International Task Force on Teachers for Education 2030

Promoting and Protecting Teacher Agency in the Age of Artificial Intelligence

Position Paper

Contents

Introduction

Artificial intelligence (AI) is reshaping the education landscape, yet its transformative potential will ultimately be defined by the people who design, implement, and mediate its use. Central to this human infrastructure are teachers, whose professional capacities and agency should be foregrounded in any AI integration strategy. Investing in teachers' professional development, through robust, future-oriented, and contextually grounded initiatives, is thus a critical way to ensure that AI technologies complement, rather than replace, the pedagogical expertise and ethical judgment at the heart of teaching.

This position paper is closely aligned with the mandate of the International Task Force on Teachers for Education 2030 (TTF), reflecting the collective perspectives of TTF's diverse global constituency and reaffirming the imperative to uphold teachers' agency, dignity, and professional autonomy as technology changes. It sets forth the TTF's initial position on AI in education and aims to catalyse deeper policy dialogue, collaboration, and the joint construction of guiding principles that acknowledge teachers' central role in equitable and sustainable education futures. The key messages presented here are intended as strategic resources to inform teaching and teacher education policy formulation, guide advocacy efforts, support institutional decision-making, and inspire critical reflection. The paper builds upon a growing body of international research and policy reports on AI in education, and extends these efforts by placing a distinct emphasis on the role and agency of teachers.

To translate this vision into action, the TTF has also developed a set of practical recommendations to help shape policies and practices that place teachers at the centre of AI integration. These are further explored in the final section of the paper.

1) **Reaffirm the irreplaceable role of teachers in education**

2) **Promote and Protect teachers' professional competencies**
   a. Implement comprehensive AI competency frameworks for teachers
   b. Support teacher collaboration and innovation through professional networks and communities of practice

3) **Evaluate AI's impact and promote human-centred pedagogies**

4) **Safeguard diversity and prevent AI from standardising education**

5) **Promote transparent, sustainable, and ethical AI governance**

6) **Ensure equitable access and prevent AI-driven educational inequality**

7) **Support experimentation and piloting in different contexts and settings**

8) **Promote international cooperation and solidarity**

AI holds complex opportunities and challenges for education

The rapid advancement of AI presents global societies with profound and complex education challenges and opportunities. AI is increasingly perceived as offering significant potential to support pedagogical practices, enhance student learning, and generally improve the efficiency of teaching, professional learning and administration tasks. At the same time, AI in education can diminish human agency, allow violations of privacy and data security, and exacerbate existing systemic inequalities and educational exclusion. Hence, *AI presents both a transformative opportunity and a profound responsibility to ensure that its design, development and implementation amplify, rather than diminish, the uniquely human capacities essential for education.* We are thus at a crucial juncture that requires collective reflection and decisive action from everyone involved, to shape an education future that ensures the ethical, inclusive and equitable application of AI technologies.

As generative AI permeates education systems, it is essential to reaffirm the importance and value of *teaching as a fundamentally human and relational practice*. Policy and advocacy efforts must prioritise protecting and elevating the role of teachers, ensuring that AI supports them rather than replaces them. To fully harness the opportunities presented by AI in education, *we must empower teachers and place them at the centre as the professionals best positioned to lead this transformation.* While AI can perform some tasks traditionally carried out by teachers, this does not imply that the teaching profession is becoming less relevant. Teachers' professional expertise, creativity, empathy, and ethical judgment remain indispensable, now more than ever.

In the era of generative AI, policymakers, school leaders, educators, and other stakeholders must safeguard the professional dignity and autonomy of teachers, reinforcing their critical role in shaping sustainable, equitable, and resilient education. Teachers, education support personnel, and their representatives must be consulted and engaged throughout decision-making and planning as AI is integrated into education. Establishing clear and regular channels of communication among teachers, school leaders, parents, learners, communities, and policymakers will ensure transparency, build trust, and foster collective ownership of AI initiatives in education. *Effective social and policy dialogue* between school authorities and the broader education community **is critical** for informed and responsible decision-making at this pivotal moment.

This position paper aims to inform and guide policymakers, education leaders, teacher unions, and other relevant stakeholders as they navigate the complex intersection of AI and education, with a focus on safeguarding and promoting the role and agency of teachers. The introduction highlights the irreplaceable human qualities of teachers, emphasizing the need to protect and promote their professional dignity and autonomy. It then underlines the importance of developing teachers' AI competencies, illustrating practical applications and international initiatives. The paper proceeds to examine implications (section 1), use cases (section 2), benefits (section 3), and potential harm of AI in education, supported by recent empirical evidence and global reports. Finally, it advocates for a complementary approach to teacher-AI interactions to amplify, rather than diminish, the uniquely human capacities of teachers and learners, concluding with actionable policy recommendations.

Defining Artificial Intelligence: Key Concepts

Artificial Intelligence systems are agents, devices, or software programs that sense their environment, process information, and take action to achieve set goals. As highlighted in UNESCO's Recommendation on the Ethics of Artificial Intelligenge (2021) AI systems are systems which have the capacity to process data and information in a way that resembles intelligent behaviour, and typically include aspects of reasoning, learning, perception, prediction, planning or control. This capacity can influence physical and virtual environments, and to the capability of AI systems to derive models or algorithms, or both, from inputs or data.' This definition is important as it highlights that AI is not a single technology – such as ChatGPT, Gemini or DeepSeekR1 – but a collection of methods that allow machines to learn complex correlational patterns, reason logically and statistically, and interact with the world through sensors and interfaces in increasingly sophisticated ways. AI systems perceive their surroundings through technologies like computer vision and natural language processing by interpreting visual data and human language.

One of the key pillars of AI is **machine learning (ML)**. Unlike traditional AI approaches with knowledge representations and logical reasoning, ML approaches involve computer algorithms that can 'learn' by finding patterns in vast amounts of data, improving over time rather than being manually programmed with explicit rule-based instructions. ML powers most of the recent innovations in AI, including **large language models (LLMs)** and generative AI.

Generative AI is a recent frontier that goes beyond recognising patterns to create new content. This type of AI can generate new text, images, music, and even videos in response to user prompts by learning the underlying structures and styles from existing data. The ability of generative models to produce novel and creative outputs holds significant promise for education and beyond, while raising vital questions about intellectual property and ethical use that are beyond the scope of this paper.

LLMs are a specific application of machine learning in Generative AI focused on processing and generating "human-like" text. These models are trained on vast amounts of written text, enabling them to produce coherent and contextually relevant responses: by finding patterns in the training data, they can predict the likelihood of a next word (i.e. token). Their capacity to emulate natural language makes them powerful tools for tasks like drafting content, generating documents, summarising information, and engaging in interactive dialogue through chatbots. Teachers can use LLMs for professional tasks such as finding teaching activity ideas, creating practice questions, adapting teaching content, crafting model answers, building exam questions, generating feedback drafts, generating lesson plans, creating tailored interventions, and summarising reports and documents.

How can we promote and protect teachers in the era of AI?

As AI increasingly takes on tasks traditionally viewed as distinctively human, everyone involved in education needs to engage in profound reflection on our essential roles and identities. What are the enduring and uniquely human qualities at the heart of teaching? How can we safeguard and elevate them, and help them flourish, as technology transforms learning?

Teachers are not merely facilitators of knowledge transfer; they foster empathy, ethical reasoning and discernment, and meaningful human interactions. They are also custodians of a culture that is preserved and shaped by its members in schools. As AI is integrated into education practices, the fundamental human capacities embodied by teachers become ever more critical: compassion, mentorship, interpersonal connection, and the nurturing of human values and virtues. These capacities also play a pivotal role in fostering learner competencies that transcend knowledge acquisition, encompassing the development of student attitudes, mindsets, skills, and higher-order understanding. Preserving and strengthening these core attributes within our education systems must be central to discussions about the responsible integration of AI into the teaching profession.

It is crucial to improve teachers' AI competencies

The effective integration of AI into education relies heavily on teachers' ability to engage critically and ethically with these technologies. Teachers should be empowered not only to use AI tools effectively but also to discern when and how these technologies align with, or diverge from, educational objectives and humanistic values; to be able to say 'no' to their use. Professional development initiatives must foreground ethical reflection, strengthening teachers' capacities to evaluate the implications of AI for student learning, well-being and agency, as well as for society as a whole.

Teachers need to understand how AI systems function, their development processes, as well as their social and ethical implications. Teachers' existing knowledge, experience, and understanding of AI significantly influence their attitudes toward its implementation in educational settings (Yue et al., 2024). Unfortunately, in most countries currently, teachers primarily acquire AI-related content knowledge through incidental learning, which frequently leads to misconceptions and fragmented understandings of AI. Key challenges include ambiguities and inconsistencies in curricular definitions, implicit expectations for teachers to interpret vague policy directives, difficulties in staying abreast of evolving competencies due to the lack of clearly specified knowledge and skill frameworks, as well as systemic constraints such as limited time, insufficient resources, and inadequate access to continuous professional learning opportunities (Velander et al., 2024). Such problems highlight the importance of developing national and international frameworks to be able to operationalise teachers' professional learning as an integrated system.

Holistic frameworks for developing teachers' AI competencies have begun to emerge, such as the [UNESCO AI competency framework for teachers](#) and the [European Commission's Digital Competence Framework for Educators (DigCompEdu)](#). These outlines emphasise that teachers need a nuanced understanding of how AI systems operate, including their strengths, limitations, biases, and social and ethical implications. These frameworks encourage teachers to critically analyse AI-generated outputs and insights, applying their judgment and pedagogical expertise to interpret and use such information responsibly. Such capabilities are indispensable to lower the risks that AI will be misused and ensure that its benefits are fairly distributed among diverse groups of learners. Therefore, an important dimension of teacher preparation for AI integration is fostering a comprehensive awareness of risks among teachers.

Numerous national and international programmes have been introduced to enhance teachers' AI competencies. These initiatives provide teachers with hands-on experience in AI-driven lesson planning (e.g. Oak National Academy, United Kingdom), personalised learning support (e.g. EdChat, South Australia), real-time monitoring of student progress (e.g. Vinci AI, Hong Kong, China), and administrative task support (e.g. Hodari, Kenya). Such practical training can also be supported by academic organisations. The University of Wollongong in Dubai offers practical AI tool training for teachers in the United Arab Emirates.

As well as practical training in using AI tools, teachers need broader programmes that emphasise foundational AI literacy, ethics and a human-centred mindset, combined with effective pedagogical design. Finland's Elements of AI project provides teachers with extensive resources to deepen their understanding of AI's core principles while equipping non-specialists with essential AI development skills. Similarly, Japan and Luxembourg are adopting teacher training that combines theory and practical instruction on ethically integrating AI tools. Other examples of holistic teacher training incorporating AI can be found in Nigeria (Edo State), South Africa, Rwanda, Brazil (Matto Grosso State), and Chile.

Beyond in-service training, AI competency development is also being embedded in initial teacher preparation programmes. For instance, Austria has integrated AI into higher education curricula for pre-service teachers, ensuring that teachers develop both theoretical insights and practical expertise in using AI. National initiatives in Portugal and Singapore similarly incorporate AI competency development within all levels of teacher education programmes, embedding AI-related competencies within subject-specific instruction (Miao and Shiohira, 2022).

AI itself can be used to facilitate teacher professional learning in AI, by designing AI-powered assistants for teacher training purposes. Such AI systems can offer tailored guidance, immediate feedback, and interactive simulation experiences, improving diagnostic reasoning and pedagogical competencies (Cukurova et al., 2024). Trainee teachers who engage with AI-supported simulations perform better in identifying student learning difficulties and applying effective instructional strategies (Sailer et al., 2023). In addition, multimodal conversational agents – which combine several forms of communication, such as spoken language, written text, facial expressions, gestures, and gaze – can simulate classroom interactions, enabling teachers to rehearse critical teaching skills, refine their instructional methods, and develop adaptive classroom management practices (Cohen et al., 2020).

Bringing AI into education environments also requires robust institutional support structures that enable ongoing teacher professional learning and growth. Schools and other education institutions should create collaborative learning spaces where teachers can experiment with AI technologies, create together, exchange experiences, and develop appropriate pedagogical strategies. Initiatives such as peer learning networks, communities of practice, co-creation labs, and continuous professional development workshops focused explicitly on AI can significantly enhance teachers' readiness and confidence. One example is GenerationAI, an initiative of the International Society for Technology in Education (ISTE), which convenes communities of practice for teachers, administrators, curriculum leaders, and computer scientists.

It is vital that AI for professional learning does not shift the locus of decision-making authority from teachers and teacher trainers to designers and developers of AI systems. Teachers and teacher trainers are uniquely positioned to exercise their professional judgment and adapt their teaching strategies dynamically, by fostering academic learning, supporting emotional development, managing classroom behaviour, promoting equity, and responding to individual student needs. AI-based systems, by contrast, typically operate with a narrowly defined and often didactic motive (Lepage and

Collin, 2024). AI use should be permitted to transform teachers from creative designers to mere implementers, as this could reduce their professional independence.

Recognising this limitation requires AI design, development and deployment in education to be an open dialogue. Students and teachers need to be involved in the co-creation of AI technologies and deciding how to deploy them. Giving teachers the leading role in decision-making is essential to ensure AI's integration in education environments genuinely complements rather than diminishes teachers' professional autonomy.

The introduction of AI may also trigger pushback from teachers already navigating frequent technological shifts, increasing demands, and limited resources. There are significant concerns about teachers facing burnout, digital fatigue, and insufficient incentives for professional learning (Duan and Zhao, 2024). That means approaches to developing teachers' AI competencies should be empathetic, well-resourced, and participatory.

Ultimately, strengthening teachers' professional identities as empowered, reflective practitioners equipped to use AI ethically and effectively is central to shaping a future where education remains fundamentally human-centred. Investment in teacher competencies, institutional support, and international collaboration should be prioritised to ensure that AI serves as a powerful ally in enhancing human teaching, learning, and overall education quality.

Reports and initiatives offer valuable insights on AI in education

The essential and irreplaceable role of teachers is rooted in the broader goals of education, which extend beyond academic learning to encompass the holistic development of human personality and the strengthening of respect for human rights and fundamental freedoms.

As articulated by the UN's Universal Declaration of Human Rights (Article 26), education serves as a transformative societal force that cultivates tolerance, empathy, friendship, and intercultural understanding. Teachers are irreplaceable because they uniquely embody and uphold these higher-order education purposes, ensuring that education remains inherently human, ethically grounded, and deeply relational.

It is also essential that any positioning on AI and education is explicitly informed by, and aligned with, the normative instruments concerning teachers, which reflect globally endorsed principles for strengthening the teaching profession in the age of AI:

- ILO/UNESCO Recommendation concerning the status of teachers (1966)

- UNESCO Recommendation concerning the status of higher education teaching personnel (1997)

- Recommendations of the UN Secretary-General's High-Level Panel on the Teaching Profession (2024)

In recent years, UNESCO has sought to help Member States integrate AI in education through a series of reports and global initiatives.

At the 2022 International Forum on AI and Education, Steering AI to Empower Teachers and Transform Teaching, UNESCO highlighted the persistent lack of dedicated AI strategies in education in several countries. The forum also raised critical concerns regarding the AI competencies teachers require and the ethical principles that must underpin AI in education.

Also in 2022, UNESCO published K-12 AI curricula: A mapping of government-endorsed AI curricula, based on a survey of Member States. The findings underscored the necessity of resource development and targeted teacher training for AI curriculum integration (Miao and Shiohira, 2022).

In 2023, UNESCO released [Guidance for Generative AI in Education and Research](). This report examines the risks generative AI poses to fundamental humanistic values in education, including teacher agency, inclusion, equity, gender equality, linguistic and cultural diversity, and the protection of pluralistic viewpoints. To address these concerns, the report encourages teachers to engage in thoughtful and responsible AI adoption.

Other international organisations have published reports on AI's role in education. The World Bank report [Artificial Intelligence Revolution in Education: What You Need to Know]() emphasised the need for significant investment in teacher professional learning – as well as equitable access to devices, high-speed internet connectivity, and robust technical support – to support AI-driven education transformation in one region, Latin America and the Caribbean (Molina et al., 2024). Similarly, through [analysis of needs in one country, Bangladesh,]() the Asian Development Bank outlined a strategic framework for AI integration in education, presenting six key recommendations and 15 action points (Kong et al., 2024). These include teacher training and professional learning, infrastructure enhancement, technical support and sustainability, AI integration into existing curricula, policy and governance measures, and data privacy safeguards.

Most national reports on AI in education go beyond infrastructure and policy considerations to highlight concerns regarding AI's design and development for education purposes. The **U.S. Department of Education**, underscored the importance of transparency in AI technologies, arguing that fostering teacher trust in AI systems requires clear explanations of how AI-driven decisions are made (Cardona et al., 2023).

Transparency not only enhances teachers' trust in AI but also empowers them to use these tools more effectively in their teaching practices (Nazaretsky et al., 2022; Viberg et al., 2024; Feldman-Maggor et al., 2025).

Individual researchers have conducted extensive surveys to identify gaps in AI integration within education, shedding light on key areas that require further attention. Niall McNulty's **Comparative Analysis of Generative AI Policies in Education** (2025) looked at Australia, Japan, New Zealand, the Republic of Korea and the United Kingdom. The study examined five key policy areas: student usage guidelines, teacher implementation frameworks, data privacy and security, equity considerations, and academic integrity. While all five countries recognise AI's potential to enhance teaching practice and reduce teacher workload, they also stress the importance of safeguards to prevent misuse and ensure student protection. Common priorities across these policies include responsible AI use, strong data protection measures, and initiatives to develop teachers' skills.

Collectively, these reports and research studies reinforce a critical consensus that successful and ethical integration of AI in education requires comprehensive and coordinated action across multiple dimensions and stakeholders. Policymakers, education leaders, and practitioners should join forces to shape frameworks that not only encourage innovation but also embed robust ethical standards and equitable practices grounded in a solid human and social foundation.

What are AI's Implications for Teachers?

AI implications for teachers can be categorised into teaching with AI, teaching about AI, and adapting teaching for a world where AI is ubiquitous. Teaching with AI involves employing AI to enhance teaching practice. Teaching about AI encompasses ensuring teachers can design, develop, and use AI technologies safely, effectively, and ethically in their practice, and teach AI to their students. Lastly, adapting teaching for a world where AI is ubiquitous is about the necessary curricular, pedagogical, and systemic innovations to ensure teaching remains compatible with, and relevant to, a world profoundly influenced by AI (Luckin and Cukurova, 2019). This categorisation is also aligned with academic literature on facilitating transformative change in knowledge production and education (Sharpe et al., 2016).

Teaching with AI

Teaching with AI encompasses a broad spectrum of AI-driven tools aimed at supporting education processes. Institution-focused tools support teachers' administrative roles such as report writing and data input. Student-focused tools include intelligent tutoring systems that teachers can use in their classrooms. Teacher-focused applications include dashboards that provide insights into students' homework completion, teacher feedback co-creation tools, and grading support tools. Teaching with AI has been found to have six primary benefits for teachers (Bond et al., 2024):

- providing personalised learning experiences

- generating deeper insights into student understanding

- generating education resources and applications

- improving students' learning outcomes

- reducing teachers' administrative and planning workloads

- enhancing equity in education opportunities

- improving the precision of assessments and feedback creation.

The evidence base is still weak, however, so increased rigour is necessary in impact evaluation studies of teaching with AI.

As AI becomes part of everyday life, teachers need to practise pedagogies that place at the heart of education students' development, human connection, social and emotional skills, lifelong learning competencies and higher-order thinking abilities. Such pedagogies should foster adaptability, critical thinking, and autonomy among learners, ensuring that students are prepared to thrive and continuously evolve in a world where AI is ubiquitous. Teaching in an AI-rich context calls for a careful balance between providing up-to-date knowledge and reinforcing fundamental concepts, enabling students to use AI as an informational resource to further deepen their understanding and build new knowledge.

Why teachers are not replaceable

AI offers substantial opportunities to enhance teaching and learning but its benefits largely depend upon teachers. Teachers' unique expertise, adaptability, and ethical judgment are essential not only in guiding and contextualising AI-generated outputs but also in safeguarding education quality and equity. AI should be conceived not as a substitute for teachers but as a powerful augmentative tool, reliant on teachers' professional acumen to shape instructional practices and maintain authentic, human-centred education experiences.

Despite its capabilities, AI fundamentally lacks the human "theory of mind," the nuanced mental models humans naturally employ when interacting with each other. Many essential competencies that teachers impart through direct human interaction, such as empathy, social understanding, and interpersonal skills, cannot be fully replicated or taught through student interactions with AI. As highlighted in UNESCO's report Reimagining our futures together, teaching is a "beautiful dynamic" between human beings.

The affective dimension of teaching, encompassing the emotional connections, interpersonal bonds, and authentic human relationships formed between teachers and their students, is essential not only to fostering student engagement and motivation but also to promoting the holistic development and socialisation of learners. Teachers uniquely possess the capacity to inspire, encourage, and guide students through emotional support, empathy, and understanding, responding intuitively to students' emotional states, challenges, and aspirations. This deeply human aspect of education significantly shapes learners' self-concept, resilience, and emotional intelligence, contributing substantially to their overall development as responsible and empathetic members of society.

AI technologies, by their very nature, lack natural emotional intelligence, relational authenticity, and the capacity to nurture authentic connections grounded in trust and shared experiences. Consequently, reliance on AI-driven instruction alone risks depriving learners of vital social-emotional interactions and mentorship experiences that are foundational to effective teaching and learning. At a practical level, this lack of affective connection leads to various challenges of adopting AI in education including the concerns regarding the prioritisation of knowledge transmission over transformative and meaningful educational experiences. It is also important that even the knowledge transmission benefits from teachers who are literate in media and information to evaluate content and discern factual content from misinformation, fake news and also provide balance to the perspectives being presented.

Furthermore, while some AI tools have the potential to be more accessible than teachers, they would not be able to provide care as teachers do and would be unable to provide more contextual lessons.

AI cannot replace teachers' expertise in resolving conflict and ethical dilemmas, inspiring creativity, or simply ensuring the physical and psychological well-being of students. Such competencies, central to fostering holistic human development, cannot be adequately decomposed into discrete components amenable to algorithmic representation (McGilchrist, 2019).

Students exhibit considerable caution towards AI-generated feedback, demonstrating a clear preference for personalised responses from teachers (Nazaretsky et al., 2024). Across diverse academic programmes and levels, 457 higher education students' perceptions of feedback quality diminished significantly upon discovering that it was generated by AI, reflecting deeper issues of trust and credibility. These results have been replicated in other

studies (Zhang et al., 2025). This potential lack of trust and credibility of AI content underscores that certain education interventions require not merely accuracy or relevance, but also the essential qualities of empathy, relational understanding, and pedagogical intuition, which can only be delivered by teachers.

The psychosocial dimensions of AI use in education also warrant careful consideration. For instance, Crawford et al. (2024) examined the implications of university students' engagement with AI-driven chatbots, indicating nuanced consequences on student well-being and social connectivity. Although AI-driven chatbots appear to be able to provide students with immediate social and mental health support, based on functionality mimics, and mitigate short-term feelings of isolation (Heinz et al., 2025), excessive reliance on such systems may inadvertently erode social bonds and increase loneliness.

How Are Teachers Using AI?

As highlighted by the TTF and UNESCO Global Report on Teachers (2024), education systems face compounding teacher and resource crises, especially in low- and middle-income countries. An estimated 44 million additional primary and secondary teachers are needed by 2030, including 15 million in sub-Saharan Africa. This worldwide shortage of teachers is aggravated by rising attrition, as many teachers leave the profession early. Rural and remote areas have been hit hardest, where underqualified teachers often fill the gaps and multi-grade classrooms are common; 90% of secondary schools in sub-Saharan Africa face serious teaching shortages. Consequently, learning gaps are widening.

Students also contend with severe shortages of education materials and quality content. In some classrooms, a single textbook must be shared by a dozen or more pupils. Much of the digital education content that could help is not in the learner's language. For instance, 92% of open education resources are in English, marginalising non-English-speaking learners (GEM Report, 2023).

AI offers opportunities to counteract these global shortages. AI-powered tools can supplement overburdened teaching workforces and provide instructional support to students in underserved areas. Translation and content generation driven by AI can expand the availability of high-quality teaching resources in local languages. And data analytics can help education authorities monitor attendance, identify learning gaps, reduce absenteeism and support at-risk schools.

What teachers say about their use of AI

The ways in which teachers engage with AI vary widely across countries and jurisdictions, making it difficult to capture the full range of practices. For instance, based on the open call for evidence of the use of generative AI in education by the UK Department for Education, which received responses from 567 participants, the majority of whom were teachers, the public generally believed AI to offer various opportunities for teachers. These include:

- freeing up teachers' time

- improving teaching and education materials

- providing additional support, particularly for students with special education needs and disabilities and those for whom English is an additional language

- enhancing subject-specific applications (e.g., science, technology, engineering and mathematics).

Overall, these perceived benefits outweigh concerns (e.g. students' overreliance on AI, academic misconduct, fear of AI replacing face-to-face teaching and exacerbating digital divide) about AI support for teachers and the teaching profession.

Recent stakeholder consultations and education hackathons indicate the potential to apply generative AI in school environments is extensive, particularly for generating content. Teachers in the Asia-Pacific region, for example, are using generative AI to create dynamic and personalised learning experiences (UNESCO, 2023b). Most self-declared surveys and interviews indicate that teachers use AI to

develop lesson materials, ensuring alignment with curricular objectives while saving time on content preparation. In assessment, teachers use it to support their marking and provide personalised formative feedback for students. Beyond the classroom, teachers use AI to draft statutory policies, streamline administrative tasks, and reduce bureaucratic burdens (UK Department of Education, 2024). However, many teachers still use AI as a functional aid for automating routine tasks – such as grading, planning, and content delivery – rather than as a transformative force in their teaching (Guan et al., 2025). There is a need for deeper engagement with AI literacy, skills and ethical considerations to ensure pedagogically transformative and responsible integration of AI in education.

What AI interactions reveal about teachers' use of AI tools

Self-reported survey data offer some insights into teachers' use of AI but face inherent limitations. Biases arising from external pressures or social desirability may prevent teachers from accurately reporting their AI practices. Examining teachers' actual conversations with AI chatbots can give another picture. Analyses by the AI startup Anthropic of over 4 million conversations with AI showed high reliance on AI among certain professional groups, including foreign language and literature teachers, who used it for more than 75% of their professional tasks (Handa et al., 2025).

Understanding the extent of AI usage by professionals is crucial, including examining precisely how AI is employed, whether primarily for augmentation (boosting teachers' capabilities) or automation (carrying out routine tasks). Evidence suggests a tendency towards automating routine tasks, with AI directly executing responsibilities requiring minimal human involvement (Handa et al., 2025). Such automated applications, although efficient, raise critical questions regarding the broader implications for teacher agency and education quality. It is imperative to further investigate the balance between automation and augmentation, prioritising AI uses that enhance, rather than diminish, teachers' professional roles, capacities, and human engagement.

Benefits of AI for Teachers

When AI is thoughtfully integrated, it can offer teachers several opportunities (e.g. Celik et al., 2022) to improve teaching and learning, including;

planning, by defining students' needs and familiarising teachers with these needs (van den Berg and du Plessis, 2023)

implementation, through immediate feedback to students (Di Mitri et al., 2022); to teachers about their practice (Demszky et al., 2025) or about their interventions (Aslan et al., 2019)

assessment, through modelling students' mastery (Minn, 2022); assessment item generation (Chan et al., 2025); supported essay scoring (Seßler et al., 2025); or AI-supported feedback generation (Zhang et al., 2025).

The limited scope of these reviews underscores the necessity for greater inclusivity and diversity in research into AI in education. The overwhelming predominance of anglophone research studies, primarily from the United Kingdom, the European Union, and the United States, constrains our collective understanding of AI's global implications and potential. The absence of significant francophone, hispanic, and other non-anglophone perspectives is apparent, as well as the absence of communities who have no or limited access to the internet and whose knowledge is usually excluded, such as indigenous knowledge systems. Coupled with limited diverse empirical research, these gaps prevent a holistic evaluation of AI's impacts on education. To accurately reflect the complexity and variability inherent in global education contexts, the TFF encourages research and practice that incorporates evidence and insights from varied geographical, linguistic, cultural, and gender-diverse perspectives. Subsequent TFF publications deriving from this first position paper will focus on bridging these gaps.

In addition, although these small-scale empirical studies provide valuable insights, their outcomes typically reflect carefully designed academic AI tools evaluated under controlled conditions in which teacher implementation is guided by researchers. To reach a more realistic and generalisable understanding, it is essential to carry out robust meta-analytical reviews of individual studies (which can take years to emerge), and large-scale randomised controlled trials investigating teachers' use of common commercial AI tools such as ChatGPT, Google Gemini, Claude, and Midjourney "in the wild". Such independent experiments are scarce in education research, particularly within research into AI in education. However, they are critical for an evidence-based discourse to shape effective and equitable AI integration in education. Below, two notable examples of studies that have pursued a similar rigorous approach are discussed.

Can AI help teachers save time?

Recent research by the Education Endowment Foundation (EEF), independently evaluated by the National Foundation for Educational Research (NFER), examined the use of ChatGPT among 259 teachers across 68 secondary schools in England (Roy et al., 2024). The randomised controlled trial revealed that teachers who used ChatGPT, supplemented by practical guidance, reduced their lesson and resource planning time by an average of 31 percent. Teachers using ChatGPT saved 25.3 minutes per week compared with their counterparts who did not use generative AI tools, reducing their weekly average planning time from 81.5 to 56.2 minutes.

An independent review of the lesson resources created during the study suggested no significant difference in quality between AI-supported materials and traditionally prepared materials. This finding indicates that teachers should consider AI-generated content as a supplementary resource rather than the sole source of information for content generation as relying upon AI tools for efficiency purposes only does not necessarily improve the quality of resources. While the evidence can still be considered preliminary due to sample size limitations, this independent trial study suggests that generative AI could address persistent challenges related to teacher workload.

Can AI help teachers teach better?

AI-powered tools can support teachers in designing and adapting contextually relevant, high-quality educational resources. This can be particularly impactful in multilingual, low-resource, and crisis-affected environments, where AI can support the contextualisation of content to specific cultural, geographical and social contexts (UNESCO, 2023c). For instance, generative AI can assist teachers in designing lesson plans aligned with national curricula and international standards, as well as adapt existing content to specific learning levels and needs. In this way AI, instead of replacing teachers, becomes an active collaborator in co-creating content and facilitating administrative tasks, while maintaining the need for critical teacher review of AI-generated contents to ensure pedagogical coherence, alignment with educational goals and values, and avoid potential biases (UNESCO, 2023b).

AI may also enhance tutoring, especially where access to expert teachers is limited. For instance, Tutor CoPilot, a Human-AI tutoring system, evaluated by Brown University, demonstrated the potential of AI to improve instructional effectiveness, particularly for novice tutors in underserved education contexts (Wang et al., 2024). The system helped increase the adoption of high-quality pedagogical strategies by teachers, including greater use of inquiry-

based questions rather than providing students with direct answers. Despite these positive outcomes, interviews with teachers highlighted challenges, including occasional inappropriate class level recommendations by generative AI. Nevertheless, such findings underscore the promise of generative AI to improve teaching practice. They also highlight some of the complexities of integrating AI to scale up expert instructional support and ensure educational equity.

AI also shows particular promise in supporting teachers to meet the needs of vulnerable groups such as learners with special education needs and disabilities. According to the 2023 Guidance for generative AI in education and research, AI can enable inclusive access to learning programmes, support personalised and open learning pathways, improve data use to expand access, and help teachers monitor progress and respond to emerging challenges. AI tools can also simplify complex content and tailor it to the needs of learners through multimodal formats such as video, audio, and adapted text (Special Needs Alliance, n.d.), as well as assist teachers in designing Individualised Education Programmes, potentially saving significant planning time (Klein, 2024). In this regard, tools such as intelligent tutoring systems can also offer guided, step-by-step instruction tailored to individual students, while real-time data insights can help teachers monitor learning and respond to emerging challenges (UNESCO, 2021). Yet, these benefits must be balanced with ethical safeguards concerning privacy, and adequate professional experience in the field of AI and disability needs (Klein, 2024).

Finally, AI can further strengthen subject-specific instruction, particularly in science, technology, engineering and mathematics (STEM), by helping teachers deliver engaging and adaptive learning experiences. While adaptive AI systems personalise instruction, provide real-time feedback, and surface misconceptions to help students master complex concepts, interactive tools, such as virtual laboratories and augmented reality, offer safe, hands-on environments for inquiry-based

learning and problem-solving (Ajuwon et al., 2024). The presence of collaborative platforms additionally facilitates teamwork, formative assessment and mentoring opportunities, further supporting responsive pedagogy (ibid.). When paired with appropriate professional development of teachers, inclusive designs and accessibility, AI tools can help close learning gaps and empower teachers across disciplines, although these benefits.

AI's impact depends on teachers and system-level factors

The benefits of AI tend to diminish when technologies are independently orchestrated by teachers without appropriate support. For example, when the Intelligent Tutoring System (ITS) ALEKS was implemented in Utah, only 2% of implementations met the recommended usage benchmark (Brasiel et al., 2016). One contributing factor, as also noted by in the case of Cognitive Tutor (Karam et al., 2017), was that teachers did not know how to use AI for pedagogical tasks and lacked dedicated curriculum time for AI use. Many teachers across the globe lack key competencies to engage with AI and digital technologies in general. For instance, a 2020 study in Chile, Ecuador, Mexico, and Peru found that 39% of teachers could only perform basic digital tasks, 40% could handle simple internet use, and just 13% could execute more complex digital functions. Such findings highlight the crucial role of system-level factors and teacher training in the effective deployment of AI in education settings. Indeed, teacher agency in human-AI contexts is not located solely within the individual teacher or the AI tool alone but is distributed across complex human-AI networks (Code, 2025). Therefore, protecting teacher agency does not mean isolating teacher decision-making from AI, but rather managing the interaction of human agency and AI in complex system-level considerations.

In addition, not all AI tools introduced into schools are grounded in learning sciences or supported by robust evidence of educational impact. **There should be a system-wide monitoring and oversight of the AI tools made available to teachers in schools.** AI tools should bridge the gap between learning sciences research and practical classroom application, empowering teachers to incorporate robust, research-driven strategies directly into their instructional designs. As an example, the Learner Variability Navigator offers teachers actionable insights into students' cognitive, social-emotional, and background-related variability, accompanied by evidence-based strategies tailored to individual needs. To avoid the multiplication of efforts, there should be a balance between the resources put into developing AI tools for education and research investigating the real-world impact and value of them.

Even if AI tools are well-grounded in learning sciences or supported by robust evidence of educational impact, numerous other factors influence their adoption and use in education contexts. These include the broader policy landscape, institutional governance, pedagogical culture, technological infrastructure, and social support mechanisms available to teachers. Research involving approximately 800 schoolteachers in the UAE across different subjects and education levels demonstrated that while AI tool-related factors are important, other critical determinants play essential roles in determining the adoption and impact of AI in schools, such as manageable workload, teacher confidence and knowledge in AI usage, supportive resources provided for teachers, ownership of the AI integration process by teachers, and ethical safeguards (Cukurova et al., 2023). **AI should not be considered the sole solution to deeper structural problems in education systems which originate from a lack of funding, poor support for teachers, and a lack of recognition of teachers as critical to the delivery of quality education.** The disruptive and swift emergence of AI can help unveil the malfunctioning of education systems, but relying on technological solutions alone, without addressing these foundational issues, risks masking systemic inequities, further entrenching them, and ultimately undermining the long-term sustainability of education systems.

What Risk Does AI Pose for Teachers?

Teachers could lose professionalism and skills

Concern is increasing that the substitution of teachers' know-how may result in their losing skills that are paramount for education and teaching, such as assessing and evaluating the progress of students' learning and tailoring education to the needs of learners. This worry is frequently highlighted by researchers (Berendt et al., 2020), teachers ((UK Department for Education, 2024), and policymakers (UNESCO, 2023a). As AI becomes more integrated into the classroom, apprehension is growing that teachers could face de-professionalisation, with their role diminishing as their responsibilities are gradually outsourced to AI. Many education experts fear that over-reliance on AI to perform teachers' tasks such as marking, feedback generation, and lesson planning, could lead to the de-skilling of teachers (Felix and Webb, 2024) and harm teacher-learner relationships. In addition, teacher unions worry that while data could increase teachers' performance, the same data could be used in a punitive manner for job performance surveillance. Data could be used to scrutinise teachers' behaviour, leading to unfair and biased evaluations, or job security risks, further harming professionalism among teachers (Pea et al., 2023).

These arguments are part of a long-lasting research trend indicating a perceived de-professionalisation of the teaching profession, often attributed to a loss of professional autonomy (Frostenson, 2015). However, the impact of AI on teachers' autonomy has yet to be measured in scaled independent trials and requires immediate investigation by researchers. For instance, there are valid concerns that the underutilisation of teacher expertise and creativity in AI-based instructional design perpetuates a paradigm that privileges standardised protocols over pedagogical autonomy, thereby limiting teachers' capacity to innovate and exercise agency. One solution to the problem of de-professionalisation has been to focus on providing comprehensive teacher training in AI and other upcoming digital technologies, yet the provision of such training is still at its early stages in most countries (Miao and Cukurova, 2024).

Could AI lead to a decline in thinking practices?

The integration of generative AI into education environments also raises significant questions about its impact on teachers' higher-order thinking skills, particularly through its influence on critical and reflective thinking practices. In this sense, generative AI represents the latest in a historical sequence of innovations and technologies that have prompted concerns regarding their influence on human cognitive abilities. Socrates objected to writing, fearing it would weaken memory. Trithemius objected to printing, arguing that printed books would devalue the work of scribes and that hand-written manuscripts were more spiritually significant. Many maths teachers opposed the use of calculators, saying they would impair students' ability to perform mental arithmetic and understand basic mathematical concepts. And many teachers feared easy access to information via the internet would lead to superficial learning and a decline in deep knowledge.

Some of these concerns are grounded in empirical evidence, as improper use of technological tools for automation can weaken the cognitive functions that society aims to preserve. Students who write an essay without using an LLM exhibit stronger, wider-ranging cognitive activity than those using a search engine, while those using an LLM demonstrated the weakest overall brain activity, indicating the limited cognitive engagement of students while writing an essay using generative AI (Kosmyna et al., 2025). The point about the automation of routine tasks inadvertently depriving individuals of opportunities to cultivate their judgment and cognitive resilience, leaving them ill-prepared for situations that require exceptional thinking, is made periodically by scholars (e.g. Bainbridge, 1983, Cukurova, 2025). Many research studies are focusing on the cognitive impacts of generative AI, examining issues of cognitive offloading, memory retention, and creative thought processes, but most so far have been inconclusive.

Teachers engagement with generative AI tools can significantly alter their creative and reflective processes (Lee et al., 2025). In one study, 319 knowledge workers, including teachers, sharing 936 first-hand examples of using generative AI in their work tasks. Researchers found that teachers' confidence levels, both in their own professional competencies and in the AI systems they employ, critically shape their creativity and critical thinking. Teachers exhibiting higher self-confidence in their instructional expertise are more likely to engage deeply with critical thinking activities, fostering creative adaptation of AI-generated content. Conversely, those with high confidence in AI technologies tend to rely more extensively on automated outputs, thereby reducing opportunities for critical reflection and innovative education practices. This finding highlights the importance of improving teachers' instructional expertise and confidence before they engage with AI.

Generative AI is likely to shift the focal points of critical thinking among teachers towards verifying the accuracy and relevance of AI-produced information, integrating AI responses within instructional strategies, and monitoring AI-supported pedagogical tasks. Similarly, while generative AI enhances individual creativity and improves the perceived quality of outputs, it paradoxically reduces the collective diversity of ideas, creating a societal dilemma regarding novel content creation (Doshi and Hauser, 2024).

AI's effects on the writing process represent another significant dimension of its influence on critical thinking. Tools like Copilot and ChatGPT can enhance writing productivity through assistance in content generation, idea creation, and stylistic editing, providing valuable support to both expert and novice writers (Lee et al., 2025). However, students tend not to engage cognitively in the writing process while using an LLM, letting the LLM do the writing for them (Kosmyna et al., 2025).

Although AI significantly reduces cognitive load in educational tasks, it can compromise the depth and quality of scientific inquiry and reasoning (Stadler et al., 2024). When students use LLMs (ChatGPT) rather than traditional search engines (Google) for information gathering, LLMs significantly reduce cognitive load, but at the expense of depth and quality in students' scientific reasoning.

If novice writers become overly dependent on tools, AI could undermine essential writing skills such as argument construction and subject-matter comprehension. The strategic use of bespoke educational AI for individualised, content-specific feedback could mitigate these risks to a certain extent, fostering skill development while maintaining productivity. AI-generated feedback from well-designed pedagogical tools can improve writing quality, logical coherence, and structural clarity, particularly benefiting students and teachers with lower performance and less confidence in language skills (Young-Ju Lee, 2020; Wambsganss et al., 2021).

Most commercially available generative AI tools are not designed for education, however, and most users do not have the skills needed to adjust the parameters of such tools to make them more conducive for education purposes. For instance, higher education students demonstrated variations in self-regulation while using "off-the-shelf" generative AI tools, like ChatGPT, without appropriate pedagogical fine-tuning and prompting, which can lead to "metacognitive laziness" (Fan et al., 2025). As measured through the logs of their interactions, students who interacted with generative AI were observed to skip important steps of metacognitive learning, such as monitoring their behaviour.

Although the findings above stems from a limited number of specific studies, they highlight the potential of generative AI to both enhance and diminish teachers' creativity, critical thinking, and reflection. As a result, the future of teachers' professional skills requires a nuanced, critical engagement with generative AI that takes various design, deployment, and deployment considerations into account for specific education uses. In addition, professional learning should cover the evidence-based risks of generic generative AI for teachers' and students' thinking practices, so that they are well-informed and cautious in the way they and their students' interact with generative AI.

By replacing teachers, AI could dehumanize education

If the adoption of AI in education were used as an opportunity to replace teachers, important moral considerations would arise, particularly in relation to the potential dehumanisation of teaching and education. Systems like AI learning companions might be efficient in content delivery but risk reducing education to mere information absorption, neglecting the holistic development of learners, including critical social and emotional competencies.

Education inherently involves developing genuine human relationships, social understanding, and the practical, embodied acquisition of knowledge and skills through direct interactions with other people and the physical environment. Fully automated AI systems might compromise the authentic experiential learning that is essential for cultivating genuinely embodied skills and real-world interactions. Teachers frequently make decisions in the classroom through moral discernment. The transfer of such responsibility to an AI system would have significant implications for education and should be approached with caution. These considerations must be central to discussions about the responsible integration of AI, maintaining a careful balance between technological innovation and human-centric education values.

AI could standardize education at the expense of diversity

The integration of AI into education also could also standardise teaching and learning experiences, leading to a homogenised and monochromatic education landscape. AI systems have an inherent tendency to privilege uniformity and predictability, often at the expense of diversity, creativity, and cultural specificity. The widespread adoption of AI-powered education tools and platforms could promote a one-size-fits-all model of education, wherein curricula, pedagogical approaches, and assessments become increasingly uniform, leaving little room for a rich plurality of cultural expressions, varied pedagogical traditions, and individualised approaches to teaching. To ensure AI supports diversity, a diverse set of education experts, including teachers, need to be involved in the development of AI in education.

Standardisation would not only undermine the capacity of teachers to tailor their teaching to diverse student populations but also diminish

the opportunities for students to engage critically with multiple perspectives. This would reduce education to transactional knowledge acquisition rather than fostering transformative learning experiences. The imposition of universal standards and practices enabled by AI technologies could also exacerbate education inequities, marginalising local and indigenous knowledge systems and reinforcing existing power asymmetries between privileged and under-resourced education contexts.

Localisation of content and models is critical to ensuring the relevance and effectiveness of AI applications in low-income countries. AI-driven education resources should be accessible in local languages to support inclusive and culturally responsive learning experiences. Effectively integrating AI in education contexts necessitates strategic alignment with local realities, achieved through carefully designed pilot initiatives, ensuring they are culturally appropriate, technically feasible, and practically sustainable (see, for instance, initiatives from the International Association for Safe and Ethical Artificial Intelligence).

Lessening this risk of educational hegemony requires concerted efforts from policymakers, teachers, and technology developers to prioritise diversity, adaptability, and cultural responsiveness in AI-driven education. Ensuring AI technologies enhance rather than constrain diversity necessitates embedding principles of inclusivity and cultural pluralism within the design, deployment, and governance frameworks that guide the integration of AI into education.

AI and the paradox of 'teacherless' schools

As AI improves its potential to support numerous aspects of the teaching profession, there are also increasing attempts to design schools in which some of teachers' roles are replaced by AI. Although branded as "teacherless," these schools generally offer more frequent and extended human mentorship and coaching to

their students than traditional schools, thereby increasing personalised interaction and support. They tend to use AI for initial content acquisition, significantly reducing traditional classroom hours, and reallocate students' time to developing lifelong learning skills through interactions with peers and mentors.

In these innovative settings, such as the Alpha schools in the United States, AI is not replacing teachers but transforming their roles into that of mentors. In such schools AI can help us address persistent education challenges by providing adaptive education for knowledge acquisition, while offering greater human interaction to develop students' higher-order thinking and lifelong learning skills. However, this approach requires extra financial resources to increase the number of teachers who act as mentors, potentially exacerbating disparities between affluent and less affluent education institutions.

To enable teachers to evolve into mentors and tutors, initial and in-service teacher education programmes need to be updated to reflect these new roles. This includes equipping teachers with the relational, reflective, and pedagogical skills essential for guiding student inquiry and supporting deeper learning. However, implementing such models would be difficult for public education systems in regions where large class sizes, limited funding, and high teacher workload make sustained mentorship difficult to achieve at scale.

AI risks exacerbating the digital divide

Affluent parts of the world might have the resources to adopt instructional strategies that increase authentic human interaction even after AI is integrated in schools. Many under-resourced schools and countries, however, might adopt AI primarily to save time and reduce costs, resulting in the automation of poor teaching practices or the substitution of teachers' core activities. Such decisions risk exacerbating existing inequalities in education systems, as schools in developed countries

use AI to enhance pedagogical approaches and foster skills like collaboration and critical thinking, while schools in underdeveloped counties are forced into using AI in ways that prioritise resource efficiency over quality.

While AI holds potential to enhance education access globally, considerable challenges remain due to persistent digital divides. AI tools alone are unlikely to bridge such systemic gaps (Bulathwela et al., 2024). Experiences with massive open online courses (MOOCs) offer valuable insights for the potential impact of AI in education. Initially developed to "democratise access to education" by providing free, large-scale learning opportunities, they have disproportionately benefited learners from developed regions and those already possessing higher education credentials, inadvertently reinforcing existing education inequalities (Kizilcec et al., 2017). MOOCs also exacerbated disparities within countries as students from higher-income neighbourhoods, larger cities, and families with greater education attainment are more likely to complete online courses (Hansen and Reich, 2015).

Similar arguments can be made for technocentric implementations of computer-based learning and learning management systems: rather than bridging education gaps, they tend to amplify disparities, underscoring the importance of carefully considering the broader socio-economic contexts in which technological innovations are implemented. If mitigating measures are not taken now, and if the mere presence of AI tools is mistaken for meaningful education reform, AI in education is likely to have similar effects on the teaching profession, teachers, and education in general, across the globe.

The three decades of global edtech experience, as documented in reports such as the 2023 Global Education Monitoring (GEM) Report on Technology in Education, offer critical insights that remain highly relevant to current debates on AI and generative AI in education. "AI colonialism", the idea that technologies developed in high-income countries risk reinforcing global inequities, must be critically addressed. The financial costs of deploying AI, such licensing fees for premium versions of LLMs, the need for scalable computing resources, and the broader environmental costs of AI, stretch education budgets and long-term sustainability in all countries.

In addition, many teachers and students around the world still lack adequate access to essential technological infrastructures, electricity, devices, internet, smart phones, and AI tools, limiting their opportunities to benefit from these advancements. According to the SDG 7.1.1 Electrification Dataset of the World Bank (2023), In Sub-Saharan Africa, only 53% of the population has access to electricity, and this lowers to 33% in rural areas. In the Gambia, for instance, only 30% of rural areas have access to electricity. Broadband connectivity remains accessible to only 37% of the African continent. These stark infrastructure limitations pose significant challenges to the feasibility and equitable implementation of AI in education (UNESCO, 2023a). As AI's capabilities expand rapidly, there is a risk that existing inequalities may further deepen.

To counter these challenges, prioritising low-tech, high-impact solutions is essential (see, for instance, Alliance for Affordable Internet's work on meaningful connectivity). There is a need for research and industrial work to develop AI solutions that perform as well as commercial AI models but can be run offline and on mobile tools, ensuring accessibility in low-resource settings (Li et al., 2025). An example of such an approach is the ProFuturo Mathematics initiative, which uses an AI-powered platform adapted specifically for offline use. Since its deployment, ProFuturo Mathematics has reached nearly 1,500 schools in 39 countries around the world, engaging over 16,000 teachers and 417,000 students. ProFuturo Mathematics demonstrates the potential of strategically designed AI tools to provide equitable, accessible, and effective learning experiences in contexts where connectivity is low. However,

the impact of access to such systems on specific learning outcomes and teacher practice still requires independent evaluations. Another promising way to bridge the digital divide in underserved regions is to enhance digital accessibility by promoting the use of solar-powered devices and fostering partnerships with telecommunications providers to subsidise data costs.

Disparities across countries and regions underscore the importance of equity-focused policies and global initiatives to ensure that AI in education benefits all learners, regardless of their socio-economic context, by fostering not only content acquisition but also genuine and enriching education experiences. Policies should work towards enabling all teachers to have the access to infrastructure, technology, and professional learning that they need to benefit from AI (see, for instance, the Giga initiative on providing connection to schools or UNESCO's Digital Transformation Collaborative on supporting education systems).

Bias in data means AI can perpetuate inequality

AI systems often draw upon data and narratives predominantly originating from wealthier and technologically advanced countries. This can perpetuate existing cultural, linguistic, and socioeconomic biases, reinforcing systemic inequalities and exacerbating exclusion (for instance, 55% of all websites are in English). Some communities even help to train AI systems through low-paid work in data labelling, annotation, and other forms of digital labour, yet rarely reap benefits from the resultant technological advances. Such inequities amount to a 'double curse' of exploitation and exclusion, and constitute a profound ethical concern. It is imperative that policymakers, education leaders, and technology developers commit globally to inclusive, equitable, and socially responsible frameworks for deploying AI in education. Such frameworks should ensure that all learners and teachers, irrespective of their geographic, economic, or social circumstances, have genuine opportunities to engage with and benefit from emerging AI technologies.

Due to the vast size of training datasets and extensive efforts to fine-tune generative AI models, they may not appear as if training data have a large influence on their performance. However, recent research reveals troubling implicit biases inherent within LLMs when applied in education settings and demonstrates that AI-generated content consistently mirrors and reinforces existing social biases and stereotypes (UNESCO and IRCAI, 2024).

Towards teacher-AI complementarity

Design and deployment of AI in education needs to focus on enhancing rather than replacing teacher capabilities. Harnessing the strengths of both AI systems and teachers in complementary ways could maximise AI's benefits while mitigating its limitations (Hemmer et al., 2024). AI could augment teachers' competencies in cognitive aspects of their profession, including situation-specific skills, while uniquely human capacities, such as critical thinking, empathy, ethical judgment, and interpersonal responsiveness, remain the exclusive domain of teachers.

AI could function, for example, as an external memory and problem-solving resource for teachers (Skulmowski, 2023). While such offloading could free up cognitive capacity for higher-order thinking, it also means cognitive performance is interdependent with technology and thus could be manipulated by technology developers. As a result, teachers need strong metacognitive skills to decide what to offload and what to retain control over. Retaining agency

might thus involve a conscious strategy of using AI for certain functions (e.g. remembering facts or filtering information) while deliberately keeping other functions (e.g. relational decision-making, value judgments) under human control. By maintaining this balance, complementarity could support holistic, genuinely supportive education outcomes in the long term. At the end of the day, meaningful integration requires careful consideration of the specific strengths and limitations of both humans and AI systems within clearly defined education contexts.

Refining our understanding of teacher-AI complementarity requires identifying what aspects of teaching can realistically be augmented through AI, and how such augmentation might be achieved (see, for instance, the new EC project on teacher-AI complementarity). One proposed framework outlines four dimensions through which teacher capabilities could be enhanced by AI technologies (Holstein et al., 2020):

1 **goal augmentation** describes scenarios where AI agents support teachers in setting, monitoring, and evaluating education objectives, thereby enriching strategic education planning and effectiveness

2 **perceptual augmentation** emphasises the enhancement of teachers' abilities to perceive and interpret student learning processes through advanced sensor data analytics and real-time insights

3 **action augmentation** focuses on expanding the range and scalability of teacher actions, enabling teachers to manage larger groups or to provide individualised support in ways otherwise unattainable

4 **decision augmentation** involves the mediation of teacher decisions through AI-informed instructional recommendations, potentially enriching pedagogical reasoning while safeguarding teacher autonomy and professional judgment.

Moving beyond the teacher replacement arguments, this multidimensional perspective underscores the nuanced potential of AI to augment teacher competencies while preserving uniquely human teacher capacities.

Recent findings presented at the UNESCO International Day of Education further illuminate the critical relationship between the degree of teacher-AI complementarity and stakeholders' acceptance (UNESCO, 2025). AI applications characterised by higher levels of teacher agency and complementary teacher-AI interactions are met by teachers, students and parents with markedly greater receptivity than systems that constrain teacher autonomy through overly prescriptive or reactive interactions. These insights reinforce the imperative of designing AI technologies that prioritise and protect the professional autonomy and decision-making capacities of teachers, thereby they are likely to foster greater trust, acceptance, and sustainability in the integration of AI within educational environments. Therefore, teacher-AI complementarity is not only needed for effectiveness, protected teacher agency, and ethical justifications, but also for increased real-world adoption of AI in education.

Key Recommendations

By now it is clear that the accelerating development of AI presents both transformative opportunities and profound responsibilities for education systems worldwide. The discourse must move beyond the polarising narratives of dystopian fears and utopian promises surrounding AI in education. Evidence-informed policymaking should acknowledge the transformative potential of AI to enhance teaching efficiency, improve learning outcomes, and alleviate administrative burdens, as well as the challenges it poses, including bias, teacher de-professionalisation, the narrowing of pedagogical approaches, and the exacerbation of digital inequalities. The following recommendations aim to inform and guide policymakers, education leaders, teacher unions, and others involved in education in navigating this complex intersection with a focus on ethical and equitable use of AI that prioritises teachers' needs, capacities, and agency.

1. **Reaffirm the irreplaceable role of teachers in education:** Governments and education stakeholders must commit unequivocally to the irreplaceability of teachers. Official education frameworks and AI governance policies should formally state that AI systems must support, not substitute, core teacher responsibilities, especially those involving emotional support, ethical guidance, cultural transitions, creative teaching, and interpersonal connections.

2. **Promote and Protect teachers' professional competencies:** To counter the risks of de-professionalization of teachers, policies must encourage models of AI implementation that foster complementarity between teachers and AI. Teachers should retain critical responsibilities and enhance their roles as mentors and tutors. Uses of AI should encourage development of teachers' competencies, with AI tools co-designed with teachers, supporting rather than diminishing teacher agency. To fulfil this recommendation:

    i) **Implement comprehensive AI competency frameworks for teachers:** Professional learning for developing teachers' AI competencies emphasise not just technical and practical proficiency with AI tools but also foundational AI literacy, ethical considerations, a human-centred mindset and AI-enhanced pedagogies. International frameworks should be localised and tailored to the specific level of readiness, needs, and existing levels of competence among teachers in a country, locality, or organisation. Educational institutions must provide structured training programmes, co-creation and dialogue opportunities, embedding AI competencies into both initial teacher education and continuous professional development.

    ii) **Support teacher collaboration and innovation through professional networks and communities of practice:** Policymakers should facilitate the establishment and funding of teacher-led professional networks and communities of practice dedicated to AI integration in education. These collaborative structures would empower teachers to exchange best practices, co-design appropriate AI solutions, and collectively tackle challenges posed by AI, thus enhancing teachers' professional agency and innovation capacity.

3. **Evaluate AI's impact and promote human-centred pedagogies:** Policies should mandate rigorous evaluation of AI's impact on pedagogical quality, teacher workload, practice and well-being, as well as learner outcomes in authentic practice environments. AI should not automate poor practices of education, but encourage innovative pedagogies, emphasising human-centred approaches. To reflect the complexity and variability of education globally, research and practice should incorporate evidence and insights from varied geographical, linguistic, cultural, and gender-diverse perspectives.

Robust meta-analytical reviews of individual studies should be undertaken, as well as large-scale trials investigating teachers' long-term use of AI. Driven by this evidence, there should be system-wide monitoring and oversight of the AI tools made available to teachers in schools. The evaluations should hold designers and developers of AI in education to account for ensuring AI tools used in education are of a human-centric nature to support critical thinking, creativity, and reflective practices among teachers and students.

4. **Safeguard diversity and prevent AI from standardising education:** Policies must prevent AI-driven standardisation and hegemony from homogenising education experiences. Education standards should require AI tools to be culturally responsive and adaptable. Such tool should support diverse teaching approaches, as well as special education needs, curricula, pedagogical traditions and cultures. They need to preserve plurality and prevent the marginalisation of local and indigenous knowledge systems and cultures.

This recommendation can only be achieved by including teachers' voices through social and policy dialogue. By creating collaborative, participatory frameworks, education stakeholders can ensure that teachers' experiences, expertise, and concerns make a genuine contribution to AI integration in education. This approach fosters teacher buy-in, confidence, and professional validation, improving teachers' working conditions and professional prestige.

Likewise, given the sensitivity of the use of AI in Education to contexts, pedagogical objectives and learning outcomes, it is necessary to **promote collaborations to experiment and pilot the use of AI in Education** and in supporting teachers to leverage the potential of AI.

5. **Promote transparent, sustainable, and ethical AI governance:** Education policymakers should enforce clear ethical standards and transparency in AI technologies deployed in schools, ensuring that teachers fully understand AI decision-making processes and implications. The resource-intensive nature of AI development raises critical environmental concerns, which can lead to excessive, purposeless consumption of natural resources. Determining precisely which educational purposes justify AI's environmental costs is challenging; thus, policies must encourage ongoing, transparent dialogue and critical reflection on these trade-offs.

Policies must include robust ethical standards addressing sustainability, privacy, data protection, and fairness of AI technologies used in education. Such standards should also involve **robust mechanisms to monitor and correct bias in AI in education.** AI systems and policies must undergo rigorous, independent, and scaled evaluations to detect and mitigate biases related to gender, ethnicity, socioeconomic status, language background, disability, and other factors. Such evaluations should assess impacts across

diverse student and teacher populations, as well as unintended consequences, including effects on well-being and autonomy. Education stakeholders should be involved in these evaluations and be informed about identified biases so they can take steps to counter them and ensure equitable outcomes.

6. **Ensure equitable access and prevent AI-driven educational inequality:** To avoid exacerbating existing disparities, policies must bridge the digital divide by investing in technological infrastructure, tailored digital literacy programmes, and equitable resource distribution across the globe, including in low-income countries. Learning from previous technological failures and existing best practices, policy should prioritise appropriate AI implementations that enhance education quality globally.
7. **Promote international cooperation and solidarity:** To effectively leverage AI in Education and fill the digital divide, there is a need for knowledge sharing, peer learning and capacity development. This should be promoted through existing platforms and networks including the Education 2030 SDG 4 High-level Steering Committee, the International Task Force on Teachers for Education 2030, the Global Education Coalition and Broad Band Commission among others. Policy learning can be further enhanced through Dedicated fora like UNESCO's Digital Learning Week and others that support multilateral dialogue and cooperation.

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As artificial intelligence (AI) continues to transform the educational landscape, it is critical to emphasize the irreplaceability of teachers and the role of human connection in classrooms. AI presents both opportunities and challenges to teaching and learning, but it cannot substitute the many necessary social dimensions of education, such as ethical reasoning, critical thinking, and empathy. If used correctly, AI has the potential to empower teachers and ensure quality and sustainable education for all. The International Task Force on Teachers for Education 2030 developed this position paper with the goal of catalyzing deeper policy dialogue, exploring the possibilities AI holds, and advocating for the protection and re-valorization of teachers.