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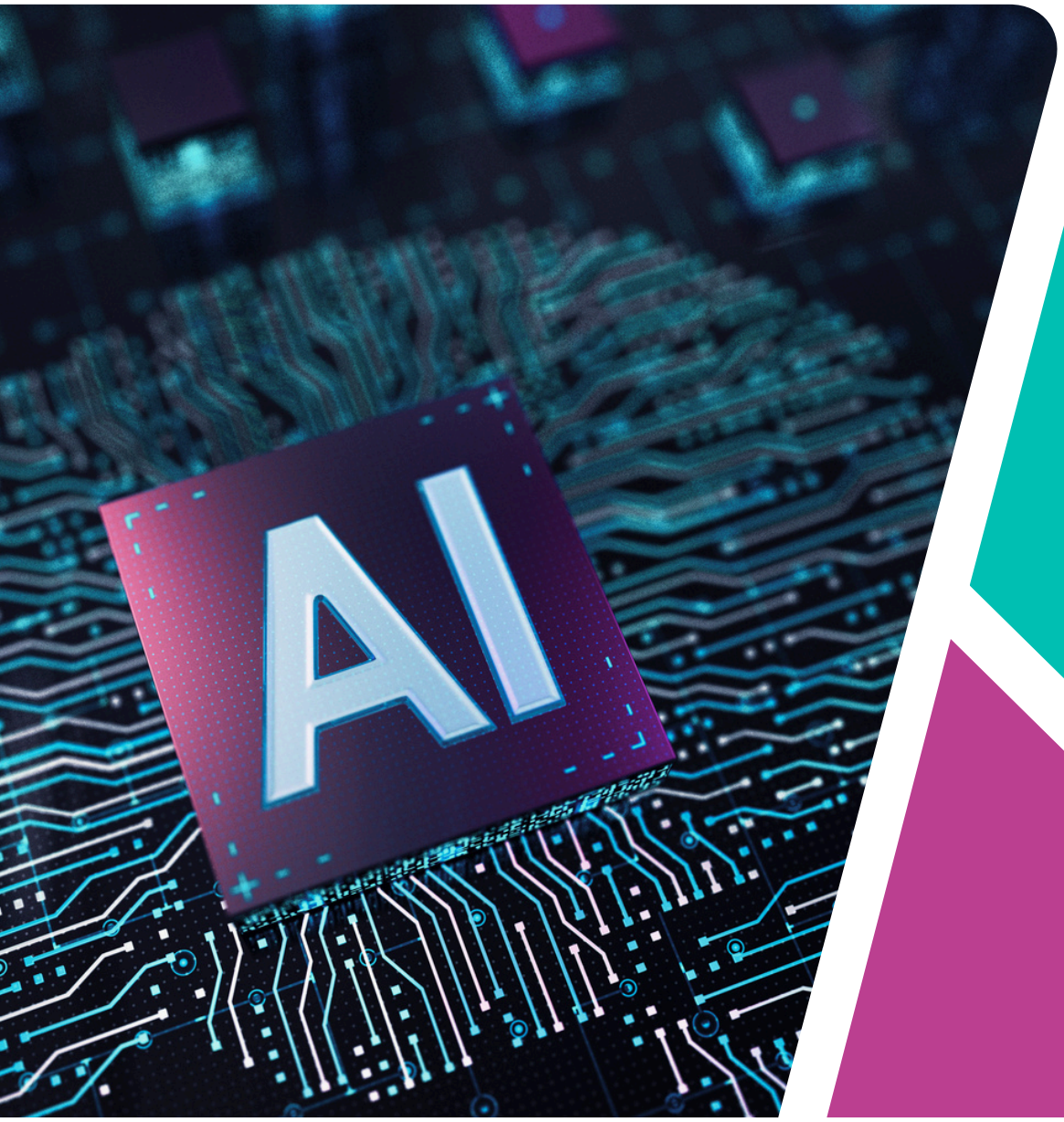
WHY AND HOW TEACHING AI IN SCHOOL

Booklet



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Introduction

Artificial Intelligence is rapidly becoming part of everyday life, influencing how people learn, work, communicate, create, and solve problems. From search engines and translation tools to educational platforms, creative applications, and data-driven decision-making, AI is no longer a distant technological concept. It is a practical reality that affects students, teachers, schools, and society as a whole. For this reason, understanding AI is now becoming an essential part of education.

This booklet aims to provide a clear and accessible introduction to Artificial Intelligence and its role in secondary education. It is designed for educators, school leaders, students, and stakeholders who wish to understand not only what AI is, but also how it can be used responsibly, creatively, and inclusively in learning environments. The goal is not to present AI as a replacement for teachers or human thinking, but as a tool that can support teaching, encourage innovation, personalize learning, and open new opportunities for collaboration and creativity.

The first chapter, “What is AI?”, introduces the basic concepts behind Artificial Intelligence in a simple and understandable way. It explains how AI systems work, where they are used, and why they are important in today’s world. This foundation helps readers approach the following chapters with confidence, even if they have no technical background.

The booklet then explores AI in Secondary Education, focusing on practical applications in schools. It examines how AI can support lesson planning, assessment, feedback, student engagement, and differentiated learning. At the same time, it highlights the need for critical thinking, digital responsibility, and awareness of the limitations and risks of AI tools.

A key part of this discussion is AI Citizenship and STEAM. Students need to become not only users of AI, but also informed and responsible citizens who can question, evaluate, and shape technology. Through STEAM education, AI can be connected with science, technology, engineering, arts, and mathematics, helping students develop creativity, problem-solving skills, ethical awareness, and interdisciplinary thinking.
The chapter on Training Teachers to Teach and Use Artificial Intelligence emphasizes the central role of educators. Teachers need support, training, and confidence in order to integrate AI meaningfully into their classrooms. Professional development should focus both on practical classroom use and on broader issues such as ethics, inclusion, bias, data privacy, and responsible digital practice.

Finally, the booklet considers Inclusion and Future Developments and the importance of ensuring that AI benefits all learners. As AI continues to evolve, education systems must make sure that innovation remains human-centered, inclusive, and accessible. The future of AI in education should be guided by fairness, participation, and the belief that technology should support every student's potential.

Ultimately, this booklet invites readers to see AI as both an opportunity and a responsibility. Rather than treating AI as a daunting standalone subject, our approach integrates AI education directly into the taught subjects. By weaving these concepts into the existing curriculum, schools can implement AI literacy more flexibly and naturally. This ensures students are prepared not only to use AI but to think critically about it, create with it, and contribute responsibly to an AI-shaped future.

I. What is AI?

This section aims to provide a foundation of theoretical and practical knowledge. It seeks to move from an intuitive or media-driven understanding of AI to a scientific and critical understanding, enabling these concepts to be accurately conveyed to students.

1. A historical perspective: from automation to algorithm

Artificial intelligence is often perceived as a sudden technological emergence, driven by the 21st-century data revolution. Yet, it **is part of a long scientific and philosophical tradition** that seeks to mechanically reproduce the mechanisms of human thoughts.

The beginnings and the ancestral quest

Long before computers, the idea of creating artificial entities endowed with reason haunted the human imagination, from the automata of Antiquity (which possessed a specific mechanical system and used various antique techniques such as pneumatics, hydraulics, weight systems, and counterweights) to the calculating machines of Pascal and Leibniz. This quest was not only technical, but philosophical: if the human mind follows logical rules, then a machine capable of applying these rules could, in theory, "think".

Official birth: Dartmouth 1956

The field was officially established as a scientific discipline at the **Dartmouth Conference in 1956**. It was at this time that the term "artificial intelligence" was coined. The pioneers of the era, such as John McCarthy and Marvin Minsky, were driven by immense optimism, convinced that human cognitive abilities could be replicated within a few decades.

The cycles of AI: "Ups and Downs"

The history of AI is not linear. It is marked by periods of enthusiasm (the "AI springs") followed by budgetary and technical disillusionment (the "AI winters").

→ **The 1960s and 70s:** development of the first problem-solving and natural language processing programs.

→ **The 1980s:** the era of "expert systems," which attempted to memorise specialists' knowledge in the form of decision rules. Instead of learning from data (like modern AI), these systems worked by memorising expert knowledge as explicit rules.
For example: If situation A happens, then do action B or IF a patient has symptom X + symptom Y → THEN suspect disease Z"

→ **The 21st century:** the current explosion. This resurgence is explained by the convergence of three factors: a tenfold increase in computing power, the massive availability of data (Big Data), and the improvement of deep learning algorithms (which will be explained later).

2. The basics of architecture and technical terminology

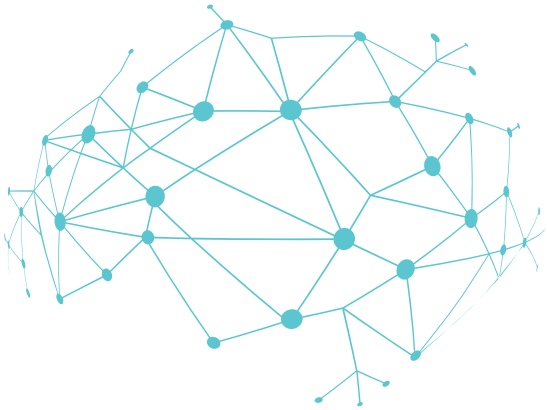
To teach AI, it is essential to distinguish the different layers that make up this field.
AI is not a single technology, but a **set of methods and tools.**

➤ General definition of AI

The definition of AI is still debated today; therefore, there is no universally accepted definition. But broadly speaking, AI is a branch of computer science dedicated to creating systems capable of performing tasks that, if accomplished by a human, would require intelligence: perceiving an image, reasoning about a complex problem, learning from mistakes, or understanding a language.

➤ The hierarchy of learning technologies

To fully understand the driving force behind current tools, one must visualise a structure resembling "Russian dolls".



Machine Learning

This is the heart of the paradigm shift. Unlike traditional computing, where humans write strict rules (if A then B), machine learning allows the machine to discover rules itself from the data. It learns to identify statistical patterns to make predictions.

Deep Learning

A subcategory of machine learning inspired by the structure of biological neural networks. These models are capable of processing unstructured data (such as image pixels or sound waves) by analysing it through numerous layers of artificial neurons.

Generative AI

The most recent and visible form. These models (like ChatGPT or Midjourney) no longer simply classify data; they create new data (text, images, sound) based on the probabilities of the sequence of elements they have learned during their training.

3. Deconstructing myths and technical realities

One of the biggest obstacles to AI literacy is the influence of science fiction, which tends to anthropomorphise machines. It is crucial to bring the debate back to technical reality.

➤ "Anthropomorphic" AI vs. "Tool" AI

Cinema often portrays artificial intelligence as machines endowed with consciousness, free will, and emotions; a concept known as strong AI (or artificial general intelligence) that remains purely theoretical for now. In reality, we are currently in the era of weak (or specialised) AI. These are systems designed to excel at specific tasks rather than possessing true human intelligence; thus, an algorithm can beat the world chess champion, but it is not really able to actually understand jokes or tie shoelaces.

This distinction easily blurs during chat interactions, where AI can give the impression of expressing feelings, showing empathy, or having a personality. However, it is crucial to clarify that this is merely a programmed conversational style, designed to make the exchange flow more smoothly—not evidence of genuine emotions. Ultimately, current AI is a powerful statistical tool, not an autonomous and sentient entity.

➤ The myth of neutrality and infallibility

A common misconception is that AI is mathematically objective. This is false. AI reflects **the biases** inherent in its training data. If the historical data is sexist, racist, or incomplete, the AI will reproduce and amplify these prejudices. It is also not infallible; it produces "hallucinations" (erroneous results presented with confidence) because it doesn't understand the underlying meaning of what it generates.

➤ The problem of "black box AI"

Like "white-box AI" (explainable AI or XAI), which facilitates the auditing, correction, and optimisation of models, black-box AI is the complete opposite. Some developers intentionally create black-box models, keeping the source code and decision-making process secret. For them, this is a form of intellectual property protection. Some complex deep learning models are so vast that it becomes difficult for the developers themselves to explain precisely why the AI made a particular decision. This lack of transparency poses major ethical challenges, particularly in the justice and healthcare sectors.

➤ The absence of intentionality

AI doesn't "want" anything. It has neither self-awareness nor an understanding of the real world. It processes digital tokens and probabilities. Tokens are the basic units that allow AI to break down long texts into more manageable chunks. When it generates a poem, it doesn't feel emotion; it statistically calculates which word is most likely to follow the previous one in a given context.

4. AI in the real world: applications and challenges

To make AI tangible for students, we need to explore how it already influences their daily lives and the structures of society.

Applications in everyday life

→ **Content recommendation**: Social media and streaming platform algorithms analyse thousands of data points to predict what will capture our attention. This influences our tastes, opinions, and consumption.

→ **Natural language processing**: Machine translation (DeepL, Google Translate) has achieved impressive fluency thanks to AI, transforming international communication. Voice assistants also use AI to translate speech into text, and then into commands.

Professional and societal applications

→ **Health and medicine**: AI excels in analysing medical images, enabling the detection of tumours or pathologies with a precision sometimes exceeding that of the human eye.

→ **Environment and climate**: It is used to model complex climate systems, optimise renewable energy production, and monitor biodiversity through the analysis of sound or satellite images.

→ **Industry and logistics**: Supply chain optimisation and predictive machine maintenance.

AI as an educational partner

In various learning contexts, AI can act as a development partner. Whether acquiring technical, analytical, or other skills, it can offer personalised support, adapted to each learner's pace. For individuals with specific needs or disabilities, it can play the role of a personal assistant, reducing performance anxiety and making knowledge more accessible.

For example, in language learning, applications or voice chatbots let you simulate professional conversations (e.g., a job interview in English, negotiating a contract) with real-time corrections and without human judgment.

5. Governance: Taming the Unknown

Given the rapid pace of technological deployments, the issue of control has become central. Regulatory frameworks are essential to ensure that AI remains in the service of the public interest.

Regulation and ethics

AI governance aims to establish rules to ensure the security, privacy protection, and legal accountability of systems. It is about ensuring that technological development does not come at the expense of fundamental human rights. The European AI Bureau and national market surveillance authorities are responsible for implementing, monitoring, and enforcing AI legislation. International organisations, such as UNESCO, are working on competency frameworks so that teachers and students can use these tools responsibly and critically.

Towards human-centred AI

The challenge is not only technical but also political: how to guide AI so that it promotes social inclusion and justice? AI literacy is the first step in this governance; it allows citizens to understand the systems around them in order to better challenge them or use them wisely.

Artificial intelligence can therefore be considered a robust scientific field, nearly 70 years old, that is transforming our relationship to information and knowledge. For teachers, understanding its mechanisms (statistical rather than cognitive), its limitations (bias and lack of understanding), and its opportunities (personalised learning) is essential to preparing students to become informed citizens in a future shaped by these algorithms.

Now that we have clarified the technical foundations of artificial intelligence and its omnipresence in our daily lives, it is appropriate to explore how this technological reality is specifically integrated into the framework of secondary education to meet the new learning needs of students.

II. AI in Secondary Education

1. Why is it important to teach AI?

The rapid spread of artificial intelligence–based technologies in everyday life has highlighted their potential to rank among the most socially and economically disruptive innovations since the advent of the Internet. Schools have not remained immune to this process. AI is no longer merely one technology among others; it is increasingly becoming a cognitive infrastructure that shapes the ways in which students search for information, write, summarise, translate, make decisions, and organise their study. The OECD emphasises that generative AI is already widely accessible and is often used beyond institutional oversight precisely because of its intuitive and versatile nature: this makes an educational response, and not merely a regulatory one, urgent.

Such an educational response is fully consistent with the historic aims of schooling: to develop critical thinking, digital literacy, and the ability to construct arguments grounded in evidence rather than in fluent but unsupported prose. When the "displacement of work" onto generative AI improves performance (for example, by producing a more polished final essay) without generating genuine learning, there is a risk that school becomes a place oriented toward output rather than understanding. The OECD warns—and teachers are already well aware of this—that if the use of generative AI is not guided by clear pedagogical principles, the outsourcing of tasks may increase performance without producing meaningful learning gains.

AI is not, in fact, a neutral tool. Students need to develop the ability to reflect critically on its ethical implications, to understand its limitations, and to consider its potential socio-economic impact, including in relation to their future educational and professional choices. The point is not to vilify this technology, but to remain aware of its limits and to accompany its adoption in ways that protect rights and reduce potential negative effects: privacy, fairness, non-discrimination, transparency, and safety.

Moreover, regulation (EU) 2024/1689 (Artificial Intelligence Act), classifies certain systems used in education as "high-risk" (for example, systems used for access and admission, assignments, assessment, and monitoring during tests), because they may affect life trajectories and amplify discrimination.

It also defines "AI literacy"[1] and introduces an obligation (Article 4) for providers and deployers to take measures to ensure a sufficient level of AI literacy among those who operate and use such systems. To this end, it is necessary to make visible what ease of use tends to conceal, namely the need to look inside the AI "black box." Given the opacity of the technology, students—and the same holds true for teachers and the school staff more broadly—must understand how models are trained and tested in order to assess their accuracy and reliability.

In short, AI in schools is not only a matter of pedagogy; it is also a matter of institutional responsibility.

2. Why secondary education?

Although digital literacy should ideally begin in primary school, the secondary level constitutes a strategic point of intervention, since it coincides with three decisive changes in students' school lives.

Cognitive maturity. The first is the development of executive functions (planning, attentional control, management of goals and strategies), which continues from childhood through adolescence and is significantly associated with academic achievement. This is the stage at which students are able to sustain longer and more complex tasks (research projects, extended assignments, argumentative essays) while still operating within an educational context that can shape habits and criteria of quality.

Epistemic development. In secondary school, questions such as "How do I know?", "What evidence supports this claim?", and "How reliable is this source?" become central. Here AI poses a direct challenge: generated texts may appear authoritative, yet their epistemic quality (sources, verifiability, consistency with external data) may be weak or entirely absent if students lack the tools to assess them. OECD PISA evidence reported in PISA in Focus (2021) shows that the ability to evaluate credibility and distinguish fact from opinion is far from guaranteed and varies considerably, including along socio-economic lines: explicitly teaching strategies of critical reading and credibility assessment therefore becomes an objective of equity as well as quality.

[1] "AI literacy means skills, knowledge and understanding that allow providers, deployers and affected persons, taking into account their respective rights and obligations in the context of this Regulation, to make an informed deployment of AI systems, as well as to gain awareness about the opportunities and risks of AI and possible harm it can cause". Regulation (EU) 2024/1689 (AI Act), art.3, comma 56.

Autonomy. In secondary school, the amount of work completed outside the classroom increases (independent study, homework, test preparation), and generative AI can easily be adopted in these contexts without supervision. Available evidence shows that the use of generative AI rises sharply during the secondary years, when students use it to simplify tasks, generate ideas, or translate. Without guidance, this may lead to a form of "metacognitive laziness," in which AI's rapid answers replace the mental effort required for deep learning. Needless to say, this process affects not only the acquisition of students' competencies, but also the future capacities they will bring into working life.

3. Skills and learning objectives

An effective way of translating general and often vague objectives—such as "AI awareness"—into curricular and assessment practices is to organise competencies into four fundamental areas, in line with the main international frameworks and with the European regulatory context.

➤ Basic understanding of AI (what it is / what it is not).

The aim is to help students understand that artificial intelligence does not coincide with a form of "human intelligence," but is better understood as a set of techniques capable of recognising patterns, generating outputs, and operating on the basis of data. From this perspective, it is essential that students become aware of the differences among the main categories of systems—such as classification, recommendation, and generation—as well as of the role played by training data. The UNESCO framework for students proposes, in this regard, dimensions that include both technical and applied aspects and, above all, a progression articulated through the levels Understand, Apply, and Create, which is useful for defining learning outcomes that are realistic and age-appropriate.

➤ Critical verification and epistemic quality (reliability, evidence, bias).

A second fundamental objective is to develop in students the ability to treat AI output as a text to be critically examined, rather than as an intrinsically authoritative source. This area includes such competencies as fact-checking, comparison with independent sources, evaluation of source authority, recognition of informational omissions, and analysis of bias and stereotypes. These are, after all, competencies already central to the literacy pathways promoted by schools, which today must also be extended to generative AI systems.

➤ **Ethics and rights (privacy, fairness, non-discrimination, safety).**

A further objective is to enable students to recognise situations in which the use of AI may negatively affect fundamental rights, for example in relation to personal data protection, profiling, or the production of discrimination. Students should also[1] be able to identify the main countermeasures that can be adopted, such as data minimisation, human oversight, the possibility of contestation, and the requirement of transparency. The AI Act (2024) explicitly emphasises both the need to promote AI literacy and the particular sensitivity of the educational sector, insofar as decisions and assessments mediated by automated systems may significantly affect students' life trajectories and contribute to the reproduction of inequalities.

➤ **Responsible use in the school context (integrity, transparency, documentation).**

Final area concerns the definition and assessment of fair and transparent study practices. This does not simply mean deciding whether to ban or permit the use of AI. Rather, it means teaching students to understand in which cases its use is acceptable, for example for brainstorming, revision, or question simulation. It also means clarifying which forms of use should be declared, how the process should be documented, and how supportive use can be distinguished from an improper substitution of one's own work. In this respect, the evidence collected by the OECD is particularly useful: many teachers recognise the educational potential of these tools, while at the same time expressing concern about risks to academic integrity in the absence of a clear regulatory framework. A guided and pedagogically structured use of AI therefore appears essential in order to reduce unethical uses and forms of excessive dependence on the tool.

4. International examples of good practice

The integration of artificial intelligence into school systems is currently advancing at different speeds and through different modalities. International comparison nevertheless reveals a number of recurring tendencies: first, the inclusion of AI as an explicit curricular content area; second, the strengthening of teacher training and infrastructure; and third, the construction of ethical and pedagogical frameworks aimed at preventing the adoption of AI from being reduced to a merely instrumental or unregulated use of generative technologies. The cases discussed below are not all identical in scale or in degree of institutionalisation, but they are significant because they illustrate different models of educational integration of AI.

The United Arab Emirates constitute one of the most advanced cases of systemic integration of AI into the school pathway. The CCDI curriculum (Computing, Creative Design and Innovation) had already been identified by UNESCO as an example of an interdisciplinary approach capable of connecting computing, design, engineering, sustainability, and visual communication within a project-based learning logic. More recently, the country has further strengthened this trajectory by introducing, from the 2025–2026 school year onward, AI instruction across public schools throughout the entire K–12 [1] span, with attention to fundamental concepts, data and algorithms, software use, ethical awareness, real-world applications, and design. What makes this case especially interesting is not simply the presence of the subject itself, but the fact that it is conceived as part of a broader strategy of technological literacy and educational innovation that is not confined to the technical dimension.

A different approach has been adopted by South Korea, where AI is closely linked to the personalisation of learning and to the digital reform of the school system. The Korean Ministry of Education has planned the introduction of AI digital textbooks and teaching models oriented toward collaboration between teachers and AI-based support tools; as early as 2023, the reform plan explicitly referred to personalised learning coordinated by teachers and "AI assistant teachers." In 2024, the Ministry then confirmed the adoption of 76 such digital textbooks, intended from 2025 for certain grades of primary and secondary school in subjects such as English, mathematics, and coding, accompanied by investments in teacher training and infrastructure. At the regulatory level, between 2022 and 2024, South Korea had already defined principles for the safe use of AI in education.

Across the Atlantic, the United States still do not have a centralised national curriculum, but they have exercised considerable international influence through the definition of widely adopted frameworks and resources. In particular, the AI4K12 initiative has organised AI education around the "Five Big Ideas" and age-band progression charts, with the aim of offering curriculum developers and school systems a common structure of concepts, skills, and expected outcomes. In parallel, MIT, through the RAISE programme, has developed specific curricula for middle school that integrate AI and ethics by means of laboratory activities and design oriented toward real-world problems.

[1] K–12 is a term used mainly in the United States to refer to the full span of primary and secondary education, from kindergarten through 12th grade. It generally includes students aged about 5 to 18.

Finally, within the fragmented European educational landscape, the Estonian model is particularly interesting because it combines pedagogical caution with advanced experimentation. The AI Leap programme was conceived as a national initiative to integrate AI tools and competencies into the education system, with an initial involvement of students in grades 10–11 and a training plan for thousands of teachers.[1] Perhaps the most relevant feature is that the initiative does not merely provide access to commercial chatbots, but seeks to develop learning applications configured not to supply answers directly, but rather to guide students in planning their work, searching for solutions, and formulating conclusions independently. In this sense, Estonia represents an example of "controlled" integration of AI, in which the stated aim is not simply to increase the use of technology, but to make it pedagogically meaningful and compatible with students' cognitive autonomy.

Taken together, these international cases illustrate four different models of AI integration in education: a systemic, centralised, and early integration model (United Arab Emirates); a personalised learning model closely tied to digital reform (South Korea); a framework-based model centred on conceptual guidance and curriculum support (United States); and a cautious, pedagogically oriented model designed to preserve students' cognitive autonomy (Estonia).

[1] A brief comparison with the Lithuanian case could also be useful. In Lithuania, the integration of AI is currently taking place mainly through broader digital competence policies, informatics curricula, and individual initiatives, rather than through a systematic national AI curriculum.

III. AI for digital citizenship and STEAM education

1. AI for digital citizenship

Artificial intelligence is already part of everyday digital life. It shapes what people see online through recommendations, search results, captions, chatbots, and suggested content, often without users even noticing. Because of this, digital citizenship today includes understanding how AI influences online experiences, information, and decisions.

This matters because AI can do more than organize content. It can also shape beliefs, emotions, and actions. A student might trust a realistic video, respond to a convincing message, or rely on AI-generated content without checking whether it is accurate. As AI-generated text, images, audio, and video become more common, it becomes easier for false or misleading content to seem believable.

Hence, to be a responsible digital citizen today, students should practice the following habits:

1. **Pause Before Reacting:** Take a moment to process emotional or sensational content before liking, sharing, or commenting.
2. **Verify Accuracy (The "True" vs. "Realistic" Test):** Recognize that while AI-generated content is a "real" digital file, it may not represent a true event. Always cross-reference with reliable sources.
3. **Think Critically:** Question the intent behind a piece of media. Why was it created, and who does it benefit?
4. **Protect Your Privacy:** Be mindful of the data you share with AI tools and platforms, understanding how your digital footprint is tracked.
5. **Assess AI Impact:** Consider how AI-generated images or text might affect others—such as spreading misinformation or creating "deepfakes" that harm reputations.
6. **Practice Digital Empathy:** Remember that behind every screen is a person; maintain kindness even when interacting in automated or anonymous spaces.

Three key challenges: truth, privacy, and fairness

One of the biggest challenges created by AI is **the problem of truth**. AI makes it easy to produce large amounts of text, images, audio, and video very quickly, which allows false or misleading content to spread faster than ever. A fake quote, edited image, or deepfake video can look convincing, especially when shared in an emotional or urgent context. As a result, **misinformation** becomes harder to spot, and critical thinking becomes even more important.

Deepfakes show this clearly, e.g. “This is not Morgan Freeman – A Deepfake Singularity“ video [1].

AI can create videos or audio that make it appear as if someone said or did something that never actually happened. Even when this content is later exposed as false, the damage to a person’s reputation or to public trust may already have taken place. For students, this means that online content can no longer be accepted passively. Seeing or hearing something is not enough to believe it; they need to develop a habit of questioning, checking the source, and comparing information across reliable sources before sharing or accepting it as true.

A second major challenge is **privacy**. Many AI tools collect or store user input, so sharing personal or sensitive information can create real risks. This may include names, passwords, private documents, photos, or conversations. Responsible digital citizens understand that convenience should not come at the cost of safety, and they must also respect the privacy of others by not sharing someone else’s image, voice, or words without permission.

The third challenge is **fairness.** Because AI systems learn from data, they can reflect or reinforce stereotypes and bias. This can lead to unfair or harmful results, especially when certain groups are misrepresented or excluded. For this reason, responsible users should not assume AI is neutral. They should ask who might be harmed, who is missing, and whether the output treats people fairly.

[1] https://www.youtube.com/watch?v=oxXpB9pSETo&list=PLxgMOEESA8vgmkkQM_jsD94AZfH9Ve2Vd&index=4

➤ Responsible use: a practical toolkit

Because AI is now part of everyday online life, responsible digital citizenship means using it with judgment, honesty, and respect for others. The goal is not to avoid AI, but to make thoughtful choices when reading, sharing, or creating content.
Before sharing online content, ask yourself:

→ **Did I pause before reacting?** Good digital citizens do not spread content impulsively.
→ **Did I check the source?** Responsible online participation means caring about truth, accuracy, and evidence.
→ **Did I look for supporting evidence?** One post, video, or image is not enough. It should be compared with reliable sources.
→ **Did I consider the intent?** Ask why the content was posted and who might benefit from people believing or sharing it.
→ **Did I think about the impact?** Before sharing, consider whether the content could harm someone's reputation, safety, privacy, or dignity.

Digital citizenship also includes how people use AI themselves. If AI helped with writing, summarizing, translating, or creating visuals, honesty matters. Responsible citizens do not use AI to mislead others, impersonate people, spread harmful content, or avoid accountability. They also respect consent, especially when another person's image, voice, or words are involved.

In this way, digital citizenship in the age of AI means more than just using technology well. It means participating in digital spaces in a truthful, respectful, and responsible way.

➤ A simple classroom activity can help students practice digital citizenship in action

Students examine a suspicious post, image, quote, or AI-generated claim and look for red flags such as missing sources, emotional language, or weak evidence. They then verify it using two reliable sources and decide whether it is trustworthy, misleading, false, or unclear.

A second option is to review an AI-generated response for accuracy, bias, and privacy concerns. This helps students practice checking information, questioning outputs, and making responsible decisions online.

2. AI for STEAM Education

AI is closely connected to STEAM education because it brings together problem-solving, creativity, experimentation, and critical thinking. In science, technology, engineering, arts, and mathematics, students are asked to explore ideas, test solutions, and explain their thinking. AI can support these processes by helping them ask questions, compare options, and develop new ideas.

At the same time, the connection also works in the opposite direction: STEAM subjects can become a natural entry point for understanding AI. In mathematics, studying algorithms can help students understand how AI follows steps, detects patterns, and makes decisions. In biology, learning about neurons can open a discussion about artificial neural networks and how they are inspired by the human brain. In the arts, exploring how an image, painting, or design is created can lead to questions about how AI generates visual content. In this way, STEAM does not only benefit from AI; it also gives students the tools and examples they need to understand how AI works.

➤ What AI can do in STEAM classrooms

AI can support STEAM classrooms in practical and flexible ways. It can help students generate questions, summarize information, explain concepts, visualize ideas, and explore different approaches to a problem. This is especially useful in STEAM learning, where students often move through cycles of testing, revising, and improving their work. In science, AI can help identify patterns in data and support interpretation of results. In engineering, it can suggest design alternatives and help students think through constraints or improvements. In mathematics, it can present more than one way to solve a problem or explain a concept in simpler terms. In the arts, it can inspire new styles, drafts, and creative experiments.

The educational goal, however, is not to let AI do the task for the student. The goal is to use AI in ways that strengthen understanding, reasoning, and active participation in the learning process.

➤ AI as a tool for inquiry and data thinking

One of the strongest uses of AI in STEAM education is in inquiry-based learning. Students can use AI to refine research questions, suggest hypotheses, organize investigations, and think through possible variables. This can help them move from curiosity to more focused and structured exploration.

AI can also support data thinking by helping students notice trends, compare results, and present findings more clearly. For example, it may help interpret graphs, explain patterns, or suggest ways to organise measurements. These supports can make data analysis more accessible and meaningful, especially for younger learners.

However, the teacher's guidance is essential in turning these AI interactions into lasting learning competencies. Educators help students interpret and contextualise AI feedback within the specific framework of their experiment, rather than accepting it as a general answer. They can also explicitly connect AI-generated insights to scientific reasoning, showing how patterns, variables, and evidence lead to stronger conclusions.

At the same time, students must learn to verify AI-generated interpretations. They need to compare suggestions with real evidence, reliable sources, and their own observations. Teachers can strengthen this process by asking students to explain why they accepted, adapted, or rejected an AI suggestion based on empirical evidence. Used in this way, AI becomes a scaffold for inquiry and critical decision-making, rather than a shortcut around scientific thinking.

AI in design, engineering, and making

In design and engineering projects, AI can help students move more quickly from ideas to prototypes. It can generate possible solutions, suggest materials or structures, help with basic coding, and support troubleshooting during the building process. This makes it useful in maker-centered learning, where students test, revise, and improve their designs.

AI is especially valuable because it encourages iteration. Instead of settling for one idea, students can explore alternatives, compare strengths and weaknesses, and improve their designs step by step. This supports a more authentic engineering mindset based on problem-solving and revision.

At the same time, the important learning still comes from students' decisions. They must judge whether an AI suggestion is realistic, safe, functional, and suitable for the task. The tool can support the process, but the learner remains responsible for the final design.

AI and creativity in the arts

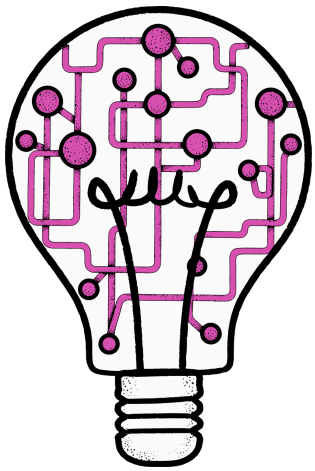
AI can also enrich creativity in arts education by helping students experiment with form, style, and expression. It can support activities such as generating visual variations, drafting storyboards, suggesting musical ideas, or exploring how changes in tone, color, or perspective affect meaning. This can make creative work feel more open and exploratory.

Used thoughtfully, AI helps students see creativity as a process of trying, revising, and shaping ideas. It can provide inspiration, but it does not replace personal voice, intention, or interpretation. Students still remain the creators who decide what their work means[1] and how it should be developed.
This also creates opportunities for important discussions about originality, authorship, and ethics. In this sense, AI in the arts is not only a creative tool, but also a starting point for reflection on how creative work is made and valued.

Conclusion

AI has an important place in education both in digital citizenship and in STEAM education. In digital citizenship, it helps students think critically about information, bias, privacy, ethics, and responsible online behavior. In STEAM, it supports inquiry, problem-solving, design, data analysis, and creativity.

Together, these two areas show that AI should be seen both as a learning tool and as a topic that students need to understand critically. The goal is not to replace human thinking, but to help learners use technology in informed, creative, and responsible ways.



IV. Training Teachers to Teach and Use Artificial Intelligence

Introduction

The integration of artificial intelligence (AI) in education is transforming both teaching practices and the professional role of teachers. Educators are no longer expected only to transmit knowledge; they are increasingly becoming designers of learning environments who guide students in critically and responsibly using digital technologies. As noted by OECD, teachers are expected to create learning experiences that effectively integrate technology while fostering student engagement and collaboration (OECD, 2019).

International discussions on AI in education consistently emphasize that technology should support, rather than replace, teachers. AI tools can assist with differentiation, assessment, and personalized learning, but professional judgment, ethical responsibility, and decision-making must remain in the hands of educators.

At the same time, the integration of AI presents important challenges. Teachers need new competencies, schools require clear strategies, and education systems must rethink approaches to assessment, classroom management, and digital literacy. Teacher preparation therefore needs to combine technological understanding with pedagogical and ethical reflection.

In practice, schools that successfully integrate AI usually focus not only on tools, but also on collaboration and professional learning. For example, in one lower secondary school, teachers participated in regular workshops where they tested AI tools together, discussed ethical concerns, and redesigned classroom activities. Teachers reported that collaborative experimentation increased their confidence and helped them identify meaningful uses of AI rather than using it simply because it was new technology.

Similarly, many educators are beginning to adapt homework and assessment practices in response to AI. Instead of evaluating only final products, teachers increasingly focus on the learning process itself, asking students to explain how they used AI, reflect on their decisions, and critically evaluate generated content. This shift encourages greater student responsibility and critical thinking.

Building on international principles, practical experiences, and empirical observations, this chapter presents a teacher preparation strategy for AI integration that encompasses technological, pedagogical, and ethical dimensions.

1. Training Teachers

Teacher training encompasses technological, pedagogical, and ethical dimensions. Teachers must understand the principles of AI, be able to integrate them into lessons and assessment processes, while maintaining critical reflection. Successful integration of digital technologies requires not only technical skills, but also pedagogical understanding and ethical awareness, meaning that teachers need to adapt both learning and assessment practices to new tools (OECD, 2020).

The institutional context—school policy and leadership support—is also essential. Without structural support, AI integration often remains fragmented and ineffective. Schools therefore need clear digital strategies, leadership guidance, and opportunities for collaborative professional learning.

AI literacy—the ability to critically evaluate AI technologies, understand their capabilities and limitations, and assess algorithmic bias and data reliability—is another essential competency. Teachers need to understand not only how AI tools function, but also how to apply them responsibly in educational contexts.

Educational transformation involves a shift from knowledge transfer to learning design, differentiated assessment, and the development of students' critical thinking skills. Integrating AI into education therefore requires teachers to rethink teaching methods, homework practices, and assessment approaches in ways that promote active learning and reflection.

A systemic approach emphasizes that AI integration is not merely the use of technology; it is a redesign of the teaching and learning process in which teacher professionalism, reflection, and ethical responsibility remain central.

For example, a teacher may use AI-generated content to differentiate tasks according to students' abilities, while still evaluating the quality, relevance, and appropriateness of the material. AI can also support formative assessment by generating immediate feedback or identifying learning gaps, but responsibility for interpretation, grading, and final decisions must remain with the educator.

2. Required Knowledge and Skills for AI Educators

Effective teacher training should address technological, pedagogical, and ethical aspects of AI. Educators need a basic understanding of how AI works, the ability to incorporate AI tools into teaching and assessment, and the skills to evaluate their use critically and responsibly. Integrating digital technologies into education involves more than developing technical competence. It also requires pedagogical knowledge and ethical awareness so that teaching methods and assessment practices can be adapted to the opportunities and challenges presented by AI (OECD, 2020).

The purpose of AI training is not to prepare teachers as programmers or AI experts. Instead, it is to equip them with the knowledge, confidence, and practical skills to use AI effectively and to support students in navigating a society where AI plays an increasingly important role in learning, communication, and everyday life.

The successful adoption of AI in education also depends on the institutional environment, including school policies and leadership commitment. When schools do not provide clear direction and organizational support, AI initiatives are often inconsistent and have limited impact. For this reason, schools should establish coherent digital strategies, encourage supportive leadership, and create opportunities for teachers to learn from one another through collaboration, experimentation, and the exchange of classroom experiences.

Developing AI literacy is equally important for educators. Teachers should understand both the capabilities and the limitations of AI technologies and know how to use them responsibly in teaching and learning. This involves evaluating AI-generated content critically, recognizing possible bias, making informed decisions about when AI is appropriate, and ensuring that sensitive or personally identifiable student information is never shared with AI systems. Safeguarding students' privacy and data protection should remain a fundamental responsibility.

Educational transformation also requires the development of new pedagogical competencies. Teachers need to know when AI genuinely adds educational value and when its use may be unnecessary or counterproductive. This often involves rethinking homework and assessment practices. Instead of evaluating only the final product, teachers increasingly need to focus on the learning process itself, including students' reasoning, reflection, creativity, and ability to critically evaluate AI-generated outputs.

AI can also be used as an assistive tool to support inclusion and differentiated instruction. For example, teachers may use AI tools to simplify texts, generate alternative explanations, or adapt materials for students with special educational needs. At the same time, educators must ensure that students continue developing independent thinking and problem-solving skills.

Not required

- High-level programming knowledge.
- Ability to create DI models.

Applying the TPACK (Technological Pedagogical Content Knowledge) model in the context of DI allows for the integration of content, pedagogy, and technology knowledge while maintaining methodological control. Mishra & Koehler (2006, p. 1020) state:

"Effective teaching with technology requires knowledge of content, pedagogy, and technology, and how these intersect in practice."

3. Overcoming Barriers: Resources, Self-Confidence, and Misconceptions

Technological barriers are often less significant than methodological and psychological challenges. One of the key factors influencing successful AI integration is teachers' confidence in using digital technologies. This confidence is shaped not only by access to tools, but also by school support, training opportunities, and collegial collaboration (OECD, 2020).

Teachers who participate in mentoring, peer-learning activities, and reflective professional communities are generally more willing to experiment with new technologies and integrate them into daily teaching practice. Supportive school environments therefore play a crucial role in reducing uncertainty and encouraging innovation.

Confidence in using technology may also vary depending on teachers' previous experiences with digital tools and professional backgrounds. In some cases, younger teachers may feel more comfortable experimenting with new technologies, while more experienced teachers often rely on stronger pedagogical expertise and classroom management skills. However, these differences should not be viewed as limitations, but rather as complementary strengths that can support collaborative learning among colleagues.

Common myths

1. AI will replace teachers.
2. AI will reduce pedagogical responsibility.
3. AI will fully automate assessment.

Several misconceptions continue to shape discussions about AI in schools. Some teachers fear that AI will eventually replace educators, reduce pedagogical responsibility, or fully automate assessment and decision-making processes. Others worry that increasing use of AI may weaken students' critical thinking or reduce meaningful teacher–student interaction.

However, these assumptions can be misleading. International organizations such as UNESCO emphasize that AI should be understood as a support tool rather than a replacement for teachers. The role of AI is to assist educators in areas such as personalization, feedback, and administrative tasks, while professional judgment, ethical responsibility, and educational decision-making remain in the hands of teachers.

For AI to be implemented responsibly, schools need clear ethical guidelines, teacher training, and institutional support. Teachers must understand both the possibilities and the limitations of AI, including issues related to data privacy, bias, transparency, and academic integrity. Open discussions about these challenges can help reduce fear and build a more balanced and realistic understanding of AI in education.

Ultimately, successful integration depends not on replacing teachers with technology, but on strengthening teachers' capacity to use AI critically, responsibly, and pedagogically.

4. Examples of training and professional development

Effective professional development for AI integration is based on practical experience, collaboration, and continuous reflection. Teachers learn most effectively when they can apply AI tools directly in their own teaching context, experiment with lesson design, and discuss results with colleagues (OECD, 2020).

Collaborative learning communities, peer mentoring, and reflective discussions help teachers build both confidence and pedagogical competence. Sharing successes, challenges, and ethical concerns encourages more meaningful and sustainable AI integration in schools.

In contrast, one-off workshops are often insufficient because they rarely provide enough time for practical application or long-term skill development. Professional development is therefore most effective when it is continuous, practice-oriented, and embedded in everyday teaching practice.

Structural principles of continuous learning

1. **Consistency** – regular reflection sessions and training cycles.
2. **Inclusion** – active participation, peer-to-peer discussions, and the creation of shared AI scenarios.
3. **Reflection** – analysis of successes and failures, and justification of pedagogical decisions.

Practical example: A group of teachers integrates AI into math lessons using algorithm-generated tasks. After each week, they reflect on which tasks were appropriate and which were not. This practice not only boosts teachers' confidence but also helps identify the potential limitations of AI tools. UNESCO (2021, p. 16) emphasizes:

> Ongoing professional learning, supported by collaborative reflection, is essential for educators to use AI tools effectively while maintaining ethical standards and professional judgment.

5. General practices in schools and case studies

The effective integration of AI in schools depends on several important institutional decisions. First, schools need clear AI policies and ethical guidelines. Teachers and students should understand how AI tools can be used responsibly, what data can be shared, and how privacy and academic integrity will be protected. Clear rules help reduce uncertainty
and support more consistent use of AI across the school.

Second, assessment practices need to adapt to the growing use of AI. Both formative and summative assessment should focus not only on final products, but also on students' learning processes, critical thinking, and responsible use of AI tools. Transparency and fairness remain essential.

Third, schools must clearly define responsibilities related to AI use. Although AI can assist with feedback, content generation, or lesson preparation, responsibility for educational decisions, assessment, and ethical practice must remain with teachers.

Successful implementation therefore depends not only on technology itself, but also on institutional support, clear guidelines, continuous professional development, and a school culture that promotes responsible and ethical use of AI.

Case analysis

A middle school mathematics department introduced AI-generated tasks as part of an effort to provide more personalized learning opportunities for students with different ability levels. Before implementing the approach in classrooms, teachers participated in practical training sessions focused on the use of AI tools, ethical considerations, and assessment strategies. They also met regularly in collegial discussion groups where they reflected on classroom experiences, shared challenges, and evaluated the effectiveness of the activities.

Over time, teachers reported feeling more confident in using AI tools and more comfortable adapting them to their own teaching styles. Students became more engaged, particularly when tasks were differentiated according to their learning needs and supported more immediate feedback. Teachers also noted that AI-assisted preparation reduced some routine workload, allowing them to focus more on student support and lesson design.

This example highlights that successful AI integration depends not only on access to technology, but also on collaboration, reflection, and institutional support. Schools are more likely to achieve sustainable results when teachers receive continuous training, work within clear ethical guidelines, and have opportunities to learn from one another.

Conclusions

AI integration is a pedagogical, not a technological, challenge.

Key conclusions:

1. AI complements rather than replaces the teacher, and successful integration requires clear ethical guidelines and structural support (UNESCO, 2021, p. 15).
2. Teachers must become designers of learning environments, integrating AI into lessons, assessment, and engagement (OECD, 2019, p. 14).
3. Reflection, collegial collaboration, and continuous professional development ensure sustainable growth in competencies and confidence in the use of AI (European Commission, 2017, p. 16; Redecker, 2017, p. 14).

It is crucial to note that the integration of AI in education is a **pedagogical transformation** in which technology is a tool, not an end in itself. Future research should examine the impact of AI tools on **teachers' professional identity, student engagement, and assessment practices.**

V. Inclusion and Policy Considerations for Teaching AI in Schools

How can AI be taught in ways that reach and empower all students? Without careful planning, AI education risks deepening existing inequalities, excluding students with disabilities, or discouraging underrepresented groups. For this reason, inclusion must shape every decision made: which tools are used, how concepts are explained, which examples are chosen, etc.

1. Access to Technology and Digital Equity

Before a single AI concept can be taught, all students must be able to participate fully. In Europe, most (though not all) students have access to internet and digital technologies at home (Eurostat, 2025). However, access does not necessarily mean equal connectivity and equal digital literacy. Internet use may be limited, low-quality, or unsuitable for learning, as it is for example the case when students rely only on a smartphone. Therefore, **schools remain a crucial space for equitable digital participation**, making classroom design choices all the more consequential.

In practice, for **the teacher**, this means not assuming the level of previous digital knowledge of the students. A brief informal survey at the beginning of a unit can help adjust the lessons to the students' starting points. Moreover, activities should not depend entirely on internet access. Mixing digital and hands-on activities helps overcome the "access gap" (Edward Dieterle, 2022) and make sure students with different digital literacy can all participate.

For **school leaders**, evaluating digital infrastructure with equity in mind is essential: not just whether the devices exist, but also whether they are fairly distributed and whether students who need additional support can access it.
Practical measures can include keeping school spaces with good Wi-Fi open beyond official hours, avoiding the "bring your own device" policies or creating device-loan libraries (potentially built thanks to the support of the municipality, region or technology companies). Additional resources can also be secured through collaborations with local media libraries, community initiatives, universities...

Remember

When certain groups of learners are absent from digital platforms, they are also absent from the data that trains AI systems. Limited participation leads to less representative AI, which shows why inclusion matters beyond the classroom itself.

2. Including All Types of Learners

➤ The UDL principles

Inclusive AI teaching requires learning environments where all students can engage with the content of the lesson, regardless of their background or ability. One effective framework for this is the Universal Design for Learning (UDL), which emphasises three core principles:

1 Engagement (the why of learning)

The idea is to **spark interest, to keep motivation high, and help learners focus**. This might involve connecting abstract concepts to situations learners already encounter in their daily lives (such as recommendation systems or voice assistants), framing discussions around concrete societal questions or framing tasks as collaborative challenges. It is also important to balance challenge with support, considering the different levels of digital experience and confidence. Gradually building complexity helps everyone stay engaged without feeling lost or not challenged.

2 Representation (the what of learning)

Information should be presented in a **clear and structured way, using multiple formats** to support different cognitive styles. As an example, the videos and resource boxes developed within AIUnderstood serve this very purpose, offering different entry points into topics like algorithms, datasets, or machine learning. Using clear language, readable fonts, as well as subtitles and translation tools for videos should also be kept in mind.

3 Action and Expression (the how of learning)

This point focuses on giving the students **multiple ways to demonstrate understanding and engage critically with AI**. This might include reflecting on how AI systems affect their community, discussing the rights and responsibilities of citizens in an AI-driven society, or expressing their views through a short essay, a podcast episode, or a collaborative digital poster.

If this approach serves all students, it becomes even more important for learners with specific needs and difficulties. For example, understanding how AI systems work and why biases exist can be particularly challenging for students who struggle with abstract concepts. In this case, step-by-step explanations, explicit vocabulary support, and chances to revisit content may help make these ideas more accessible.

AI Tools as a Support for Inclusion

Now consider the student who struggles to read, or the one who knows the answer but cannot get it down on paper. For learners with Specific Learning Disorders, and more broadly for neurodivergent students or students with disabilities, traditional one-size-fits-all approaches often fall short. In this context, AI can become a valuable support for inclusion in the classroom.

One of AI's main contributions lies in **personalisation**. Rather than presenting the same content to everyone, AI can analyse how individual students learn, adjust difficulty levels, and provide real-time feedback adapted to each learner's pace and needs (Luckin et al., 2016). If a student doesn't understand a concept, the software can immediately change its approach, offer a different representation or a simplified explanation.

Overall, AI democratises tools that were once very expensive. A student with dyslexia may use Microsoft Immersive Reader or Read&Write to listen to texts and focus on understanding rather than decoding. A student with dysgraphia may use the help of an AI writing assistant like Textero.io to organise ideas before putting words on the page, while learners with attention difficulties may get lessons into shorter segments to reduce cognitive overload. At the visual level, customisable fonts, contrast settings, and dyslexia-friendly layouts can reduce visual stress (e.g. with Helperbird). And in multilingual classrooms, AI tools that allow students to engage with content in their home language add yet another layer of accessibility.

For many students, this kind of personalised support can make a real difference, both in **learning outcomes and in confidence and autonomy**. With AI, there is no judgment, no fear of getting it wrong in front of the whole class. Students can try, fail, and try again at their own pace, overcoming the "shame barrier". And many of these tools can also accompany the students outside the classroom (homework, etc.), strengthening their independence.

While AI can introduce new flexibility, several points remain essential. First, it is important to **not over-rely on AI tools**. They are not a substitute for inclusive pedagogy. They are more effective when used alongside the UDL principles described above. Nor do they replace teachers. By handling some repetitive tasks, AI can help teachers focus on supporting students and developing critical thinking, reflection, and interpersonal learning. At the same time, teachers play a key role in making sure AI personalisation does not restrict students' learning experiences but instead broadens their opportunities to learn and explore.

Then, **AI is not automatically inclusive**. Used without critical thinking, it may reinforce the inequalities it tries to reduce. Speech-recognition systems, for example, often perform poorly with diverse accents (Noble, 2018). Adaptive platforms may overlook regional dialects or non-native speakers, which can marginalize certain students, etc.

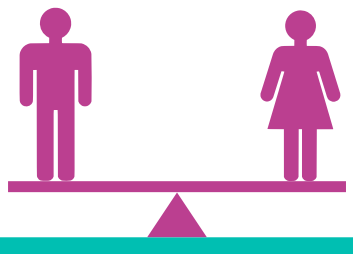
For this reason, inclusive AI-teaching requires a careful tool selection and ongoing attention to who may still be excluded.

3. Addressing Gender Gaps and Encouraging Diversity

In 2018–23, women represented only 35% of all STEM graduates worldwide (UNESCO Institute for Statistics), a figure that has not changed in a decade. This gap logically appears in the labour market too: women's participation in STEM declines as careers progress, and they remain largely absent from senior and decision-making positions in these fields. Beyond equity concerns, this imbalance also affects AI itself: those who design systems influence which problems are addressed, whose data is used, and whose needs are reflected in the technology. A less diverse AI workforce means less fair and less effective AI for everyone.
Teachers are in a unique position to help change this. But how? ...

a) Adapting the content of the lessons

Girls are often held back not by ability, but by **stereotypes, a lack of role models, and a weak sense of belonging in STEM spaces**. Research shows that girls' motivation increases when they can identify with people working in a field. Changing the narrative and actively promoting the idea that women also belong in STEM is something teachers can do.



Bringing in diverse role models and examples

Include AI innovators and researchers from different genders, cultures, and regions in your lessons. When students see people like themselves in these roles, interest and confidence grow. More generally, think of varying the examples that are used.

Framing AI as socially meaningful

Research shows that some learners, and more especially girls who may not initially see themselves as “belonging” in STEM fields, engage more when technology is linked to real-world purposes such as healthcare, the environment, social justice… (Margolis and Fisher, 2003). Choosing such real-world examples rather than purely abstract coding or technical problems can help make AI more relevant, accessible and engaging for all.

Staying alert to AI bias in the classroom

A Stanford study (2024) showed that something as small as the choice of a name in an AI-generated story can reflect and reinforce bias.
This is a reminder that AI tools must be used critically: always review what AI produces and use these moments as opportunities to discuss fairness and representation.
Moreover, making ethics and critical thinking central to AI lessons sends a clear message: diverse perspectives are not just welcome in AI, they are necessary.

b) Adapting teaching methods and the general presentation of AI

Sense of belonging is one of the strongest indicators of whether students, especially girls, will persist in computing (UNESCO, 2021). Collaborative, project-based learning has been shown to strengthen that sense of belonging. Rather than assessing only technical output, consider also **valuing problem framing, ethical reflection, and teamwork.** This makes space for a wider range of strengths and identities.

Moreover, a simple **change in language** can also make a difference: when a school rewrote its computer science course descriptions in plain, accessible terms, enrollment tripled (UNESCO 2016). The message for your school and classroom is clear: small shifts in how you present AI can open the door for students who might otherwise not walk through it.

4. Teaching Critical AI Ethics

As mentioned before, teaching AI cannot be separated from teaching critical AI ethics and algorithmic literacy. AI systems are not neutral: they reflect specific worldviews, rely on historical data, and they can reproduce or even amplify existing biases and exclusions when those are present in the data (Ferrero and Barujel, 2019). For this reason, students, teachers, and schools need to learn to question the tools they use.

Moreover, teaching AI ethics is an opportunity to build empathy and cultural awareness. Understanding who is represented and who is missing in datasets encourages students to consider perspectives different from their own and to recognise how technology can affect different communities in unequal ways.

A simple way to begin is to use a **small set of guiding questions** that can be applied to any AI system:

1. **Who created** this AI and for **what purpose**?
2. **What data** was used to train it, and whose voices are included or excluded?
3. **Who benefits** from this system, and who might it disadvantage?

Real-life examples are also powerful tools to explore AI ethics as they make it easier to see how data and design choices can lead to unfair outcomes. They do not require technical expertise, which makes them accessible entry points for classroom discussion, and a natural way to explore key concepts such as fairness, transparency, accountability, privacy or human oversight.

From a **policy** perspective, schools play an important role in ensuring that AI supports inclusion. This can be done by embedding AI ethics across subjects to develop algorithmic literacy for all students, adopting transparent institutional policies on the use of AI tools and data, and supporting teachers, making sure they feel confident in critically evaluating AI tools and facilitating ethical discussions with the students.

VI. Encouraging Ongoing Development and Innovation in AI Education

There is a familiar tension in education that has only intensified in the age of AI: school curricula evolve in years, sometimes decades, while technology evolves in months or even weeks. By the time a new course is approved and scaled, the technology it was designed to address may already be outdated or unrecognizable. This is not a reason for despair, but it is a reason to build differently. The goal is not to create a perfect, fixed AI curriculum. It is to **build a living system that adapts alongside the evolutions of AI.**

1. Stay Updated in a Rapidly Evolving Field

No single teacher, school, or even ministry can track the full pace of AI development alone. What works is **collective intelligence**. Schools can establish AI Innovation Committees bringing together teachers from different subjects, administrators, students, and external partners to monitor trends, test tools, and share good practices. External partnerships matter more than they might seem. Universities bring research rigour. AI companies offer insight into evolving skills needs. NGOs and civil society can keep an eye on the ethical dimension of AI. These multi-stakeholder ecosystems reflect the collaborative approach promoted by the OECD's Future of Education and Skills 2030 framework. It emphasises shared responsibility and continuous collaboration to help education systems adapt to rapid technological change.

At the national level, countries such as South Korea and Estonia illustrate how governments can integrate AI through policy frameworks, curriculum updates, and infrastructure investment. **Staying curious** and keeping an eye on what is being done abroad can help education systems learn faster and avoid reinventing solutions. Moreover, International cooperation increasingly supports this exchange of practices. In May 2023, the UNESCO brought together education ministers to launch a global dialogue on generative AI and outline a roadmap for cross-government collaboration.

Finally, **emerging issues** such as algorithmic justice and the environmental impact of AI systems are also worth keeping an eye on.

> Today's edge conversations may become tomorrow's essential curriculum.

2. Design Flexible Curricula

Tools change fast. Ways of thinking don't. Rather than building courses around specific platforms or applications, build them around durable skills: critically evaluating AI outputs, understanding algorithmic logic, recognising bias...

Examples of practical activities to develop and assess these skills

1. The creation of a **prompt portfolio** by students, showing how they refine their questions to reach better results. They can also improve a poorly written prompt given to them - tools confidence.
2. The creation of a short **impact analysis of an AI use case**, reflecting on possible ethical risks - development of critical thinking.
3. **Model debugging**: the students are presented with a failing model, and must identify whether the problem comes from the data (data bias) or the structure (logic)

Moreover, this also means adopting a **modular design**: a stable structure with flexible content that can be updated as the field evolves. Introduce new, relevant developments as live classroom examples rather than waiting for the next curriculum review. At the same time, keep a balance. Some educators feel that AI tools are being introduced into classrooms with far less scrutiny and oversight than other educational materials would typically receive. This is a reminder not to mix adaptability and precipitation.

Interdisciplinary approaches are also very valuable in the case of AI education. Ethics paired with data science. Psychology woven through AI design... These combinations prepare students to navigate AI responsibly within whatever field they may enter. Most of the complex questions AI raises are not technical questions. They are human ones.

3. Supporting Teachers and Making it a Shared Project

No curriculum update, even well-designed, will reach its goal without teachers feeling equipped to deliver it. AI literacy is not reserved for computer science teachers. It is a basic need across the entire profession. Building it, however, requires more than one-off training sessions. **Structured, ongoing professional development** matters, as well as cross-subject collaborations. Beyond training, teachers also need reliable access to experts, resources, and time, and schools should encourage teachers to experiment and innovate in the classroom, within clear pedagogical and ethical frameworks.

Moreover, sustainable AI education implies **involving the whole school community.** Involve students in assessing new tools, in peer learning initiatives and in shaping how AI is used in the school. Keep parents informed and engaged. Anxiety about AI in education is widespread, and transparent communication is a key factor of success.

At the level of the school, don't forget to **track outcomes**, both in terms of learning gains and equity dimensions. Algorithmic systems that are embedded in education can quietly reproduce existing inequalities if no one is watching.

4. The Horizon Ahead

Success in AI education isn't just about students mastering today's tools. It's about helping them build the adaptability, critical thinking, and confidence to handle technologies that haven't been invented yet. This is what 'future readiness' means, and supporting it is one of the most important roles schools have today.

Conclusion

Artificial Intelligence is already part of students' everyday lives, shaping how they search for information, communicate, create content, study, and make decisions. For this reason, AI education can no longer be seen as optional. It is becoming an essential part of modern education, closely connected to digital literacy, critical thinking, creativity, citizenship, and preparation for future learning and work.

A key conclusion of this booklet is that students need to understand both the possibilities and the limits of AI. AI should not be presented as human intelligence or as an objective source of truth. It is a technology based on data, patterns, probabilities, and human design choices. Therefore, students must learn to question AI outputs, verify information, recognise bias, and understand the ethical consequences of using AI tools.

Secondary education is a particularly important stage for this work. At this age, students become more autonomous and increasingly use digital tools outside the classroom. Without guidance, AI may encourage shortcuts, superficial understanding, or overdependence. However, when used with clear pedagogical aims, it can support reflection, creativity, problem-solving, and deeper learning. The goal is not to ban AI, but to help students use it transparently, responsibly, and meaningfully. Therefore, the role of teachers remains central. However, they need practical training, institutional support, time to experiment, and opportunities for collaboration.

AI also offers important opportunities for STEAM education and digital citizenship. In STEAM contexts, it can help students explore ideas, analyse data, design solutions, and experiment creatively. In digital citizenship, students must learn to identify misinformation, deepfakes, privacy risks, manipulation, and biased outputs. Responsible AI use means checking sources, protecting personal data, respecting others, and considering the social impact of digital actions.

Inclusion must also be central. AI can support learners with different needs, abilities, and language backgrounds through personalised explanations, assistive tools, and flexible learning pathways. However, AI is not automatically inclusive. Unequal access to devices, connectivity, digital skills, and support may deepen existing inequalities. Schools must therefore ensure fair participation and careful tool selection.

Finally, since technologies change rapidly, schools should focus less on specific tools and more on durable competencies such as critical evaluation, ethical reasoning, creativity, collaboration, data awareness, and adaptability.

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