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# A snapshot of the evolving landscape of artificial intelligence in education

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**AI4T: In-service Teacher Training**

**AI Squad: Briefing Reports**

**Scientix – Italy: Best Practices**

Education must keep pace with the rapid development of technologies and with the constant access to vast amounts of new knowledge and information, for this improving 21st century skills is becoming increasingly urgent. (UNESCO, 2019; Brun-Schammé & Rey, 2021)



https://waitbutwhy.com/2015/01/artificial-intelligence-revolution-2.html
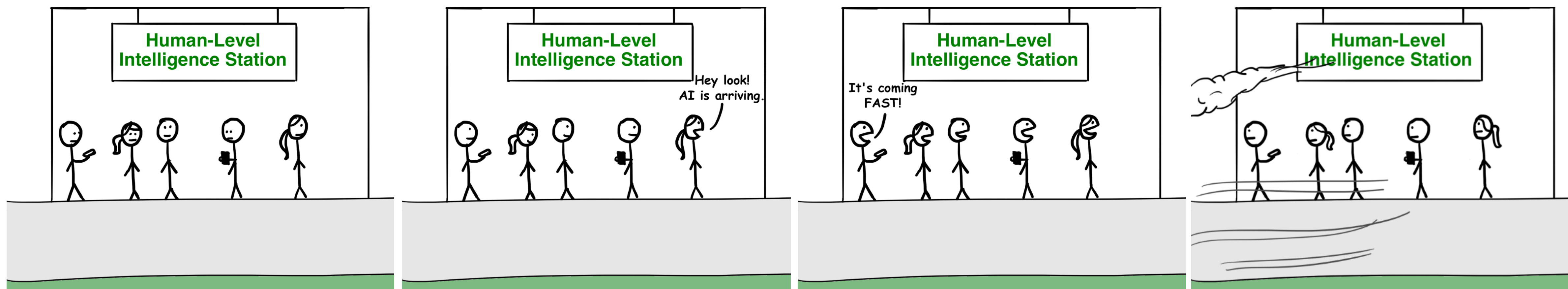
Educators often struggle to adapt their pedagogy to the complexity of modern societies

Policies tend to lag behind due to the speed of technological advances

(Zawacki-Richter et al., 2019)

Despite the impact of AI on our daily lives, most people do not fully understand AI and the decisions made by machine algorithms, or the role that humans play in the interaction with AI.

(Korinek et al., 2021)

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In education, the discussion focused on how technology is affecting the relationship and effectiveness in the process of teaching and learning, particularly as artificial intelligence (AI) is increasingly used in educational systems.

Key impacts for the use of AI in education (UNESCO, 2022):

human
intercultural
inclusivity
problem
equity
interdisciplinary interconnected
solving social solidarity
practices participatory

- Promote equity and inclusivity and reducing competition.
- Encouraging curricula approaches emphasizing interdisciplinary, intercultural, and ecological approaches for in-/formal education.
- Support teachers to create transformative education by investing in teaching practices that promote cooperation and solidarity.
- Use digital technology to enhance connectedness to one another and to the world as a force for social solidarity, involving stakeholders in problem solving and solution development.
- Ensure that new technological paradigms are aligned with democratic values and inclusive, participatory practices to serve an interconnected human and planetary future.
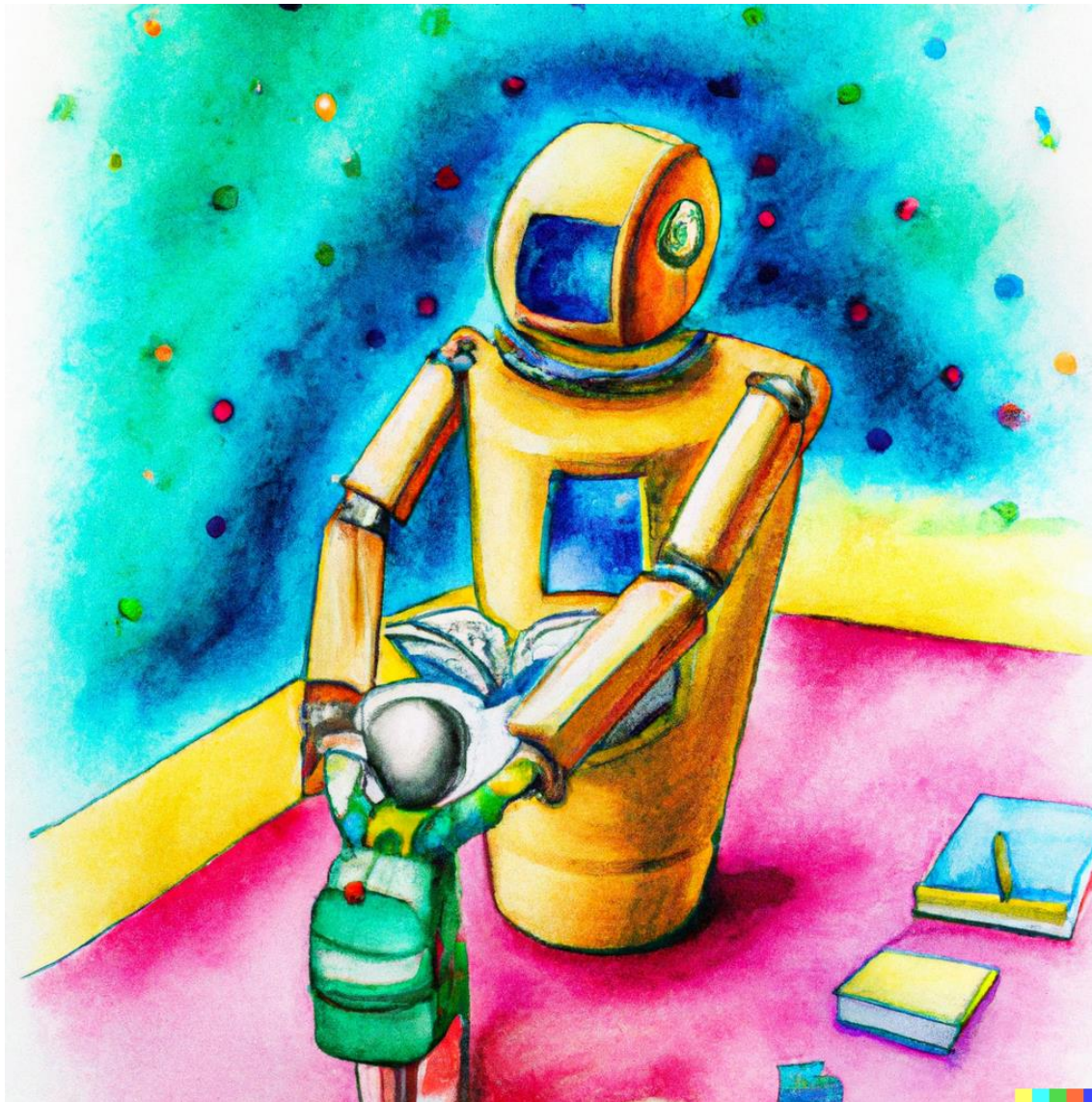
Discussion should address ethical implications such as using AI to empower and enhance teaching and learning, assessing, and managing the educational process

(Miao et al., 2021).

Need of transversal human skills for supporting one's ability to communicate and collaborate with AI tools in life, learning, and work (Carvalho et al., 2022).

The evolving technological landscape requires a new set of skills for teachers and students.

In particular, the development of digital literacy with a focus on AI and data literacy is needed to be aware of the potential and limitations of these technologies (Markauskaite, 2022).
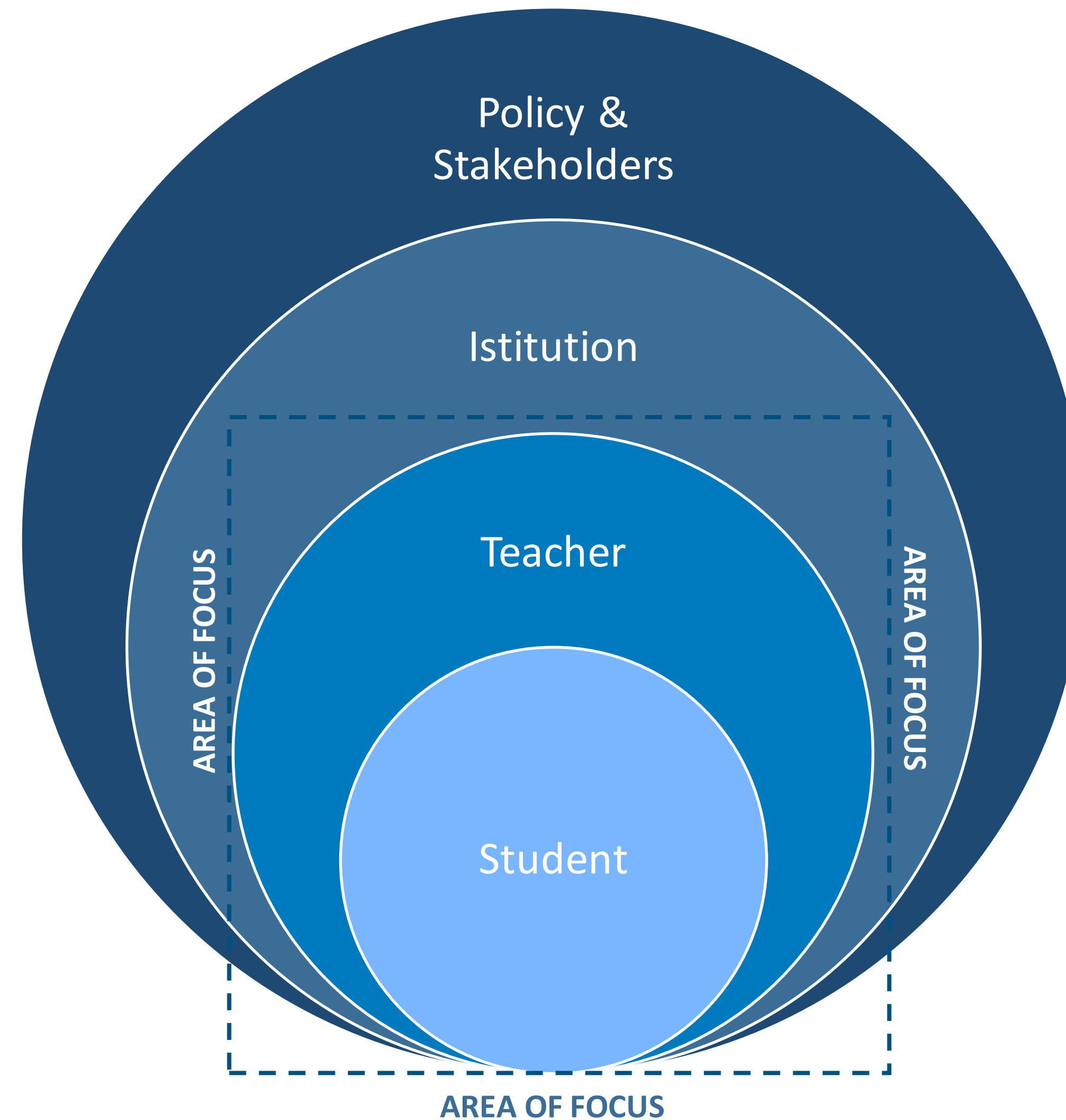
**Ed for AI**

How to engage with AI in a confident, critical, and safe way, without necessarily requiring a specific background in mathematics or programming .

Requires broader teacher and learner competencies to provide the necessary knowledge and attitudes.

**Ed with AI**

**Ed about AI**

How AI can enhance the teaching and learning process.

Requires knowledge of how the methods and technologies used can best work together in a defined context to enhance the teaching and learning of specific content

Focuses on the fundamentals of AI as technology.

Requires knowledge of processes like programming or machine learning as a key to preparing students for the labor market

Often discussed as a topic in a renewed curriculum

**Education for AI**

Provide **basic knowledge about AI and its applications in everyday life**. Including basic principles of machine learning and deep learning, as well as common AI applications and bias and fairness in the use of AI algorithms (UE, 2021).

Characteristics of different **data types, data formats, and data sources**, as privacy and ethics in data collection, storage (CE, 2022).

**AI literacy and digital citizenship**, awareness and recognition of potential biases and limitations of AI systems, reliability and quality of AI-generated content (UNESCO, 2019).

By integrating **practical data analysis methods and real-world examples**, students can better understand and navigate the increasingly AI-driven world (Holmes & Tuomi, 2022).

**Education with AI**

Use of digital educational tools, to **support and enrich the learning experience** as engaging alternatives for students to **foster innovative teaching and learning methods** that were generally unattainable before the development of such technology (Baker, 2021).

Requires knowledge about how AI can be used to personalise learning, provide feedback, or enhance peer collaboration (Chaipidech, 2022).

Educational technologies:

- to **overcome a one-size-fits-all approach**, by managing personalised learning aspects and providing tailored learning activities (Mori et al., 2023).

- to address **students**' self-regulated learning capabilities, **empowering** them to make effective choices that **improve learning outcomes** and efficiency and can detect when students are using inefficient strategies and provide recommendations to guide them towards **more effective learning** paths (Molenaar, 2021).

- to **connect students' learning experiences with their values and personal interests**, resulting in higher course completion rates, increased work pace, reduced disengagement, and improved learning outcomes (Walkington & Bernacki, 2019).

- to **explore and interact with simulations and games** with teacher-led explanations to help students bridge the gap between informal, practical understanding and formal, academic understanding (Asbell-Clarke et al, 2020).

**Education about AI**

Understanding how AI applications work can be complex, as they often use multiple AI techniques that require highly technical knowledge (Holmes et al. n2019) .

UNESCO identifies  in its *K-12 AI curricula* report (2022) three key areas for education about AI:

- Understanding the fundamentals of AI: algorithms and programming, data literacy, and contextual problem solving.

- Understanding ethics and social impact, including topics such as the ethics of AI, the social or societal impact of AI, and applications of AI in fields other than ICT.

- Understanding, using, and developing AI includes topics such as understanding and using AI techniques and developing AI technologies.


Requires:

- students and teachers to gain a comprehensive understanding of the fundamentals of AI, including algorithms, programming, data literacy and contextual problem solving. This will enable them to manage data cycles, apply AI to solve real-world challenges, and navigate the ethical and logistical complexities (AI4K12, 2022)

- skills in theoretical knowledge, AI processes and specialised expertise in programming, mathematics, statistics, and data science (Bellas et al., 2022).

**The learning ecosystem is fragmented**, there are multiple and different AI technologies operating independently of each other. This can lead not only to inefficiencies, but also to missed opportunities for collaboration and development.

A scenario of an integrated learning experience, where AI technologies work together and communicate with teachers and school organization could be a tool to improve the landscape of the learning/teaching process in schools (Niemi, 2022).

- **streamlining administrative functions** within schools and universities, such as timetabling, staff scheduling, facilities management, finance, cybersecurity, safety, and security to optimize resource allocation and improve overall efficiency within educational institutions (Luckin et al., 2022).

- **empowering teachers by automating tasks** such as grading assignments or monitoring attendance, allowing them to focus on more sophisticated aspects of teaching (Roll & Wylie, 2016).

- **provide valuable insights into student performance**, enabling targeted instruction and early intervention when needed. These tools have to potential improve the educational environment for both teachers and students (Hwang et al., 2020).

- **promote inclusion and equity in education**, by design of AI tools that are responsive to diverse learners, including those with disabilities and historically underserved populations. By focusing on these issues, AI can help create a more inclusive and effective educational experience for all students (Barua et al., 2022).

- **designing AI tools with accessibility** in mind can help bridge the gap and meet the needs of learners and close gaps not only for the diversity of aptitudes of learners but could also help **overcome also ethnical and socioeconomic differences** (Mohammed & Watson, 2019).

**Risks**

potential ethical and societal risks of AI applications in education (Akgun and Greenhow, 2022)

**Privacy:** Exploitation of data via face recognition and recommender systems can compromise students' privacy.

**Surveillance**: Personalized learning systems and social networking sites can monitor students' activities.

**Autonomy:** Predictive systems can jeopardize students' (and teachers) autonomy and agency to govern their lives.

**Bias and Discrimination:** Automated scoring systems can perpetuate gender and racial biases and social discrimination.

Following the recommendations set out in the proposal of the Artificial Intelligence Act should be classified as high-risk AI systems technologies

- to determining access or materially influence decisions on admission or assigning persons to educational and vocational training institutions
- to evaluate persons on tests as part of or as a precondition for their education
- to assess the appropriate level of education for an individual and materially influence the level of education and training that individuals will receive or
- to access or to monitor and detect prohibited behavior of students during tests

**Points of attention**

In curriculum development, it is **increasingly important to prioritise culturally relevant and responsive pedagogies**. by focusing on students' knowledge, family backgrounds and cultural experiences, to allow students to express their own cultural and contextual experiences (Gay, 2010).

Sustained professional training can provide teachers with **suggested curriculum resources and teaching strategies**, while fostering **a community of practice** where they can share and critically reflect on their experiences with other educators. In addition, further research is needed **to identify reflective teaching practices and students' meaning-making processes in relation to AI and ethics education**.

Educating future generations to participate ethically in the development and use of AI will require more professional development for K-12 teachers, including both pre-service and in-service training (Miao & Yao, 2021).

«… focus more on the implementation effects when including techologies and teaching methods, the when and how within the learning cycle, the dosage and fidelity of various apps … « (Hattie,2023; p. 408)

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