



United Nations
Educational, Scientific and
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Education
Sector

Leveraging Information and Communication Technology to Achieve Education 2030

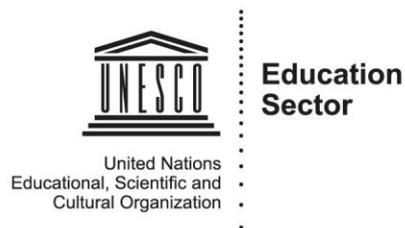
Report of the

UNESCO 2017 International Forum on ICT and Education 2030



UNESCO Education Sector

Education is UNESCO's top priority because it is a basic human right and the foundation on which to build peace and drive sustainable development. UNESCO is the United Nations' specialized agency for education and the Education Sector provides global and regional leadership in education, strengthens national education systems and responds to contemporary global challenges through education with a special focus on gender equality and Africa.



The Global Education 2030 Agenda

UNESCO, as the United Nations' specialized agency for education, is entrusted to lead and coordinate the Education 2030 Agenda, which is part of a global movement to eradicate poverty through 17 Sustainable Development Goals by 2030. Education, essential to achieve all of these goals, has its own dedicated Goal 4, which aims to *"ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."* The Education 2030 Framework for Action provides guidance for the implementation of this ambitious goal and commitments.



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Executive Summary

The main goal of the [*International Forum on ICT and Education 2030*](#) (hereinafter, 'Forum') was to discuss how ICT can be leveraged to accelerate the achievement of the targets of the Education 2030 Agenda, combining the views of policy-makers, academics and the private sector. The main themes identified during the Forum were the following:

- *Digital innovations for SDG 4:* The presenters from the academia and the private sector shared emerging digital innovations such as artificial intelligence (AI), big data and their roles in promoting sustainable development of education. Utilizing such advances of digital innovations for emerging markets in under-resourced areas remains a challenging issue. It is critical to develop localized solutions and local capacity building in low infrastructure environments.
- *Successful national ICT in education policies and large-scale programs:* The presenters shared the recent development of national policies at the regional and cross-regional level that aimed to leverage the potential of ICT to achieve the Education 2030 Agenda. A call for action was made to develop ICT in education policies as integral part of national education sector plans.
- *Best practices in future e-school and future learning:* Several cases of designing future learning environments were shared with the illustration of relevant projects and initiatives. Specific examples include the digital textbooks and software education initiative in the Republic of Korea, the process of curriculum reform and school-level contextualization in Finland, and the future e-school systems in China. A consistent theme was that empowering teachers through adequate training and support is central to enhance pedagogically-sound use of ICT in education.
- *Education and learning management:* Measuring and tracking data related to the availability and use of ICT is critical for making evidence-based policies. This plenary session provided information about the current status of ICT-integrated education and management systems, and the advances of big data and learning analytics in education. It was noted that with the advances of big data technology, a new ecosystem for self-monitoring and self-evaluation has been emergent, implying its application in education management information systems (EMIS).
- *Planning the way forward:* It is expected that Open Educational Resources (OER) will continue to play an important role to ensure inclusive and equitable access to quality content. Despite the explosive growth of digital technology, many developing countries have not fully benefited from technological innovations due to their local infrastructure. The emphasis was made on leveraging the power of ICT to broaden educational opportunities to learners in remote, under-resourced, small, and isolated areas.

The key output of the forum was the [2017 Qingdao Statement](#), which outlines the strategies and prioritizes actions to deepen and widen the implementation of [Qingdao Declaration](#). The Statement includes the four key actions: (a) priority for equitable access to and use of ICT, (b) policies to unlock ICT for quality and relevance of learning, (c) integrated ICT solutions across areas of SDG 4 and the SDGs, and (d) fostering the evolution of locally sustainable ICT solutions for education. Further, the Statement puts forth strategies to move forward the achievement of SDG 4. The strategies emphasized include resource mobilization, establishing an International Network on ICT for Education 2030 (INIE 2030), and strengthening the clearinghouse function of UNESCO.

1 Introduction



The [International Forum on ICT and Education 2030](#) (hereinafter, ‘Forum’) was organized by UNESCO, with the support from the Government of the People’s Republic of China, the Municipal Government of Qingdao, and the Weidong Group of China. The Forum was held from 10 to 11 July, 2017 in Qingdao, China, as a follow-up to the [International Conference on ICT and Post-2015 Education](#) in 2015 when the ‘[Qingdao Declaration](#)’ was announced and adopted for leveraging Information and Communication Technology (ICT) to achieve the Education 2030 Agenda in response to the global shift toward the Sustainable Development Goals (SDGs).

SDG 4 emphasizes the collective commitment for achieving the goal to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” (UN, 2015). The [Qingdao Declaration](#) provides more concrete visions and missions concerning the role of ICT in education for achievement of the global SDG 4 by 2030. The Declaration clearly states that “the remarkable advances in ICT and the rapid expansion of internet connectivity have made today’s world increasingly interconnected and made the knowledge more accessible for every girl and boy, woman and man. To achieve the goal of ‘Inclusive and Equitable Quality Education and Lifelong Learning’ by 2030, ICT must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more efficient service provision”.

As most Member States have started to develop national action plans and targets for Education 2030 Agenda that harness ICT to transform education, it was imperative and timely to convene stakeholders again to review emerging digital innovations and existing best practices that could be scaled up to advance progress towards SDG 4. It was under that context, UNESCO staged the Forum on 10-11 July 2017. The main goals of the Forum were to reaffirm the commitments made in the [Qingdao Declaration](#) and to reinforce the inter-sectoral and multi-stakeholder platform that was established during the Conference in 2015. The specific objectives of the Forum were to:

- Share national policies and programs that aim to capture digital innovations to accelerate the achievement of SDG 4;
- Explore the digital innovations and best practices that could be scaled up to enable new school models and transform the education provision;
- Formulate partnerships and develop action plans around flagship projects on leveraging ICT to take forward SDG 4.

More than 400 participants from around 80 countries attended the Forum. The participants of the Forum included officers from governmental ICT in education agencies and institutions from all regions, international development partners, international experts, private IT device and service providers, and representatives from private and public sectors in China.

Under the overarching theme of '*Leveraging ICT to accelerate the achievement of SDG 4*', the Forum was structured to promote forward-looking debates, sharing of cutting-edge knowledge and ICT solutions, and deliberation on sector-wide strategies, around the following sub-themes: (1) digital innovations for SDG 4, (2) successful national ICT in education policies and large-scale programs, (3) best practices in future e-school and future learning, (4) education and learning management, and (5) planning the way forward. More than 60 speakers presented at the Forum, which included five plenary sessions and nine breakout sessions under the five sub-themes. The key output of the Forum was the adoption of the '[2017 Qingdao Statement](#)', which outlines the collective strategies, and prioritized actions to deepen and widen the implementation of Qingdao Declaration.

2 Keynote Speeches



During the opening ceremony, Mr. Stanley Mutumba Simataa, President of the General Conference of UNESCO, addressed the important role of ICT for achieving the Education 2030 Agenda. He emphasized the digital revolution for sustainable development and bridging divides, especially the use of ICT to reach displaced populations. Mr. Simataa asserted that “this Forum is a call to action” for developing effective strategies for teacher training and professional development, and system-wide support for the effective use of ICT in education.

The important role played by ICT in taking forward the Education 2030 was reiterated by Mr. Michael Worbs, Chairperson of the UNESCO Executive Board. Mr. Worbs recognized that utilizing ICT in education contexts comes with several obstacles such as the lack of quality materials, insufficient teacher training, poorly designed content, irrelevant curriculum, and privatization of online learning content. He emphasized the importance of knowledge and resource sharing between North and South, and leveraging digital innovations to ensure no one is left behind.



Mr. Zhanyuan Du, Vice Minister of Education of the People’s Republic of China, delivered a speech on “[Comprehensively Promoting ICT in Education toward 2030](#)”. Mr. Du addressed the achievements of the past decade that China has made to harness ICT to improve the access to and quality of education, especially the Ten-Year National Development Plan on ICT in Education (2011-2020), which significantly enhanced the level of ICT infrastructure in schools. He further shared China’s experiences learnt from the past trajectory that aimed to make education more open, appropriate, people-centered, equitable, and sustainable. In the end, he articulated four suggestions to leverage ICT for the ultimate achievement of inclusive, equitable quality education and universal lifelong learning, including: the responsibility of the government to drive progress via ICT should be strengthened; research and practical applications should be deepened and harmonized; efforts should be made to improve information literacy among teachers and students; and international exchanges and the sharing of results should be enhanced.

Following the opening ceremony, the Forum continued with the insightful keynote speeches by Mr. Eugenio Ramón González Pérez, Vice Minister of Education of the Republic of Cuba; Mr. Chaozi Lei, Director-General of the Ministry of Education of the People’s Republic of China; and Mr. Duanrui Wang, Chairman of the Weidong Group. Under the theme of “Harnessing ICT to Achieve SDG 4”, the session was chaired by Mr. Yue Du, Secretary-General of the Chinese National Commission for UNESCO.

Firstly, Mr. Eugenio Ramón González Pérez, the Vice Minister of Education of the Republic of Cuba shared the experiences drawn from Cuba’s efforts to enhance the equity and quality of education. Mr. González Pérez said that the introduction of ICT to the Cuban education system is and will be fully aligned with SDG 4 until 2030, by establishing and extending ICT-based national systems such as online tutors, the national portal for curricula resources (e.g.

[CubaEduca](#)), and teachers' library. In particular, CubaEduca sets an exemplary case of low-resource national-level OER platform.

Mr. Chaozi Lei, Director-General of the Ministry of Education of the People's Republic of China, presented the "National Strategy and Implication of ICT in Education in China". As China has one of the largest education system with approximately 260 million students and 15 million teachers in over 500,000 schools, the use of ICT is instrumental to meet the multiple challenges faced in the education system. Drawing from years of experiences of ICT in education in China, Mr. Lei underlined four key principles: (1) adhering to application orientation, establishing a positive development mode of ICT in education; (2) innovating cooperation mechanisms through a close partnership among government, market (private sector) and schools; (3) deepening understanding of ICT in education through systematic professional development for teachers, school leaders and administrators; and (4) strengthening the role of the demonstrable units to build sustainable and scalable models through experiments and piloting.

Lastly, Mr. Duanrui Wang, Chairman of the Weidong Group presented the various projects and online learning platforms that integrate the innovative solutions of the [Weidong Cloud Education](#). The Weidong Group, in partnership with UNESCO, has been supporting countries to integrate cloud-based digital learning solutions and platforms in education.

3 Thematic Discussion

The two-day Forum was organized with five plenary sessions and nine breakout sessions under five sub-themes (1) digital innovations for SDG 4, (2) successful national ICT in education policies and large-scale programs, (3) best practices in future e-school and future learning, (4) education and learning management, and (5) planning the way forward. The key topics discussed during the sessions are summarized below.

3.1 Digital innovations for SDG 4

Under the theme of digital innovations for SDG 4, there was one plenary session and four breakout sessions to discuss various innovations and issues around leveraging ICT to transform education systems. The plenary session included presenters from the academia (China, the Republic of Korea, and Spain) and the private sector who shared their views on emerging digital innovations such as AI, big data, and their role in promoting sustainable development of education.

The representative of the State Key Lab of Intelligent Technology and Systems from Tsinghua University shared the latest development of AI technologies through tapping into the advances of machine learning and natural language processing techniques, highlighting how such AI-based applications have been applied to our daily life including medical treatment, machine translation, and human-computer conversation systems. The potential of AI technologies in education was further articulated by the presenter from Korea National University of Education with an overview of various AI-infused applications that have been experimented and implemented in education contexts, such as AI-assisted instruction systems and learning analytics systems that identify and adapt to students' individual needs. It was predicted that the role of AI is not to replace, but to empower teachers. The big-picture perspective on cutting-edge technology with nine disruptive innovations that have the great potential to be applied in education contexts has been elaborated by the representative from Universidad Carlos III de Madrid, with a particular attention to digital technologies that seamlessly link the physical world and the digital world. Innovations of the physical world include additive manufacturing, robots, and drones, whereas innovations of the virtual world include big data, deep learning, and internet of values. The physical and the virtual worlds are seamlessly linked through the innovations in interfaces, including mobile devices, natural interfaces, and Internet of Things (IoT).

Utilizing such advances of digital innovations for emerging markets in under-resourced areas remains a challenging issue. The final presenter of this plenary session, from BRCK, Kenya, provided a new perspective on the digital innovations that address the needs of African students and teachers. The opening question "Why do we use technology designed for London and LA when we live in Nairobi and New Delhi?" highlighted the criticality of localized solutions and enabling communication in low infrastructure environments by developing useful hardware-centered solutions for Kenya and other African countries. BRCK has manufactured

the [KioKit](#), a simple solution of 40 Kio tablets with a wireless tablet charging system, long battery hours, and durable features, considering the conditions of African schools.

To allow in-depth sharing and discussions among the participants around various issues associated with digital innovations for SDG 4, the breakout sessions on the first day of the Forum were organized around four sub-themes: (a) promoting digital innovations through the global partnership; (b) scaling up digital innovations for disadvantaged groups; (c) fostering self-evolution of digital innovations for SDG 4; and (d) promoting best practices of digital innovations. The key topics discussed during the breakout sessions are summarized below.

3.1.1 Promoting digital innovations through the global partnership

In this session, the presenters from the Arab, Caribbean, and African regions shared insights on the challenges faced in their respective region and the strategies for promoting collaboration and partnerships to transform education through digital solutions. In the Arab region, ALECSO presented the collective initiative for creating a [Pan-Arabic OER community and hub](#) to allow Arab countries to share, develop, and disseminate OER, thus facilitating access to these resources and exchange at a large scale.

Member States in the Caribbean Community (CARICOM) have been facing the urgent needs to transform their education systems and workforce development for the knowledge society and digital economy. As a response to meet the emerging challenge, CARICOM has developed the [HRD Strategy 2030](#) with a vision towards “An inclusive Regional Knowledge Society”, which is globally competitive, widely accessible, and driving sustainable development. Instrumental to this strategy is the notion of the ‘[Single ICT Space](#)’, which is a transformative strategy to create a regional socio-economic growth and to promote digital citizens and entrepreneurs. Partnerships across various stakeholders and agencies in the areas of ICT in education were emphasized as a critical component in the delivery and implementation of the two strategic plans.

In Africa, one of the key challenges is to establish a scalable model to provide quality and equitable learning experiences at the secondary school level that can cultivate student competencies in Science, Technology, Engineering, and Math (STEM) areas, seen as to curtail the future socio-economic development of Africa (Burnett & Jayaram, 2012). The [African Digital School Initiative \(ADSI\)](#) is a project to address such needs for developing a scalable and sustainable model to transform teaching and learning practices in African schools. The ADSI project is implemented in three countries (Kenya, Tanzania, and Cote D’Ivoire) over a 5-year period (2016-2020), with the main goal to promote a sustainable and scalable model of the whole-school approach of ICT integration to raise the quality of teaching and learning, and to enhance the level of ICT integration in secondary schools.

Innovations of online and digital learning have been essential for achieving SDG 4 in higher education systems (Target 4.3). The International Council for Open and Distance Education (ICDE) shared their vision to enhance the quality and equity of higher education through the global partnership. Specific actions include the [Global Doctoral Consortium](#), connecting an OER repository to build a global online and open library, and a collaborative open platform for teacher professional development.

3.1.2 Scaling up digital innovations for disadvantaged groups

This session featured innovative ideas, practices, and applications of digital innovations that aim to improve the access and quality of education for students and teachers in disadvantaged areas. Undoubtedly, teachers play a central role in bringing about pedagogical innovations through leveraging ICT solutions. The initiative “[Laptop Computer for Every Teacher in Israel](#)” is a good example of how technologies can empower teachers and subsequently give them the tools to change their pedagogical practices. Initiated by the Athena Fund, the project aims to empower teachers by providing laptop computers and pedagogical training. In particular, the use of an iPad empowered special education teachers who were struggling with the diverse needs of students with disabilities.

In Bangladesh, lack of qualified teachers has been a consistent barrier to raise the quality and equity in education, especially in rural areas. Leveraging the synchronous communication technologies, the Jaago Foundation has created [online school systems](#) for children in under-served areas where they can receive lessons from qualified teachers in the capital via Internet-based video conferencing technology. This simple but powerful solution was awarded the 2016 [UNESCO King Hamad Bin Isa Al-Khalifa Prize for the Use of ICTs in Education](#). Another good example of digital learning for remote, under-resourced areas is the [StoryMaps program](#) by PPKM, Indonesia, which is a tool for creating digital maps with narrative texts, images, and multimedia content. This geospatial application helps students in remote villages to know about their geographical context, engaging them in digital story-telling activities.

3.1.3 Fostering self-evolution of digital innovations for SDG 4

Sustainable solutions adapt to local needs through a self-evolution process. This breakout session featured several examples of digital innovations that aim to develop sustainable and scalable ICT-based solutions. Some concrete applications and programs shared during this session include:

- [Sûrtab Tablet](#) is a mobile classroom solution in Haiti that aims to providing affordable, power-efficient and portable devices in schools.
- [Antura](#) is a video game designed for Syrian refugees. It is the winner of the Norwegian government-funded game development contest “EduApp4Syria”.
- [Maptanker](#) uses real, relevant, and dynamic data that are presented in an attractive and meaningful way to engage students.
- Aruba China shared their technical solution of smart campus, with a feature to monitor and analyze student profiles.

Collectively, the session reaffirmed that it is possible to develop creative and sustainable solutions via digital technologies that foster localized solutions for achieving SDG 4 targets.

3.1.4 Promoting best practices of digital innovations

This breakout session brought together presenters from different countries to share best practices of ICT solutions that are aligned with the achievement of SDG 4 targets. The

presenter from the Consortium for School Networking (CoSN) provided the overview of key trends and challenges of integrating technologies in K-12 schools and lessons learned from the [Horizon Report](#) on enabling digital innovations and preparing for future education. The key challenges include digital divide (devices and access), Internet safety, acceptable to responsible use, privacy, and digital equity (broadband anywhere). It is further affirmed that the momentum of transforming education comes from rethinking the fundamental goal of learning for today and tomorrow rather than technological innovations alone. Some strategies derived from best practices shared in this session include the following:

- Developing a financially sustainable solution. It is important to combine simple technical solutions, human resource development, and on-ground support in order to create sustainable models ([Sunbeams Schools in Pakistan](#)).
- Ensuring universal and safe access to OER in mobile learning. It is necessary to develop an education-centric search engine that provides open access to authoritative, safe, and quality resources ([WikiEye](#)).
- Developing the whole-school approach of ICT integration to realize student-centered pedagogical practices, with a particular attention to students' physical development and mental well-being (Shu Ren Jing Rui Primary School, China).

3.2 National policies to leverage ICT to achieve Education 2030

The plenary session on national policies to leverage ICT to achieve Education 2030 included the presenters from the Commonwealth of Learning (COL), UN broadband commission for sustainable development, the Ministry of Higher and Secondary Specialised Education of the Republic of Uzbekistan, UNESCO Bangkok, and UNESCO Headquarters. They shared recent developments of national policies at the regional and cross-regional level aiming at leveraging the potential of ICT to achieve the Education 2030 Agenda.



The President and CEO of COL said that among the 52 COL members, 28 have an ICT in education policy. Since most policies were formulated before the SDGs were adopted, there is a need to review them to be aligned with SDG 4. The evaluation done by COL showed that ICT can increase access to education, enhance quality for teaching and learning, and reduce educational costs. To move policy development or realignment forward, COL emphasized the strategies of 5P: Political will, People (Capacity), Pedagogy, Partnerships (private sector involved), and Process (timelines & Monitoring and Evaluation). The presenter from the Ministry of Higher and Secondary Specialised Education of the Republic of Uzbekistan, shared the specific case of National ICT in Education Policies and Master Plan developed in collaboration with UNESCO. The components of the national ICT policy include development of ICT infrastructure,

development of human resources, development of digital learning materials, and enhancement of education system.

Concerning the impact of digital revolution on youth development in the developing world, the presenter from the UN Broadband Commission for Sustainable Development claimed that the 4th revolution is actually part of the industrial revolution, and further emphasized the opportunities from a “South-South cooperation”, propelled by China’s One Belt, One Road (OBOR) initiative aimed at creating a network of railways, roads, pipelines, and utility grids to link China and Central Asia, West Asia, and parts of South Asia. Finally, he suggested to prioritize STEM education, especially in developing countries; nurture women through TVET, entrepreneurship development and financial incentives; and increase the investment in continuing professional development for digital professionals.

UNESCO Bangkok Office presented the [*Asia-Pacific Regional Strategy on Using ICT to Facilitate the Achievement of Education 2030*](#), which was deliberated and adopted by the Member States in the Asia-Pacific Ministerial Forum on ICT in Education in May, 2017. The strategy specifies the four priority areas that the Asia-Pacific Member States identified through a regional survey to pursue for the next five years for the achievement of SDG 4 targets: (a) ICT for expanding relevant skills development through secondary, TVET, and tertiary education (SDG 4.1, 4.3, 4.4, 4.5); (b) ICT for improving the quality of teaching and teaching practices (SDG 4.c); (c) ICT for enabling inclusion and equality in education (SDG 4.5); and (d) ICT for enhancing monitoring and evaluation. The six action points at the sub-regional levels, including the action to develop ICT in education policies as integral part of national education sector plans were also presented.

The need for collective efforts and global vision to accelerate the achievement of SDG 4 was articulated by UNESCO Headquarters. With the thought-provoking question “Is ICT for achieving Education 2030 a pseudo proposition?”, it is claimed that it is imperative to revisit the propositions of ICT-based solutions in the SDG 4 and Qingdao Declaration, with a clear definition of objectives that each proposition aims to achieve. UNESCO Headquarters proposed the following specific objectives corresponding to the targets of SDG 4:

- Objective 1: Ensure equitable access to and use of ICT: concrete domestic targets developed and backed by specific programmes with adequate budget allocation.
- Objective 2: Quality-assured online courses recognized as an alternative or complementary mode to face-to-face programmes of study in achieving EFA.
- Objective 3: Sector-wide strategies and programmes developed to harness Open educational Resources (OERs) to expand and lower costs of access to education.
- Objective 4.1: Big data and learning analytics applied to enhance relevance and quality of online learning programmes.
- Objective 4.2: Policies and systems developed to ensure transparent and auditable use of big data and safeguard the privacy and confidentiality of students’ information.
- Objective 4.3: Access to and knowledge on AI tools and technology be deployed in school curriculum and adult training programmes, and made freely accessible.
- Objective 5: All girls and boys have access to connected digital devices and a relevant, responsive digital learning environment by 2030.
- Objective 6.1: National ICT in education policies developed to unlock ICT for quality education through adjusting assessment of quality of learning, and empowering

teachers, etc.

- Objective 6.2: ICT competency standards for teachers developed; and teachers trained, supported as well as incentivized to unlock ICTs for quality of learning.

Several cross-cutting strategies have been suggested for harnessing ICT for the achievement of Education 2030, including: integrated ICT solutions across the targets of SDG 4, fostering the self-evolution of ICT solutions and content development with a consideration of local ecosystem, and identifying systemic business model innovations that remain to be seen in educational contexts.

3.3 Designing and building future e-school



The landscape of education has been transformed significantly with the integration of various ICT tools into teaching and learning processes. As an overview of this plenary session on “Designing and building future e-school”, the presenter from South Africa posed the question “how can a model of future schools help address the challenges of poverty and inequity in education?” and introduced a number of projects around the world that aim to build future classrooms and educational models. It was stressed that the notion of future means not only the use of digital technology, but also the changing paradigm in values, innovations, and learner-centered pedagogy. This plenary session also gathered the presenters from China, the Republic of Korea, and Finland to share their country’s initiatives to design future learning environments with the illustration of relevant projects and initiatives. Specific examples include the digital textbooks and software education initiative in the Republic of Korea, the process of curriculum reform and school-level contextualization in Finland, and the future e-school systems in China.

Further discussions and sharing of ideas continued with the breakout sessions that were organized around the four sub-themes: (a) developing national policies to harness ICT for achieving SDG 4; (b) training teachers on pedagogical use of ICT; (c) designing and building future e-schools; and (d) developing digital skills. The key topics discussed during the breakout sessions are summarized below.

3.3.1 Developing national policies to harness ICT for achieving SDG 4



This session included presenters from Jamaica, Turkey, Egypt and Chile, who shared their experiences of developing national policies in education. In Egypt which has been facing challenges with a high rate of unemployment and limited resources, ICT has been playing an important role to improve the access to and quality of vocational education. In Jamaica, the national policy on ICT in education has been developed to enact five major programs, encompassing educational management, transforming teachers and students' learning, and nurturing talents and innovations by the Ministry of Education. The [FATIH project](#) initiated by the Ministry of National Education of Turkey is an exemplary case of system-wide strategic planning to enhance the quality of education by leveraging SDG 4. The project brought changes in students' motivation to learn, by enhancing teacher professional development experiences, and leading to high access and use of ICT tools in schools. The presenter from Chile shared the current status of ICT usage in education with relevant statistics in Latin American countries (LAC) that have faced the challenge of improving equity and quality of learning. It is imperative to take a systemic and systematic approach in policy planning to ensure inclusive, equitable, and quality use of ICT. It was also emphasized that students need to experience diverse digital tools in school, home, and other places to link formal and informal learning spaces in the digital ecosystem. The key lessons commonly highlighted across the presentation is that it is important to develop national policies on ICT in education

through a systemic approach, involving teacher training, adequate allocation of digital resources, investment in improving ICT infrastructure and provision of supporting mechanisms for the transformation of practices.

3.3.2 Training teachers on pedagogical use of ICT

Empowering teachers through systematic training and support is central to enhance pedagogically-sound use of ICT in education. The presenters of this session shared insights of how their country has been leveraging the power of ICT for providing quality teacher training. In particular, this session included examples of recent initiatives, initial successes, and challenges in teacher training from several African countries.

In Cote D'Ivoire, the mismatch of training programs and required skills for teachers had been a long-lasting challenge. With the support of UNESCO-China Funds-in-Trust project (CFIT, 2012-2016), the country now created seven training centres, 20 modules and 260 trainers for teacher training. The second phase (2017-2018) will take it further with an expansion of the established infrastructure. With the CFIT (first phase), Congo developed a national learning content portal, six multimedia rooms, and built an open distance teacher training system. The second phase will expand the open distance training system with face-to-face training to benefit as many as 3000 teachers. In Namibia, main challenges in teacher training include its sparsely populated vast land, unqualified teachers in pre-primary education, poor infrastructure and outdated ICT in education policy. CFIT's support aspired to the government's additional funding to sustain the teacher training programme. In Ethiopia, enhancing teacher education to bridge quality education gap fits well into the government initiative of quality education. Since 2014, with the first phase of CFIT, Ethiopia created 14 modules of learning materials for teacher development, trained 989 teachers, teacher trainers and school managers, set up ICT enhanced classrooms, and language laboratories.

China's national ICT competence standards (2014) provides insights to other countries that intend to develop similar ICT competence models. China has been introducing the new ICT competency standards for teachers by taking a two-tiered approach, namely ICT infusion and ICT transformation, to accommodate both teachers with less and more readiness levels. The five key components in the ICT standards include information literacy, planning & preparation, organization & management, learning & development, and evaluation. By the end of 2017, 21 million teachers in China will be trained based on the national competence standards.

3.3.3 Designing and building future e-school

For the past decade, the landscape of higher education has been transformed with the open education movement and OER. Several challenges, however, exist to promote the wide implementation of open education and OER. Some of the main challenges lie in the areas of course accreditation, proper licensing, certified educational quality, and technology access. Integrating formal and informal learning spaces was also emphasized as a future model of higher education. As a future learning model for displaced groups and populations, [Hacker School](#) demonstrates a new approach to learning that reaches out to refugees. The program provides coding education to refugees, which can in turn facilitate their integration in vocational paths in Germany. [Kiron](#), which is specifically developed for refugees, is another

example of innovative higher education models. Kiron is a blended learning education platform that allows refugees from any place to take courses through their portable devices, enabling them to embark on a journey to earn a university degree. E-school models similar to the Hacker school and Kiron may continue growing to address the needs of displaced groups and communities. Furthermore, this session highlighted the need for continuous investment to develop relevant non-formal education models, beyond the existing online learning approach, to address new challenges that higher education institutions are facing.

3.3.4 Developing digital skills

This session included presentations on developing digital skills from K-12 students to TVET education. In Norway, the national framework for digital skills has been developed to improve students' digital competence. It is worthwhile to note that the Norwegian approach is to integrate digital skills within subjects rather than teaching them as isolated skills. ICT in TVET education has been seen as a tool for learning, a specialized field of experiences, and a tool to improve access and quality to bridge schools and workplaces. Several ICT innovations such as virtual reality (VR) and augmented reality (AR) simulation, e-portfolio, and flipped learning with OER, have good potential to transform TVET education for the future.



3.4 Education and learning management

Measuring and tracking data related to the availability and use of ICT is critical for developing evidence-based policies. Under the theme of education and learning management, this plenary session gathered the presenters to share the current status of ICT-integrated education and management systems and the advances of big data and learning analytics in education. Cetic.br presented the importance of ICT-related data on policy design and implementation for achieving SDG 4. It is argued that often the collection of ICT-related

initiatives is challenging because of the gap between the policy agenda and what is being measured. The current status of SDG 4 targets in Brazil was presented with relevant data, and it was stressed that the multi-source and multi-stakeholder approach on measuring ICT-related statistics is important for informed policy decision-making and data-driven planning. Additionally, relevant disaggregation in data by gender, age, education level, socio-economic status and other key variables, can provide much clearer and more accurate indicators for SDG 4 that cannot be captured with an aggregated data approach alone.

The session also included a case illustration of ICT-integrated educational management and information system (EMIS) at the national level. The presenter from Sungkyunkwan University in the Republic of Korea, shared the development of the National Education Information System (NEIS), which has been implemented as part of the national e-governance system. Since early 2000s, EMIS in Korea has been gradually decentralized to data centers in 18 providences, integrating the Edufine (the real-time educational financial management system) and e-Approval system. It was also noted that the use of NEIS has relieved teachers from tedious tasks, and improved the transparency and efficiency of administrative process in schools. The expert highlighted that leveraging learning science and datafication takes important roles for quality education and efficient management of educational process.

With the advances of big data and learning analytics, a new eco-system for self-monitoring and self-evaluation is emerging. The representative from Beijing Normal University presented on the potential of the big data-based EMIS in China, which provides students with feedback per subject and competency areas, resulting from the use of big-data generated and accumulated over time. The pedagogical value of big data in such an EMIS system is high, as students know where their strengths and weaknesses lie, they are provided with recommendations on relevant learning resources, and teachers can be informed of what to provide in necessary support to students.

The session also included the illustration of data-driven management, which has been implemented in Hamdan Bin Mohammed Smart University, United Arab Emirates, with an emphasis on the importance of “learner centricity” in achieving campus-wide smart education systems in higher learning institutions. The experts of the session agreed that the culture of innovations is important for transformation of education and learning management. It should take into consideration of quality assurance and ethics.

3.5 Planning the way forward

Based on the thorough discussion on the four sub-themes, the last plenary session provided the participants with forward-looking perspectives on the role of ICT for designing future learning environments. It is expected that OER will continue to play an important role to ensure inclusive and equitable access to quality content. Achieving the mainstreaming of OER will be realized by overcoming a number of obstacles, including achieving or reforming sustainable business models, language and cultural barriers, reusing and sharing OER, development of appropriate policy solutions, and the need for clarity on the term ‘open’. The representative of the Ministry of Education, Science and Sport of Slovenia, reminded the audience of the 2nd World OER Congress in September 2017, when solutions to meeting the

challenges of mainstreaming OER practices into education systems worldwide will be discussed.

As the paradigm is shifting to learner-centric approaches, there is an increasing need to promote self-directed learning and to extend learning experiences taking place in a variety of settings and contexts. With a particular attention to the convergence of media and its potential for learning, the COL shared its perspective on three developments for the future learning environment: (a) the convergence of flexible and online learning leads to new ways to hybridise online and offline paradigms in developing countries; (b) messaging can foster development of new genre of learning management systems that can integrate social media and Chatbots; and (c) certification based on blockchains and Open Standards will enable independent verification of qualifications. The presenter further emphasized the importance of facilitating the close link among education, labour market, and learners to better prepare the next generation of workforce.

Despite the explosive growth of digital technology, many developing countries have not fully benefited from such technological innovations due to the characteristics of their local infrastructure. The current situation of Small Island Developing States (SIDS) was shared with key challenges and potential of integrating ICT. It was argued that using ICT as a conventional means to deliver learning in SIDS is challenging due to their isolated geographical locations. It was stressed that utilizing distance education technology and renewable energy can be a way to overcome such challenges and to broaden educational opportunities to learners in remote, small, and isolated communities.

As having the largest education system in the world, China has implemented the systematic plan at the national level to boost the use of ICT in education, as demonstrated in the initiative on the national public system for educational resources, which serves students and teachers in 150,000 schools. Moving forward, China plans to infuse emerging technologies such as the cloud system to enable co-creation and seamless access of OER. The modernization of education by 2030 aims to align with SDG 4 targets, making education student-oriented, equal, open, and sustainable.

4 Main Trends

During the Forum, the presenters shared diverse perspectives, practices, and issues concerning the role of ICT for achieving the Education 2030 Agenda. Key trends emerged across the sessions, and are identified as follows:

- *ICT in education policies*: A comprehensive policy guide and roadmap is a must to concert and synergize the collective efforts of diverse stakeholders from different sectors when it comes to prioritizing and achieving SDG 4. For example, the comprehensive policy such as ICT in Education Master Plan can guide systematic professional teacher development, reaching out the most remote areas and scaling up experimental innovations to the national level. At the same time, since most national policies on ICT in education were formulated before the SDGs were adopted, there is a need to review the existing policies to be better aligned with the specific targets of SDG 4. Government commitment and leadership are the key factors for the successful development and integration of education management information systems (EMIS) and other ICT-infused initiatives.
- *Digital innovations for equity and quality of learning*: Advances of emerging technologies such as AI, big data and learning analytics can increase the potential of providing personalized learning programs and efficient monitoring and evaluation. However, conflicting views and tensions on the role of ICT were also discussed in several presentations. In particular, there is an increasing concern about potential harms of advanced technologies, such as replacement of teachers, data ethics, and digital divide.
- *Designing future learning environment*: Several countries have been experimenting with ideas to transform learning environments with the integration of various digital innovations. Coupling technology with appropriate pedagogy is central to designing future e-school models that adequately address each country's vision, goals, and directions toward future school and education. The transformation of learning environments can better prepare the next generation of workforce, especially preparing students to have creative minds and self-directed learning competencies. Prioritizing STEM education in developing countries was also emphasized as a strategy to nurture digital professionals in the information society.
- *Locally sustainable ICT solutions*: Sustainable ICT solutions need to be built with deep understanding about the reality of socio-economic, technological, and cultural dimensions of each country and region. Still, the infrastructure is a critical issue in many developing countries. Donors and partners should pay more attention to SDG 4.a, especially improving school connectivity. Investment on hardware is necessary but not sufficient to bring desired learning outcomes in many developing and under-resourced areas. Several cases of innovative yet low-cost technology (e.g. BRCK Kiokit) proved that developing and least developed countries can benefit from simple and easy ICT solutions, at least in the beginning stage, provided that investment on local capacity building and localized resources/applications is given adequate attention. Appropriate technology that leverages the affordances of low-cost solutions and

locally available resources can increase the sustainability and scaling-up of ICT-based solutions.

- *Empowering teachers with ICT:* As the pedagogical practices are shifting from knowledge-delivery to knowledge creation, teachers need to equip themselves with necessary skills and knowledge to facilitate students' higher order learning. That is to say, empowering teachers is essential to bring tangible changes in teaching and learning practices. ICT plays an enabling role in improving the quality of teaching (SDG 4.c) through expanding the training opportunities and connecting teachers to share their knowledge and support with each other. Developing competency standards for teachers is a key factor to systematically implement nation-wide large-scale teacher development. It is important to support building teachers' community of practices (CoP) to enhance innovations through lifelong learning with technology.
- *Open education movement:* It was predicted that the open education movement, marked by the use of OER and MOOCs, will continue playing an important role in achieving the equity and quality goal in SDG 4. There have been several efforts to build region-wide OER communities and repositories for sharing quality resources. However, certification, accreditation, licensing, and access to quality content remain challenging issues to overcome with collective efforts.

Drawing the implications of ideas and practices shared during the Forum, the following recommendations are made to accelerate the achievement of SDG 4 by 2030:

First, it is recommended to review ICT in Education policies written before 2015 to realign the plans with the SDG 4 targets. It is important to develop ICT in education policies as an integral part of national education sector plans.

Second, Member States are encouraged to experiment with ideas to design and build future learning models that are aligned with local conditions. The recommendation is to support research that can guide the design of future school models and evaluate the impact of digital innovations.

Third, it is recommended to build a proper system to collect a large amount of data that can inform policy planning. Data becomes an important asset for schools and education policy planning. Harnessing data flows, which are a common by-product of using digital learning environments, can improve the effectiveness of teaching and learning provisions. For instance, a well-constructed EMIS can help improve teacher quality (SDG 4.c) as well as the entire implementation and monitoring of the SDG 4. In addition, there is a need to establish proper guidelines and policies on the ethical collection, management, and use of educational data.

Fourth, systemic and holistic approaches are central to harness ICT in education. Clearly, focusing on technology alone is unlikely to bring desired outcomes. It is strongly recommended to take a systemic approach involving teacher training, digital resources, infrastructure, curriculum reform, and in-site support for the transformation of practices.

Fifth, following the commitment made in the Qingdao Statement, continuous support and planning should be pursued to build international networks and platforms for sharing ideas, resources, lessons learned, and best practices within and across regions.

5 2017 Qingdao Statement

The representatives from Member States and other partner organizations discussed and adopted the 2017 Qingdao Statement, which outlines the strategies and prioritizes actions to deepen and widen the implementation of the Qingdao Declaration. The Statement affirms the vision and commitment adopted in the Qingdao Declaration to harness the power of ICT for achieving SDG 4. The content of the 2017 Qingdao Statement is as follows:

PREAMBLE

1. We, high-level government officials, representatives of international and regional organizations and key partners, convened at the International Forum on Information and Communication Technology (ICT) and Education 2030 from 10 to 11 July 2017 in Qingdao, co-organized by UNESCO and the Government of the People's Republic of China. We express our sincere gratitude to the Government of the People's Republic of China for hosting the Forum and for its generous hospitality.
2. We reaffirm the vision of Sustainable Development Goal 4 (SDG 4) for Education 2030 articulated in the Incheon Declaration and the commitments adopted in the Qingdao Declaration on leveraging ICT for achieving SDG 4. We recognize that ICTs are both drivers and enablers of progress for governments in taking forward SDG 4 and multipliers for other SDGs.

PRIORITY FOR EQUITABLE ACCESS TO AND USE OF ICT

3. We resolve to ensure that the digital revolution is a revolution for development that bridges divides, strengthens inclusion, and leaves no one behind. For this to happen, inclusive access to and capability of using digital devices and internet connection are vital preconditions.
4. We are cognizant that barriers to equitable access and use of ICT remain and will not be overcome by ICT solutions alone. We call for national strategies for SDGs to integrate concrete domestic targets for equality in ICT access and use, backed by specific programmes with adequate budget allocation to equalize the access, ICT skills and relevant content for girls and women, persons with disabilities, internally displaced persons, socially or economically disadvantaged groups, and other under-served populations.

POLICIES TO UNLOCK ICT FOR QUALITY AND RELEVANCE OF LEARNING

5. We reaffirm that national ICT in education policies and strategies should focus on unlocking the potential of ICT to ensure that education institutions and programmes will be adequately and equitably resourced, including through cost-efficient Open Educational Resources (OER) and Massive Open Online Courses (MOOC), equitably accessible ICT facilities and learning management platforms, and sufficient numbers of qualified teachers who are equipped with adequate ICT competencies and appropriate pedagogy.

6. We reaffirm that the most effective policy to integrate ICT in education is through whole school based planning, teacher training and professional development. We highlight that the challenge is not only to develop ICT competency standards for teachers and prepare teachers to integrate ICT in their pedagogy, but also to offer continuous support and to provide them with the incentives and the professional motivation to unlock ICT to enhance the quality of learning. To incentivize teachers, governments and institutions are recommended to integrate the evaluation of the use of ICT by institutions and teachers into the systems and practices for monitoring the quality of learning.
7. We are cognizant of the high degree of consensus around the importance of ensuring that all students acquire digital competences. We call on governments to explore and adopt mechanisms to develop and evaluate these competences.
8. Noting the potential of ICT breakthroughs, such as big data and artificial intelligence, in driving transformation of the way education institutions and learning are organized, we call upon governments to support research and pilot practices in harnessing emerging technologies to transform education systems, to equalize access to learning opportunities, and to enable intelligent and individualized learning service provision.
9. We reaffirm that policies and strategies are increasingly needed to ensure secure, appropriate and ethical use of data, including safeguarding the privacy and confidentiality of students' personally identifiable information.

INTEGRATED ICT SOLUTIONS ACROSS AREAS OF SDG 4 AND THE SDGS

10. We note with concern that existing fragmented ICT solutions and programmes for education need to be integrated and harmonized towards SDG 4, and planning ICT solutions separately for different targets of SDG 4 will exacerbate the information and service isolation. We call for interministry coordination and sector-wide planning to integrate solutions to internet connection, users' unique identification and authentication, privacy protection, and quality-assured online courses management across sub-sectors and levels.
11. We further call on governments to promote Open Standards to enable interoperability across platforms and ICT solutions developed for different SDGs, and to adopt policies and strategies to promote OER across different target areas within SDG 4.

FOSTERING THE EVOLUTION OF LOCALLY SUSTAINED ICT SOLUTIONS FOR EDUCATION

12. We are mindful that without an ecosystem for developing and upgrading digital devices and content rooted in local communities, efforts for using ICT in education either have limited impact and sustainability, or may result in a further drain of resources. To make sustainable use of ICT for SDG 4, governments and institutions are called on to shift from relying on a device-shipment approach to fostering the evolution of locally sustained ICT solutions through giving local communities agency in the process of developing technologies and digital content that meets their needs.

13. We call on UNESCO and other partners to provide support in building local capacities in developing and deploying relevant ICT solutions, planning national ICT in education policies and strategies, and monitoring and evaluating the impact of ICT for achieving SDG 4.

COORDINATION MECHANISMS TO STRENGTHEN REGIONAL AND INTERNATIONAL COOPERATION

14. Noting the importance of the proposals made by the Qingdao Declaration in support of international cooperation in the field of ICT in education, we call on the Qingdao Forum 2017 partners, including UNESCO, to
 - i. further mobilize resources to assist developing countries, with a special focus on Least Developed Countries and Small Island Developing States, to harness ICT for achieving Education 2030;
 - ii. create an International Network on ICT for Education 2030 (INIE 2030), including governmental agencies responsible for ICT in education, non-state agencies, regional and global partner organizations, and academic experts, including UNESCO Chairs. The network will plan and coordinate projects on leveraging ICT for achieving Education 2030 in the following areas: the development and monitoring of national ICT in education policies and master plans, promoting scalable future e-School models and fostering digital innovations for Education 2030;
 - iii. strengthen the clearinghouse function of UNESCO to further promote sharing of knowledge, effective policies and practices across the regions, including through the online platforms, international and regional meetings, and prizes on the innovative use of ICT in education.

References

The International Forum on ICT and Education 2030 website:

<http://en.unesco.org/themes/ict-education/international-forum-2017>

Burnett, N., & Jayaram, S. (2012). Skills for employability in Africa and Asia. ISESE Skills Synthesis Paper.

Comitê Gestor da Internet do Brasil (CGI.br). Unesco Institute for Statistics (UIS) (2016). Methodological Framework for measurement of access and use of ICT in Education. Concept note. São Paulo: CGI.br. Available at: <https://is.gd/conceptnote>

Jemni, M., & Khribi, M. K. (Eds.). (2016). Open education: from OERs to MOOCs. Springer.

Popescu, E., Khribi, M. K., Huang, R., Jemni, M., Chen, N. S., & Sampson, D. G. (Eds.). (2017). Innovations in smart learning. Springer.

Tamim, R. M., Borokhovski, E., Pickup, D., & Bernard, R. M. (2015). Large-scale, government-supported educational tablet initiatives. Common Wealth of Learning.

Tay, L. Y., & Lim, C. P. (Eds.). (2013). *Creating holistic technology-enhanced learning experiences: Tales from a future school in Singapore*. Springer Science & Business Media.

UNESCO (2017). Asia-Pacific regional strategy on using ICT to facilitate the achievement of Education 2030. Available from: http://www.unescobkk.org/fileadmin/user_upload/ict/Workshops/amfie2017/UNESCO_Regional_Strategy_-_AMFIE_2017.pdf

UNESCO (2017). The 2017 Qingdao Statement.

UN, 2015 (2015). Sustainable development goals.

World Economic Forum. (2016). *The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution*. World Economic Forum, Geneva, Switzerland.

“Information and Communication Technologies (ICTs) are both drivers and enablers of progress for governments in taking forward SDG 4 and multipliers for other SDGs.”

2017 Qingdao Statement

More information



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