

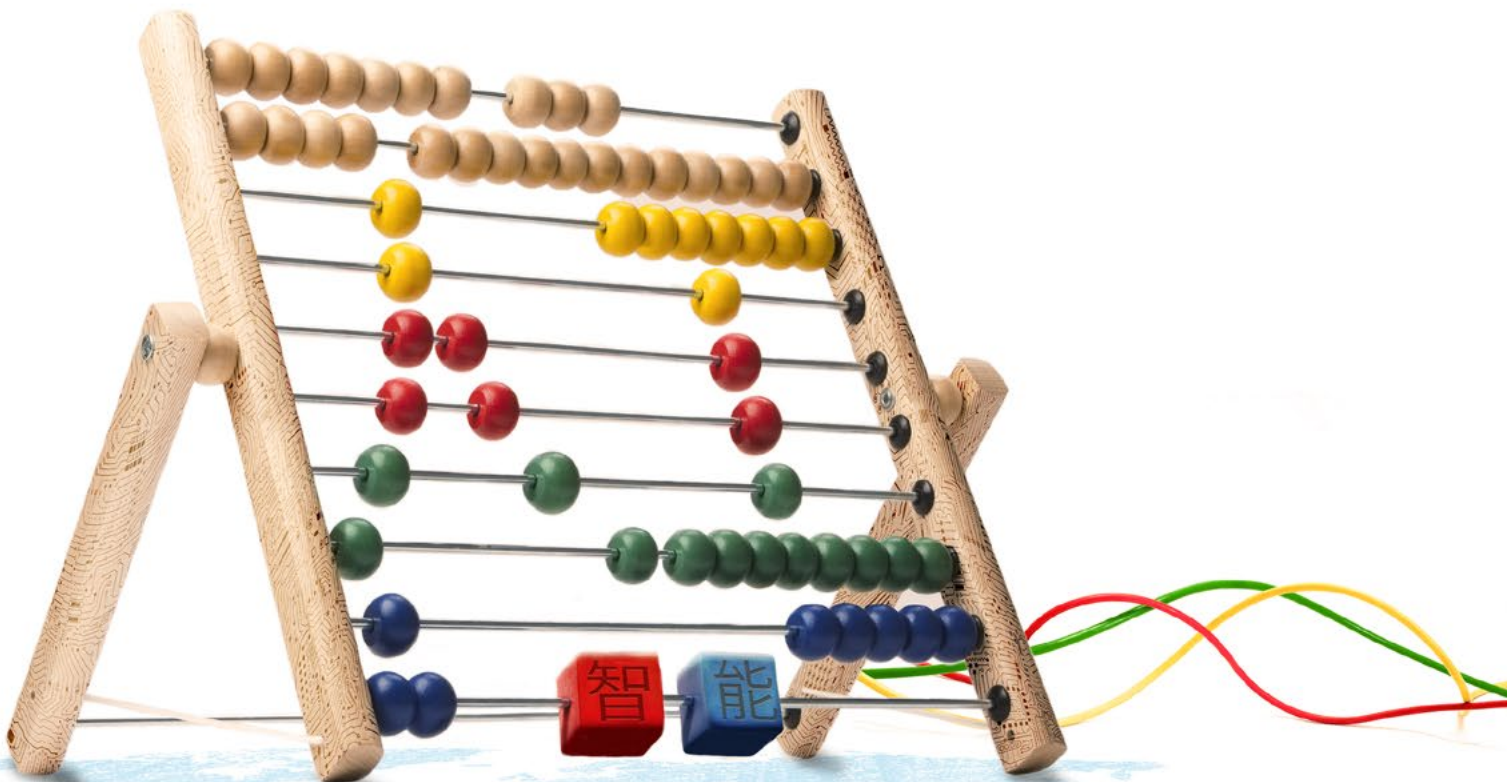


United Nations
Educational, Scientific and
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International Conference on RTIFICIAL INTELLIGENCE and Education

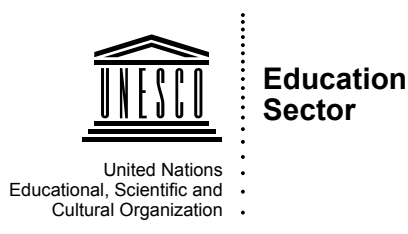
Final Report

Planning Education in the AI Era: Lead the leap



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Executive summary

The current report is an exhaustive account of the discussion and debate at the International Conference on Artificial Intelligence and Education (hereafter referred to as ‘the conference’) held in Beijing from 16 to 18 May 2019. Under the overarching theme of ‘Planning Education in the AI Era: Lead the Leap’, the conference was structured into seven plenary sessions and 16 breakout sessions complemented by a live exhibition and study tours to facilitate forward-looking debates, share cutting-edge knowledge and AI solutions, and deliberate on sector-wide strategies.

The executive summary captures the five key areas of take-aways and seven main trends in AI in education emerging from the conference discussions.

KEY TAKE-AWAYS

1. AI is envisioned as a new tool to accelerate the progress towards the achievement of Sustainable Development Goal (SDG) 4.

The latest advance in AI technologies opens up new opportunities to tackle resistant issues and barriers in education, in order to accelerate the achievement of the Education 2030 Agenda. This is also a key message from President Xi’s congratulatory letter to the Conference.

Member States are aware of the potential of AI in education but promote strategic implementation at policy levels to varying degrees. While some countries already have national AI strategies and initiatives in place, some are still lagging behind, stalled at the awareness-raising stage. Some national pioneering practices reflected at the conference include China’s ‘New Generation AI Development Plan’, Japan’s ‘Society 5’, Slovenia’s international AI research centre, and the EU’s AI strategy.

2. Policies and strategies for using AI in education are central to maximizing AI’s benefits and mitigating its potential risks.

Fostering AI-ready policy-makers is the starting point. Policy-makers need to conduct continuous policy learning on what AI is and how AI is used in life, work and education, as well as how ethical and legal risks should be managed. Various tools are being developed to help policy-makers profile the readiness of their country for harnessing AI in education. According to the International Telecommunication Union (ITU) analysis, economies with greater readiness to benefit from AI may achieve absorption levels higher than those of slow adopters. This indicates that like the digital divide, an “AI divide” may emerge

between advanced and developing economies.

Policies need to be based on examining the implications of AI for the core foundation of education, including skills development, governance, the management of curricula and qualifications, and the organization of teaching and learning. For instance, AI empowers teachers rather than replacing them. Positioning AI as an intelligence augmentation opportunity for teachers has significant implications for teacher training. Teachers shall be equipped with necessary AI and data knowledge and skills to make informed decisions. Teacher training emphasizes the social and emotional aspects, which are out of the scope of AI support.

The current education management information systems (EMIS) are being transformed into AI-powered learning management systems, which will facilitate the formulation of responsive policies, monitoring and evaluation of learning outcomes, real-time decision-making, and prediction of learning and teaching.

3. Skills to live and work in the AI era shall be anticipated and developed in a dynamic manner.

The positive effects of AI and education on each other are reciprocal. While AI is a booster for education, education provides incubation for AI advances. The penetration of AI in life and work has implications for the preparation of the future workforce. Many countries also establish AI research centres and university programmes in light of the importance of nurturing AI talent as a national priority.

There are two main perspectives on the impact of AI and automation: replacement and transformation. The replacement perspective emphasizes fears around the loss and displacement of jobs due to automation. On the other hand, the transformation perspective highlights the optimistic view that the automation of low-skilled routine jobs creates opportunities to increase the demand for highly skilled and creative jobs that were rather limited in the traditional labour market.

New job creation and placement could happen unevenly, and divergence might exist within a country. Since low-income jobs are more likely to be automated, a significant transition from the low- to the high-skill domain is essential.

AI and big data technologies can contribute to the analysis of skill supply and demand, and the forecast, profiling and recommendation of skills

needed in the labour market. The first tool for making use of ICT tools to integrate labour market information into lifelong guidance, was 'Labour Market Information', which was developed by the European Centre for the Development of Vocational Training.

A common AI competency framework is needed for both teachers and learners. This framework can shed light on the integration of AI skills into school and institutional curricula. A re-emphasis on teaching more human-centric soft skills is equally important in the AI era, because analysing demand reveals that skills in project management, adaptability and understanding other languages are particularly needed. **It is inappropriate to promote AI systems that evaluate what is testable and ignore what is not,** as testable features are not always important, while competencies such as tolerance, intercultural understanding, and adaptability are not currently testable but essential.

The reskilling and upskilling of existing workers to equip them with the necessary AI skills can involve an agile and modular approach to enable continuous lifelong learning. Relevant initiatives are employing AI and big data to respond to the lack of personalization often seen in upskilling and reskilling. These initiatives also create links between the government, vocational education and training centres and businesses to map supply-and-demand expectations.

4. Promoting equitable, inclusive, and transparent use of AI in education is the key to achieving an AI dividend for everyone.

Some countries have experienced problems when attempting to build the necessary infrastructure, increase access to technologies and manage budget constraints. However, **the issue here is not necessarily having poor infrastructure, resources or connectivity; instead, it is having poor priorities and governance that stops a country benefiting from AI.**

It is sometimes said that 'data is the new oil'. In fact, this understates the power of data, as unlike oil, it can be reused and repurposed again and again. It is worrying that ownership of data is highly concentrated among a few countries and companies, potentially contributing to growing inequality. Individual data should be used for the common good.

Less has been done in the social, legal and ethical dimensions of AI governance, although there is progress in the technical side. AI in education should position ethics at its core, making it essential to establish an ethical framework. It is also necessary to

develop a regulatory framework that is agile enough so as not to discourage innovation.

It is a top priority to ensure that Africa can benefit from AI in education and sustainable development.

Deepening subregional dialogues, developing a regional approach and unleashing the potential of youth are considered as the three top strategies for Africa to leverage AI for achieving the SDG 4.

Research on good practices in rectifying gender imbalance in this arena is rare, despite alarming evidence of gender inequality in harnessing AI. More action needs to be undertaken to promote the empowerment of women in AI, such as gender-responsive policy development and more scholarships for girls and women to study STEM subjects.

There are co-occurring issues affecting AI's potential to support learners with special educational needs and provide alternative learning modalities. For example, AI is being developed to recognise and respond to human emotions, although not when the person has attention deficit hyperactivity disorder or is on the autism spectrum. Privacy is also an issue for people with disabilities. Mobile phone companies can infer when someone is blind in the context of AI, and there will be deeper digital footprints for people who are the most vulnerable.

5. International partnerships shall be built for an AI-enhanced future of education.

Areas of opportunity have been identified where public-private partnerships could impact the progress of using AI in education, including:

- cloud infrastructure, data storage, computational resources, apps, services, development and licensing
- hardware and in-school devices
- infrastructure, communication and access
- operations, security, maintenance and cyber-security protection
- expertise, evaluation, usage training and efficacy measurements
- AI-education support such as courses, resources, competitions and incentives for learning about AI.

Addressing the issue of an increasingly large number of different platforms, which overlap to a great extent in terms of use and functionality, necessitates **the formation of an open-source platform** to which all can agree and contribute, in order to help leverage open internet resources, translation, and adaptation to local contexts. There is also a call for sharing not only the data but also the AI algorithms, since it is in the algorithms that the data is put to use and the solutions can be found.

MAIN TRENDS

1. It is critical to employ a humanistic approach to leverage the potential of AI to achieve SDG 4. There was a consensus among participants that education systems should continue focusing on investing in human intelligence, rather than focusing on those aspects that are likely to be automated with machine intelligence. The humanistic approach views AI as a tool to augment human intelligence and expand the boundaries of human capabilities.

2. AI is playing an increasingly important role in shaping the future of teaching and learning. In general, AI was seen as an opportunity to provide quality education to an increasing number of learners at all levels, especially for disadvantaged groups who have socio-economic challenges, special educational needs, or no access to formal education. AI knowledge and skills are being integrated in the school curricula by some Member States.

3. It is crucial to employ a holistic approach to leverage the potential of AI for educational policy, management, curricula, teaching and learning, including giving due consideration to the ethical and social implications of using AI technologies across educational practices. Without concerted policy interventions, appropriate considerations of the complex implications of AI for education would not be possible.

4. The impact of AI on the labour market transforms the methods of training existing and future workers. The impact of AI has been highly visible in the labour market, with the changing nature of job competencies and demands. In this changing landscape, the role of AI has three implications: a) the transformation of education and training systems through the integration of AI; b) the building of AI-related skills for a group of learners; and c) the development of highly-skilled AI professionals.

5. Different regional and national strategies tailored to the local needs and status quo should be adopted to maximize the benefits of AI and avoid widening the AI divide. Low-resource areas are more likely to be deprived of the dividend brought by AI due to a lack of infrastructure, connectivity, and data ownership. The panel discussion of ministers from Africa suggested continuous subregional dialogues to develop regional and subregional strategies on AI in education through unleashing the potential of youth and cultivation of local AI professionals.

6. There is a pressing need for a common framework for the governance of ethical and transparent use of AI technologies and data.

Although AI is viewed as a powerful tool to change the way we live, work and learn, not many countries have full-fledged policies and regulatory frameworks on data protection, privacy and ownership. Ensuring an adequate ethical and legal framework is one of the three pillars of the EU strategy on AI.

7. Various initiatives on AI in education shared at the conference have adopted multistakeholder (government, academia and industry) inter- and cross-sectoral partnerships and collaborations.

PRIMARY OUTPUT

The key output of the conference was the adoption of the '[Beijing Consensus on Artificial Intelligence and Education](#)', as the first-ever document to offer guidance and recommendations on harnessing AI technologies to achieve the Education 2030 Agenda. At the end of the report, Member States and stakeholders are encouraged to start implementing the Beijing Consensus to progress towards SDG 4 through unleashing the potential of AI technologies in education.

1. Introduction

Artificial Intelligence (AI) is advancing pervasively as a result of emerging technologies such as new algorithms, cloud computing, big data, and the internet of things. This is bringing human history into a new era where human beings need to live and work together with AI, giving rise to the fourth industrial revolution (industry 4.0). This raises a fundamental question about how education can prepare individuals to engage with AI effectively to build sustainable societies.

AI has brought unprecedented opportunities as well as challenges to the education system at the macro level. From the perspective of education policy-making and planning, how can we harness AI to optimize the provision and management of education, empower teachers, improve learning outcomes, expand access to schools, and improve educational quality? From the perspective of demand, how can we respond to the iteration of employment and entrepreneurial skills affected by AI? How may we mitigate the effects of replacing low-skilled jobs and ensure adequate supply for emerging occupations? From the perspective of humanity, ethics, and fairness, how might we close the digital divide among social and economic groups, and avoid the deeper and more ubiquitous privacy and ethical violations that AI can cause?

In this regard, the International Conference on Artificial Intelligence and Education was co-organized by UNESCO, and the Ministry of Education and National Commission of the People's Republic of China. The aim was for UNESCO, in order to examine and respond to the challenges and opportunities presented to education by AI. The conference was held in Beijing from 16 to 18 May 2019, hosted by the Municipal Government of Beijing City with financial support from the Weidong Group and the TAL Education Group.

The conference aimed to provide a platform for Member States, international organizations, civil society, and the AI industry to:

- debate whether the skills needed to succeed in the AI era can be anticipated, and share experiences on the development of AI skills, in order to enable humans to live and work together with AI;
- exchange information on the latest AI trends and how they are shaping teaching and learning;
- assess lessons learned from emerging national policies and strategies for leveraging AI to achieve Sustainable Development Goal (SDG) 4; and

- strengthen international cooperation and partnership to promote equitable, inclusive, and transparent use of AI in education.

Fifty government ministers and vice ministers, as well as around 500 international representatives from more than 100 Member States, attended the conference. The participants included officials from governmental ICT-in-education agencies and institutions, international development partners, international experts, and private AI device and service providers. The large number of participants is evidence of the importance and status of the conference. This boded well for its objective to renew the spirit of [the Qingdao Declaration](#) (UNESCO, 2015) and make a difference in education for fair and inclusive globalization.

Under the overarching theme of “*Planning Education in the AI Era: Lead the Leap*”, the Conference was structured into seven plenary sessions and 16 breakout sessions to promote forward-looking debates, share cutting-edge knowledge and AI solutions, and deliberate on sector-wide strategies, around the following subthemes:

- Envisioning the AI-enhanced future of education in the context of SDG 4
- Guiding the development of AI-in-education policies and strategies
- Anticipating and developing skills needed for life and work in the AI era
- Promoting equitable, inclusive, and transparent use of AI in education
- Building international partnerships for an AI-enhanced future of education

The discussion was complemented by demonstrations of hands-on practices of AI in education, including an interactive exhibition which showcased initiatives from K-12 to higher education designed and implemented by leaders in the field, and three parallel study tours to the Beijing National Day School, Tsinghua University, and the Zhongguancun Demonstration Zone.

The key output of the conference was the adoption of the ‘[Beijing Consensus on Artificial Intelligence and Education](#)’, as the first-ever document to offer guidance on how best to harness AI technologies to achieve the Education 2030 Agenda.

This report is structured to provide a summary of (a) the main ideas discussed in each subtheme, (b) the insights of the keynote and invited speakers, (c) the main trends observed across the subthemes, and (d) the recommendations of the Beijing Consensus.

2. Envisioning the AI-enhanced future of education in the context of SDG 4

AI is envisioned as one element of the future of education and can contribute to progress towards SDG 4 by helping Member States to tackle challenges in education. As Member States enter the fourth year of implementing the Education 2030 Agenda, they face enormous challenges. Globally, about 262 million children and youth were out of school for the school year ending in 2017. More than 617 million are not achieving minimum proficiency levels in reading and mathematics, and in sub-Saharan Africa alone, fewer than 40% of female children complete nine years of education, according to the UNESCO Institute for Statistics (UIS, 2018).

Relying solely on traditional education management and resource provision is insufficient for addressing these challenges faced by Member States. The latest breakthroughs in emerging technologies enable new solutions to resistant obstacles in education. For instance, AI can remove linguistic and logistic barriers for vulnerable groups, so that they can gain access to education. AI can not only reduce teachers' mechanical workload for more meaningful teaching, but also enable 'intelligent tutoring' (an AI system that gives learners customized classroom instruction and feedback on its own), which is extremely conducive to areas with teacher shortages. AI can also optimize the allocation of resources in favour of disadvantaged groups by automating the management process, and improve the learning process and outcomes by analysing learning models.

To ensure that Member States may fully benefit from AI through evidence-based planning and policy-making, the conference organized debates on how AI will reshape education and learning. The debates took place at the opening ceremony, and in the ministers' forum and keynote sessions to set the scene for the following discussion. Key questions included: What are the latest trends in AI? How are these trends reshaping education and learning? How should policies be planned to lead systemic change and innovation in response to the opportunities and risks presented by AI?

The impact of AI in reshaping education and learning was highlighted in the opening remarks by Mr CHEN Jining, Mayor of Beijing Municipal People's Government, and Mr Lee Byong-Hyun, Chairperson of the Executive Board of UNESCO.

Ms Stefania Giannini, the Assistant Director-General for Education at UNESCO, reaffirmed the need to adopt a systematic approach to the design and implementation of AI in education in order to reap the benefits while being cautious about its long-term implications. Given that fewer than 10% of countries have developed a systematic strategy on AI, Ms Giannini proposed that we develop shared understandings about the impact of AI in the following three dimensions. First, we need investment in human intelligence. Teachers are at the forefront at all stages of the learning journey, and cannot be replaced by machine learning and robots. While AI can be an asset to personalise learning and help us better understand how learning happens, achieving such benefits depends on collaboration between teachers, researchers and developers. Second, we need to understand AI from the lifelong learning perspective. AI is a new form of literacy and has been impacting higher education institutions and labour markets. To prepare people to become lifelong learners, we need to develop guiding principles for skills development and support higher education to strengthen STEM (science, technology, engineering and mathematics) education. Third, we need concerted policy interventions. Despite universal access to open education and open science, fewer than 30% of European countries have data protection policies. UNESCO is in the process of developing a framework for data protection, and its role and responsibility on this matter is also reflected in the outcome document of the conference.

Ms SUN Chunlan, Vice Premier of the People's Republic of China, shared a congratulatory letter from President Xi emphasizing China's determination to tackle the AI transformation and foster high-quality talent and initiatives to integrate AI. He states,

Artificial Intelligence (AI) is an important driving force behind a new round of scientific and technological revolution and industrial transformation. It is bring profound changes to our way of production, life and learning and ushering mankind into an age of intelligence featuring human-machine synergy, cross-sectoral integration and shared creativity. Hence, staying on top of the global trend of AI development, identifying possible areas of breakthroughs and priorities, and cultivating a large number of high-caliber AI professionals good at innovation and teamwork has become an important mission of education.

China attaches great importance to the profound impact of AI on education. It is therefore actively promoting the integration of AI and education to bring about a transformation in education. Efforts are being made to tap into the potential of AI to deliver equitable, lifetime and customized education with greater openness and flexibility.

China will work with other countries around the world to focus on the frontier issues of AI development and innovation in the context of the rapid development of AI. Let us build consensus, deepen cooperation, and pursue greater sharing for the building of a community with a shared future for mankind.

Ms Sun affirmed that the Chinese government continues supporting UNESCO's activities and strategic coordination on educational reform in the AI era.



国际人工智能与教育大会

规划人工智能时代的教育：引领与跨越

International Conference on Artificial Intelligence and Education
Planning Education in the AI Era: Lead the Leap

SUN Chunlan

Vice Premier People's Republic Of China

孙春兰

中华人民共和国国务院副总理



Figure 1 : Ms SUN Chunlan, China's Vice Premier shares a congratulatory letter from President Xi of the People's Republic of China

The conference was followed by the Ministers' debates on emerging policies and strategies for leveraging AI to achieve SDG 4. Mr Chen Baosheng opened the ministers' forum with a keynote speech on AI and education in China. He shared that China's five-year development plan supports educational modernization to continuously improve quality. He envisioned four ways of leveraging AI in education: popularization, integration, transformation and innovation. First, the popularization of AI is a foundational aspect whereby the new knowledge and AI advancements need to be reflected in the syllabuses, curricula, textbooks and delivery, to raise

students' awareness and develop their interests and competence. Second, integration means that teachers should be equipped with knowledge and skills through pre-service and in-service training to implement intelligent teaching. It is equally important to advocate for AI in all non-formal and informal education. Third, AI can transform education and lifelong learning systems in all aspects, including governance and management. Last but not least, it is fundamental to strengthen in-depth innovative research at universities and enterprises and guarantee them through long-term investment mechanisms.

CHEN Baosheng

Minister of Education People's Republic of China

陈宝生

中华人民共和国教育部部长



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Figure 2 : Mr CHEN Baosheng, China's Minister of Education opens the ministers' forum



Figure 3: Mr Jernej Pikalo, Slovenia's Minister of Education, Science and Sport, delivers an introductory speech during the ministers' forum

Mr Jernej Pikalo, Slovenia's Minister of Education, Science and Sport (where Europe's first international AI research centre will be set up with UNESCO), asserted that AI can help boost education, learning participation, and lifelong learning, via three steps. These were: assessing the real needs of teaching and learning, considering how AI can be brought

in to support the identified needs, and adopting a holistic approach to harness AI potentials for the achievement of SDGs. Slovenia has the highest per-capita number of AI researchers in the world, and will create a research centre in Ljubljana to advise other governments on policy and ethical issues.



Figure 4 : Ministers' forum on emerging policies and strategies for leveraging AI to achieve SDG 4

Mr Yutaka Hishiyama, Japan's Assistant Minister for Cybersecurity, IT Management and Evidence-Based Policymaking, introduced '[Society 5.0](#)' (Council for Science, Technology and Innovation, 2017), which highlights the design, development and use of human-centred technologies including AI. In Japan, AI literacy is a focus for all university graduates. The country aims to provide applied AI foundations to 250,000 university students, which is 50% of graduates who are doing double majors, and to support about 2,000 of them to be AI experts. There is also a plan to build the next generation of schools with adaptive learning technologies.

At the forum, two rounds of panel discussion ensued after the introductory remarks, involving Mr Hishiyama, Mr Pikalo, and eight other ministers:

- Mr Arayik Harutyunyan, Minister of Higher Education and Science, Armenia
- Mr Gaspard Banyankimbona, Minister of Higher Education and Scientific Research, Burundi
- Mr Anatole Collinet Makosso, Minister of Primary,

- Secondary Education and Literacy, Congo
- Mr Emery Okundji Ndjovu, Minister of Posts, Telecommunications and New Technologies of Information and Communication, Ministry of Primary, Secondary and Vocational Education a.i., Democratic Republic of the Congo
- Ms Gulmira Kudayberdieva, Minister of Education and Science, Kyrgyzstan
- Mr Girirajmani Pokharel, Minister of Education, Science and Technology, Nepal
- Mr John Chrysostom Musingo, Minister of State for Higher Education, Uganda
- Mr Deng Deng Hoc Yai, Minister of General Education and Instruction, South Sudan

They shared in turn how their countries have been responding to the challenges and opportunities of AI in education. Three highlights are as follows:

- Overall, countries are aware of the potential of AI in education but promote strategic implementation at policy levels to varying degrees. One of the commonly observed policy directions was to invest

in skill development through formal education systems, such as the provision of STEM education (e.g. Armenia, the Congo) and the fostering of AI specialists for higher education (e.g. Burundi, Kyrgyzstan).

- Despite the awareness of AI's potential, strategic plans for promoting AI in education have not been reflected in national ICT or education plans. This may be due to the fact that countries are at different stages of developing and implementing such plans. For instance, South Sudan is a post-conflict country that only developed a national ICT strategy in 2018 and is lagging behind in terms of adopting AI. Nepal has established a national ICT strategy plan for 2025, but this mainly aims to improve technological infrastructure, and concrete strategies on AI in education have not yet been produced.
- Countries have been facing some common challenges in terms of building the necessary infrastructure, increasing access to technologies, and managing budget constraints. For instance, the DR Congo initiated work on a national network system with fibre optics to tackle the ICT infrastructure challenge. Countries faced with such challenges called for support from and partnerships with international organizations and industry sectors. Kyrgyzstan also drew attention to gender inequality in the field. In Kyrgyzstan, women are 25% less likely to knowledgeably use technologies, and four times less likely to take up programming. Social programmes have been set up to improve girls' access to the labour market.

The keynote session on 'Envisaging the future of education in the AI era' had presentations from a senior policymaker, Mr ZHONG Denghua, Vice Minister of Education, and three senior industry leaders from China, the Board Chairman of [Weidong Group](#), Board Chairman of [TAL Education Group](#), and CEO of [iFLYTEK](#), as well as a senior academic from the UK, Professor John Shawe-Taylor of University College London.

AI technologies that are used to improve educational practices were perhaps the most frequently discussed aspect of the future of education in the AI era. Under this topic, there was an apparent consensus that the global AI race should be about improving learning outcomes and supporting teachers and teaching practices, as well as sharing good-quality open educational resources.

In terms of AI technologies' potential to support teachers and teaching practices, Mr ZHONG argued that these technologies will free teachers from simple mental labour. To exemplify his vision, he presented a new AI learning assistant, '[Xiaomu](#)', which is being

developed by [XuetangX](#) in cooperation with Tsinghua University's Department of Computer Science and Technology. Xiaomu is an example of a personalized study partner, which can reduce teachers' burden and help students improve their efficiency and independence. This virtual teacher has been tested in several courses on XuetangX's massive open online course (MOOC) platform.

Concerning improved learning outcomes, the Board Chairman of the Weidong Group presented adaptive learning platforms as examples of AI in education. For instance, in 2016, Weidong provided a complete learning management system to Air France for their staff training, which has AI-based adaptive features. In addition to the adaptive online learning platforms, they also have augmented-reality and virtual-reality products that focus on business training. Since 2014, Weidong has hosted four conferences and is in full support of UNESCO's [Education 2030 Agenda](#) and its targets.

On the other hand, the Board Chairman of the TAL Education Group particularly emphasized the fact that although technologies change very fast, the nature of education changes very slowly. He argued that the focus of AI in education should not only be on students' subject knowledge, but also on their skills development. TAL presented examples of their AI-in-education products. For instance, [iMobby](#) is an interactive adaptive platform for iPads and [izhikang](#) is an adaptive platform for personalized learning in secondary school subjects. TAL also aims to provide online English lessons to students in rural areas to improve their learning through interaction with language teachers.

Similarly, the CEO of iFLYTEK presented their virtual agent that can speak in multiple languages as well as their new real-time translation tool. In China, iFLYTEK implemented a large-scale project for English teaching with virtual agents and human teachers, along with an AI-based homework system. Their evaluation showed that with the intervention of their AI platform, there is a 53% decrease in teacher time, and the overall efficiency increases by 26% to deliver the same amount of teaching. Their current AI voice synthesis system has an output as accurate as an average American university student and has been used to teach English to Chinese students. They put this recent AI system under evaluation through the CET (College English Test) 6 exam and it passed, proving its mastery of English.

AI was considered to play a crucial role in providing access to quality educational resources. Professor Shawe-Taylor, the UNESCO Chair in AI and Chair of [Knowledge4All](#), touched upon this issue. He argued

that machine-learning AI seeks patterns in data and focuses on probabilistic analysis rather than logical inference. Its potential has been shown in many examples including [IBM Watson](#), which built an AI to defeat human experts in the game of Jeopardy!; [DeepMind's AlphaGO](#), which won against the world Go champion; and [EmoTech's OLLY](#), an AI system that adapts to the emotional states of its users. AI can help us process large amounts of digital resources, select those that are of good quality, and deliver them to the geographically disadvantaged areas of the world. For instance, University College London initiated [X5gon](#), an EU-funded project for helping students find what they need not only in open educational resource (OER) repositories, but also across all OER on the web. This new AI-driven platform will deliver OER content from everywhere, based on students' needs at the right time and place. It will aggregate relevant content from the internet, curate it, personalise it, and create new content with the help of machine-learning AI.

The key messages on leveraging AI to transform education arising from these debates are reflected in the Beijing Consensus:

- (para. 2) We reaffirmed the commitment made in the 2030 Agenda for Sustainable Development, particularly SDG 4 and its targets, and discussed the challenges faced by education and training systems in achieving SDG 4. We are committed to leading appropriate policy responses aimed at the systematic integration of AI and education to innovate education, teaching and learning, and at leveraging AI to accelerate the delivery of open and flexible education systems that enable equitable, relevant and quality lifelong learning opportunities for all that will contribute to achieving the SDGs and the shared future for mankind.
- (para. 4) We reviewed the recent trends in the evolution of AI and its profound impact on human societies, economies and the labour market, as well as on education and lifelong learning systems. We examined the implications of AI for the future of work and skills development and considered its potential for reshaping the core foundations of education, teaching and learning.

3. Guiding the development of AI in education policies

While AI has the profound potential to alter every aspect of education, policy-makers are struggling to seize the opportunity and to align AI in education strategies with other policy initiatives in the context of achieving SDG 4 targets. This subtheme focused on how lessons learnt from emerging AI strategies can inform the development of AI in education policies. Key questions in the plenary and breakout sessions included: What are the key lessons learned from the implementation of national strategies? What system-wide planning is needed to transform education and lead it into the AI era? How can adequate resources and key stakeholders be mobilized to fund AI-in-education policy and support its implementation?

To start from a global perspective, Mr Fengchun Miao, Chief of the Unit for ICT in Education of UNESCO, and Mr Wayne Holmes, Assistant Professor from the Open University of the UK introduced UNESCO's on-going creation of guidelines and instruments to support Member States in developing AI-in-education policies and strategies, including a forthcoming publication 'Policy Guidelines for AI in Education' and a project entitled 'Building AI-readiness in education systems'. The policy guidelines will outline the essentials, real applications, and grounding principles of using AI in education, and recommendations for Member States as they harness AI to achieve SDG 4.

Mr GONG Ke from the Chinese Institute of New Generation AI Development Strategy presented China's national strategy for developing new-generation AI. The overall deployment is comprised of building an open collaborative AI R&D system; grasping the dual (technical and social) attributes; integrating research, application and commercialization as a trinity; and strengthening AI support in scientific and technical innovation, economic development, human welfare, and national security.

Mr Olli-Pekka Heinonen, Director-General of Finland's National Agency for Education, argued that AI has brought fundamental changes to societies, but we should only accept changes that are conducive to learning and human development. For the effective adoption of AI technologies, he highlighted the importance of trust in teachers, and generating evidence that learning and teaching practices do indeed improve with the help of AI so that we can act upon this evidence as a community. For effective capacity-building, it is also very important to trust teachers. This leads to opportunities for learners to take ownership of their learning and improve their self-regulation and metacognition. When teachers

are trusted, they also shift their role to become expert developers of human capacity.

The breakout sessions under the subtheme 'Guiding the development of AI in education policies' were organized around four topics: a) planning AI in education policies and developing AI-ready policy-makers; b) AI transforming the delivery and management of education; c) AI empowering teaching and teachers; and d) AI for better learning outcomes and effective assessment.

3.1 Planning AI in education policies and developing AI-ready policy-makers

This breakout session focused on the planning of policies and the knowledge areas around which policy-makers should be empowered. All of the speakers recognised that in order to maximize AI's benefits and mitigate its potential risks, policy-makers need to conduct continuous learning on what AI is and how it is used in life, work and education, as well as how ethical and legal risks should be managed. The session chair Francesc Pedro, Director of the UNESCO International Institute for Higher Education in Latin America and the Caribbean (UNESCO-IESALC) emphasized that in order to transform and lead it into the AI era, policies need to be based on examining the implications of AI for the core foundation of education, including skills development, governance, management, curricula, qualifications, and the organization of teaching and learning.

The first speaker, Ms Alexa Joyce, Director of Microsoft's project on AI-ready policy-makers, argued for addressing AI in education in a holistic manner. Microsoft and UNESCO have a longstanding partnership, combining UNESCO's policy-making expertise with Microsoft's industry and technical expertise. The aim of the new AI-ready policy-makers project is to implement an AI maturity model, a self-assessment tool to allow countries to understand how ready they are for AI development and deployment. Rather than being a quantitative index, it acts as a self-reflection tool that can be used locally to better understand what needs to be done, and where inspiration can be found.

Later on, Ms Scarlet George from Oxford Insights presented [the government AI readiness index](#). This is an index produced in 2019 to measure how well prepared governments are for taking on AI technologies in the delivery of public services. The index covers 194 countries and territories. The index is comprised of four high-level clusters: governance;

infrastructure and data; skills and education; and government and public services. The purpose of assessing and scoring governments' AI readiness is to help policy-makers see where they are performing well, and in which areas they may wish to target their attention going forward.

Similarly, Ms María Florencia Ripani, National Director of Education Innovation at Argentina's Ministry of Education, said that her country's national strategy focuses on skills development and curriculum implementation initiatives. New national standards have been created to make digital education, programming, and robotics courses part of compulsory education in Argentina. With the purpose of providing necessary skills for the future of its citizens, students start these courses in primary education and continue them in secondary education. Innovative and creative resources for different age groups are provided, focusing on digital literacy and AI. Furthermore, the country has initiatives to promote equality in programming projects. For instance, they

have specific categories for female students in their national marathon of programming and robotics activities, in which students design video games, and the successful projects are used in schools nationwide. Initial evaluations of the programmes implemented in Argentina show gender-balanced gains in learning.

Finally, Ms Walaa Turki, the Director-General at Tunisia's National Centre for Technology in Education, talked about her country's technology centre for education, which was established to take care of digital strategy and implementation. The centre focuses on the development of four aspects: a) infrastructure improvements with more connective facilities, including providing junior and senior high schools with broadband; b) information systems within the ministries; c) digitalization of resources; and d) legislative frameworks for teachers. Tunisia has been implementing a strategy whereby certain schools are tagged specifically as 'digital schools', with the provision of one tablet device per student, which they may use for their entire learning journey.



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Figure 5: A participant engages in the discussion

3.2 AI transforming the delivery and management of education

This breakout session highlighted AI's potential in revolutionizing the sourcing and delivery of study programmes, education management, and evidence-based policy planning. All speakers agreed that to make meaningful use of data to drive change, it is critical for training providers to establish comprehensive partnerships with the education technology industry. Moreover, there was agreement that the approach of these partnerships should shift, such that the education technology industry is no longer a mere provider of goods and services, but a fundamental collaborator in joint reviews of the potential of data, planning, solution design and framework development. The session had three speakers: Ms Paula Valverde, Product Director at the ProFuturo Foundation in Spain; Mr Alexandre Barbosa, President of the Centre for Research in Information and Communication Technologies (CETIC) in Brazil; and Mr ZHENG Qinghua, Vice President of China's Xi'an Jiaotong University.

First, [ProFuturo](#) is supporting initiatives to transform education management information systems (EMIS) into AI-powered learning management systems, which includes formulating responsive policies and plans in addition to monitoring and evaluating education outcomes, real-time decision-making, learning analytics, data dashboards, and predictive decision-making algorithms. Ms Valverde discussed the challenges with regard to incomplete data, poor reliability, and trouble collecting and aggregating data. In order to address some of these issues, ProFuturo functions both offline and online and offers data accuracy checks with validation mechanisms, as well as fixing data redundancies in systems. Next, Mr Alexandre Barbosa emphasized the AI-powered EMIS's potential to change the school management. Critical activities for Brazil include measuring and monitoring the expansion of these new technologies, and access to ICTs by citizens, businesses and government through research aimed at producing data for public policies. There are multiple CETIC initiatives including annual UNESCO Institute for Lifelong Learning (UIL)/CETIC surveys on AI, and the design and implementation of a MOOC on AI in partnership with UNESCO Uruguay. The last speaker, Mr ZHENG presented a 'big data' platform to enable students to develop 'four precisions': precise data collection, precise assessment, precise supervision, and precise assistance.

In general, this breakout session demonstrated the power of AI at a range of levels and in multiple subsectors of education. The participants discussed

effective transformative models for using AI to boost EMIS. Participants agreed on two key recommendations: i) we need to protect data and apply it ethically; and ii) teachers should have appropriate training to deal with all aspects of data management. The value of a unified EMIS that accounts for various types of standards, including on data protection and data operations, was also stressed. This echoes the Beijing Consensus which states that we should:

- (para. 10) Be cognizant of the breakthrough in the use of data in transforming the evidence-based policy planning process. Consider integrating or developing AI technologies and tools that are relevant for upgrading EMIS in order to enhance data collection and processing, making education management and provision more equitable, inclusive, open and personalized.
- (para. 11) Consider also introducing new models for delivering education and training in different learning institutions and settings that can be enabled by the use of AI, in order to serve different actors such as students, teaching staff, parents and communities.

3.3 AI empowering teaching and teachers

Policy options for better continuing professional development and management of teachers' careers were discussed in this breakout session. All speakers clearly agreed that while there is a possibility that some of the daily routine and low-skilled tasks assumed by teachers today can be replaced by AI, teaching as an occupation will not be displaced by machines in the near future. On the other hand, with increasingly intelligent support from AI, there might be more possibilities for teachers to focus on high-skilled tasks, including more adaptive curation of educational resources, more effective and efficient teaching methodologies, and better assessment of learning outcomes. The speakers acknowledged the urgent need to deliberate on how teachers' rights and working conditions will be affected by AI and how system-wide training and support for their career management should be adapted.

The first speaker was Mr GUO Shaoqing, a professor from China's Northwest Normal University. He presented a project that focuses on how AI can help teachers develop their skills in an intelligent learning environment. The project aims to optimize classroom learning with differentiation for each learner, including intelligent marking analysis, analysis of classroom dynamics to see where students are succeeding and falling behind, preparation of 'knowledge maps' for each student to produce an individual portrait of their learning habits and prepare a learning plan, and

professional development through collecting data on the teacher's pedagogical practice.

The second speaker, Mr Mutlu Cukurova from University College London, argued that AI technologies should provide opportunities for human intelligence augmentation, with AI supporting our decision-making practices rather than automating decisions to mimic teachers or replace them. Mr Cukurova said that the various AI conceptualizations have significant social and ethical implications, and he presented several research projects that exemplify the use of AI to support human decision-making processes in educational contexts. One example utilizes AI to support project-based learning, and another supports the social and emotional aspects of tutoring with emotion detection from audio data. Mr Cukurova argued that the positioning of AI as an intelligence augmentation opportunity has three significant implications for teacher training: a) teacher training should focus on data literacy skills to help teachers make informed decisions on what should be

automated with AI, and how and when this should be done; b) there should be a greater concentration on social and emotional aspects of learning in teacher training in order to build those skills that currently cannot be supported effectively with AI; and c) there should be more opportunities for collaboration between teachers, educational technology designers, researchers, and policymakers. The [EDUCATE research incubator](#) from University College London is one example of how such collaboration can be fostered to create evidence-informed AI technologies that benefit education.

Mr Ki-Sang Song from the Korea National University of Education, emphasized the value of AI to empower teachers to help students in a timely fashion. He presented a project on supporting students' computational thinking with AI and concluded that replacing teachers with AI is not the way forward but AI can provide them with data to more effectively achieve learning outcomes.



Figure 6 : Ms Heloise Dufour emphasizes the use of AI for the inclusion of all students

Ms Heloise Dufour, Director of the [#Leplusimportant in France](#), spoke about the use of AI for inclusion, particularly for students with special learning needs. She argued that although AI allows teachers to adapt to individual learners and creates new tools to support targeted pedagogical methods, we need to be aware of its potential risks including ethical issues, implicit biases, inappropriate judgements from assessment tools, uncontrolled use of personal data, exacerbation of inequalities and discrimination, and economic discrimination due to lack of access to AI. The speaker concluded her talk by exploring the value of stakeholder collaborations that can be accelerated through: a) increasing the speed of development in a creative and collaborative environment where industry works with researchers and teachers; b) networking with peers to discuss classroom solutions and whole school development; and c) exploring options for expanding local contextual approaches internationally.

Mr Dennis Sinyolo, Zimbabwe's Senior Coordinator for Education, Employment and Research, reinforced the idea that AI cannot and must not replace teachers, and argued that it is just a tool for teachers because human interaction and collaboration are still essential for learning. He discussed that what can be tested is not always important, and competencies such as tolerance, intercultural understanding, and adaptability are not testable but essential. Therefore, it is inappropriate to promote AI systems that evaluate what is testable and ignore what is not. He concluded with three recommendations: a) All AI policies and programmes should involve teachers and academics; b) Governments should ensure the professional development of teachers in the use of ICTs including AI, thus improving human capacities; and c) UNESCO should establish a UN Convention on the Ethical Use of AI in Education.

The final speaker was Mr Mohamed Jemni, the Director of ICT at the Arab League's Educational, Cultural and Scientific Organization (ALECSO). This organization promotes projects to encourage the effective use of ICT in education, including OERs in the Arab language; e-learning and MOOCs; ICT competencies for teachers; and mobile learning apps to encourage Arab students to create their own apps in Arabic which can then be made freely available. He noted that AI will enhance GDP in the region by significant margins, e.g. in Egypt (7.7% of GDP), Saudi Arabia (12.4%), United Arab Emirates (13.6%), and the Gulf Cooperation Council (GCC) (8.2%). He presented the first robot citizen of Saudi Arabia, Sofia, and explained the inception of the Institute of AI, which will conduct applied and fundamental research.

Throughout this session, there was a clear consensus

that teachers need to be empowered with AI rather than being replaced. Over-reliance on AI may affect teacher morale as it can be perceived as an intention to replace them, and may have long-term effects on staff recruitment and retention. Initial teacher training needs to strike a balance between teaching with and without AI-assisted tools. In-service training is also required to allow practising professionals to benefit from AI.

The discussion on AI empowering teaching and teachers is reflected in the Beijing Consensus:

- (para. 12) 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.
- (para. 13) 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.
- (para. 42) Support the integration of AI skills into ICT Competency Frameworks for Teachers and support countries in training teaching staff on working in AI-rich education settings.

3.4 Unleashing the potential of AI for better learning outcomes and effective assessment

This session focused on AI's potential to enhance the tracking and recognition of learning outcomes, and assess and perform quality assurance, especially for competencies acquired in non-formal and informal contexts. Despite being somewhat scarce, evidence does exist to show how AI can improve learning outcomes.

Ms Inge Molenaar from Radboud University in the Netherlands argued that AI technology can help students learn and empower teachers. She emphasized that we should focus on how to make the machines more user-friendly to be optimally applicable to educational contexts. Mr Ilkka Tuomi, the Founder and Chief Scientist of Finland's Meaning Processing organization, argued that AI will bring productivity and employment growth in the long run. On the other hand, while AI can support many tasks, we should not lose track of skills like creativity. We still need humans to be able to teach these skills. Mr Y Minhong, Chairman of China's New Oriental Education and Technology Group, which uses AI to assist English

learning, argued that AI can make learning more interesting, accessible and effective. He gave an example of an English app that provides computer-aided pronunciation training, and the [ReadingPro app](#), a program that helps students read English. The last speaker was Ms Mona Laroussi, the Deputy Director at Senegal's Institute of Education and TVET (technical and vocational education and training). She argued that AI can mainly be used to support automated scoring, share digital resources, and analyze learner behaviour for effective feedback. She presented a system in which students receive timely feedback.

During the session, it was clear that although the benefits of AI systems are potentially great, we need to take a critical positioning when considering the long term. We should decide when and where AI technologies are appropriate and adopt them accordingly. Teacher and student agency are important factors for the design and implementation of AI technologies. Although current systems heavily focus on subject knowledge, AI should provide opportunities for skills development as well. AI is mainly used for auxiliary work at the present time, but the future might bring broader advantages, e.g. using AI to create musical compositions and paintings. These creative arts and their connection with AI require further investigation.

The debate on this topic was reflected in the Beijing Consensus in the following three points:

- (para. 14) Be cognizant of trends regarding the potential of AI to support learning and learning assessments, and review and adjust curricula to promote the in-depth integration of AI and transformation of learning methodologies. Consider applying available AI tools or developing innovative AI solutions, where the benefits of AI use clearly outweigh the risks, to facilitate well-defined learning tasks in different subject areas and supporting the development of AI tools for interdisciplinary skills and competencies.
- (para. 15) Support school-wide pilot tests on the use of AI to facilitate innovation in teaching and learning, drawing lessons from successful cases and scaling up evidence-based practices.
- (para. 16) Apply or develop AI tools to support adaptive learning processes, to leverage the potential of data to enable the evaluation of the multiple dimensions of students' competencies; and to support large-scale and remote assessment.

4. Anticipation and development of skills needed for life and work in the AI era

The penetration of AI into existing occupations, and its generation of new jobs, has brought both opportunities and challenges. Several reports have predicted that many jobs are at risk of being automated in the near future. In education, AI is a tool to innovate learning environments, as well as a set of skills to be learned for work and life. Overall, the impact of AI on skills can be considered largely from four aspects: (a) AI's impact on the labour market, (b) the transformation of education and training systems, (c) the development of AI-related skills for learners, and (d) the emergence of skilled AI professionals.

Mr Borhene Chakroun, Director of UNESCO's Division for Policies and Lifelong Learning Systems, moderated the plenary session on the anticipation and development of skills needed in the AI era. The session included two keynote speakers and one panel presentation by four experts from diverse agencies. The first keynote speech was by Mr ZHANG Jiaming, Vice Mayor of Beijing Municipal People's Government. He said that there are three roles that education can play in relation to AI. First, education incubates AI. Many countries have been active in establishing AI research centres and university programmes, acknowledging the importance of nurturing AI talent as a national priority. Second, AI is a booster for education. When used appropriately and responsibly, AI can promote educational equity and quality, and contribute to lifelong learning. Lastly, AI is a double-edged sword and its impact will not be sustainable if issues with ethics and security are not thoroughly evaluated.

The plenary session was followed by a video presentation from the second keynote speaker, Mr Carl Benedikt Frey, author of *The Technology Trap: Capital, labour and power in the age of automation* (2019, Princeton University Press). His key message was that technology is the driver not only for economic changes but also for social changes. He underlined that many people oppose AI due to the fear of losing their jobs. Mr Frey explained that such resistance to technological changes has arisen frequently throughout history. An interesting phenomenon is that new job creation and placement happen unevenly, which can be seen in job creation trends in Detroit and San Francisco. Since manufacturing work can be easily automated, this has led to a decline in

the jobs and local population in Detroit. The opposite happened in San Francisco, where technology jobs have been created and supported increases in local services and population. Since low-income jobs are easily automated, a significant transition from the low- to the high-skill domain is essential. Mr Frey concluded the speech with three recommendations about the role of education in making this transition: a) teach statistics since it is becoming an increasingly important skill set in the era of data; b) take a modular approach in education, to allow students to complete academic degrees flexibly in their own timescale; and c) teach differently. Creativity is the hardest to automate, so AI can be used as an interactive tutor to teach material from textbooks, and this can then be complemented by small group learning to work on social skills and creative thinking.

The plenary session continued with a panel discussion by four experts. First, Ms Nathalie Smuha from the European Commission high-level expert group on AI presented 'Building skills for trustworthy AI in a changing world: The EU approach'. This presentation aimed to give an overview of the '[EU Strategy on AI](#)' report published in April 2018, which delineates a holistic approach of AI with three pillars: boost AI uptake, tackle socio-economic change, and ensure an adequate ethical and legal framework. The socio-economic pillar includes the new skills agenda for Europe, funding for basic and advanced digital skills, social partners' dialogues to exchange best practices, and cooperation between the EU and Member States. In addition, AI has legal, psychological, and ethical impacts. Since AI is a double-edged sword, those who specialize in it need to be well versed in ethics. Pillar 3, the ethical and legal framework, includes seven key requirements for trustworthy AI: 1) human agency and oversight, 2) technical robustness, 3) privacy and data governance, 4) transparency (data subjects knowing how their data is used), 5) diversity, non-discrimination and fairness (avoiding bias), 6) societal and environmental well-being (caring for our environment as well as ourselves), and 7) accountability (recognizing that AI is not always accurate).

Ms Irene Zhou Chang from the Beijing office of the International Labour Organization (ILO), added the global perspective about the changing labour market.

She introduced the 'Work for a brighter future' report, released by the ILO's Global Commission on the Future of Work in January 2019. Digital transformation has brought fundamental changes in the world of work. As a response to the question 'What is decent work in the digital age?', the ILO developed 205 recommendations. In essence, the report calls for a human-centred agenda with the following three recommendations:

- Increase investment in people's capabilities. This calls for the establishment of effective lifelong learning systems so that people can develop the skills demanded by the labour market. People have an entitlement to lifelong learning.
- Increase investment in the institutions of work. This calls for a human-in-command approach to AI and international governance on a digital platform. This approach ensures that the final decisions affecting work are taken by human beings, not by the machinery.
- Increase investment in decent and sustainable work on the green and rural economy. Enable a human-centred approach in business.

The panel session continued with a case presentation by Mr Gary Gan from [Jobkred](#). He demonstrated how Jobkred used big-data analytics and AI to help people and companies transform in the digital economy. The existing practice of understanding skills demand is centred on using surveys, and it takes several years to analyze the data from these and use them to adapt curricula and training. Instead, Jobkred used big data to forecast, profile and recommend skills with three areas of focus: a) business and workforce transformation, b) data-driven human capital development, and c) future-proof people and organizations. The presentation included specific case studies for each area of focus. For instance, JobKred completed UNESCO projects in Malawi and Myanmar

to understand job demand using online labour market data and skills demand analysis. Another example is work by Singapore's Nanyang Technological University to determine students' aspirations after graduation. Using big data on skills profiles, it was possible for the university to provide them with personalized career guidance, recommendations, and improved preparation for their future career.

Mr Francois Taddei, President of France's Centre for Research and Interdisciplinarity (CRI), added the global perspective that SDG-based pedagogies must become the norm to initiate a real change in learning culture. He asked what machines can and cannot do better than humans. While machines are good at memorization and calculation, human beings are better at identifying meaning. This implies the importance of education systems that help human beings find meaning and solve complex problems. Such an educational system is found in Haiti where children are taught not to memorize, but to solve meaningful problems. Another good example is the 'citizen science of learning', where citizens become reflective learners and solve scientific problems in a public platform. Mr Taddei emphasized the shift from AI to 'collective intelligence' wherein humans can learn from machines and machines can also support humans' metacognitive thinking (e.g. knowing the current status of what people know and do not know).

To allow in-depth discussions about specific aspects of skills development, the breakout sessions under this subtheme were organized around four topics: a) anticipating the future of work and defining an AI skills framework; b) mainstreaming AI skills development in school and institutional curricula; c) upskilling and lifelong learning opportunities for the existing workforce; and d) developing AI professionals and promoting AI research in higher education.

4.1 Anticipating the future of work and defining an AI skills framework

This breakout session aimed to explore how to define AI skills frameworks for the future of work. AI is replacing human occupations but its impacts vary across contexts. Ms Claudiana Ayo Cole, Gambia's Minister of Basic and Secondary Education, provided the African perspective on this. While employment overall has not declined, there have been shifts from manufacturing to services, and income losses for

displaced low-skilled workers. Concerning an AI skills framework, she highlighted the need to establish a common framework for effective governance, such as the 'Paris call for trust and security in cyberspace' launched at the UNESCO Internet Governance Forum in 2018. Regarding the national frameworks on AI skills, the 'Global AI strategy landscape' (Holon IQ, 2019) reported that only three African countries (Kenya, South Africa and Tunisia) have an AI strategy, which implies the need for strategic efforts in the African context.



Figure 7: Breakout session on anticipating the future of work and defining an AI skills framework

Mr Konstantinos Pouliakas introduced the EU approach for AI skills identification demonstrating the advantages of utilizing an online data-based platform. The European Centre for the Development of Vocational Training (CEDEFOP) in Greece developed the first tool for online job vacancies and skills analysis, called Labour Market Information (LMI). Recognizing the limitations of survey-based methods, the new platform applied big data analytics to better understand skills changes. The tool shows a demand for particular occupations and sheds light on the distribution of skill levels. In job vacancies, highly demanded skills include project management, adaptability, and understanding other languages. This demand analysis may imply that education should not be about making the curriculum more technological, but about teaching more human-centric skills (e.g. communication, design, empathy, systems thinking, and cultural agility).

Mr Sameer Sharma, Senior Advisor from the regional office for Asia-Pacific of the International Telecommunication Union (ITU), shared that the technological landscape continues to feature a general upward trend in the use of ICTs. With the growth in mobile access facilitated by increasing network coverage, now 96% of the world's population lives within a range of a cellular signal, and 90% can access the Internet through a 3G or higher quality network. The McKinsey Global Institute (2018) reveals seven dimensions of the economic impact of AI, three of which are related to skills development: a) the use of AI-driven automation to substitute existing labour; b) the application of AI to innovation that creates better products and services; and c) AI-driven competition and the resulting disruption to firms and workers.

According to the ITU analysis, gaps in AI absorption levels may increase over time. Levels vary significantly between the country groups with the most and least absorption. According to the ITU's simulation, economies with greater readiness to benefit from AI may achieve absorption levels about 11 percentage points higher than those of slow adopters by 2023, and this gap will be widened to about 23 points by 2030. This indicates that like the digital divide, an 'AI divide' may emerge between advanced and developing economies. Indeed, there is already a regional gap between basic and advanced skills. The percentage of individuals with ICT skills is the highest in Europe, and lowest in the Middle East and Africa. Since ICT skills are needed at every stage of employment, lifelong learning is critical for the adjustment to changing work environments.

Mr Venkataraman Balaji from the Commonwealth of Learning shared how AI skills development has been promoted in the Commonwealth countries.

Since there is currently no framework for this in most Commonwealth countries, collaboration is essential to develop a common AI competency framework for teachers.

Mr Huang Ronghuai from Beijing Normal University talked about the potential of integrating AI into K-12 education in response to the changing school context in China. The integration of AI is built upon the current practice of teaching and learning ICT as a subject. Its core components in the national curriculum standards include information awareness, computational thinking, digital learning and innovation, and responsibility for an information society. This integration should take into consideration both technical and ethical aspects. On the technical side, students should learn that computers perceive the world using sensors, and can learn from data and use it to create models for reasoning. On the ethical side, students should learn that AI can both help and harm our society, and that it is difficult to make applications that can interact comfortably with humans.

The debate on this topic is reflected in the Beijing Consensus as follows:

- (para. 17) Be mindful of the systemic and long-term transformation of the labour market, including its gender dynamics, due to AI adoption. Update and develop mechanisms and tools to anticipate and identify current and future skills needs in relation to AI development, in order to ensure the relevance of curricula to changing economies, labour markets and societies.

4.2 Mainstreaming AI skills development in school and institutional curricula

Overall, there are two types of perspectives on the impact of AI and automation: replacement and transformation. The replacement perspective shows fears around the loss and displacement of jobs by automation. The transformation perspective highlights the optimistic view that the automation of low-skilled routine jobs creates opportunities to increase the demand for high-skilled and creative jobs that used to be rather limited. Both perspectives require a fundamental redesign of what people learn in schools and TVET institutions, in order to meet demand in the labour market. Under this context, the breakout session brought together four experts from Singapore, France, China and UNESCO to share experiences on how schools and TVET systems should respond to the challenges inherent in teaching AI skills to a large and diverse group of learners.

Mr Michael Fung Jin Lung, Deputy Chief Executive

(Industry) from Singapore, introduced the [SkillsFuture](#) initiative which has focused on reskilling, upskilling and skilling of digital and emerging skills since its inception in 2016. SkillsFuture works on the balance between academic and vocational pathways and leverages agile and modular initiatives to bridge the skills gap. Rather than front-loaded learning, this initiative adopts a continuous lifelong approach that includes acquiring soft skills separately from technical skills in a bite-sized fashion. In addition to the traditional support for employer-sponsored training through course fee subsidies, SkillsFuture has started a credit system, with SGD 500 allocated to individuals' accounts to encourage them to take charge of their own learning. Similar programmes have been launched in France and Canada. Under this initiative, there is a diversity of AI skilling programmes available, ranging from basic AI appreciation to advanced training through apprenticeship and work placements. This is to enable the general population to have foundational understandings about AI and facilitate strong skill sets for AI scientists and engineers.

Mr Jean-Marc Merriaux, Director of Digital Education of France's Ministry of National Education, confirmed that AI skills development has been integrated into school curricula in France. In 1985, a strategy to teach computer science for all was implemented in schools, and the curricula were reviewed in 2015 and 2018. The fundamental principle in the French education system is to allow all disciplines to be integrated with digital tools. This system lays special emphasis on algorithmic training and thinking right from primary level (ages 6-11) to college (ages 11-15) through mathematics, technology, media and information education, and finally, through an online digital competency certification tool. France has made CAPES (*Certificat d'Aptitude au Professorat de l'Enseignement Secondaire*), the diploma for teachers, part of their digital initiative. In addition, the school curricula aim to develop 21st-century skills that focus on the 4Cs: critical thinking, creativity, collaboration and communication. At the same time, the ethical dimension of AI has been considered in the curriculum for reasoned use and data control.

In addition to the curricula in formal education, a partnership between the public and private sector can scale up the inclusive and equitable deployment of AI for learners on a larger scale. For instance, UNESCO and Ericsson launched a global AI skills initiative where partners develop new digital-skills-learning programmes with a special emphasis on AI skills for youth (ages 12-18). In particular, to help achieve SDG 4 on quality education, the UNESCO and Ericsson initiative focuses on specific areas

of AI skills development, namely: a) development and management of AI repositories and other key global digital courses; b) building the capacities of master trainers from selected countries; and c) supporting master trainers to mobilize AI hub centres and organize 'hackathons' to train young people to develop AI applications.

Mr XU Li, CEO of [SenseTime](#) of China, introduced their private-sector strategies to support the mainstreaming of AI skills development and enrich school curricula. As one of the largest AI algorithm and solution providers in Asia, SenseTime constructs AI laboratories and produces the *Fundamentals of Artificial Intelligence* textbook series for schools. It holds the SenseTime cup competition and exhibition for international high school students, and provides AI teacher training and certification.

The Beijing Consensus proposes the following two recommendations for this topic:

- (para. 18) Be cognizant of the emergence of a set of AI literacy skills required for effective human-machine collaboration, without losing sight of the need for foundational skills such as literacy and numeracy. Take institutional actions to enhance AI literacy across all layers of society.
- (para. 17) ... Integrate AI-related skills into the school curricula and qualifications of technical and vocational education and training (TVET) and higher education, taking into consideration the ethical aspects and interrelated humanistic disciplines.

4.3 Upskilling and lifelong learning opportunities for the existing workforce

The emerging technologies like the internet of things (IoT), robotics and AI have brought many challenges and opportunities for education, TVET, and lifelong learning. Since there is a high demand for workers with AI skills, it becomes equally important to provide the existing workforce with upskilling and reskilling programmes for career development and lifelong learning. The key questions in this session included how to develop inclusive programmes for the existing workforce; what successful reskilling models are led by the private sector; and what the roles of governments and partnerships are in this endeavour.

Regarding the role of governments, Ms Kelly Shiohira from the JET Education Service emphasized the need to requalify and redeploy employees to avoid unemployment in a context where 50% of jobs could be automated. Ms Shiohira suggested that governments can focus on five priorities: a) establish the necessary infrastructure for obtaining and

managing data and ensuring connectivity across the country; b) create partnerships with universities and businesses to compensate for skill dearths and be more resilient to rapid changes; c) define minimum standards in skills development, talent recruitment and reskilling; d) ensure an inclusive professional requalification; and e) develop more responsive and adaptive curriculum development methods to adapt quickly to changes and improve mapping and planning in collaboration with the industry.

The session was followed by two cases from the private sector where data-driven solutions were adopted for upskilling and reskilling. In the first case, Mr Raphaël Moraglia from Skillogs introduced an AI platform for TVET that was designed to respond to the lack of personalization and overly academic approach of conventional platforms. This platform adapts its content quickly and creates links between governments, vocational training centres, and businesses to meet the needs and expectations of the labour market and learners. As for the second case, Mr Davor Miskulin from Burning Glass Technologies has developed skills data analysis to address job seekers' and employers' dissatisfaction with the availability of information about the labour market. The company's solution collects online information on vacancies from several countries (including the USA, Canada, the UK, Singapore, Australia, New Zealand, and Italy). On the basis of this information, the labour market is analyzed in 48 hours by an AI application, through a textual evaluation of jobs and skills. This data-driven solution is useful for matching the skills needed with the supply and content of training. It also helps job seekers to adapt their skills to rapid changes.

This discussion resonates with the following recommendations in the Beijing Consensus:

- (para. 20) Reaffirm that the guiding principle for achieving SDG 4 is lifelong learning, which encompasses formal, non-formal and informal learning. Adopt AI platforms and data-based learning analytics as key technologies in building integrated lifelong learning systems to enable personalized learning anytime, anywhere and potentially for anyone, with respect for learners' agency. Exploit the potential of AI to enable flexible learning pathways and the accumulation, recognition, certification and transfer of individual learning outcomes.
- (para. 21) Be mindful of the need to give appropriate policy attention to the needs of older people, especially older women, and to engage them in developing the values and skills needed for living with AI in order to break the

barriers to digital life. Plan and implement well-funded programmes to equip older workers with skills and options that enable them to remain economically active for as long as they choose and to engage in their societies.

4.4 Developing AI professionals and promoting research on AI in higher education

One of the main impediments preventing countries and organizations from incorporating AI into the economy and education is a lack of AI professionals. A way to tackle this impediment is to cultivate local AI talent, including creating a pool of individuals who have the expertise to develop AI systems and teach AI skills. This requires higher education to systematically introduce new academic programmes and research entities that can contribute to the capacity-building of local AI talent. With this backdrop, this session brought together experts from Egypt, China and Romania to address the key questions concerning how universities can develop AI professionals and contribute to AI research.

Mr Khaled Abdel Ghaffar, Minister of Higher Education and Scientific Research of Egypt, provided an overview of how higher education in Egypt has been responding to these changing demands. Egypt seeks to be a major AI actor in Africa, with a large investment in AI and education in the national strategy. Under this direction, the role of universities is to educate AI professionals, but they have faced some challenges in doing so. Firstly, the number of well-trained AI experts must be increased, in accordance with the needs for new research centres and education programmes. The cultural perception is another challenge. Students do not clearly see where the future of work is going, partly due to the prestige of traditional professions.

Mr YANG Zongkai, President of Xi'an University of Electronic Science and Technology, reiterated that China attaches great importance to the cultivation of AI talent, as seen in the establishment of AI schools and joint research institutes. There is a need to build a new AI-based environment for education. For instance, Xi'an University of Electronic Science and Technology has attempted to cultivate students' innovative spirit and entrepreneurial awareness through interdisciplinary training and project-based learning. At the same time, through the deep integration of artificial intelligence technology in teaching and management, the quality of cultivation of all professionals is improved. Mr Stefan Trausan Matu, Senior Researcher and Professor of the University Politehnica of Bucharest, introduced that

AI research has been promoted with the EU research fund in Romania. While AI-related courses are offered in undergraduate and graduate programmes, more researchers and teaching staff are needed. Strategies to develop AI professionals in universities include dedicated research grants, study abroad programmes, research conferences and awards, and partnerships with industry and start-ups.

Corresponding to the discussion, the Beijing

Consensus suggests that Member States:

- (para. 19) Set up mid- or long-term plans and take urgent actions to support higher education and research institutions in developing or enhancing courses and research programmes to develop local AI talent, in order to create a massive pool of local AI professionals who have the expertise to design, program and develop AI systems.

5. Promoting the equitable, inclusive, and transparent use of AI in education

This plenary session included representatives from ministries of education and human development, academia, and the voluntary sector. These speakers shared their views on the potential of AI to bring education to all, wherever they might be in the world. The session began with the government representatives establishing the key issue for the discussion: poverty, which is the focus of SDG 1. To date, 30 million people worldwide have been lifted out of poverty, but its complete eradication is far from being achieved.

Mr Mohibil Hassan Chowdhury, Bangladesh's Deputy Minister of Education, explained that their new Prime Minister made a political commitment to develop a digital Bangladesh. As a country with one of the world's highest population densities, it could not industrialise. Instead, Bangladesh developed its ICT infrastructure, which meant first ensuring that electricity was available throughout the country. The second focus was on education, and the country has established 50,000 classrooms equipped with Internet connections, multimedia, and integration of ICT and pedagogy. Teachers have also been empowered to share digital content that they have created.

Mr SUN Yao, China's Vice Minister of Education, added that China has also made institutional arrangements to eradicate poverty at every level. New technologies are being leveraged to improve education quality, close the gap between urban and rural education, and explore new pathways of education for poverty alleviation. Thus, 97% of primary and secondary schools have internet access, and China is equipped with more than 34 million multimedia classrooms. About 93% of schools have at least one multimedia classroom, and in 73%, all of the classrooms are multimedia. China also improves teachers' IT application abilities, having implemented the 'National project for improving the information technology application ability of primary and secondary school teachers'. Colleges and universities have been innovating the new pathways of poverty alleviation by concentrating on AI and education, as per the statement by President Xi that this is a major endeavour for China.

India is also one of the world's most populous countries, with 1.5 million schools, 8 million teachers, 42,000 colleges and 900 universities. Mr N. Saravana

Kumar, Joint Secretary of the Ministry of Human Resource Development, said that because of the millions of children who are still not in school, the ambition for primary and secondary education has traditionally been on providing equal access, rather than excellence. This balance between equity and quality continues to be a key issue for the country. However, India is an "ICT-ready nation" since it has already established the world's largest rural broadband network and digital identity system, and has a young population who are very 'tech-savvy'.

Each of these three countries, Bangladesh, China, and India, has as many people in education as some other countries' entire populations, and each of them is turning to AI-based technologies to support their teachers and students. First, Bangladesh is investing in AI to improve efficiency and reach the objective of digitalization. They already have many AI start-ups, and use AI in teacher training and school management. In addition, ICT is a mandatory school subject. Meanwhile, China believes that they now need to come up with new policies and approaches to eradicating poverty, to ensure that poorer children have access to high-quality education. To this end, they are deploying AI-integrated distance classrooms to enable real-time remote interaction with expert teachers. India is also developing AI solutions to ensure that quality education is available in hard-to-reach areas. They are also establishing an overarching structure to support many education technology start-ups, and promoting the use of MOOCs, which are easily accessible to people across the country. In addition, AI is being introduced into the school curriculum, and India is launching 'Operation Digital Board', the banner under which they, like China, are utilizing 'smart classrooms' instead of traditional blackboards.

However, India believes that countries should not be using AI just for the sake of it. AI needs to be used in ways that respect equality and transparency, reduce regional disparities, and prioritise privacy. Bangladesh also recognizes important challenges. For a country like Bangladesh that is heavily labour-based, the introduction of AI might have severe consequences for the workforce by reducing the need for many workers. Countries like the USA and China have home-grown companies, meaning that AI may be used to benefit their own people. If countries like Bangladesh

do not own the data generated within their borders, and instead international companies are taking their data, it is unclear how they will benefit from AI. Mr Chowdhury concluded that removing poverty is not possible unless they regulate and own their data, which necessitates an 'Internet of the East'.

The third speaker in the plenary, Ms Ivana Bartoletti, the UK-based founder of the Women Leading in AI Network, argued that AI is about much more than technology. AI is about power because it highlights our humanity, and how illogical we are. When many people talk about AI, they are talking about artificial general intelligence, which has all the capabilities of humans, and is often portrayed negatively in the media. This narrative needs to change. For example, we should stop portraying AI as something that is going to take over all jobs, as this is unlikely to happen. Nonetheless, we need to address the initial phases of unemployment and changes in the labour landscape. AI is also about data and who has access to it. Many argue that data is the new oil. In fact, data is much more powerful than oil. Once oil is used, it is gone. But data is always there and can be repurposed again and again. This is why we need to rethink how we view the concept of privacy. If we want to make the most of AI, we need data from individuals to be shared for the common good. Ms Bartoletti suggested that one approach would be to create 'data trusts' that manage data on everyone's behalf. She also pointed out that in the West, only 18% of AI coders are women, which must change.

The final speaker was Mr WU Zhaohui, President of China's Zhejiang University, who provided a perspective from academia and cutting-edge AI developments. He said every wave of new technology has brought about social challenges and shifts in productivity. The new generation of AI modelling, coupled with big data, deep learning, and autonomous control, is going to increase this further and push forward 'intelligent industries'. He identified three key changes that will happen during the next few years. First, AI will become smarter. There will be improvements in perception, memory and reasoning, and smarter human-machine interaction. Second, AI will be more inclusive. Research outcomes will be used extensively in both the physical and virtual worlds. Third, AI will become more disruptive. It will result in 'super intelligence' and 'converged intelligence'. AI will also have a major impact on education, as we make the transition from 'Education 1.0' to 'Learning 2.0'. The targets of Learning 2.0 are deep learning and whole-person development, and depend on a human-machine symbiosis.

The discussion continued in the four breakout sessions, on a) promoting human-centred and responsible AI for education and learning, b) reducing the AI divide in education with Africa as a priority, c) promoting gender equality and the empowerment of women in AI, and d) leveraging AI to promote inclusion and equity in education.

5.1 Promoting human-centred and responsible AI for education and learning

In the first breakout session, Mr Joe Guan, Head of Public Policy at GSMA (the Global System for Mobile Communications), returned to the theme of children's access to schools, and the importance of the telecommunications infrastructure. Improvements in the provision of education are likely to depend on access to digital technologies, which in turn depends on good connectivity, such as the new 5G high-speed mobile systems. GSMA has been involved in developing international 5G standards, which will benefit many sectors, including education. 5G will enable students to access AI technologies from any location. This "Intelligent Communication" (5G plus AI) will help classrooms in remote locations to access resources and support. However, all of this will depend on an effective regulatory framework (building on existing regulations, such as the General Data Protection Regulation in Europe). Mr Fedorov, from Skoltech in Russia, added that 'edge computing' might address the worries about data security and surveillance by enabling local processing on the actual device rather than in the cloud. In fact, cloud-based processing is only necessary today because of the limits in technology, which is rapidly improving.

Mr Avik Sarkar from the National Institution for Transforming India (NITI) is part of a team developing a national strategy for AI, involving smart cities, mobility and education. He suggested that AI might reduce teacher workloads, leading to increased productivity in the classroom. AI might also assist teachers coping with multiple regional languages, give educators a more detailed understanding of effective practices by automating teacher evaluations, and increase the availability of personalized learning and assessment. A key question is how AI, a 'black box', interacts with the world. We do not need to know how the decision was made, but we do need to know the outputs, and how to interpret the machine's predictions.

Mr Lionel Brossi from the University of Chile is an expert in the impact of AI on the dynamics of inclusion and exclusion of Latin American youth. He noted that Latin America has bigger gaps in

educational technology provision than the US and China. This also means that there is the opportunity to think ethically before implementing AI widely. The key problem is that AI does not take into account the local context. As mentioned earlier in the plenary session, data is in the hands of a few conglomerates, increasing the gap between those who have access to data, and those who do not. This raises three main challenges: information asymmetries (only experts understand how the algorithms work); the lack of normative consensus (multiple stakeholders have multiple perspectives); and the mismatch between what is useful for governments and what is good for their people. Mr Bossi presented a 'layered model for AI governance' (Gasser & Almeida, 2017), which includes three layers: social and legal, ethical, and technical. He conceded that only the technical layer is being comprehensively addressed, and much more time is needed to address the other two.

Mr Maxim Fedorov, Director of Russia's Skoltech Centre for Computational and Data-Intensive Science and Engineering, introduced the Russian perspective and how they are thinking carefully about the global social impact of AI (e.g. the challenges of data being susceptible to manipulation), and how education is one of the four main components of their AI strategy.

Russian scientists and engineers have collaborated with more than 60 countries on AI developments, publishing thousands of research papers. He agreed that establishing an ethical framework for AI in education is essential, and proposed that this might be usefully informed by the approach taken in the principles of human-earth ecosystem interactions, which involve reasonable transformation, involvement of people, transparency, interconnectivity, and sustainable development.

The issue of ethics was explored by Mr ZHANG Hongjiang from the Beijing Academy of AI, which has pro-active and pre-emptive ethics embedded at its core. The problem is that, while there are extensive discussions around the ethics of AI in general (e.g. the Asilomar principles), currently there are not many discussions around the ethics of AI in education. A key question is how, after a few years, the accessibility of new technologies becomes polarized: those who have access to the technology go ever faster while those who do not fall even farther behind. This is why AI for education needs to have ethics at its core to reduce gaps before they appear (e.g. the gaps in teachers' abilities and students' learning abilities).

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Promoting human-centred and responsible AI for
education and learning



Figure 8 : Breakout session on promoting human-centred and responsible AI for education and learning

The participants of this breakout session discussed a range of complementary issues. For example, concerning data, Mr ZHANG began with the example of mobile phone operating systems, pointing out that once permission is granted for the operating system to access to personal data, then that data is available forever. Mr Sarkar built on this by proposing that the purpose for which data is being collected should be made clear at the point of collection, something that he recognised might be easy to legislate for, but difficult to police. Mr Brossi acknowledged that although informed consent is necessary, students younger than 15 cannot legally give consent. In any case, students might not understand the need to be concerned about what happens to their data, so it is up to us to be concerned on their behalf. The best that can be achieved is to prepare easy-to-understand information for young people while asking for parents' consent for their children to engage with the AI system. Mr Fedorov pointed out that AI is already being used with young children to predict their achievement in the classroom.

A second issue was the balance between innovation and regulation. Mr Fedorov said that some of the leading technology companies support open-source development, which can help improve trust in algorithms and ensure that they benefit everyone, reducing the need for regulations. However, if developers cannot achieve the levels of transparency required, their products should not be used. Mr Guan noted that in many fields regulations have been in place for a long time, which has meant that innovations have been slow. In Silicon Valley, on the other hand, the low-regulation environment enabled significant leaps in innovation. Mr Guan concluded that, while we do need adequate protection, we should not use protection as an excuse to stall innovation. Regulations need to be designed to address particular risks, and we should be thinking about how to develop a regulatory framework that is agile enough to deal with the unknown and unexpected.

With regard to promoting human-centred and responsible AI, three recommendations are made in the Beijing Consensus:

- (para. 28) Be cognizant that AI applications can impose different kinds of bias that are inherent in the data that the technology is trained on and uses as input, as well as in the way that the processes and algorithms are constructed and used. Be cognizant of the dilemmas of balancing between open access to data and data privacy protection. Be mindful of the legal issues and ethical risks related to data ownership, data privacy and data availability for public good. Be

mindful of the importance of adopting principles of ethics-, privacy- and security-by-design.

- (para. 29) Test and adopt emerging AI technologies and tools for ensuring teachers' and learners' data privacy protection and data security. Support robust and long-term study of deeper issues of ethics in AI, ensuring AI is used for good and preventing its harmful applications. Develop comprehensive data protection laws and regulatory frameworks to guarantee the ethical, non-discriminatory, equitable, transparent and auditable use and reuse of learners' data.
- (para. 30) Adjust existing regulatory frameworks or adopt new ones to ensure responsible development and use of AI tools for education and learning. Facilitate open debates on issues related to AI ethics, data privacy and security, and on concerns about AI's negative impact on human rights and gender equality.

5.2 Reducing the AI divide in education with Africa as a priority

The second breakout session focused on the application of AI in Africa, and began with a video introduction from Mr Firmin Edouard Matoko, UNESCO's Assistant Director-General for Priority Africa and External Relations. Mr Matoko described how new technologies are making great progress all over the world, and how Africa needs to be fully prepared for this revolution. There is an urgent need for the continent to collectively put in place strategies to reduce the digital divide and harness the potential of AI. Mr Du Yue, UNESCO's Director of Intersectoral Cooperation and Partnerships in the Sector for Priority Africa and External Relations, highlighted the role of AI for education and jobs creation in a continent where education remains the priority and keystone for sustainable development.

Mr Yao Ydo, Director of UNESCO's Abuja Office in Nigeria, pointed out that while in some African countries there are some Trusted Internet Connection (TIC) initiatives, the conversation around AI has barely started. However, it is alarming that more than 90% of secondary students leave school without having learned the rudiments of computing, and sometimes without having used a computer. There are a number of encouraging youth-led innovations in many countries such as: in Uganda, a mobile application to diagnose malaria; in Nigeria, a pen that reads text; in Côte d'Ivoire, a solar pack for phone charging, and a drone for farmers to access accurate weather forecasts; and in Congo, the first locally developed smartphone in Africa, and 'Sophia', a robot designed by young Ethiopians in a partnership with a private

company. It is clear from these initiatives that young people have the capabilities to drive the AI revolution in Africa. Policy-makers, therefore, need to create an enabling environment, including high-quality education. Nonetheless, there remain a number of critical questions, such as: How can governments support young people to scale up AI and make it inclusive and cost-effective? What should be done to make Africa a key player and driver of AI, instead of just a consumer?

Mr Afework Kassu, Ethiopia's State Minister of Science and Higher Education, highlighted the need for African governments to align their national policies with the SDG 4 agenda of the continent. He also raised the importance of partnerships between African governments and the private sector, to help create an enabling environment for AI and provide adequate tools for young people. In short, African young people represent a huge untapped resource for AI developments.

Mr Anatole Collinet Makosso, the Congo's Minister of Primary and Secondary Education and Literacy, agreed that regional cooperation is key to the successful development of AI in Africa. The lack of cooperation on the continent makes it difficult to scale up the development of innovative applications (such as the smartphone made in the Congo). But he suggested that AI is slowly becoming a reality, with many young people already one step ahead of their African leaders. Finally, the Minister acknowledged the importance of respecting local cultures and languages in order to avoid cyber-colonization and cyber-acculturation. He invited UNESCO to reflect on this issue through a task force.

Mr Khaled Abdel Ghaffar, Egypt's Minister of Higher Education and Scientific Research, said that Africa clearly has the necessary human and natural resources but it appears to lack a willingness and capacity to work in a collaborative way. The continent has much to gain by embracing AI, for example in the areas of poverty reduction and health. In particular, there is a need to strengthen Africa's scientific capacity at all levels of the education system, and address the scarcity of expertise, accurate data, and broadband connectivity. Mr Ghaffar explained that Egypt is already working with many developed countries to exploit AI. It has also established a national AI strategy, and invested 200 million Egyptian pounds (US\$12.2 million). In particular, the strategy is focused on applications in agriculture, transport, and education. Already around 10,000 schools have broadband connectivity, making them ready to take advantage of AI, and Egypt has introduced AI certification courses. In addition, new formal schools in AI and ICT have been created.

Ms Itah Kandjii Murangi, Namibia's Minister of Higher Education, Technology and Innovation, added that Africa is not only a young continent with enormous resources, but also one with a high level of poverty and frequent natural disasters such as floods and droughts. The hope is that AI will help address these issues. However, the main challenge for AI in Africa is the lack of infrastructure and access to the internet. Potentially, some solutions can be provided by the Southern African Development Community (SADC) protocol in education. Ms Murangi suggested that each country should identify its priorities and the driving sectors of its economy that AI might support, and consider starting the race for AI in its own context, at its own pace.



Figure 9 : Ms Itah Kandjii Murangi Namibia's Minister of Higher Education, Technology and Innovation, delivers a speech during the breakout session

Mr Emery Okun Ndjovu, Minister of Posts, Telecommunications and New Technologies of Information, of the Democratic Republic of the Congo (DRC) continued the theme. She stated that to overcome some of the challenges, African countries need to strengthen South-South and North-South collaboration, and ensure their alignment with the continent's overall goals and priorities. In particular, as AI provides an innovative solution to education around the world, Africa must ensure it reduces the digital divide, encourages young people and develops partnerships across the continent. As part of the Congo's contribution, an annual Science and Technologies Week promotes Congolese know-how and aims to stimulate science-related vocations. The Congo also believe that it is necessary for each country to review its tax system, in order to encourage the private sector to set up the infrastructure and import the equipment needed for AI.

Mr Bagalatia Arone, Botswana's Minister of Basic Education, raised two key issues: what UNESCO is

doing to protect small nations in the AI race, and how African leaders are supporting young people who are typically far ahead of their governments. In particular, he suggested, it is important to rethink priorities. For example, is it right that many African countries spend more on defence than on education? In other words, the problem is not necessarily poor infrastructure, resources or connectivity; instead, it is poor priorities, poor governance, and corruption. It is also important to manage big data in Africa and not to let it be managed by third parties. Scientific capacity needs to be strengthened at all levels of the education system to address the lack of expertise. This requires demystifying science and stimulating student motivation.

The picture from academia was provided by Mr John Walubengo from Kenya's Multimedia University. Most machine-learning systems sift through massive amounts of data to recognize patterns and automate decisions. In Africa, although mobile phones are often available, there are generally insufficient digital devices for AI to work. There are also few data scientists. Most

experts in statistical models and algorithms work in and for developed countries. Yet the challenges of education are more serious in developing countries. Another problem is that AI mostly works with UN languages, and many African languages are not supported, possibly because there is no business case. If AI could work with indigenous African languages, this would make a huge difference, particularly for students in rural Africa.

All the panellists agreed that African countries must cooperate and communicate more constructively. They pointed out the need for a regional strategy to promote AI in Africa, involving regional meetings, conferences and discussions. Accordingly, the AI sub-regional forums being organized by UNESCO over the next two years are welcome.

In relation to the equitable and inclusive use of AI in education, the Beijing Consensus articulates the following recommendations for Member States:

- (para. 22) Reaffirm that ensuring inclusion and equity in and through education, and offering lifelong learning opportunities to all, are the cornerstones of achieving SDG 4—Education 2030. Reaffirm that technological breakthroughs in the field of AI in education are an opportunity to improve access to education for the most vulnerable groups.
- (para. 23) Ensure that AI promotes high-quality education and learning opportunities for all, irrespective of gender, disability, social or economic status, ethnic or cultural background, or geographic location. The development and use of AI in education should not deepen the digital divide and must not display bias against any minority or vulnerable groups.

In the Beijing Consensus, the international organizations and partners active in the field are urged to:

- (para. 33) Monitor and assess the impact of the AI divide and disparities in AI development across countries based on data voluntarily submitted by countries, and be mindful of the risks of polarization between those who have access to AI and those who do not. Reiterate the importance of addressing these concerns, giving special priority to Africa, least developed countries (LDCs), small island developing states (SIDS), and countries affected by conflict and disaster.
- (para. 38) Create multi-stakeholder partnerships and mobilize resources to reduce the AI divide and increase investment in the application of AI in education.

The Director-General of UNESCO is invited to seek to:

- (para. 39) Establish an 'AI for Education' platform to act as a clearinghouse for open-source AI courses, AI tools, examples of AI in education policies, regulatory frameworks, and best practices on AI in education, with a view toward promoting the use of AI for SDG 4, supporting debate on the future of education and learning, and making open-source AI resources and courses accessible to all.



Figure 10 : Breakout session on reducing the AI divide in education with Africa as a priority

5.3 Promoting gender equality and the empowerment of women in AI

Ms Saniye Gülser Corat, Director of UNESCO's Division for Gender Equality, began the third breakout session by suggesting that AI systems and technology can help shed light on discrimination and disparities in education. However, they can also amplify prejudice through embedded bias. Gender imbalance in the AI sector, driven in part by the digital skills gap between women and men, also exacerbates this problem.

UNESCO, as part of the EQUALS global partnership to bridge the digital gender divide, has published a policy paper on closing the gender divide in frontier technologies such as AI through education with the German government. Entitled '[I'd blush if I could: Closing gender divides in digital skills through education](#)', the paper is comprised of three sections: 1) rationales and recommendations for gender-responsive digital skills training; 2) a piece on the 'ICT gender equality paradox' (which refers to the lack of a direct relationship between a country's gender

equality levels and the proportion of female students pursuing advanced-level digital skills education); and 3) a piece on the potential repercussions for gender equality of the rise of biased AI (through the example of digital voice assistants that are typically given female voices). Promoting gender equality in and through AI requires empowering girls and women with digital skills and fostering their participation in the sector through conducive workplace policies and practices.

Ms Kudayberdieva Gulmira Karimovna, Kyrgyzstan's Minister of Education and Science, explained that her country is a parliamentary republic that is committed to gender equality, with a legislative base supporting this. The first Gender Equality Strategy (2012-2020) is coupled with a National Action Plan, which state that all State institutions must promote gender equality and female empowerment. She said even though women participate significantly less than men in the AI sector, very little research on this situation or the means to address it is being carried out. Gender disparities become evident as early as the ninth grade,

due in part to 'hidden' influences on gender equality (e.g. gender-biased pictures shown in textbooks). It is critical that more research and analysis is carried out quickly, so that the international community can identify the best approaches to rectifying this imbalance.

Ms Khanthaly Siriphongphanh, Laos's Vice Minister of Education and Sports, added that education laws in his nation have been revised to be gender-responsive. The country aims to strengthen ICT in secondary and higher education, to address the fact that fewer than 30% of computer studies students are women. The main stumbling blocks to female participation in digital professions are gender roles in rural locations and cultural beliefs, and limitations in teacher skills, teaching facilities, and AI infrastructure. New policies will focus on AI for girls and women, scholarships for girls to study STEM, teacher training, and more budgetary support.

The theme was further developed by Ms Moojan Asghari, Co-Founder of Women in AI, an international non-profit, community-driven initiative concentrating on education and initiatives such as the 'Women in AI Awards'. She described how girls and young women often drop out of STEM education at

around age 15, and how it is important for countries to try to understand why this is happening and take appropriate action. Efforts might include, for example, partnering with universities to foster an understanding of why AI is interesting and exciting, and creating a pool of role models and mentors. Single-sex education may also help address AI's 'masculine' image.

Ms Ethel Agnes Pascua-Valenzuela is the first female Director of the Southeast Asian Ministers of Education Organization (SEAMEO). In SEAMEO's 11 member countries, she said, there are slightly more male students than female students, but more female teachers. Being a girl is a risk factor for doing poorly in mathematics, and being a boy is a risk factor for doing poorly in reading and science. Meanwhile, female STEM researchers range from 20.7% in Cambodia to 85.5% in Myanmar; although in technology specifically, the percentages of women are far lower, from 10% in Cambodia to 44% in Malaysia. The gender gap in university-level STEM remains a persistent issue, which means that SEAMEO's advocacy, information sharing, and encouragement of regional research and support for women's scholarship opportunities in STEM remain critical.



Figure 11 : Breakout session on promoting gender equality and the empowerment of women in AI

In the Beijing Consensus, it is underlined that the gender gap in digital skills contributes to the low proportion of women among AI professionals and exacerbates existing gender inequalities (para. 25). To address the gender gap, Member States are called upon to:

- (para. 26) Affirm commitment to developing AI applications in education that are free from gender bias and to ensuring that the data used for AI development are gender sensitive. AI applications should drive the promotion of gender equality.
- (para. 27) Promote gender equality in the development of AI tools and empower girls and women with AI skills to promote gender equality among AI workforces and employers.

5.4 Leveraging AI to promote inclusion and equity in education

Mr Shadi Abou-Zahra, Accessibility Strategy and Technology Specialist of the World Wide Web Consortium (W3C) began this session by reminding participants that around 15-20% of the world's population have disabilities. Students with cognitive and learning disabilities are often excluded from learning in traditional education systems. AI has the potential to support additional modalities that might be more effective. However, although automatic video captioning has improved, many languages are still not supported. Furthermore, AI can recognize and respond to human emotions, but not when the person has ADHD or autism. Privacy is also an issue, because mobile phone companies can infer when someone is blind in the context of AI, and there will be deeper digital footprints for people who are most vulnerable. To address the UN Convention on the Rights of Persons with Disabilities, we need to ensure diversity and meet ethical standards.

The second speaker, Ms Gail Wong Yeng Hoong from Malaysia's Limkokwing University of Creative Technology, introduced the university's approach to disability. Limkokwing has 30,000 students from 165 countries, and campuses in five African countries (Botswana, Namibia, Lesotho, South Africa and Zambia) and is planning to open campuses in four additional African countries. The university believes that inclusivity empowers innovation, which is why it provides scholarships and promotes lifelong learning for students with disabilities and economic vulnerability, including orphans. The university has a range of specialized equipment across the university campuses, e.g. a special needs learning lab in Botswana. Limkokwing is also the first Malaysian partner of China's 'Belt and Road Initiative', and has a partnership with China's Zhengzhou Institute of Technology, supporting hearing-impaired students to learn English and sign language. The university has an MOU with UNESCO's Institute for Information Technologies in Education for a joint project using ICT to support accessibility for people with disabilities.

Mr CHEN Jingying from the Central China Normal University explored how AI might be used to support children on the autism spectrum. AI and computers can offer predictable, controllable, and tailored instruction, which can be especially appropriate for children with difficulties in communicating and interacting with others. AI-driven 'adaptive learning' (e.g. with the use of robots, virtual reality, and mobile games) can also help address the significant differences among these children.

In congruence with the discussion on leveraging AI to promote inclusion and equity in education, the Beijing Consensus recommends that we:

- (para. 24) Ensure that AI tools in teaching and learning enable the effective inclusion of students with learning impairments or disabilities and those studying in a language other than their mother tongue.

6. International partnerships for an AI-enhanced future of education

Implementing AI in education depends on a number of pre-requisites such as an existing school ecosystem within which AI can be integrated, and an available infrastructure including connectivity and hardware. Changing current structures and practices to accommodate AI-based technologies is at an incipient stage, and will take some amount of trial and error before best practices are established. International collaborations and partnerships are seen as a potential avenue for enabling governments to harness AI technologies to improve the quality of education systems. Analysis is provided below of some of the challenges in developing and deploying these technologies, alongside relevant areas for international partnerships.

AI technologies are still prohibitive to deploy in developing countries where the required infrastructure is lacking. Some of the logistical costs which need to be considered include: the availability of large volumes of data in a usable format, intensive computational resources on which to train the AI algorithms, available infrastructure including internet connectivity, and capable hardware for the use of educational AI tools. The large volumes of data on which the AI algorithms need to be trained may not be available. The less technology-ready a schooling environment currently is, the less likely it is to already have relevant data. This poses the risk of the AI being trained on external, out-of-context data. AI algorithm training also depends on intensive computational resources. Designing AI technologies according to ethical guidelines requires advanced scrutiny and quality assurance, which may be expensive to implement, requiring expertise in design and evaluation. These aspects present challenges in terms of the at-scale and long-term sustainability of such technologies.

These costs risk widening the digital divide, as those that are least AI-ready will also be the most expensive to reach in terms of deployment. Public-private partnerships have a long tradition of being used to support governmental efforts to deliver good quality education, through maximizing financial resources, expertise and capacity (UNESCO, 2017b). The conference identified the following areas of opportunity where public-private partnerships could impact the progress of AI in education:

- cloud infrastructure - data storage and computational resources
- apps and services - development and licensing
- hardware - in-school devices
- infrastructure - communication and access
- operations and security - maintenance and cyber-security protection
- expertise and evaluation - usage training and efficacy measurements
- AI education support - courses, resources, competitions and incentives for learning.

One of the plenary sessions was centred specifically on the role of international partnerships moving towards an AI-enhanced future of education. It included an unprecedented discussion of the formation, role and impact of inter-sectoral and multi-stakeholder collaborations to address the educational potential of AI.

The session included representatives from the private sector presenting their outreach efforts, as well as the Honorary President of the World Federation of UNESCO Clubs, Centres and Associations. The session began with a summary of the main challenges related to AI in education from the content presented in the conference up to that point:

- the use of AI to promote and support lifelong learning
- new teacher skills and competencies
- the creation of and access to teacher and learner resources
- data collection, protection and ownership, especially in the context of Africa
- access to virtual learning resources such as MOOCs
- monitoring existing and new challenges emerging from AI in education
- developing country-specific solutions, tailored to their characteristics and needs
- the need to focus on developing countries, for a 'no one left behind' policy.

The role of partnerships was reinforced as a means to address some of these challenges, with the panellists asked to detail their vision of how we should work together towards an AI-enabled future of education and what type of international collaborations should be set up.

Mr TAO Xiping, the Honorary President of the World Federation of UNESCO Clubs, Centres and Associations (WFUCA), and Member of China's National Advisory Council on Education, began by introducing [WFUCA](#). He discussed its role in implementing UNESCO's mission through the folklore movement enabled by more than 2,000 UNESCO clubs, centres and associations in more than 100 countries. Specifically, he pointed to WFUCA's efforts to promote a deeper understanding

of AI, especially in education, through its own events as well as external partnerships. Three aspects of this were highlighted: 1) the direct correlation between education and the changes in our society; 2) the deep rooting of education in the country-specific culture - he argued against the creation of one unified educational system, but for an increase in the diversity and richness brought by the differences between cultures; 3) the leaps and bounds brought by the integration of technology in education, and the importance of AI not simply adhering to traditional methods, but following the changes in educational progress.

He continued by describing three projects which have contributed to the facilitation of AI convergence. Firstly, he talked about the 'Primary School Culture Dreaming Classroom' public welfare project, which was jointly developed by the Beijing Education and Culture Association and Japan Nissan Investment Ltd. It provides education in AI, reaching out to about 300,000 students and 364 schools in 11 Chinese provinces and cities. Second was the 'Smart Health School' initiative to conduct quantitative health management on campus, established by China's Education and Culture Association and the Zhongxing Development Corporation. This was complemented by the setup of the 'Regional Education Governance Big Data Platform' for dynamic analysis of regional education driven by big data. The third project was the Youth Cultural Festival held in Beijing in 2018, where students from Japan, Republic of Korea and China gathered to debate AI educational issues and publish the 'China, Japan and Republic of Korea Youth Summit Declaration of Responsibility'. This put emphasis on the younger generation consciously assuming their social responsibility in the era of AI.

To address AI-in-education challenges as we work toward SDG 4, Mr Sameer Sharma, Senior Advisor for ITU, recommended a multi-stakeholder approach, where the private, public, academic and civil society sectors discuss the ethical implications for AI. To that end, he pointed to the global summit organised by ITU, "[AI for Good](#)". In terms of countries' capacity and involvement in shaping AI progress, Mr Sharma noted that the countries that already have or are building capabilities to store and leverage data will be at the forefront of the AI revolution.

When addressing the question of global internet connectivity, Mr Sharma noted that whilst 99% of the population lives within range of internet access, 47% of people have no means of utilizing it, which is 6% below the internet connectivity target worldwide. Addressing this requires national leadership, digital targets and investment in public-private partnerships that maximize affordability. Making internet access more affordable can alternatively be realized through operators sharing towers to avoid duplication and drive the costs down, or through using satellites in remote areas rather than more

expensive means like fibre optics. Such alternatives could be encouraged through government regulation. A special emphasis should be placed on areas where there are no incentives for operators to invest given the very high costs driven by challenging geographical landscapes and insufficient infrastructure.

Mr Sharma was asked about consumers' trust in corporations, which are often foreign, that need their data in order to implement AI solutions. He argued that their confidence in the use of the data is the important factor, and shared ITU's mandate for generating trust in information technologies through a variety of cybersecurity-related activities. These included a) advise nations on how to develop cybersecurity and cybercrime strategies, with clear guidelines and key actions; b) assist the setup of computer emergency response teams who can respond quickly to cyber crises in the local context; c) support cyber drills and build local technical expertise; and d) devise an online child protection framework, including national guidelines for the use of ICT by children.

Mr Mohamed Jemni, Director of ICT for ALECSO, mentioned several partnerships in the Arab region. The first was aimed at capacity-building for ICT educators, using the UNESCO regulatory framework. Secondly, a common Arab platform was established for OERs covering 22 states using the [EdCast](#) platform in partnership with UNESCO. Thirdly, a collaboration with ITU promotes smart education and formulates national policy guidelines for AI national education.

Mr Larry Nelson, Microsoft's Regional General Manager of Education, highlighted his company's experience from their involvement and investment in educational AI for the past few years. As a consequence, he reinforced the commitment to ensuring an appropriate level of ethics, alongside a set of guiding principles that Microsoft has outlined for all their projects: fairness, reliability and safety, security and privacy, inclusivity (with a focus on special needs), transparency, and accountability. He identified three aspects of Microsoft's partnerships: a) commercial - more than 70 education companies who build solutions using Microsoft platforms; b) industrial - emphasized through the standardization of data models, open-source or otherwise; and c) public-private collaborations. Along these three lines, Microsoft will work with UNESCO on building a self-assessment policy tool, based on a maturity model for countries to evaluate how ready they are to make effective use of AI. In the context of multilingual support, Mr Nelson pointed to the Microsoft translation tool, which supports 56 different languages, including African languages, embedded across the entire suite of Microsoft products including Office 365.

From ProFuturo's experience in the field, Ms Paula Valverde suggested a couple of areas of improvement

when it comes to leveraging AI more effectively. Firstly, there is an increasingly large number of platforms that overlap to a great extent in terms of use and functionality. This necessitates the formation of an open-source platform to which all can agree and contribute. Secondly, she suggested the creation of an AI hub, to include and share not only data but also AI algorithms. It is in the algorithms that the data is put to use; therefore sharing data is not sufficient to leverage AI's potential. Ms Valverde also emphasized the importance of not only multi-stakeholder partnerships between industry, academia and governments, but also cross-sectoral partnerships, raising the level of coordination amongst players inside the industry, following a national strategy for AI. As for translating resources into African languages, she noted that it was insufficient to simply open a global pool of resources that can be directly translated without adaptation to the cultural realities of the individual countries.

Mr Joe Guan, GSMA's Head of Public Policy, talked about how AI and 5G technologies can work together. He said that more than half of children remain unable to read, write or do basic sums despite spending several years in school (UNESCO, 2017a). GSMA has partnered with various organizations to increase the efficacy of education delivery, including a global capability-building programme helping governments to implement their policies. In partnership with ITU, GSMA delivers training aimed at helping policy-makers to better understand technologies. GSMA have also set up the [GSMA Foundation](#), bringing together American, British, and Australian financial aid to support a host of programmes across Africa to involve stakeholders in finding the best use of technology to serve their country's purpose. Lastly, a start-up innovation fund supports educational technology start-ups to deploy AI. Mr Guan pointed out that trust in data collection and manipulation by external partners must be earned by everyone in the supply chain. GSMA tries to facilitate frameworks for a multi-stakeholder approach to secure consumers' trust.

Mr SHEN Dai, the Weidong Group's Senior Vice President, then elaborated on two partnership examples related to the use of AI in education. In the first example, the Shanghai organization and UNESCO operated collaborated in Uzbekistan with the country's Education Minister to create and deliver training courses for more than 300 teachers, enabling them to formulate their own content and putting a data centre at their disposal to which they could upload their lesson plans. After 18 months, initial evaluations point to the content being adopted by other schools. The second example outlined a partnership with the Chinese government, through which Weidong set up a cloud infrastructure to serve 20 different provinces and 21 cities where digital systems can now be established to collect and analyze data, and

collate information from different geographical areas.

Mr YANG Songfan, TAL Education Group's Senior Director of AI Business, elaborated on the WISROOM AI application, which is open to the global community. A WISROOM-enabled classroom has two teachers. One is physically present at the front of the classroom. The second is an AI-enabled teacher delivering pre-prepared content, watching the students' actions, asking questions, and evaluating answers, using a camera installed at the top of the classroom and a microphone for each individual student, for audio and video interpretation. Given that internet connectivity is not always available, the platform can be pre-loaded with content and delivered in the same manner as long as there is electricity. Mr Yang claimed that encouraging teachers to spend time in remote areas is unsustainable, but AI support can facilitate social impact. He also underlined private companies' ability to meet their customers' demands, which can be leveraged in partnerships with governments.

Technology is reshaping the definition of partnerships in the context of education (UNESCO, 2017c) in terms of meaning, rationales, policy options and effects. It is difficult to envisage a 'pure' public educational system where the government is responsible for the design, development, delivery and maintenance of everything that is involved in the implementation of technology across all schools. Existing studies look at more traditional public-private partnerships - private philanthropic initiatives, private sector management initiatives, private school funding programmes (e.g. subsidies and vouchers), adopt-a-school programmes, capacity-building initiatives, and school infrastructure partnerships (LaRocque, 2008). Whilst these include some examples of digital technology provision, none focus specifically on the implications in this context. This means that we lack research on public-private best practices in this area and need to know more about their specific needs and risks.

In addition, there is often little comprehensive proof that public-private partnerships (PPPs) deliver on their promises. PPPs' benefits include increased competition amongst suppliers, sharing the risk, pooling human and physical resources, increasing efficiency, improving learning outcomes, and enabling innovation and reform. On the other hand, PPPs may bring disadvantages such as undermining broad policy goals and practices, hiding risks and masking the real costs of operations, bringing minimal value for high cost, reducing transparency and democratic participation, and decreasing equality amongst participants (Ginsburg, 2012). These aspects may be worthy of consideration when forming new international collaborations to enable the use of AI.

7. A consensus on AI and education and the way forward

As the key outcome of the conference, representatives from Member States and other partner organizations adopted the '[Beijing Consensus on Artificial Intelligence and Education](#)' (UNESCO, 2019).

It is the first-ever document to offer guidance and recommendations on how best to harness AI technologies to achieve the Education 2030 Agenda.



Figure 12: Adoption of the '[Beijing Consensus on Artificial Intelligence and Education](#)'

During the closing ceremony, Ms Stefania Giannini praised the event for its a) high level of political attention to the topic; b) quality of speakers, knowledge sharing, and depth of discussions and debates; and c) consensus on the new challenges and strategic directions set to achieve SDG 4 goals by 2030, with an emphasis on the humanistic approach to AI. To achieve such an approach, UNESCO called for a shift from competition to collaboration. In the remarks of congratulations, Mr Jernej Pikalo, Minister of Education, Science and Sport of Slovenia, reaffirmed that the outcome document shows the Member States the high potential that AI brings to our society

and education to fulfil SDG 4 goals.

Mr TIAN Xuejun, China's Vice Minister of Education and Chairman of the National Commission for UNESCO, delivered the closing remarks. He said that the conference attracted worldwide attention to the theme, and the Beijing Consensus will lay a solid foundation for AI in education. He also emphasized some remaining issues such as the new digital divide and digital risks. When solving global problems, joint efforts are essential to build a communication platform to provide guidelines to developing countries.

The 'Beijing Consensus on AI and Education' recommends the following actions to be taken by governments and other stakeholders in UNESCO's Member States in response to the opportunities and challenges imposed by AI:

- Planning AI-in-education policies
- Using AI for education management and delivery
- Using AI to empower teaching and teachers
- Using AI for learning and learning assessment
- Developing values and skills for life and work in the AI era
- Using AI to offer lifelong learning opportunities for all
- Promoting equitable and inclusive use of AI in education
- Facilitating gender-equitable AI
- Ensuring ethical, transparent and auditable use of education data and algorithms
- Monitoring, evaluating and researching the impacts of AI applications in education

The Beijing Consensus also recommends that international organizations and partners consider implementing actions for financing international partnerships and cooperation.

- (para. 33) Monitor and assess the impact of the AI divide and disparities in AI development across countries based on data voluntarily submitted by countries, and be mindful of the risks of polarization between those who have access to AI and those who do not. Reiterate the importance of addressing these concerns, giving special priority to Africa, least developed countries (LDCs), small island developing states (SIDS) and countries affected by conflict and disaster.
- (para. 34) Coordinate collective actions to promote the equitable use of AI in education in the context of the global and regional Education 2030 architecture, including through sharing AI technology, programmes, and resources for capacity-building, with due respect for human rights and gender equality.
- (para. 35) Support forward-looking reviews of frontier issues related to the implications of emerging AI development, and facilitate the exploration of effective strategies and practices for using AI to innovate in education, with an aim towards building an international community with common views on AI and education.
- (para. 36) Align international cooperation with national needs for the development and use of AI in education and for cross-sectoral cooperation, in order to enhance ownership of

the development of AI technology among AI professionals. Strengthen information sharing and the sharing of promising practices, as well as coordination and complementary actions among countries.

- (para. 37) Provide adequate platforms for international exchange of regulatory frameworks, instruments and approaches to AI in education, including through UNESCO's Mobile Learning Week and through other United Nations agencies, and thereby support and benefit from South–South and North–South–South cooperation on leveraging AI for SDG 4.
- (para. 38) Create multi-stakeholder partnerships and mobilize resources to reduce the AI divide and increase investment in the application of AI in education.

At the end of the Beijing Consensus, the Director-General of UNESCO is invited to implement the following actions:

- (para. 39) Establish an 'AI for Education' platform to act as a clearinghouse for open-source AI courses, AI tools, examples of AI-in-education policies, regulatory frameworks, and best practices on AI in education, with a view towards promoting the use of AI for SDG 4, supporting debate on the future of education and learning, and making open-source AI resources and courses accessible to all.
- (para. 40) Develop guidelines and resources in consultation with Member States to support the development of policies and strategies for effective and equitable use of AI in education. Support the capacity-building of education policy-makers.
- (para. 41) Reinforce the leading role of UNESCO in AI in education across concerned sectors, divisions or departments, and mobilize the Organization's institutes and networks.
- (para. 42) Support the integration of AI skills into ICT competency frameworks for teachers and support countries in training teaching staff on working in AI-rich education settings.
- (para. 43) Further expand UNESCO's cooperation in the field of AI in education with relevant United Nations and multilateral partners, as well as with regional development banks and organizations and with the private sector.
- (para. 44) Undertake appropriate regional and international follow-up actions to the Conference, acting in cooperation with development partners active in this field, to build on and extend the outreach of the Consensus.

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Education Sector

United Nations Educational, Scientific and Cultural Organization

" Recalling the principles set forth in the Universal Declaration of Human Rights, we reaffirm UNESCO’s humanistic approach to the use of AI with a view towards protecting human rights and preparing all people with the appropriate values and skills needed for effective human–machine collaboration in life, learning and work, and for sustainable development."

— Beijing Consensus on Artificial Intelligence and Education

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