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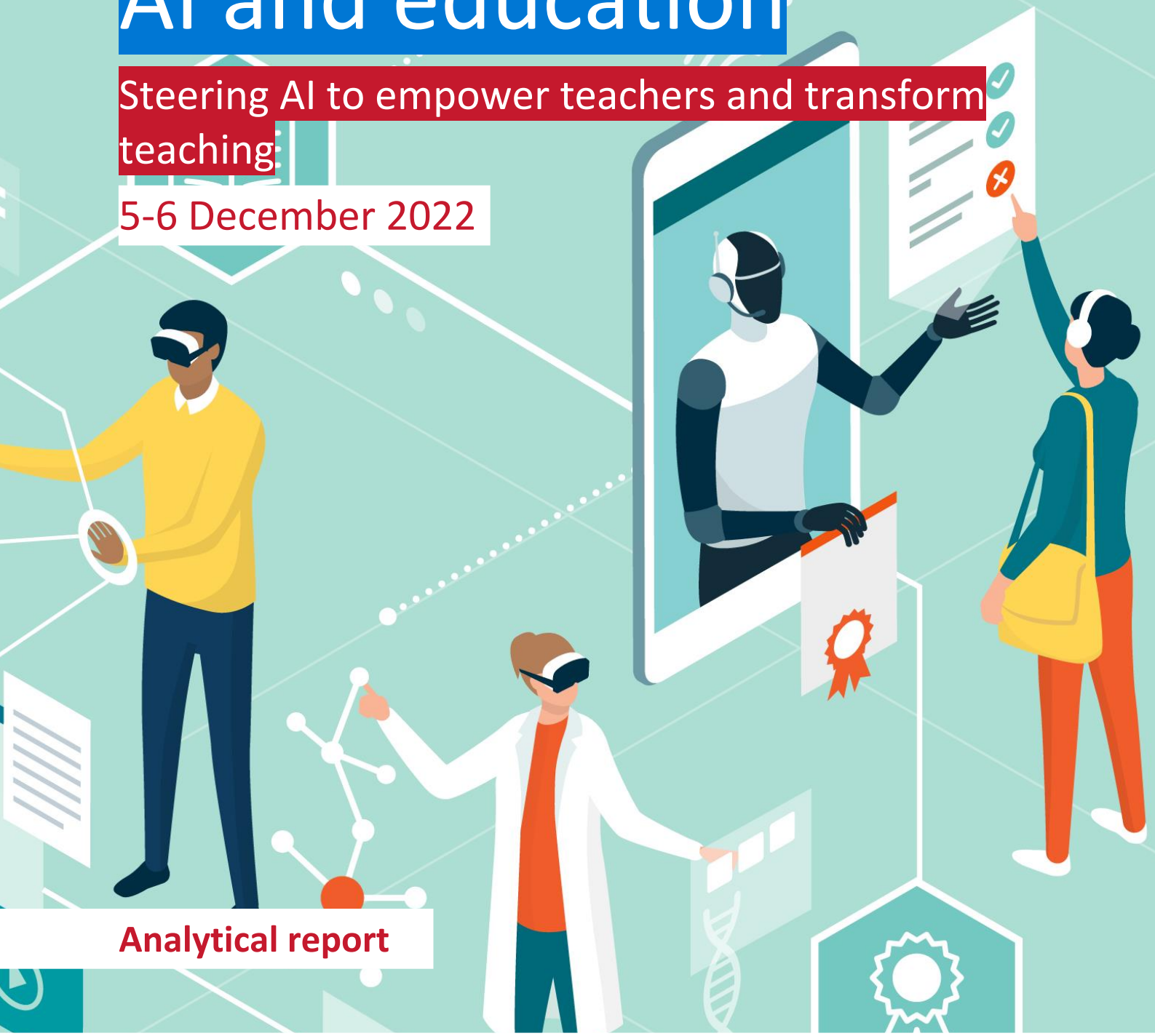
International forum on AI and education

Steering AI to empower teachers and transform teaching

5-6 December 2022



Analytical report

ED-2023/FLI-ICT/AI&ED

Education 2030

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Education 2030

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7, place de Fontenoy, 75352 Paris 07 SP, France

Authors: Fengchun Miao, Kelly Shiohira, Zaahedah Vally and Wayne Holmes

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[1] See https://www.unesco.org/en/articles/international-forum-artificial-intelligence-and-education-2022

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Introduction

Since 2019, UNESCO, in cooperation with China, has been leading global efforts centred on the twin strands of Artificial Intelligence (AI) and education, aiming to ensure that (i) the application of AI serves education as a public endeavour and a common good; and (ii) education systems teach the technological and human competencies needed for the AI era.

2019 UNESCO's far-reaching work on AI and education formally began with UNESCO's flagship Mobile Learning Week, held in Paris in March 2019, which was dedicated to the theme Artificial Intelligence for Sustainable Development (UNESCO, 2019*a*).

The **first International Conference on AI and Education**, 'Planning Education in the AI Era: Lead the leap' was held in Beijing in May 2019 (UNESCO, 2019*b*). It was during this conference that the seminal *Beijing Consensus on Artificial Intelligence and Education* was adopted (UNESCO, 2019*c*). This first international conference and subsequent editions of the **International Forum on AI and Education** have been co-organized by UNESCO and the Government of the People's Republic of China.

2020 The **second International Forum on AI and Education**, 'Developing Competencies for the AI Era' was held online and in person in Beijing in December 2020 (UNESCO, 2021).

2021 The **third International Forum on AI and Education**, 'Ensuring AI as a Common Good to Transform Education' was held online and in person in Beijing in December 2021 (UNESCO, 2022*a*).

2022 The **fourth International Forum on AI and Education**, 'Steering AI to empower teachers and transform teaching' was held online and in person in Beijing in December 2022.

This fourth edition of the **International Forum on AI and Education**, which is the focus of this report, involved 97 speakers. This included ministers, vice-ministers and state secretaries from 17 countries: Brazil, Côte d'Ivoire, Ethiopia, Indonesia, Mongolia, Namibia, Nigeria, Oman, People's Republic of China, Qatar, Republic of Korea, Serbia, Slovenia, South Africa, Spain, Sri Lanka and the United Arab Emirates. Presentations were also made by leading experts from UN agencies, NGOs, the private sector, universities and international organizations from a further 26 countries: Argentina, Armenia, Australia, Belgium, Cameroon, Colombia, Democratic Republic of the Congo, Costa Rica, Finland, France, Germany, India, Ireland, Israel, Kenya, Lebanon, Morocco, Nepal, Netherlands, Pakistan, Saudi Arabia, Senegal, Tunisia, Türkiye, United Kingdom and United States. A total of 3,000 participants from more than 115 Member States attended the Forum. It was also live-streamed on YouTube (in English, French and Chinese) and by the Chinese Ministry of Education's channel.

From its very beginnings, the **International Forum on AI and Education** has contributed 'to peace and security by promoting collaboration among the nations through education, science and culture' (UNESCO, 1945). Having featured, since 2019, almost 300 speeches and presentations[2] and reached more than 11,000 real-time international participants and viewers from almost every country across the globe, the Forum has now become the world's leading event promoting knowledge-sharing, the understanding of peoples, and the achievement of international agreements, in the fast-developing and increasingly impactful field of AI and education.

[2] Videos and speeches from the four international forums can be accessed via https://aiedforum.org

The use of AI to transform teaching and the required AI competencies for teachers

Teachers and effective teaching remain the backbone of education. The benefits of the digital transformation of education will not be achieved if teachers are not empowered and teaching practices are not transformed. Moreover, AI will only benefit the transformation of teaching practices and education if it enhances – by design – learner-centred pedagogical approaches and higher-order thinking while respecting ethical norms and standards.

Despite its potential to enhance teaching, the design and deployment of AI to empower teachers and to support teaching has so far received far less attention than AI-assisted tools designed for learners. Those teacher-facing AI tools that do exist rarely involve creative pedagogical methodologies designed to transform teaching and learning, rarely develop innovative approaches to the organization of learning, and rarely address the social and emotional interaction between teachers and students. As underlined in UNESCO's *AI and Education: Guidance for Policy-makers* (Miao et al., 2021), AI applications designed to support teachers have so far focused on replacing low-skill tasks, aiming to reduce teacher workloads by automating responsibilities such as assessment, plagiarism detection, administration and feedback.

In particular, AI cannot transform teaching and education until AI technologies are designed and used at scale to drive and enable the implementation of 'context-responsive learning options, pedagogies and curricula in diverse forms, assessment strategies and expected learning outcomes, from high tech to low-tech, and no-tech contexts' (United Nations, 2022, p. 5). The design of AI algorithms and AI-assisted tools should aim to open up teaching and learning possibilities that are otherwise difficult or impossible to achieve, should challenge or even disrupt existing pedagogies, and should augment not try to replicate teachers' expertise. Equally importantly, multiple ethical issues need to be addressed before AI is or can be properly harnessed in real educational settings.

As AI tools become more available in classrooms and other formal or informal learning settings, it is likely that teacher roles will change. The Vision Statement of Transforming Education Summit 2022 envisaged the transformation of teachers' roles and recommended key training and support that will be needed: 'Teachers must become knowledge producers, facilitators, and guides in the comprehension of complex realities. They must be trained and empowered to transcend from passive to active, from vertical and unidirectional to collaborative. They must promote learning based on experience, enquiry, and curiosity' (United Nations, 2022, p. 5).

To spark such a transformation, it is important for policy-makers to ensure that the introduction of AI in education will empower teachers, protect their rights, and enhance teacher agency – all of which are widely recognized as being crucial to high-quality education. In particular, the capacity, agency and autonomy of teachers must be both broadened and sustainable (e.g. through professional development and ongoing support). However, when AI-assisted technologies for teachers are designed only to relieve teachers of time-consuming activities such as marking assignments and repeating answers to the same academic questions, as is currently typical, they can actually interfere with teacher-student relationships and undermine teacher agency.

The *Beijing Consensus on Artificial Intelligence and Education* (UNESCO, 2019*c*) recommends that governments should

> "be mindful that while AI provides opportunities to support teachers in their educational and pedagogical responsibilities, human interaction and collaboration between teachers and learners must remain at the core of education. Be aware that teachers cannot be displaced by machines, and ensure that their rights and working conditions are protected (p. 5).

It further calls on governments to 'dynamically review and define teachers' roles and required competencies in the context of teacher policies, strengthen teacher training institutions, and develop appropriate capacity-building programmes to prepare teachers to work effectively in AI-rich education settings' (UNESCO, 2019*c*, p. 5).

This analytical report

The fourth edition of the **International Forum on Artificial Intelligence and Education** aimed to foster knowledge sharing specifically on how to steer the design and use of AI to empower teachers and to transform teaching methodologies within the broad framework of digital transformation of education. In this report, we focus on the following key themes: national strategies on AI and education; critical reviews of roles of AI in the digital transformation of education; ethical principles and their implementation with a specific focus on gender equality; AI competencies for teachers, and notable algorithms or AI platforms and AI-informed pedagogies. The report concludes with considerations for the future based on the authors' own analysis, in which we explore the key role of human teachers, steering the human-centred approach, mainstreaming gender equity, designing education-specific AI models and innovative pedagogy, and ensuring human agency in defining problems and designing solutions.

National strategies on AI and education

The Forum sought to bring together a range of expertise and experiences across the globe, and, in keeping with UNESCO priorities, a special focus was placed on Africa. A total of 16 national strategies were presented at the Forum by the various national ministers and representatives invited to attend. Of these Member States:

- Five were African States – Ethiopia, Namibia, Nigeria, Senegal and South Africa
- Three were Arab States – Morocco, Oman and United Arab Emirates
- Four were in Asia and the Pacific – China, Indonesia, Republic of Korea and Sri Lanka
- Two were Eastern European States – Serbia and Slovenia
- One was from Western Europe - Spain

However, it is important to note that not all of these strategies were directly related to or containing AI. In Africa, all but one of the countries represented does not yet have a specific AI strategy or AI strategy elements, while in Asia two of the four countries represented do not have specific AI strategies. Of those represented, one country in the Arab States and one in the Eastern European States do not yet have AI specific strategies. In short, some areas that were well represented at the conference, particularly Africa and Asia and the Pacific, are still at the nascent stages of AI Strategy development.

In total, the presentations of national initiatives and strategies related to AI from these countries shed light on the general awareness of policy-makers on the impact of AI in education and the commitment of national governments to fostering AI competencies among students and teachers. This commitment is evident through various measures undertaken, such as the revision and updating of national curricula seen in the Republic of Korea, Slovenia, Spain and Sri Lanka; efforts to cultivate an AI ecosystem through research collaborations and partnerships as well as providing training and incubation programs for AI talents as observed in Morocco; the engagement of technology industries in ensuring AI safety in Singapore, etc. The national strategies shared during the Forum also unveiled the varying levels of preparedness and policy responses toward AI across different regions, a reminder that the pre-existing digital divide still underpins the system-wide uptake and integration of AI in education.

African States

To align with UNESCO's global priority on Africa, the Forum devoted a special session under the theme ‘Global partnership for centring the most marginalized with priorities for Africa’. As a result, the Forum brought forth a wealth of valuable perspectives pertaining to Africa, as exemplified by this section.

The *Windhoek Statement on Artificial Intelligence in Southern Africa* (UNESCO, 2022*b*) had recently been adopted at the UNESCO Sub-Regional Forum on Artificial Intelligence in Southern Africa, which took place in September 2022. The Statement begins with a recognition:

> “ …Artificial Intelligence (AI) is fast transforming the world and the future of humanity, raising complex questions and blurring traditional boundaries of the physical, digital and biological worlds, influencing human thinking, interaction and decision-making, and raising socio-economic, ethical and political risks engendered by the use of AI systems mainly produced outside our region, that often rely on low quality and nonrepresentative data, with limited knowledge of local languages and indigenous knowledge (p. 1).

This single statement outlines many of the current challenges of African States with regard to Artificial Intelligence, particularly the fact that AI is largely developed outside the continent, resulting

in AI which is not representative of Africans and does not leverage or even incorporate the diverse knowledge systems and languages of the continent, including indigenous knowledges and languages. And yet, in Africa as in the rest of the world, AI is already a part of everyday life for many citizens, and the anticipation is that this influence will only continue to grow.

While five Member States from Africa presented initiatives at the Forum, only Nigeria specifically referenced artificial intelligence strategies, with most focused on basic digitalization and/or digital governance initiatives. Based on the Forum proceedings, there appears to be a need to develop more advanced and specific policies that address the real humanistic integration of AI into schools and societies on the continent, should AI integration be deemed desirable by decision-makers in these contexts.

Ethiopia

Although Ethiopia does not have a national AI strategy, Ethiopian universities offer postgraduate studies in artificial intelligence, and the Ethiopian AI Institute was established to work on research related to AI. The AI Institute works closely with the academic community and other research institutes and centres in Ethiopia.

Namibia

Although Namibia does not have an AI strategy, Namibia is seeking to 'maximize the integration of artificial intelligence in education' through the revision of the basic education curriculum to incorporate ICT (information and communication technology) subjects and maximize the exposure of learners to digital skills and ICT literacy. The Ministry has procured a School Link management system, supportive platforms and applications such as Moodle and Microsoft 365, which were presented as a basis from which to eventually enhance the integration of artificial intelligence in the education system.

Nigeria

Nigeria is currently implementing the *National Digital Economy Policy and Strategy (2020-2030)* (Federal Ministry of Communications and Digital Economy, 2019) that is hinged on eight key pillars to drive the Digital Transformation Journey in the country. The pillars of the National Digital Economy Policy and Strategy (NDEPS) have been carefully selected to include all the key aspects that Nigeria needs to focus on in order to actively participate in the global digital economy.

The National Centre for Artificial Intelligence and Robotics (NCAIR) was established to promote research and development on emerging technologies and their practical application in areas of national interest for Nigeria. The NCAIR is focused on AI, with the goal of supporting Nigeria's digital transformation journey in accordance with the NDEPS.

Senegal

Although Senegal does not have an AI strategy, it has established SIMEN, the national education management information system of the Ministry of National Education. Senegal is seeking to modernize teaching and learnings through the Sector Program 2018-2030, which is focused on the improvement of quality, equity and transparency in education (PAQUET), as well as the capacity of teachers, administrative staff and establishing ICT-friendly learning environments in schools.

South Africa

Although South Africa does not have an AI strategy, the Minister for Basic Education in South Africa detailed the policies and frameworks in place for the digital transformation, including the National Development Plan 2012, a long-term plan for development which provides a broad strategic framework to guide key choices and actions, including inclusive digital transformation; the Public Service Corporate Governance of ICT Policy Framework 2012, which promotes the governance of ICT

as an integral part of corporate governance within the public sector in a standardized and coordinated manner; the National CyberSecurity Policy Framework of 2015, which presents a comprehensive legal framework governing cyberspace; and the National Integrated ICT Policy 2016 articulates how the government will deal with issues of digital transformation of government, digital access and digital inclusion.

Arab States

Four Arab States presented national policies or strategies related to AI. Qatar and the United Arab Emirates reported on specific AI strategies or national policies in place, with Oman soon to develop integrated policies and legislation. In Morocco, initiatives are currently focused on research and training across grade levels.

Morocco

Although Morocco does not have an AI strategy, the International Center for Artificial Intelligence of the Mohammed VI Polytechnic University in Morocco has a partnership in place which deals with training 150 African women leaders in technology and AI. The Center offers an executive Masters in AI and data with a focus on ethics and responsibility. There are also offerings for young people (age 8-14) such as the Junior Masters which raises awareness of youth on AI and robotics. Another initiative the Center is involved in is a hackathon which aims to promote artificial intelligence for the empowerment of women and the achievement of gender equality.

The Center signed a Strategic and Financial Partnership Agreement with UNESCO, which aims to build AI in Africa. As part of this partnership, more than 500 students, entrepreneurs and leaders from across Africa will have the opportunity to participate in awareness-raising activities, skills building and certification training in the field of AI, with a special focus on African women entrepreneurs.

Oman

The Ministry of Transport, Communications, and Information Technology in Oman recently established the National Programme for Artificial Intelligence and Advanced Technologies. The programme aims to prepare integrated national policies and legislation, as well as provide capacity building, scientific research and innovation programmes. The Ministry of Education is developing a national framework for artificial intelligence in education as part of the e-learning roadmap. The Ministry also plans on including artificial intelligence technology in the educational evaluation platform project and incorporating it in the analysis of educational indicators.

Qatar

The state of Qatar launched the National AI Strategy in 2019 and education is one of its key pillars. The strategy seeks to establish Qatar as a leader in AI, and 'accrue downstream benefits by owning the future means of production' (Ministry of Transport and Communications, 2019, p. 5). The strategy argues that AI should be a fundamental part of education in all grades and subjects in primary and secondary schools, with ample investment in tertiary education so that computer science majors are equipped to develop world-class and useful AI, and that students of other subjects are well-equipped to utilize AI when they encounter it.

United Arab Emirates (UAE)

The UAE is currently implementing the National Strategy for AI 2031, with the vision of becoming a leading nation in AI by 2031. This Strategy aligns to the country's Centennial Plan 2071. There is also a move to encourage students to undertake postgraduate training in AI in order to develop the skills needed to build AI tools and systems that will assist the economy. The UAE has also established the Digital School, the first integrated and digitally-enabled school that provides digital and hybrid

learning compatible with national and international curricula, currently reaching underserved communities globally.

Asia and the Pacific

Asia and the Pacific is an active region with initiatives underway both nationally and regionally. For example, a regional education agenda was adopted by 11 Southeast Asian countries in 2015 which is in part focused on the advancing of the twenty-first century curriculum and twenty-first century skills. In addition, a number of national strategies were presented in brief at the Forum. China and Singapore presented fully-developed national strategies, while Sri Lanka and the Republic of Korea focused on ICT more broadly, with AI initiatives embedded in existing frameworks.

People's Republic of China

The Minister for Education of China noted the 'transformative impact of AI technology, to the building, development and well-being of the teaching force in the digital era, and to providing talent and intellectual support for a more equitable, inclusive and resilient educational system.' China is seeking to 'optimize the governance of education' by implementing the National Education Digitalization Strategic Action launched in early 2023 by the Ministry of Education. The Action will make use of big data, AI and other technologies.

The Republic of Korea

Although Korea does not have an AI strategy, the Korean government developed the 'Roadmap for Digital Talent Cultivation' in August 2022 to provide an opportunity for all citizens to acquire digital skills to 'actively respond to swift future changes'. To do this, a number of ministries are implementing policies that hone skills at various levels. Furthermore, digital skills have been incorporated into the revised national curriculum, with double the compulsory class hours of ICT education in primary and secondary schools.

Singapore

Singapore published a National AI Strategy in 2019 and a Model AI Governance Framework in 2020. The National AI Strategy emphasizes the importance of Singaporeans understanding AI and its benefits, as well as the development of a well-equipped workforce for the era of AI, with reliance on 'personalized education through adaptive learning and assessment' as a means to this end (Smart Nation Digital Government Office, 2019, p. 8). In 2022, the country launched AI Verify, an AI governance testing framework and toolkit, developed in order to assist companies in measuring how safe and reliable their AI tools are.

Sri Lanka

Although Sri Lanka does not have an AI strategy, the Ministry of Education in Sri Lanka has formulated a National Digital Education Policy in partnership of the Information Technology Agency of Sri Lanka. A Digital Education masterplan has also been drafted and is aligned to the 20 policy objectives presented in the Digital Transformation Policy. At present, the Ministry of Education has planned to establish innovative corners in schools in order to support such technologies such as Internet of Things (IOT), robotics and AI. AI will also be included in the curriculum reforms from Grade 8 onwards.

Eastern Europe

Serbia presented a strategy for the development of AI, while Slovenia had a more general digital action plan.

Serbia

The country developed the Strategy for the Development of Artificial Intelligence 2020-2025. In 2020, the country began implementing a mandatory school subject called Digital World for pupils aged 7 to 10. The subject aims to develop students' digital competences to enable them to use their digital devices safely and wisely for learning and communication, as well as develop algorithmic thinking.

Slovenia

Although Slovenia does not have an AI strategy, the National Digital Education Action Plan (2021-2027) has been adopted in Slovenia, in which the vision and goals of digital education for the next seven years have been laid out. One component of the Digital Education Action Plan is the revision of the curriculum, as well as the establishment of the National Centre for Coordination of Digital Education within the Ministry of Education to ensure quality digital education and research. The National Centre provides strategies of all the most important areas of education (based on the Digital Education Action Plan). The National Centre works with hubs and encourages them to cooperate and to enhance the quality of digital education.

Western Europe

While only one Member State from Western Europe presented a strategy, the Digital Education Action Plan 2021 – 2027 of the European Commission adopted in 2020 was also raised. This strategy seeks in part to enhance the digital skills of Member States, with a view towards enabling digital transformation.

Similar to this strategy, efforts in Spain embed AI in more general digital competence frameworks.

Spain

In Spain, the government has made a strong commitment to artificial intelligence as part of educational reform. The new educational curricula incorporate the study of artificial intelligence throughout the educational stages, within the framework of digital competence. Under the Digitalization and Digital Skills Plan, the country plans to implement Digital Centre Plans in 240,000 classrooms and to provide students with more than 800,000 digital devices. The government has also approved the School Code 4.0 Plan, which will focus on offering programming and robotics to all students.

Roles of AI in the digital transformation of education: critical reviews

While many speakers focused on the positives of the digital transformation such as increasing access for disadvantaged groups and more inclusive educational practices, some critical voices emerged from the Forum, highlighting key points of contention and concern that need to be taken into account as systems continue to engage the digital transformation of education. Two speakers in particular were notable, Mr Ben Williamson, who emphasized the oversized role of industry and investors in the digital transformation, and Mr John Traxler, who presented thoughts around the intersection of AI, education and the increasing calls for decolonization.

AI is already being positioned to transform teaching, learning and administration, well ahead of detailed evidence on its effects or discussions about some of its risks… AI is not always going to be good for education and we therefore need to take seriously the problems it could cause.

- Ben Williamson, University of Edinburgh

Mr Ben Williamson, University of Edinburgh, United Kingdom, discussed the limitations of current AI development and programs, for example pointing out that automatically-generated texts at times may appear believable but may be factually wrong or biased. He noted that despite the obvious limitations, AI is increasingly being integrated into schools and schooling systems, and pointed out that the development and spread of AI into education is largely driven by the private sector and investors, and that these groups hold a lot of power in terms of determining what kinds of products and AI will be used in schools. He outlined just one of the ways in which these interests are pushing education away from inclusive norms, citing a pre-market think tank in London which was seeking to apply AI as part of a 'super teacher scheme' where data from students is used to identify teachers who can be offered to parents as part of a market, with parents booking time slots for their children to receive personalized remote tutoring based on AI evaluations. He pointed out this proposed application is 'far away from the positive vision we're heard already of using AI to address inequality and to see education as a public good.'

Mr Williamson also pointed out that EdTech platforms collect huge amounts of student data, which can then be mined for insights that inform new products or feature upgrades, amounting to a relationship in which corporations are not invested in the public good or human rights, but in extracting economic and data value from education stakeholders such as teachers and learners for market expansion and revenue growth. He noted the need to 'treat AI as a political project' and 'not to shy away from occasions when discussions need to be overtly political, like pushing back against corporate hype or standing up for marginalized and disadvantaged groups', and called on the Forum to 'grapple now with the technology stacks they are enmeshed in, in order not to lose further control of key pedagogical choices.'

In what ways is AI helping one community and disadvantaging others? To what extent does AI represent one community and fail to represent others? To what extent does it perpetuate a particular mindset based around hegemony power and authority, and is it disenfranchising other ways of looking at the world knowledge systems and perspectives?

– John Traxler, UNESCO Chair on Innovative Informal Digital Learning in Disadvantaged and Development Contexts and Professor of Digital Learning, University of Wolverhampton

John Traxler, UNESCO Chairholder and Professor of Digital Learning at the University of Wolverhampton in the United Kingdom, spoke about the importance of considering the contributions of technology and AI to education in the context of the growing call for the decolonization of systems and structures, including education. He framed the broader context as inclusive of a number of movements including the Black Lives Matter movement in the United States and the anti-racism movement internationally, the Rhodes Must Fall movement in the universities of England and South Africa, and the reparations movement in which countries whose have been historically devastated by centuries of slavery are pushing for recompense and those whose artifacts have been removed by colonizers asking for their return.

He described colonialism as 'the domination and exploitation of one community culture or country by a larger or more powerful one', noting that this could take place economically, militarily, culturally, demographically and/or digitally, but that the relationship was always extractive, with the resources of one area or country being taken by another. In this relationship, the benefits are more heavily weighted towards the country which extracts the resources. Decolonization involves 'identifying colonial systems, structures and relationships, and working to challenge these systems…it involves a paradigm sight from a culture of exclusion and denial to making space for other political philosophies and knowledge systems.'

In this context, governments and education system actors are called on to consider the ways that digital technologies perpetuate and reinforce the attitudes and values of one community or country over others that are less digitally powerful. This includes an examination of both the curriculum – what is taught, how and by whom – and the research that underpins the theories of learning that lie behind the curriculum, questioning, for example, whether instruments such as surveys, interviews and questionnaires as well as the curricula that are derived from these instruments are essentially European tools that grow out of a European mindset to the exclusion of others. Similarly, when considering the vast range of technologies being integrated into learning systems, including virtual learning environments, learning management systems or other administrative systems, e-folio systems, or even platforms such as social media that can used for informal learning, it is necessary to consider the extent to which these technologies perpetuate a particular standpoint, culture or mindset, and to 'reassure ourselves that there is equity and fairness in what these technology systems do for us in our education systems.'

During the address by China's Minister of Education, it was mentioned that the 'integration and application of AI technologies in education are key factors for educational transformation.' According to the Minister, the *Beijing Consensus* (UNESCO, 2019*c*) promotes the integration of AI with education, teaching and learning.

Only by designing and using bias-agnostic AI that is responsible for the needs of all teachers and learners, will we navigate the transformation in a way that elevates education and humanity to new heights.

- Stefania Giannini, Assistant Director-General for Education, UNESCO

Other mentions of AI in the digital transformation of education were included in the address by the UNESCO Assistant Director-General for Education, Ms Stefania Giannini, who presented the transformative potential of AI and cautioned the importance of responsible, bias-agnostic AI. She noted that education practices have to be reorganized, and that 'digital inclusion and digital equity must be integrated as the cornerstone of policies and practices on the digital transformation of education.'

The Vice Minister of Education in China, H.E. Mr SUN Yao, mentioned the following with regard to empowering education with AI:

- AI is an important driving force for reshaping education and realizing its sustainable development.
- AI is an important way to address the common demands of education development and improve the quality of education.
- AI is an important practice to adapt to the development needs of the digital age and innovate the talent training mode.

Teacher training was presented as one mechanism through which AI could be applied in the digital transformation of education. The Sri Lankan Minister of Education, H.E. Mr Susil Premajayantha, mentioned that a university was being established to address the quality of educators and teachers in particular, emphasizing that 'new faculties of educational technology and STEM (science, technology, engineering and mathematics) education will spearhead digitization of education, enabling the use of AI, robotics and new technologies of the Fourth Industrial Revolution at a speed higher than expected before.' The Minister of Education and Vocational Training of Spain, H.E. Ms Pilar Alegría Continente, stated that the Spanish government has made a strong commitment to AI as part of the education reform and as a result, the new educational curricula incorporate the study of artificial intelligence throughout the educational stages, within the framework of digital competence.

The presentations of National Strategies at the conference confirmed that many countries are forging ahead with the integration of AI into their education systems, creating a spotlight on the important issues raised by the critical perspectives voiced in the conference. The challenges and problems experienced with existing AI, the need for more robust evidence of efficacy, the domination of the corporate sector and investment as a driving force behind AI and education integration, and the natural extension of colonial structures into the new realm of artificial intelligence were all prominent contributions to the conversation that suggest the need for more and deeper international and intersectoral collaboration and reflection opportunities to unpack the implications of AI and education integration and forward-thinking strategies to ensure AI does not result in repeated patterns of inequity.

Ethical principles and their implementation

While 113 references were made to ethics during the Forum, this topic was only explored in depth a few times. Specific issues related to ethics identified received different levels of emphasis. Topics covered included:

- Access and equity
- Bias
- Data use and data privacy
- Decolonization (one presentation)
- The effectiveness of AI (including the selection of AI for effectiveness, and outcomes of AI and education technologies)
- Fairness
- Human-centred design
- AI for the common good
- Teacher autonomy

The topics which were the most heavily emphasized were related to access and equity, two concepts that operate at the epicentre of ethical AI and as such are related to other concepts (e.g. bias, decolonization, fairness, AI for the common good, etc.). A number of examples in which AI is or could be used to increase access for special needs and/or minority populations were outlined. These included:

- **The integration of multi-sensory instruction allowing learners to access text in various modes or formats**. For example, the use of text-to-speech or speech-to text to increase access for those with auditory or visual disabilities was noted as a practice in China and Nepal, while sign language to text and speech to sign language in real time is being explored in Kenya to enable individuals with auditory disabilities to communicate with a wider range of people.
- **The use of AI to support neuro-divergent individuals.** It was reported that in Türkiye the use of speech-to-text and text-to-speech technology is being explored to assist individuals with neurodivergence to better communicate with others, or practice their own speech patterns and pronunciation without embarrassment. Other Forum participants suggested that initiatives such as Google Glasses[3] could be used to help neurodivergent people interpret facial expressions and make them more at ease. Individuals could also 'practice' interactions in the metaverse, leveraging simulated environments to gain more comfort and confidence in their everyday lives.

The point is to be able to bring them into the mainstream and be able to accept them the way they are.

- Gopali Contractor, Managing Director and Lead (Accenture)

- **The use of AI-enabled robots to provide psycho-social support.** The use of robots as confidants for children with mental health needs, such as psychological trauma in need of counselling/support was raised as one promising area of AI applications. Robots could act as confidants for children, as well as providing functions such as role-playing interactions for children bullying or being bullied in school.
- **The targeted use of AI to improve student support.** Participants suggested that AI offered opportunities for 'personalized learning' to be based on behaviours as well as academic performance. It was suggested that additional collection of data and its processing through AI

[3] Note these are no longer in production.

may lead to earlier identification of at-risk populations.

- **The use of natural language processing for minority language speakers**. Natural language processing (NLP) has the potential to help preserve and grow minority languages, and to assist speakers of minority languages to access mainstream texts or other resources in their mother tongue. It was noted that this sort of technology has the potential to assist with complex multilingual classroom contexts, such as those often found in refugee camps.
- One participant also raised the potential of **AI to fill teaching gaps** in particularly at-risk contexts with no or low-quality teachers, for example for children in refugee camps.

Discussions held at the Forum also touched on human-centred design, and asked participants to reflect on the less tangible aspects of education, such as the role of mistakes and classroom interactions, and how AI may affect these dynamics. The presentation concluded by reinforcing the idea of centring learner and teacher well-being.

The challenge of gender equality

Speakers noted that AI is expanding rapidly, but that both a skills shortage and gender gaps persist. More women globally are going into higher education, however, fewer of them have STEM degrees or degrees in technology. The statistics show that the share of female graduates in STEM subjects (e.g. engineering or ICT) are below 25 per cent in two-thirds of countries. Forum speakers highlighted the importance of women in STEM, noting that although 57 per cent of graduates from higher education are women, unfortunately only 25 per cent have a diploma in AI or the digital sectors while only 13 per cent of female graduates work in the digital sector. Access challenges for women were cited as high data prices, as well as a lack of knowledge and skills to access the internet. One speaker suggested that it is important for females to hold diplomas in the digital field because this improves their earning power and can therefore improve the standard of living for both them and their families. The participation of women and minorities in the design and development of the digital system should become a fundamental human rights priority. Therefore, the intervention of the private and public sectors as well as private individuals is necessary to address the gender gap.

The interventions mentioned were not centred on AI competencies or competency-building, but rather spotlighting the lens of gender equality in the context of AI and education, including on general engagement, female networks and empowerment, and confidence-building. Different platforms have been created to encourage sharing experiences and resources, growing women's teacher networks and increasing their professional development as well as their AI competencies. To help women teachers in their careers, it is important to create a positive working environment and offer them the necessary help. Platforms namely, 'RELIEFH' and 'Caravan' in Senegal, promote teacher training and certification as well as give the promise to implement the same positive practices in other countries.

I decided purposefully to have all women run team so that they're not only role models to young girls who we want to encourage to learn AI at a young age, but we also want these women to be role models to each other; to give them their representation that if she can do it, so can I.

- Supriya Bhuwalka, Founder (Coding and More)

Other teaching initiation platforms consisting of only female teachers, such as 'Coding and More', have been created to encourage AI learning in schools and create positive working conditions for women (e.g. flexible working hours, no geographic requirement, professional development courses, opportunity to meet with different stakeholders working in the digital field, etc.). It is noteworthy that these approaches can help women balance their career and personal life, help them build self-confidence and create opportunities for them to contribute to the digital world. 'Coding and More' also gathers teachers of all ages from different fields and ethnicities to develop much-needed diversity and establish shared practices across different countries creating personalized learning opportunities for children.

Taking a critical look at our cultural norms, the unusual behaviour from children and invisible gender bias embedded in language make a negative impact on girls' life choices. National-wide initiatives, like the AI master's programme in Ireland designed with diversity in mind aims to address the root causes of the gender gap in AI literacy and makes digital education more accessible for women.

Other initiatives, such as 'HolexP', promise to respond to the market's high demands and help make

coding available for everyone interested as it is easy to use for a student and a teacher. Using natural language, any student can code making it available for a wide range of students, starting with students with mild learning difficulties and ending with youth who have promising coding skills.

AI competencies for teachers

Defining AI competencies for teachers

When thinking about AI competencies for teachers, there are dual considerations of AI for subject teaching and AI as a subject itself. The Forum was more concerned with the first aspect, areas most teachers should know in order to teach using AI. Ms Yan Hanbing, Professor of the East China Normal University, proposed the following levels of engagement:

- Level 1 encompasses all teachers, and would focus on a basic understanding of AI without necessarily coding. This level would cover issues such as the ethics of AI.
- Level 2 would help teachers who use AI support in their classrooms, and would focus on designing effective classroom environments using AI.
- Level 3 would focus on empowering teachers to create AI programmes and resources, and help teachers navigate tasks such as easy AI and EdTech coding or working with big databases.

Others such as Mr Kaushal Kumar Bhagat of the Indian Institute of Technology and H.E. Mr Enkh-Amgalan Luvsantseren, the Minister of Education in Mongolia, suggested that all teachers should try their hand at coding and some of the more complex processes around data. This provided an example in which viewpoints could be influenced by factors such as country context, a theme which closely intersects with the required teacher competencies. Of particular interest are views on teacher autonomy, which can influence views on teacher competency needs as well as the role of AI in the classroom.

One set of competencies referenced in the Forum spoke to the typical domain tools teachers might need to know for the subjects and grade levels they teach, as well as for educational administration and assessment. Of these, assessment was portrayed as perhaps the most critical of these uses, with a number of speakers stressing more thorough data collection on students. For example, H.E. Mr Sun Yao, the Vice Minister of Education for China, stated the following goal for AI in education in China:

> “ We will strengthen the accompanying collection, intelligent analysis and accurate prediction of data in the whole process of teacher education and students' learning to promote the revolutionary transformation of educational evaluation. We will explore the pathway for how intelligent technology could empower education examination evaluation reform, and build a comprehensive learner-centred evaluation model.

Some speakers focused on this aspect emphasized the increased teacher and school accountability that could be achieved based on this data, while at least one took a softer approach, indicating that teachers should learn to evaluate their own capacities realistically and apply technology or AI to fill their own gaps and noting that these gaps would differ from teacher to teacher.

A third set of required teacher competencies dominated much of the conversation: the ability of teachers to evaluate AI and its classroom use. While there was some tension between the high degree of teacher autonomy implied by this strand of thinking and some of the more bureaucratic uses of AI expressed by national speakers, proponents of teacher autonomy expressed that teachers must first understand the hierarchies and theories of knowledge and pedagogy that underpin unique EdTech systems, and frame the discussion on AI and technology within broader questions about education – its purpose, goals and the values it reflects. Teachers must also be able to understand the benefits and limitations of AI, and the ways in which the use of AI can affect classroom dynamics, lesson design, and learning and ‘soft skills’ development. They must be able to evaluate the design of artificial intelligence and education (AIED) products, and identify poor design principles, but also be able to identify the intended purposes of AI products and the misuse of AI. One example given during the Forum spoke to ‘Grouper’, an assessment-based AI which would create student groups and

educational plans for each group. Participants were encouraged to consider the other contextual data which should be considered by teachers in making these sorts of determinations, such as test anxiety, lack of ICT knowledge or relevant personal attributes.

In other words, many Forum speakers placed a significant responsibility on individual teachers to judge the appropriateness, fairness and relevant applications of AI tools for their classroom and context. Forum speakers noted this as vitally important due to a number of factors, including:

1. the lack of top-down regulation on what AI can/should be used;
2. the pace of AI introduction into schools and new tool development; and
3. the prevailing corporate interests which currently dominate EdTech development and introduction, often without sufficient – or in some cases even any – consultation with teachers.

Speakers suggested that teachers need to develop the meta-skills required to keep up with technological developments, an admittedly difficult endeavour. Some frameworks to assist teachers were referenced, most notably the *Ethical guidelines on the use of artificial intelligence (AI) and data in teaching and learning for educators* published by the European Commission (2022). Forum speakers stressed that in order to evaluate AI effectively, teachers needed to understand the ethics of teaching and learning as well as ethical issues and solutions in AI. In this discussion, bias and privacy were referenced the most often as examples of ethical issues teachers were likely to encounter.

In addition, Forum speakers suggested that in order to effectively engage classroom AI, teachers would need to understand the data cycle, particularly data management and data-driven decision-making. Speakers noted that teachers should practice basic digital skills routinely, including the ethical collection and management of data, data analysis and data use, and data sharing. Digital competency frameworks for teachers were mentioned, including DigiComp, the Digital Competence Framework for Educators,[4] and the *ICT Competency Framework for Teachers* (UNESCO, 2018).

In terms of pedagogy, Forum speakers suggested that teachers needed to be upskilled in new(er) pedagogical concepts. Computational thinking and design thinking were raised as examples of pedagogies with which teachers should engage.

One final teacher competency need raised in the Forum was spurred in part by the emerging proliferation of generative AI tools: the need for teachers to understand the types of tools students have access to and will/can use to augment or inform their class and homework. At the time of the Forum, this conversation was only beginning to emerge, and so was merely referenced without many concrete suggestions or solutions.

Upskilling teachers

Upskilling methodologies included both pre-service and in-service training, which were not presented by any speakers as mutually exclusive. Speakers advocated for the incorporation of learning about AI into initial teacher education programmes, and expert participants from a limited number of countries spoke on the development of teacher and/or teaching standards for AI. In-service training methodologies included national upskilling centres, the use of micro-credential courses on AI, university-driven courses and public-private cooperation. Among the in-service teacher support models presented, a few examples stood out:

- In China, AI was reported to be used to 'research and evaluate teachers', together with a national teacher development platform focused on the IT capacity of teachers and the use of specific tools, in this case a smart teaching assistant.

[4] See https://joint-research-centre.ec.europa.eu/digcompedu_en

- In France, collaborations between EdTech providers and teachers provide higher degrees of autonomy at the school level to engage and learn as determined by individual school needs, potentially differentiating learning content.
- In India, teacher development is undertaken through a national government effort in cooperation with IBM and Google using a train-the-trainer model, with both pre- and in-service teacher training emphasized.
- In the United States, an AI app has been developed for teacher reflection, which enables teachers to receive 'coaching' feedback on their classroom engagements. The goals of the app include increasing student speaking time in class, and particularly opportunities for minorities and language learners to speak.

Notable algorithms, AI platforms and AI-informed pedagogies

Notable AI in education algorithms

While the Forum took place only a week after the launch of ChatGPT by OpenAI, large language models as well as generative AI were mentioned in the Forum by a few speakers who were already able to anticipate their disruptive potential in education. In particular, the power of large language models for accessing information across the many languages of the world, the use of large language models to enable those without coding expertise to create digital artefacts, and the generative potential of large language models for essays and text were put forward by different speakers. However, cautions were also raised by one speaker, Mr Ben Williamson:

> “ Meta, as many of you would have heard, recently launched a large language model for science trained on millions of scientific articles, websites, textbooks, lecture notes and encyclopedias, which is described as a shortcut for researchers and students to summarize academic papers, solve math problems, generate articles, write scientific code, and more. Now, as widely reported it got taken down after just a couple of days, after it generated authentic-seeming articles about the history of bears in space, for example…so this may not be the kind of artificial intelligence you want built into the digital infrastructure of education.

Ms Shi Yuanchun, the President of Qinghai University and Professor of Tsinghua University in China, as well as Mr Bai Jinfeng of the TAL Education Group in China spoke about the use of AI as measures of engagement in classrooms. Mr Jinfeng presented AI technology that measured audience engagement as well as other factors in order to give real-time feedback on the performance of a speaker. Ms Yuanchun outlined a model of personalized education based on facial recognition technologies, suggesting that AI be used to ‘assess the performance of the teacher and students’ and offering a published case in which AI was used to detect a lack of attention in students, so targeted inputs could bring the student back to concentrating more on the material presented. She did not mention any ethical issues.

AI can assess the performance of the teacher and students…the state of learning of all the students can be taken into account in order to assist the teachers to optimize their approach. Here, interactive AI follows in real time the behaviour of the students. For example, the hands raised, is a student sleeping, is the student listening with attention. If a certain number of students look lost or don't understand specific points, the teacher can slow down and give examples. And in a case of a lack of attention of several students, the teachers will ask questions so that the students can once again focus and concentrate on their class.

- Shi Yuanchun, President (Qinghai University) and Professor (Tsinghua University)

One other area of interest mentioned by participants is the use of domain-specific algorithms and

subject-specific models trained specifically for educational purposes, as well as for young learners. MathGPT, an AI tool trained using textbooks for the purpose of teaching people how to do math (as opposed to doing math for them), was given as one example. Rory, a learning chatbot engaged through SMS, WhatsApp or on web browsers was also introduced as a low-tech solution currently being implemented to help learners learn mathematics in African countries.

Notable AI tools/platforms

Many of the platforms mentioned were related to education management information systems, learning management systems, and/or the collection of additional data on which to evaluate and manage teacher performance:

Through the interconnection with related systems, the centralized collection and management of teachers' basic data can be realized, and the service can be improved. At present, we have collected the basic data of more than 16 million primary and secondary school teachers across the country, and achieved the goal of 'one person with one number and one school with one code'. Based on this, the level of our education management services has been significantly enhanced.

- H.E. Mr SUN Yao, Vice Minister of Education, China

A student-facing application described was AI-based tutor bots which are endowed with information on a particular subject, for example urban regeneration or solid waste management. Drawing on a database of 300 to 500 frequently asked questions, short answers are programmed into the bots. Students taking a self-based course or a mock exam can engage the tutor bots. Due to the AI programming, as the students engage the machine 'learns' and improves.

In Beirut, researchers have developed an AI-enabled system that enables anyone to code using human text, lowering the barrier to programming. Efforts are underway to leverage machine learning and AI to enable anyone to code using natural language, essentially eliminating the need for coding expertise to develop code-based outputs or programs.

In Brazil, a national policy aim is to develop learning, reading, math and writing skills among students. One initiative is a platform-based AI support system for writing. The students write their essays on a specially-prepared sheet of paper. The federal university prepares the questions for the analysis, and after students write their responses to the questions, the teachers take a picture of the essays and send them through the platform to the university. Feedback is returned to the professor, providing suggestions and identifying the mistakes and writing problems of each student.

The Ministry of Education, Culture, Research and Technology of Indonesia is prioritizing user-centred design in pushing the digital transformation in education. The emancipated teaching digital platform for teachers is designed to answer Indonesian teachers' need for a safe community-based digital platform that connects more than three million educators across the country. The platform described appeared to be more of a digital community of practice rather than containing any elements of AI within it.

Emerging AI-informed pedagogies

In addition to references to design thinking and computational thinking, a few innovative pedagogical approaches were outlined at the Forum:

- In the smart education demonstration zone of Guangzhou, China students have opportunities to design AI in response to social problems, for example attempting to design a voice-control desk lamp for elders. These sorts of problem-solving applications of AI encourage students to connect learning and life and support problem-solving and creative thinking.
- AI is used to provide an analysis of student dance performances and to evaluate students in the subject of calligraphy in order to enable precision teaching of complex and intricate movements.
- One of the more emphasized uses of AI was for 'personalized learning' or 'adaptive learning'. This use of AI was generally assessment-based, with students participating in a short assessment on a given platform which would give the AI a starting point to begin delivering content to the student. As students respond to questions, the AI integrates data to determine learning gaps, which are then addressed. Depending on the sophistication of the AI, the progression may be linear along a set curriculum, or incorporate 'tangential' subject content, and it may incorporate feedback additional to programme engagement, such as teacher input, student self-ratings of confidence or, in some cases, student engagement data gathered through methods such as facial recognition software. Facial recognition software was also suggested as a method to measure student concentration in class independently of other platforms.

Considerations for the future

This section presents the authors' reflections on the prominent themes and discussions presented in the conference and outlined in the report analysis. The section presents important emerging considerations for future policy conversations at both the national and international level.

Respecting key roles of human teacher when introducing AI in education

Good teachers operate in a complex space and take on multiple roles in their profession, not only as a teacher but also as a lifelong learner, as a leader in their classroom, and often as part of a massive national system of education. AI may give teachers additional tools to engage and evaluate students, but it can also give systems instruments that may quickly become overly bureaucratic or prescriptive. The systems that successfully engage AI to improve classroom practice will be the ones that respect the roles and abilities of their teachers, provide teachers with the new skill sets necessary to evaluate and integrate AI, and still allow the degree of freedom and autonomy necessary for teachers to examine and respond to the unique contexts and needs of their classrooms.

And yet, it is clear from the Forum conversations that many countries are considering AI as a means to automate teacher work, increase teacher accountability, and in one extreme case replacing teachers entirely with AI was mentioned.

Further, there is an assumption underpinning much of the AI technology being created, which is that teachers need help identifying which students are struggling or which students are not paying attention. This is an assumption which may need to be tested – it is possible that some applications of AI in some contexts or classrooms are solutions without problems.

Policy-makers and educationalists should also pay attention to the possibility of unintended consequences of AI integration. For example, administrators may decide to increase class sizes based on assumptions that AI technology will assist teachers in more targeted student interventions or even in delivering lesson content.

Steering the human-centred approach to the use of AI in education

The conversations held during the Forum clearly demonstrate that countries are beginning to engage AI more seriously, including in their education systems. However, it is also clear that for many this thinking is at a nascent stage, with AI either conflated with other forms of digital technologies or assuming to fall under existing ICT policies or similar. The potential for AI as a 'decision-making tool' requires special consideration. In a simple example, a government with an ICT in Governance Policy that pre-dates the proliferation of AI into data processes may need to be augmented with specific regulations or prescripts about ethical application, human agency, and human oversight and accountability when AI programmes are used for government administration.

At this level, UNESCO has made significant strides, particularly with the *AI and education: Guidance for policy-makers* (Miao et al., 2021) and the *Recommendation on the Ethics of Artificial Intelligence* (UNESCO, 2022*c*). A core principle of these documents is regulations and policies to ensure that emerging technologies such as AI benefit humanity as a whole, and that a human-centred approach to AI in which AI serves the interest of people is maintained. These core principles must form a foundation for future work in artificial intelligence.

Mainstreaming gender equality throughout the life cycle of the design and use of AI

Speakers at the Forum made ample reference to the ways in which AI is being utilized to provide education to disadvantaged groups such as linguistic minorities and people living with disabilities. These efforts are to be commended and expanded in pursuit of greater equity in education and education systems. However, while strides have been made towards digital literacy and there are initiatives focused specifically on gender inclusion, there is still a deeply unequitable share of AI degrees and positions occupied by women. Curriculum developers, teachers, policy-makers and the broader international community are called on to consider measures to empower and engage girls and women with digital literacy and opportunities to engage technology, AI training and each other in order to further build the participation of women and girls in the field, a critical consideration for equitable, inclusive AI development and implementation. A more balanced and representative AI workforce is key to developing AI applications that suit a wider range of problems and demographics, as well as the identification and elimination of bias in systems and in implementation. To this end, not only women but other underrepresented demographics should receive targeted interventions aimed at boosting participation.

Designing education-specific AI models and innovating pedagogy

While 'personalized learning' was raised among the uses of AI in classrooms, the applications that fall under this category are governed by an overarching perspective that education is a 'straight line' through a set process which can be mapped and augmented through, essentially, direct instruction and particularly the application of methodologies such as repetition and reward. The process of learning is an important consideration, given the skills needs of the new knowledge and information society, which requires far more from students than rote repetition of knowledge and simple literacy and numeracy applications.

The roles of AI in education must be carefully evaluated for its strengths and potential contribution, and ultimately considered as part of a learning programme which builds foundational skills and then emphasizes their use for advanced problem solving in context. Particularly in contexts in which literacy and numeracy outcomes are very low, AI could play a significant role in 'bridging the gap' by assisting learners to master the basic skills required for more advanced competencies such as communication, critical thinking and complex problem-solving.

The introduction of technological frameworks into education has also brought discussions on new problem-solving methodologies. In particular, design thinking and computational thinking are often referenced in the context of AI. Both of these methods can be integrated into educational systems, building on simpler problem-solving strategies such as hypothesis testing and trial-and-error already introduced in many school curricula. One implication is that teachers should be introduced to a wider range of problem-solving strategies and understand the conditions for application of different problem-solving strategies.

Ensuring human agency in defining problems and designing solutions

While there are undeniably challenges around teacher availability and teacher performance in some contexts, before AI is presented as an education solution, the 'problem' of education needs to be more fully differentiated, as there are many potential problems that may coexist. It also needs to be better defined, as the potential problems may manifest completely differently in different contexts. It is important that the global community does not approach the use of AI in classrooms with a poorly defined or profit-driven deficit view of teachers, teaching and education systems. Any good intervention, including EdTech products, will begin with a thorough understanding of the problem being faced. Even design thinking, the problem-solving process most deeply connected to AI education, begins with an elaborate stage of understanding and defining the problem. Challenges can emerge when AI is developed without a clearly-defined problem or purpose to address, without

being informed by education professionals, and/or without ample testing of the assumptions underpinning the usefulness of an AI tool. While the broad strokes goals of most of the AI presented at the Forum are to improve learner performance, there are many underpinning factors that can influence learner outcomes, including poor nutrition, low-literacy communities, competing responsibilities at home, a lack of textbooks and resources, poor student attendance, poor teacher attendance, learning disabilities, language competence and poor classroom practice. The unique combination of factors affecting learner performance in different contexts may require different types of intervention, and depending on the configuration of underlying factors and their significance in a given context, AI may be a whole solution, be part of a holistic solution, or play no part in the solution.

One other consideration is AI education programmes which may scale or implement their programmes internationally without consideration for contextual adaptation. While teachers and in-country researchers likely have a very good understanding of the educational problems faced by their countries, today's decision-makers and education interventionists must be careful not to repeat the past mistakes of replicating educational programmes in different contexts without sufficient attention to the relevance, feasibility and cultural fit of the solution. When considering the integration of an AI tool for a system or a school or a classroom, decision-makers must be able to draw on information related to the creation of the tool, perhaps most importantly the characteristics of the dataset it was trained on, but also its parameters. While we are starting to see some companies be more explicit with this information as well as the purposes for which their AI tools were created, this is still not the majority practice.

Disrupting inequitable and exploitative systems through a paradigm shift

A thought-provoking discussion was also held during the conference on the issue of decolonization. Decolonization referred to 'a paradigm shift from a culture of exclusion and denial to making space for other political philosophies and knowledge systems.' Participants were called on to reflect on the extraction of digital resources and data in some contexts as a manifestation of colonization - 'the domination and exploitation of one community culture or country by a larger or more powerful one.' Critical questions: 'In what ways is AI helping one community and disadvantaging others? To what extent does AI represent one community and fail to represent others? To what extent does it perpetuate a particular mindset based around hegemony, power and authority, and is it disenfranchising other ways of looking at world knowledge systems and perspectives?' These are important questions for national and international policy-makers to grapple with as they create the parameters of engagement for AI in their respective contexts.

At the individual level, the conference demonstrated a number of ways in which AI can be used to increase access to education particularly for marginalized individuals. However, at the national and international level there are still shifts that will be necessary to ensure that existing digital divides within and between countries are minimized and, ideally, eliminated. With AI, an additional dimension has emerged which is the production and consumption cycle, this time as it relates to data. The world is poised to perpetuate another iteration of the cycle in which lower income countries are positioned as both suppliers of raw data – in this case, data – and consumers of final products, without significant financial or economic gain from the profitable processing and development of tools based on this data. To break this cycle will take a concentrated investment in these countries focused on the development of infrastructure, expanded access to data and markets, and the development and sharing of expertise and techniques.

Concluding note

There is considerable excitement around the different uses of artificial intelligence in education, from chatbots and tutor assistants to new types of student measurement to the new inclusion of large language models in the education space. AI is already being used around the world to reach underserved populations and deliver learning programmes, to monitor and feedback to teachers on student engagement, and to inform teachers and systems administrators with nuanced views and recommendations regarding student and teacher performance. The AI discussed in the Forum includes tools to provide access to minority language speakers, learners with different abilities and neurodivergent individuals; replicate the process of teacher coaching; provide emotional support to students; and support academic achievement. At the policy level, AI is already being integrated into national strategies, including into broader digital strategies.

The Forum also highlighted some of the broader questions surfacing with the rise of AI in education, including what the implications of AI in the digital transformation of education may be and exactly how education systems and structures will be transformed. A commitment for human-centred principles and an increased emphasis on the importance of teachers and human interaction in classrooms was expressed. While at the same time for some systems, particularly those facing teacher shortages, AI is an appealing solution to a very real looming crisis, the fundamental question is what categories of teachers' tasks can be replaced or automated by AI, and what categories of human interaction should never be replaced by machines.

The discussions at the Forum demonstrate the need for more international and national conversations around the values underpinning education in an AI-rich world. In addition to a need to more evidence on AI-integrated learning and the outcomes achieved for learners, the Forum highlighted the ethical, human rights and regulatory challenges that need to be considered in order to AI to be a safe and effective tool for the digital transformation of education. Going forward, the powerful commercial interests; inequities expressed and perpetuated through the geological and demographical patterns of data extraction, AI production and AI use; and introduction or systematic perpetuation of biases are issues that cannot be overlooked.

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Appendix 1: Programme

Background

While the TES '[Call to Action: Assuring and improving quality public digital learning for all]' focuses on assuring public digital learning opportunities for all, it is silent on how AI and big data can be used as a common good to enable the digital transformation of education. The design and use of relevant AI technologies to support the transformation of education is a convergence of two frontier areas: (1) the next-generation of AI algorithms and tools to trigger and support innovative pedagogy; and (2) the planning of prospective strategic directions and actions on the digital transformation of education. The pioneering exploration of these frontier fields of policies and practices will require collaborative deliberation, forward-looking opinions, and sharing of lessons learned from early pilot tests. There is a mounting need for a venue to facilitate thematic knowledge sharing and international cooperation in this domain. In response to this need, UNESCO, with support of China and interested partners will co-organize a online edition of the fourth edition of the International Forum on Artificial Intelligence and Education on 5 and 6 December 2022 under the theme *Steering AI to empower teachers and transform teaching.*

Sub-themes

The two days programme of the Forum will be structured under the following sub-themes:

1. **Strategies for leveraging AI to enable the digital transformation of education**
2. **Steering AI by design to empower teachers and transform teaching and learning**
3. **Defining and developing teachers competencies needed to work in AI-rich education settings**
4. **Global partnership for centring the most marginalized with priorities for Africa**

Programme

(CET – Paris time)

Please visit the dedicated website of the Forum to review the details of the sessions and speakers, and sign into sessions of your interest: https://aiedforum.org

5 December, Day 1		Video Link
	**** By clicking on "Signing in" below in the programme, participants will receive the meeting ID and passcode for a specific session. **** ****Interpretation provided in English, French and Chinese****	
9:00 - 10:30	**Opening** **Moderator: H.E. Mr TIAN Xuejun**, Vice Minister of Education, Chairperson of the National Commission for UNESCO, China **Welcome Addresses** **H.E. Mr HUAI Jinpeng**, Minister of Education, China **H.E. Mr Santiago Irazabal Mourão,** President of the 41st General Conference, UNESCO **Ms Stefania Giannini**, Assistant Director-General for Education, UNESCO **Plenary Session 1: Strategies for leveraging AI to enable digital transformation of education** **Moderator: Mr Sobhi Tawil**, Director of Future of Learning and Innovation, UNESCO The novelty and complexity of leveraging AI to enable the digital transformation of education calls for the planning of forward-looking strategic directions and inter-disciplinary evidence. This session will examine the value of AI in the transformation of education as a public endeavor and share national strategies on how AI will be leveraged to transform learning, teaching, education management and provision of education while ensuring the protection of human rights, data privacy, digital inclusion and digital well-being of both teachers and learners. Ministers' statements will respond to the following guiding questions: ▪ How do you position AI in the digital transformation of education (including teaching and learning, system management, accessibility, digital competencies, protection of privacy, etc.)? ▪ To what extent is this vision institutionalized in your national policies or strategies? **Ministers' Statements** **H.E. Mr Nadiem Makarim**, Minister of Education, Culture, Research and Technology, Indonesia (video message) **H.E. Mr SUN Yao,** Vice Minister of Education, China **H.E. Mr Igor Papič,** Minister of Education, Science and Sport, Slovenia **H.E. Ms Ester Anna Nghipondoka,** Minister of Education, Arts and Culture, Namibia **H.E. Mr Ahmad Belhoul Al Falasi,** Minister of Education, United Arab Emirates **H. E. Mr Majid bin Saeed bin Suleiman al Bahri,** Undersecretary for Administrative and Financial Affairs, Oman **H.E. Mr Susil Premajayantha**, Minister of Education, Sri Lanka (video message) **H.E. Ms Pilar Alegría Continente**, Minister of Education and Vocational Training, Spain (video message) **H.E. Mr Branko Ružić**, Minister of Education, Serbia (video message) **H.E. Mr Jang Sang-Yoon**, Vice Minister of Education, Republic of Korea (video message) **Comments from the Chatboard and Moderator's Closing Remarks**	English Français 中文

10:30 - 10:40	**Break**	
10:40 - 12:00	**Plenary Session 2: Steering AI by design to empower teachers and transform teaching and learning** **Moderator: Mr Fengchun Miao**, Chief of Unit for Technology and Artificial Intelligence in Education, Future of Learning and Innovation, UNESCO The transformation of education needs teachers to become micro-curriculum designers as well as facilitators and guides of "context-responsive learning options", and AI should be designed to empower teachers in doing so. Before the design and use of AI tools in teaching and learning processes, fundamental questions should be asked on whether the use of AI will undermine the human interaction and social caring, which should remain as the foundation of human teaching and learning. This session will send a clear message of "starting with questioning the proportionality" with a critical perspective on AI and education. It will go on to examine the extent to which AI tools have been designed to trigger and support the planning and organization of innovative teaching methodologies, context-responsive learning options, and competency-based assessment. It will also try to surface practices of using AI to transform teaching in TVET, higher education institutions and adult education settings. → **Critical perspectives on AI and education: The use of AI in education should be questioned first** **Mr Ben Williamson,** Professor, The University of Edinburgh, United Kingdom → **The design and use of AI to facilitate teaching and learning in schools: Country examples** **Mr REN Youqun**, Director-General, Department for Teacher Education, Ministry of Education, China **Mr Mikko-Jussi Laakso**, Director of the Centre for Learning Analytics at the University of Turku and the laureate of the 2020 edition of UNESCO Prize for the Use of ICT in education, Finland **Discussant: Ms Hannele Niemi**, Professor, Research Director at the University of Helsinki and the UNESCO Chair in Educational Ecosystems for Equity and Quality of Learning, Finland **Mr Julio Albalad**, Director of the National Institute of Educational Technologies and Teacher Training (INTEF), Ministry of Education and Vocational Training, Spain → **The use of AI in tertiary education and adults' learning from a lifelong learning perspective** **Ms Kaśka Porayska-Pomsta**, Professor of Artificial Intelligence in Education, University College London, United Kingdom → **Review of the use of AI in Technical and vocational education and training** **Ms Kelly Shiohira**, Executive Manager, Research and Data Ecosystems, JET Education Services, South Africa → **Can creative AI tools inspire the learning of art?** **Mr Jason Allen**, Winner of the emerging artist digital arts category at the Colorado State Fair fine arts exhibition with AI-created work "Théâtre D'opéra Spatial", University of Southern Colorado, United States **Mr François Pachet, Director,** Spotify Creator Technology Research Lab, France **Comments from the Chatboard and Moderator's Closing Remarks**	English Français 中文

12:00 - 13:30	**Break**	
13:30 - 15:00	**Parallel Session 2.1: AI innovations and best practices on the use of AI in teaching, learning and learning assessment** **Moderator: Ms Michela Pagano,** Associate Project Officer, Unit for Technology and Artificial Intelligence in Education, Future of Learning and Innovation, UNESCO → **AI developments and implications for teaching and learning** **Ms DONG Le**, Professor, Executive Vice Director and Vice Chairman of the Board of Directors, Beijing Institute for General Artificial Intelligence, China → **Accelerating AI Empowerment for High Quality Education Development** **Mr GUO Huipeng**, Chief Expert on the Digitalization of Public Services, Huawei, China → **AI tools to support personalized learning of Math** **Mr Thierry de Vulpillières,** CEO and cofounder of EvidenceB, France → **Equipping teachers with learning data for differentiated instruction in the Dominican Republic** **Mr Juan Baron,** Senior Economist, World Bank, Colombia → **Developing writing foundational skills of students at scale in Brazil: A hybrid human-AI approach** **Mr Helber Vieira**, National Deputy Secretary for Basic Education at the Ministry of Education, Brazil → **Early exploration with AI in global capacity initiative** **Ms Sheila Jagannathan**, Global Head of the Open Learning Campus, World Bank, United States **Comments from the Chatboard and Moderator's Closing Remarks**	English Français 中文
	Parallel Session 2.2: AI innovations and best practices on the use of AI for learners with special needs **Moderator: Mr Imed Ouertani,** Training Officer, International Disability Alliance → **AI applications designed to support learners with disabilities** **Mr WU Xiaoru**, Vice President, iFlytek, China → **AI for education and empowerment: the voice of a blind learner** **Mr Yuvraj Lama**, Master student in development studies, Nepal → **Overcoming speech barriers using Artificial Intelligence** **Mr Hasan Zafer Elcik**, Co-founder and CEO of Otsimo, Turkey → **AI platforms to facilitate learners speaking minority languages** **Mr Mitja Jermol,** UNESCO Category II International Research Institute on Artificial Intelligence, Slovenia → **A fireside chat: Leveraging AI to support inclusive learning** **Ms Jia Li**, Co-Founder and Chairperson, HealthUnity; Chief AI Fellow, RWE for Sleep Health, Stanford University, United States	English Français 中文

Ms Gopali Contractor, Managing Director and Lead, Advanced AI and ML Capability, Accenture, India

Mr Suren Aloyan, Co-Founder and CEO, PopUp School, Armenia

Mr Nick Haber, Assistant Professor, Stanford Graduate School of Education, United States

Comments from the Chatboard and Moderator's Closing Remarks

Parallel Session 2.3: Youth forum on AI-assisted pedagogical innovations
Moderator: Mr Zubair Junjunia, Educational Activist, Founder of Znotes, Saudi Arabia

English
Français
中文

→ **Youth Declaration of the Transforming Education Summit**
Ms Sofía Bermúdez, SDG4Youth Network member, Argentina

→ **How can AI enable the education that transforms the youth from the marginalized groups?**
Mr Amisi Jospin Hassan, Co-founder of Africa Deep Artificial Intelligence (ADAI) Circle - empowering young refugees and marginalized communities with the digital skills, Congolese refugee living in Malawi

→ **How do young generations see the role of AI in shaping the future of learning?**
Ms Nomisha Kurian, PhD candidate in Education, India

Mr Ammar Alvi, MSc candidate in AI and Machine Learning, Pakistan

Ms ZHU Yumeng, PhD candidate in Educational Technology, China

→ **What will the futures of teachers and teaching look like? How are young teachers reacting to the introduction of AI in education settings?**
Ms DA Zhu, a Tibetan teacher, No. 2 Middle School, Golmud City, Qinghai Province, China

→ **From your experience in designing AI solutions to address SDG challenges, what next generations of AI technologies might emerge? How can they possibly transform teaching and learning?**
Ms Arielle Kitio Tsamo, Director, CAYSTI, Cameroon

Mr Elly Savatia, Inventor, technology optimist and budding social entrepreneur, Kenya

Comments from the Chatboard and Moderator's Closing Remarks

6 December, Day 2		Video Link
	**** By signing in, participants will receive the meeting ID and passcode for a specific session. **** ****Interpretation provided in English, French and Chinese****	
9:30 - 11:00	**Plenary Session 3: Defining and developing teachers' competencies needed to work in AI-rich education settings** **Moderator: Mr Shahbaz Khan,** Director of the UNESCO Office in Beijing As AI is revolutionizing digital technologies and the digital infrastructure of education, the requirement for teachers' capacities in using AI tools especially in making choices between machine decision and human decision, and between human-machine interaction and human interaction with students, will also revolutionize the definition of digital competencies for teachers. The session will facilitate policy dialogues and knowledge around the following questions: ▪ How the latest developments in human-machine collaborative technologies might affect teacher-facing AI tools? ▪ How can policy-makers ensure AI tools abide by ethical principles before introducing them to teachers and require teachers to develop competencies to use AI them? ▪ What lessons can be drawn from global and national frameworks on AI competencies for teachers? → **The latest developments in human-machine collaborative technologies** **Ms SHI Yuanchun**, President of Qinghai University and Professor of Tsinghua University, China → **De-colonizing EdTech and its implication for the use of AI to empower teachers** **Mr John Traxler**, UNESCO Chair and Professor Digital Learning, University of Wolverhampton, United Kingdom **Ministers' Statements on Defining and Developing AI Competencies for Teachers** **H.E. Ms Mariatou Koné,** Minister of National Education and Literacy, Côte d'Ivoire **H.E. Mr Enkh-Amgalan Luvsantseren**, Minister of Education, Mongolia **H.E. Buthaina Bint Ali Al Jabr Al-Nuaimi,** Minister of Education and Higher Education, Qatar → **Key considerations on defining and developing AI competencies for teachers: UNESCO's consultation** **Mr Fengchun Miao**, Chief of Unit for Technology and Artificial Intelligence in Education, Future of Learning and Innovation, UNESCO → **Teachers' voices on defining and developing AI competencies for teachers** **Mr Jelmer Evers**, Vice President of General Education Union - Algemene Onderwijsbond (AOb), Netherlands → **The definition and development of AI competencies for teachers: Korea** **Mr Ki-Sang Song**, Professor, Korea National University of Education, the Republic of Korea **Comments from the Chatboard and Moderator's Closing Remarks**	English Français 中文
11:00 - 11:20	**Break**	

11:20 - 12:40	**Parallel Session 3.1: Development of AI competencies for teachers** **Moderator: Ms Laicia Gagnier,** Associate Project Officer, Unit for Technology and Artificial Intelligence in Education, Future of Learning and Innovation, UNESCO → **Ethical principles on the definition and development of AI competencies for teachers** **Ms Vanessa Nurock**, Professor of Philosophy, the Université de Côte d'Azur, France → **Examples on the definition and development of AI competencies for teachers** **Ms YAN Hanbing**, Professor, East China Normal University, China **Mr Colin de la Higuera**, Professor, Nantes University, France **Mr Kaushal Kumar Bhagat**, Assistant Professor, Indian Institute of Technology Kharagpur, India **Mr Alain Thillay**, Policy Officer, Digital Education Unit, European Commission, Belgium → **Reflections on the definition and development of AI competencies for teachers** **Ms Ethel Agnes Pascua-Valenzuela**, Director, SEAMEO Secretariat **Ms Helene Charpentier,** Senior Project Officer, Association for the Development of Education in Africa (ADEA) **Comments from the Chatboard and Moderator's Closing Remarks**	English Français 中文
	Parallel Session 3.2: AI innovations to support teacher professional development and collaboration **Moderator: Mr Abdourahamane Diallo**, Director, UNESCO Office in Accra → **AI-assisted teachers' development: Pilot test in Ningxia Province of China** **Mr HUANG Tao**, Deputy Director of Education Information Management Centre, Department of Education, Ningxia Province; Professor of Central China Normal University, China → **Rori - A personalised AI Chatbot complimenting in & out of school quality education** **Ms Claudia Jerger,** CEO, YOU Foundation, Germany → **Advancing educational equity with automated teacher feedback Interventions** **Ms Alyssa Van Camp,** Head of Grant & Research Partnerships at TeachFX, United States → **Empowering teaching through capacity-building efforts in medical education in Ethiopia** **Ms Sanja Sontor,** Director of Development Partnerships, Lecturio, Germany → **Empowering teachers with AI: A tool for personalized instruction in the science classrooms** **Mr Giora Alexandron,** Assistant Professor, Weizmann Institute of Science, GrouPer (Group-based Personalized Instruction), Israel → **AI assisted platforms to support teachers** **Mr Mohamed Jemni**, Director of ICT in education of ALESCO, Tunisia	English Français 中文

	→ **AI virtual teaching assistant in large classes** **Mr BAI Jinfeng,** Tomorrow Advancing Life Education Group (TAL), China **Comments from the Chatboard and Moderator's Closing Remarks**	
	Parallel Session 3.3: Empowering women and women teachers in the digital age **Moderator: Ms Justine Sass**, Chief of Section of Education for Inclusion and Gender Equality, UNESCO → **Gender equality in the development and use of AI** **Ms Alessandra Sala**, President of Women in AI, Italy (video message) → **AI competency development for women and women teachers** **Ms LUO Bin**, Dean of Beijing Haidian Teachers Training College, China Development, Haidian District of Beijing, China **Ms Supriya Bhuwalka**, Founder of Coding and More, India **Ms Mariette Assad Awad**, CTO / Associate Professor, American University of Beirut, Lebanon **Ms Anne Forbes**, Senior Lecturer, Macquarie University, Australia **Ms Mona Laroussi,** Director, Institute of the Francophonie for Education and Technical and Vocational Education and Training (IFEF), Senegal **Comments from the Chatboard and Moderator's Closing Remarks**	English Français 中文
12:40 - 13:00	**Break**	
13:00 - 14:30	**Plenary Session 4: Global partnership for centring the most marginalized with priorities for Africa** **Moderator: Marielza Oliveira**, Director for Partnerships and Operational Programme Monitoring, Communication and Information Sector, UNESCO The most fundamental commitment of digital transformation is to ensure that AI will be a common good for all to advance equity, inclusion and gender equality. AI will not transform education if it only benefits the privileged groups exclusively and widens educational inequity. This session will convene policy-makers and partners to steer policies, actions and resource mobilization to centre the most marginalized. Priority focus will be given to marginalized learners in Africa and beyond. The session seeks to enhance global partnerships for steering AI to empower teachers and transform teaching and learning based on the following questions: ▪ How can the 'Call to Action: Assuring and improving quality public digital learning for all' of the Transforming Education Summit be taken forward at global, regional and national levels? ▪ What are the focus areas around which partners can steer the equitable and ethical design and use of AI to empower teachers and transforming teaching and learning? ▪ How can international cooperation in the field of AI in education be strengthened to support the research on the design and use of AI in teaching and the capacity development for teachers with a focus on the most marginalized? **Opening Addresses** **Mr Leonardo Garnier**, Special Advisor of the UN SG for TES (video message) **Mr Firmin Edouard Matoko,** Assistant Director-General for Priority Africa and External Relations, UNESCO (video message)	English Français 中文

Call to enhance global partnerships for steering AI to empower teachers and transform teaching and learning
Mr Sobhi Tawil, Director of Future of Learning and Innovation, UNESCO

Responses from partners
H.E. Ms. Matsie Angelina Motshekga, Minister of Basic Education, South Africa
Mr Seyni Ndiaye Fall, Coordinator of SIMEN (System for Education Management of the Ministry of National Education), on behalf of the Minister of National Education, Senegal
Mr Zelalem Assefa, Chief Executive Officer, ICT and Digital Education, on behalf of the Minister of Education, Ethiopia
Mr Abubakar Dahiru, Special Assistant (Cybersecurity & Digital Identity), on behalf of the Minister of Communication and Digital Economy, Nigeria

Ai movement - the Moroccan International Center for Artificial Intelligence to support African countries
Ms Amal El Fallah Seghrouchni, Head of Ai Movement, International AI Center of Morocco, Mohammed VI Polytechnic University, Morocco

UN system and UNESCO Institutes and Centres
Mr Tao Zhan, Director, UNESCO Institute for Information Technologies in Education (IITE)
Mr Frank Van Cappelle, Global Lead, Digital Learning, UNICEF
Mr Alex Wong, Chief, Special Initiatives, International Telecommunication Union (ITU)
Ms Mahra Hilal Al Mutaiwei, Director, UNESCO Category II Regional Center for Educational Planning (RCEP)
Mr Alexandre Barbosa, Manager, UNESCO Category II Regional Centre for Studies on the Development of the Information Society (Cetic.br) (video message)

UNESCO Category II centres in China:

- **Mr LI Ming,** Director of International Centre for Higher Education Innovation (ICHEI), Shenzhen, China
- **Mr HUANG Ronghuai**, Director of International Research and Training Centre for Rural Education (INRULED), Beijing, China
- **Mr ZHANG Minxuan,** Director of Teacher Education Centre (TEC), Shanghai, China

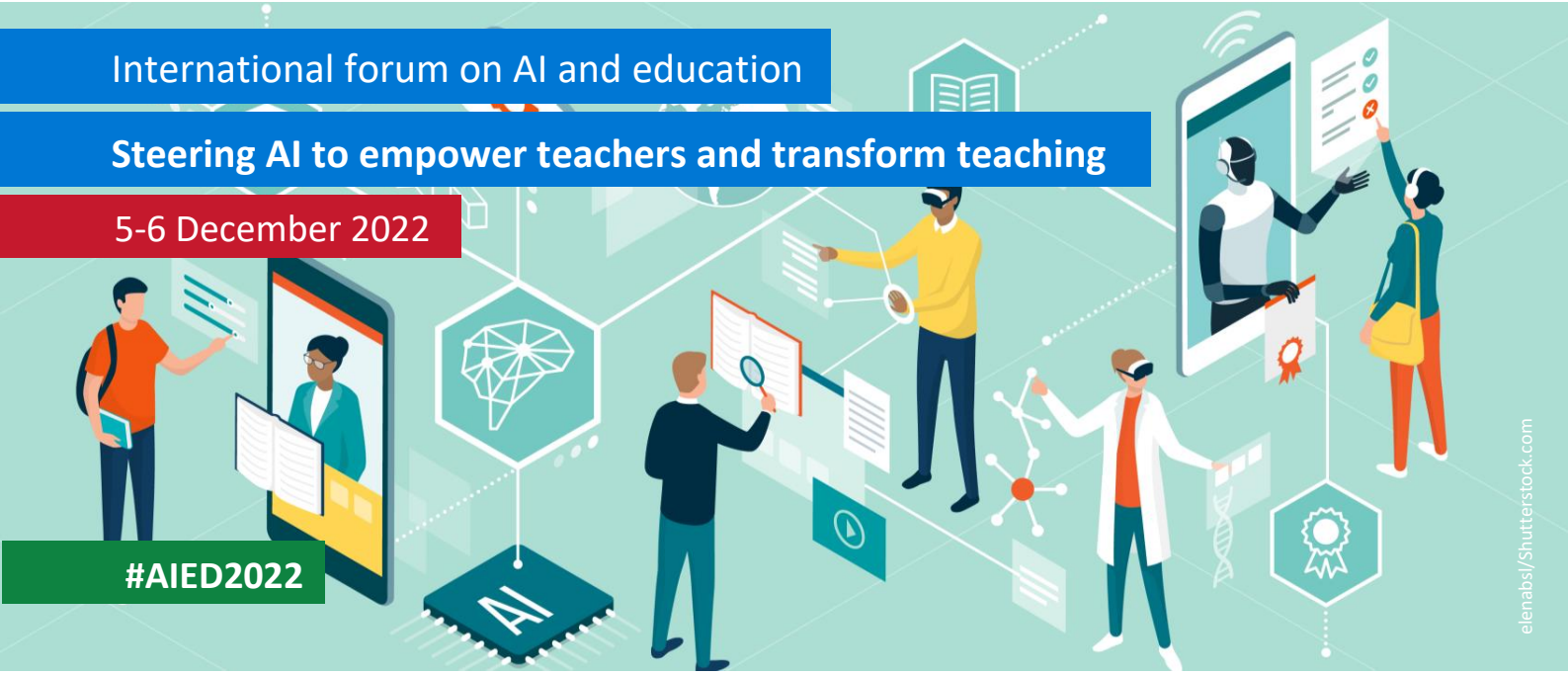
Closing Session
Moderator: Mr QIN Changwei, Secretary General, National Commission for UNESCO, China

Closing Remarks
Mr MA Jun, President of Beijing Normal University, China
H.E. Mr TIAN Xuejun, Vice Minister of Education, Chairperson of the National Commission for UNESCO, China
Ms Stefania Giannini, Assistant Director-General for Education, UNESCO

For more information:

Please contact **aied@unesco.org**, Team of Future of Learning and Innovation, Unit for Technology and AI in Education, UNESCO Headquarters.

Appendix 2: Concept note



Concept Note

Background

Artificial Intelligence is part and parcel of the infrastructure of the digital transformation of education

The 'Call to Action: Assuring and improving quality public digital learning for all',[5] launched during the Transforming Education Summit (TES) in September 2022, reaffirmed that the power of the digital revolution must be harnessed to ensure that quality education and lifelong learning is provided as a public good and a human right for all, with a particular focus on the most marginalized.

The realization of the digital transformation of education requires systematic transformation covering various aspects of education, including pedagogy, curriculum content, assessment, social caring and the organization of learning, across educational institutions and in lifelong learning settings. Artificial Intelligence (AI) is part and parcel of the infrastructure of the digital transformation of education, and it plays a unique role in connecting fragmented parts of decision-making processes and enabling the creation of workflow for provision of education as a public good. AI is one of the core technologies in digital transformation, acting as a driving force and enabling the architecture for the transformative upgrading of models on using technology to serve human across sectors. Building AI into digital infrastructure can help make the EdTech architecture more reliable and cost-effective.

[5] https://www.un.org/en/transforming-education-summit/digital-learning-all

Infusing AI-assisted solutions into education and learning management systems can enhance intelligent workflows, enable data-based monitoring, and facilitate effective human decisions.

Steer the design and use of AI to transform teaching

From using AI to ensure that the most marginalized have access to learning opportunities, to leveraging AI to enable the futures of learning we want, well-prepared teachers and effective teaching remain the backbone of education systems to deliver the promises of public digital education. The benefits of the digital transformation of education will not be achieved if teachers are not empowered and teaching practices are not transformed. Moreover, AI will only benefit the transformation of teaching practices and education if – by design – it can enhance learner-centred pedagogical approaches and higher-order thinking while respecting ethical norms and standards.

Despite its potential to empower teachers and enhance teaching, the design and deployment of AI for teachers and teaching to date has received far less attention than AI tools designed for learners. If examined by the aims and algorithms behind teacher-facing AI tools, current AI tools are not designed to transform approaches to pedagogy, the organization of learning, and the social and emotional interaction between teachers and students.

As pointed out in the UNESCO publication *AI and Education: Guidance for Policy-makers*,[6] AI applications designed for teaching have so far focused on replacing low-skill task units and reducing teachers' workloads by automating tasks such as assessment, plagiarism detection, administration and feedback. While this might have some benefits in contexts where teachers in general or certain subject-specific teachers in particular are scarce, the aim of replacing human teachers' functions reveals a fundamental misunderstanding of teacher agency and their essential social role in the learning process. This approach clearly undervalues teachers' unique skills and experiences, as well as learners' social and human needs.

In addition, current AI tools focus mainly on the profiling of learning content. The self-claimed use of AI to enable personalized learning in fact only allows for the assessment of the memorization of factual knowledge and falls short of enabling higher-order thinking and creative pedagogical methodologies. The design of AI algorithms and tools should be steered to open up teaching and learning possibilities that are otherwise difficult to achieve, challenge or even disrupt existing pedagogies, and augment teachers' expertise. Equally important, corresponding ethical issues need to be addressed before AI can be harnessed in real settings.

AI cannot transform teaching and education until AI technologies are designed and used at scale to drive and enable the implementation of 'context-responsive learning options, pedagogies and curricula in diverse forms, assessment strategies and expected learning outcomes, from high tech to low-tech, and no-tech contexts.'[7] For this to happen, the possibilities of developing and employing AI tools at scale to address more complex educational issues, such as collaborative learning or new ways to assess and accredit, should be fully researched. Relatedly, AI technologies and practices of using AI tools effectively to support innovative teaching methodologies, context-responsive learning

[6] https://unesdoc.unesco.org/ark:/48223/pf0000376709

[7] https://www.un.org/sites/un2.un.org/files/2022/09/sg_vision_statement_on_transforming_education.pdf

options, competency-based assessment across schools, TVET institutions, higher education institutions, and lifelong learning settings remain to be surfaced and shared.

Develop teachers' competencies needed to work with AI to transform learning

It is widely agreed that as AI tools become more available in classrooms and other formal or informal learning settings, it is likely that teacher roles will change. Yet, it is important for policy-makers to ensure that the introduction of AI in varied education settings will protect the rights of teachers and teacher agency.

The Vision Statement released by the UN Secretary-General during the Transforming Education Summit[8] envisaged the transformation of teachers' roles and recommended key trainings and support needed for the transformation: 'Teachers must become knowledge producers, facilitators, and guides in the comprehension of complex realities. They must be trained and empowered to transcend from passive to active, from vertical and unidirectional to collaborative. They must promote learning based on experience, enquiry, and curiosity.' To spark such a transformation, the first action required is that the capacity, agency and autonomy of teachers must be broadened.

However, when AI technologies for teachers are designed with the aim of relieving teachers of time-consuming activities such as marking assignments and repeating answers to the same academic questions, AI tools actually interfere with the teacher-student relationship and can undermine teacher agency. Teachers may, for example, lose key opportunities to learn about their students' formative strategies and capabilities with the use of AI tools to automate formative assessment and grading. In addition, when adopting intelligent tutoring systems, teachers often need to spend a great deal of time monitoring the dashboard that presents the data on students' learning processes rather than moving around classrooms to interact with students. This tends to reduce human interaction between students and teachers.

AI for teachers should be more of a technology working behind the scenes and should not disrupt human behaviours and the workflows of teaching and teacher-student interaction. Teachers will therefore also need to build new competencies to work effectively with AI especially the new skills needed to make AI-assisted decisions on effective strategies for teaching and social caring. In response to this emergent need, the *Beijing Consensus on Artificial Intelligence and Education* recommends that governments should 'be mindful that while AI provides opportunities to support teachers in their educational and pedagogical responsibilities, human interaction and collaboration between teachers and learners must remain at the core of education. Be aware that teachers cannot be displaced by machines, and ensure that their rights and working conditions are protected.' It further calls on governments to 'dynamically review and define teachers' roles and required competencies in the context of teacher policies, strengthen teacher training institutions, and develop appropriate capacity-building programmes to prepare teachers to work effectively in AI-rich education settings.'

International forums on AI and education: A global platform for knowledge-sharing

[8] Transforming Education: An urgent political imperative for our collective future: https://www.un.org/sites/un2.un.org/files/2022/09/sg_vision_statement_on_transforming_education.pdf

Since 2019, UNESCO, in cooperation with China, has been leading global efforts centred on the twin strands of AI and education, aiming to ensure that (i) the introduction of AI in education serves education as a public endeavour and a common good, and (ii) education develops the competencies needed for the AI era. The first International Conference on AI and Education[9] was co-organized by UNESCO and the Government of the People's Republic of China in Beijing in 2019. It was during this Conference that the *Beijing Consensus on Artificial Intelligence and Education* was adopted. To follow up on the implementation of the *Beijing Consensus*, the second international forum was held both online and in person in Beijing in December 2020.[10] In December 2021, the third forum took place online and in person in Beijing,[11] under the theme 'Ensuring AI as a Common Good to Transform Education'. Together, the three international forums featured more than 200 interventions and presentations, and reached more than 8,000 real-time international participants and viewers from more than 150 countries. This series of the forums has aimed to become a sustainable platform to promote knowledge sharing and the achievement of international agreements in the field of AI and education.

The *Beijing Consensus* recommends that UNESCO reinforce its lead role in steering the use of AI in education across concerned sectors and mobilize the Organization's institutes and networks, and further expand its external networks in the field of AI and education with relevant partners.

While the TES 'Call to Action: Assuring and improving quality public digital learning for all' focuses on assuring public digital learning opportunities for all, it is silent on how AI and big data can be used as a common good to enable the digital transformation of education. The design and use of relevant AI technologies to support the transformation of education is a convergence of two frontier areas: (1) the next-generation of AI algorithms and tools to trigger and support innovative pedagogy; and (2) the planning of prospective strategic directions and actions on the digital transformation of education. The pioneering exploration of these frontier fields of policies and practices will require collaborative deliberation, forward-looking opinions, and sharing of lessons learned from early pilot tests. There is a mounting need for a venue to facilitate thematic knowledge sharing and international cooperation in this domain.

Aim

In response to this need, the fourth edition of the UNESCO International Forum on Artificial Intelligence and Education aims to convene debates and foster knowledge sharing specifically on how to steer the design and use of AI to empower teachers and to transform teaching methodologies within the broad framework of digital transformation of education. UNESCO, China, representatives of large population countries with some of the largest public education systems, and interested international or regional organizations will co-organize a hybrid edition of the International Forum on AI and Education on 5 and 6 December 2022 under the theme *Steering AI to empower teachers and transform teaching.*

Subthemes

[9] https://unesdoc.unesco.org/ark:/48223/pf0000370967

[10] https://unesdoc.unesco.org/ark:/48223/pf0000377251

[11] https://unesdoc.unesco.org/ark:/48223/pf0000381226

The Forum will be structured around the following sub-themes:

5. **Strategies for leveraging AI to enable the digital transformation of education:** The novelty and complexity of leveraging AI to enable digital transformation of education calls for the planning of forward-looking strategic directions and inter-disciplinary evidence. This session will examine the value of AI in the transformation of education as a public endeavour and share national strategies on how AI will be leveraged to transform learning, teaching, education management and provision of education while ensuring the protection of human rights, data privacy, digital inclusion and digital well-being of both teachers and learners.

6. **Steering AI by design to empower teachers and transform teaching and learning:** The transformation of education needs teachers to become micro-curriculum designers as well as facilitators and guides of 'context-responsive learning options', and AI should be designed to empower teachers in doing so. This session will share innovative AI tools designed to trigger and support the planning and organization of innovative teaching methodologies, context-responsive learning options, and competency-based assessment. It will also share innovative practices of using AI to transform teaching in school education, TVET, higher education institutions and adult education settings.

7. **Defining and developing teachers competencies needed to work in AI-rich education settings:** As AI is revolutionizing digital technologies and the digital infrastructure of education, the requirement for teachers' capacities in using AI tools especially in making choices between machine decision and human decision, and between human-machine interaction and human interaction with students, will also revolutionize the definition of digital competencies for teachers. The session will share national and institutional frameworks, standards or training programmes on AI competencies for teachers, drawn from a global survey and call for proposals. The conceptualization of a global AI competency framework for teachers will be examined.

8. **Global partnership for centring the most marginalized with priorities for Africa:** The most fundamental commitment of digital transformation is to ensure that AI will be a common good for all to advance equity, inclusion and gender equality. AI will not transform education if it only benefits the privileged groups exclusively and widens educational inequity. This session will ally policy-makers and partners to steer policies, actions and resource mobilization to centre the most marginalized. Priority focuses will be given to Africa, Small Island Developing States (SIDS), and other marginalized learners. The session also seeks to launch or announce global partnerships for steering AI to empower teachers and transform teaching to facilitate knowledge and resources sharing.

Target Participants

The participants will include Ministers of Education and/or ICT, high-level representatives of UN agencies or international organizations, senior policy-makers, representatives of private sector partners and civil society organizations, prominent academic researchers, and managers of selected AI in education projects.

Co-organizers

The Forum is co-organized by:

- United Nations Educational, Scientific and Cultural Organization (UNESCO)
- Ministry of Education of the People's Republic of China
- National Commission of the People's Republic of China for UNESCO

Working Languages

Interpretation services will be provided in English, French and Chinese.

Technical specifications

The event uses Zoom applications to support the live sessions, and uses an online conferencing website to support the registration, the update of live sessions and networking among participants. Live streaming platforms will be used to expand real-time participation.

Provisional Programme Structure

(CET Time, Paris Time)

<table>
<tr><th colspan="2">Day 1 (5 December 2022)</th><th colspan="2">Day 2 (6 December 2022)</th></tr>
<tr><td>09:00-10:30</td><td>Opening Session
and
Plenary Session 1: Strategies for leveraging AI to enable the digital transformation of education
Sign in</td><td>09:30-11:00</td><td>Plenary Session 3: Defining and developing teachers competencies needed to work in AI-rich education settings
Sign in</td></tr>
<tr><td>10:30-10:40</td><td>Break</td><td>11:00-11:20</td><td>Break</td></tr>
<tr><td rowspan="3">10:40-12:00</td><td rowspan="3">Plenary Session 2: Steering AI by design to empower teachers and transform teaching and learning
Sign in</td><td rowspan="3">11:20-12:40</td><td>Parallel Session 3.1: Development of AI competencies for teachers
Sign in</td></tr>
<tr><td>Parallel Session 3.2: AI innovations to support teacher professional development and collaboration
Sign in</td></tr>
<tr><td>Parallel Session 3.3: Empowering women and women teachers in the digital age
Sign in</td></tr>
<tr><td>12:00-13:30</td><td>Break</td><td>12:40-13:00</td><td>Break</td></tr>
<tr><td rowspan="3">13:30-15:00</td><td>Parallel Session 2.1: AI innovations and best practices on the use of AI in teaching, learning and learning assessment
Sign in</td><td rowspan="3">13:00-14:30</td><td rowspan="3">Plenary Session 4: Global partnership for centring the most marginalized with priorities for Africa
and
Closing Session
Sign in</td></tr>
<tr><td>Parallel Session 2.2: AI innovations and best practices on the use of AI for learners with special needs
Sign in</td></tr>
<tr><td>Parallel Session 2.3: Youth Forum on AI-assisted pedagogical innovations
Sign in</td></tr>
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International forum on AI and education

Steering AI to empower teachers and transform teaching

Analytical report

The fourth **International forum on Artificial Intelligence and education**, held in 2022, explored the theme 'Steering AI to empower teachers and transform teaching'. This report is an analysis of the key discussions, focusing on the role in AI and education of digital humanism, and on how to steer the design and use of AI to empower teachers and to transform teaching methodologies within the broad framework of digital transformation of education.

Co-organizers

MINISTRY OF EDUCATION
THE PEOPLE'S REPUBLIC OF CHINA

unesco
Chinese
National Commission

Stay in touch

dlw@unesco.org

http://en.unesco.org/digital-education

@UNESCO @UNESCOICTs

@ICTs in Education

UNESCO
7 Place Fontenoy
75007 Paris
France

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