can take on, such as a Socratic opponent, guide on the side, co-designer and study buddy.
- [The University of Queensland](#) lists example prompts and ways generative AI can be used for students, including understanding content, summarising content, creating content for drafts, refining or getting feedback, and performing repetitive tasks.

Tools

- [Brisk teaching](#) offers a freemium teaching tool that can generate material, rubrics, quizzes, presentations, examples, and more.
- [International Society for Technology in Education \(ISTE\) and ASCD](#) is developing an AI coach specifically for educators to get tailored guidance to improve their teaching with answers based on a carefully validated set of research-based publications.

The tools listed here are provided for informational purposes only. No endorsement, guarantee, or responsibility is assumed for their performance or suitability for specific needs. Users are advised to exercise discretion when utilising these tools.

Conclusion



This document has provided guiding principles and practical examples for using AI in teaching and learning. Underpinned by a human-centred approach, the **PATH principles**—'Promote teaching and learning', 'Advance wellbeing and social interaction', 'Train for AI literacy', and 'Harness AI ethically'—serve as key guidance to ensure the ethical and effective integration of AI systems into teaching and learning.

The practical examples of AI applications underscore the transformative potential of AI in education. They highlight not only the diverse types of education-specific AI systems but also how generative AI can be employed to support teaching and learning. From adaptive learning platforms to AI-driven content creation, the possibilities are vast, but they also require thoughtful implementation aligned with the PATH principles and awareness of challenges.

As AI continues to evolve, it is imperative to remain adaptive and critical in its adoption within education. By following the PATH principles and engaging in ongoing dialogue, we can ensure that AI contributes positively to the educational landscape, empowering both educators and learners while upholding ethical standards.

Appendix

Table 5. Reference to ‘Benefit’, ‘Evaluation’, and ‘Thinking’ in the guidelines reviewed: additional information

Source	Benefit	Evaluation	Thinking
Institute for Ethical AI in Education (2021a)	<p>“Achieving Educational Goals. AI should be used to achieve well-defined educational goals based on strong societal, educational or scientific evidence that this is for the benefit of [the] learner” (The Ethical Framework for AI in Education).</p> <p>“AI should be used to assess and recognise a broader range of learners' talents” (The Ethical Framework for AI in Education).</p>	<p>“Monitor and evaluate the extent to which the intended impacts and your stated objectives are being achieved” (The Ethical Framework for AI in Education).</p> <p>“Insist that suppliers conduct periodic reviews of their AI resources to ensure these are achieving the intended goals and not behaving in harmful, unintended ways” (The Ethical Framework for AI in Education).</p> <p>“Where the impacts of using AI as intended are found to be unsatisfactory, identify whether this is due to how the resource was designed, how the resource is being applied, or a combination of both factors. Create an action plan for achieving improved impacts” (The Ethical Framework for AI in Education).</p>	
UNESCO (2021)	<p>Weighing the benefit versus risks of AI use is discussed under “Analyse and review teachers’ roles in facilitating knowledge transfer, human interaction, higher-order thinking, and human values”(p. 35).</p>	<p>Discusses the importance of “pilot testing, monitoring and evaluation, and building an evidence base” for using AI in education rather than using AI due to hype (p. 36).</p>	
UNICEF (2021)	<p>It recommends leveraging “the use of AI systems in education, when it is appropriate (emphasis added)” (p. 41)</p>		
World Economic Forum (2019)	<p>Discusses on how AI algorithms can be optimised for learning (p. 7).</p>	<p>Discusses “Assessment and Evaluation” of AI (p. 11).</p>	

Commonwealth of Australia (2023) ^a	They highlight this under “Teaching and learning: Generative AI tools are used to support and enhance teaching and learning” and specifically in the guiding statements of “Impact: generative AI tools are used in ways that enhance and support teaching, school administration, and student learning” (p. 6).	“Reliability: generative AI tools are tested before they are used and reliably operate in accordance with their intended purpose” (p. 6). “5.3 Monitoring: the impact of generative AI tools on school communities is actively and regularly monitored, and emerging risks and opportunities are identified and managed” (p. 6).	“Critical thinking: generative AI tools are used in ways that support and enhance critical thinking and creativity, rather than restrict human thought and experience” (p. 6). “Learning design: work designed for students, including assessments, clearly outlines how generative AI tools should or should not be used and allows for a clear and unbiased evaluation of student ability” (p. 6).
Code.org et al. (2023)	“Purpose. Leverage AI to help all students achieve educational goals” (p. 9). “Balance. Recognise the benefits of AI while addressing its risks” (p. 9).	“Evaluation. Regularly assess the impacts of AI fit” (p. 9).	
OECD (2023)		An emphasis is placed on maximising and evaluating pedagogical impact with co-creation, with two guidelines: “Co-creation of AI-enabled digital learning tools” (p. 10) “Research and co-creation of evidence through disciplined innovation” (p. 10)	
Jin et al. (2024)	“Enhancing teaching and learning—Universities see GAI [Generative AI] and ChatGPT as tools to increase the effectiveness of teaching methodologies, enhance learning experiences, improve educational outcomes, and foster continuous learning.” (p. 5) “Integrating AI into Educational Practice—This theme emphasizes the importance of making AI a part of the educational curriculum, encouraging its use for	“Continuous evaluation—Universities are planning to test and evaluate the effectiveness of AI tools through new assessment methods and periodic evaluations involving various stakeholders.” (p. 6) “Collaborative discussions—Universities are focusing on fostering collaboration and dialogue among educators, students, and other stakeholders to address the	“Assessment Design and Authentic Assessments—This theme emphasizes designing assessments that evaluate higher-order thinking skills and are resistant to being solved solely by AI, thereby ensuring academic rigor.” (p. 6) “Critical Evaluation [of AI-output] and Human-Centric Perspectives and Competencies—“Universities encourages a critical stance towards AI-

enhancing content creation, facilitating interactive learning, and adapting teaching and assessment strategies to leverage AI for educational benefits.” (p. 5)	challenges and opportunities presented by AI.” (p. 6) “Ongoing monitoring— Universities are committing to continuously monitor AI technologies, adapting their use cases, policies, and guidance as their understanding and the technologies themselves evolve.” (p. 6)	generated content and prioritize human-centric perspectives and skills, including the verification of information for accuracy and encouraging students to critically evaluate AI tool outputs.” (p. 5)
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^a Note that some guiding statements under this principle (1.2 and 1.3) are categorised in the other PATH principles.

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