Education in the 4th Industrial Revolution

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Today, the world lives on the impact of the Fourth Industrial Revolution (4IR), as its manifestations accelerated and its effects increased in various areas of human activity, and it became one of the most disruptive forces altering our societies economically, culturally and politically. The Fourth Industrial Revolution refers to how new technologies are merging with the physical, digital, and biological worlds, affecting all disciplines, economies, industries, as well as challenging ideas related even to the concept of humanity. This enabled the use, integration and adaptation of emerging technologies such as Artificial Intelligence (AI), Robotics, Virtual Reality (VR), Blockchain, the Internet of Things (IoT), etc., to achieve digital transformation in various fields, especially in the field of education.

In light of the rapidly increasing development in the uses of the Fourth Industrial Revolution's technologies, several new trends and innovations related to the educational field have emerged, which contributed a lot to the promotion of smart, open and inclusive learning, coping with global education priorities and principles, especially the fourth goal of the SDGs 2030 related to "ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all". Among the most important capabilities inherent in the Fourth Industrial Revolution's technologies and their uses, driving transformation in the field of education, we mention in particular, Artificial Intelligence, Virtual Reality and Augmented Reality, Cloud Computing Technology, the Internet of Things, Robotics, Mobile Technologies, Open Educational Resources OER and MOOCs, Social Networks, Big Data, Learning Analytics, Coding, Ethics and privacy protection, etc.

From this standpoint, it is becoming obvious that the jobs that will be created in the near future and beyond will be completely different from what's available today, which requires preparing a workforce empowered with the technologies of the Fourth Industrial Revolution and able to exploit them optimally. Therefore, students, today need to be enabled, in a bid to acquire and also to comprehend how benefiting from the latest technologies and innovations and generating subsequently new knowledge. Accordingly, students require advanced skills to succeed in the globalized, knowledge-based changing world of today (in particular 21st century skills encompassing, among others, use of ICT for learning, creativity, knowledge construction, real-world problem-solving and innovation, etc.). This is what made the education, aligned with the emerging 4IR, termed as the fourth generation of education, or abbreviated "Education 4.0". One of the most important technological developments that underlie Education 4.0 is the use of technology innovations such as Artificial Intelligence, Machine Learning, Learning Analytics, and Open and Ubiquitous learning, in order to provide flexible and personalized learning experiences for all students, according to their needs, interests, characteristics,

levels, and understanding, which makes the learning process more adaptive, effective, engaged, flexible, thoughtful and accessible.

Artificial Intelligence for instance offers a wide range of techniques to support education, many tools and solutions are used to enhance teaching and learning practices, taking advantage of the tremendous computer capabilities and the availability of big data. Today, we find many examples of AI tools available and used in education such as machine translation tools for educational content, AI-based tutoring for students commendation Systems, etc. In this regard, the report of the United Nations Educational, Scientific and Cultural Organization – UNESCO, on artificial intelligence, which was issued as a summary of seminars and expert meetings organized, on the sidelines of the Mobile Learning Week conference (MLW 2019), under the theme of Artificial Intelligence (AI) for Sustainable Development, discusses the potential opportunities and challenges of AI and how to harness it to accelerate the achievement of Sustainable Development Goal (SDG) 4. In the same vein, the Educause's Horizon Report (2019 Higher Education Edition) explores key emerging technology trends supporting learning and teaching, and highlights the AI considerable potential to drive changes in the education sector.

Additionally, the fourth generation of education is characterized by the ease and continuing access to learning, anytime and anywhere, so that everday learning can be made either inside or outside educational institutions, whenever and wherever the learner wants, supported by mobile technologies (BYOT Bring Your Own Technology & BYOD Bring Your Own Device), this is what made the ubiquity aspect of learning (Ubiquitous Learning). Equally important, the emergence of the open education movement contributed largely to the sharing of knowledge and increasing access to quality and inclusive education for all, especially through OER Open Educational Resources available through specialized repositories and platforms. Open educational resources are "learning, teaching and research materials in any format and medium that reside in the public domain or are under the copyright that have been released under an open license, that permit no-cost access, re-use, re-purpose, adaptation and redistribution by others". Indeed, OER's transformative potential, coupled with the expansion of 4IR technology innovations, represents a strategic opportunity to foster access to inclusive education and to promote pedagogical innovation and knowledge creation and sharing. Furthermore, the movement of open education and open educational resources along with the growing demand for lifelong learning have paved the way for the emergence of a new learning trend called MOOCs Massive Open Online Courses. Two key distinctive dimensions characterizing those courses can be drawn obviously from the term MOOC itself: "Massiveness" and "Openness". Indeed, by providing MOOCs, it is intended to offer open learning for free to a wide range of online learners through the Internet. This type of education has spread all over the world and it has become more desirable by all age groups, according to their different backgrounds and educational goals. On that premise, MOOCs can provide tremendous opportunities to enhance formal and informal learning as well as lifelong learning, at no or low cost, which will inevitably contribute to increasing access to education for all.

In light of the rapidly developing 4IR technology innovations and related transformation and trends in learning and teaching, it became necessary to provide teachers with the skills required to keep pace with technological developments, make good use of them and employ them in their teaching practices. This would support the achievement of quality and inclusive education and enhance access to the knowledge economy. With this in mind, the importance of training teachers about the use of information and communication technology in education was emphasized during the World Education Forum in Incheon 2015. Moreover, the 2015 Qingdao Declaration[1] stressed the importance of developing teachers' professional skills in order to integrate information and communication technologies in their practices effectively. In this regard, UNESCO has created an international framework of reference that defines the necessary competencies required to teach effectively with ICT, which is known as the UNESCO ICT Competency Framework for Teachers (ICT CFT). The third edition of the Competency Framework took into account the 2030 Agenda for Sustainable Development, considering the inclusive principles of non-discrimination, open and information accessibility and gender equality in the delivery of education supported by technology. Furthermore, the latest edition addresses the impacts of 4IR technologies and their uses in education, such as AI, Mobile Technologies, IoT, OER, etc. in order to promote building inclusive knowledge societies.

In this context, Mada Center, in cooperation and partnership with the Qatari Ministry of Education and Higher Education, provides assistance through the program of "Preparing the Creative Teacher". The program is a diversified, comprehensive and integrated training program, using the latest technological tools and systems, for the benefit of teachers in order to enable them to use the latest available technologies and to use and employ them according to the best methods, strategies and contexts in the inclusive classroom.

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Dr Mohamed Koutheair Khribi is ICT specialist in education. He has over 20 years' experience in the Technology Enhanced Learning field. Dr. Khribi served as programme specialist in educational technology at the ALECSO ICT department (The Arab League Educational, Cultural and Scientific Organization). He'd been leading several projects at large scale in Arab countries, related mainly to the ICT in education field, namely, Smart Learning, OER, MOOCs, ICT-CFT, Mobile Applications and Cloud Computing. Dr. Khribi participated in the establishment of the Virtual University of Tunis in 2002 where he served as head of the ICT department. He also headed the Online Education Department at the University of Kairouan in Tunisia. Dr. Khribi is a Fulbright Alumnus, He attended the Knowledge Discovery and Web Mining Lab at the University of Louisville in the USA as a Fulbright visiting scholar. Currently, Dr. Khribi is associate professor and researcher at the University of Tunis in Tunisia. He is member of L@tice laboratory at the University of Tunis, and IEEE member. His research interests include Technology Enhanced Learning; Educational Recommender Systems; Open Educational Resources; Artificial Intelligence, Learning Analytics; Machine Learning, Mobile and Ubiquitous Learning. He has authored several well-cited e-learning related publications in scientific books, journals, and conferences.

