

Review

Shaping the Future of Education in the Fourth Industrial Digital Revolution

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Abstract

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The fourth industrial revolution is transforming our world at a staggering pace, with never-before dreamt of innovation accelerating the move away from mechanical and analog electronic technology towards STAARA technology. The impact of the fourth industrial revolution on the education sector will be huge. Educators need to investigate the future to determine what should be done to be relevant and serve society in the future. This paper will focus on the intensity of the technology that shapes the future of education and to understand the competencies expected for the teachers. The major challenges in the next few years will be coherent learning, customized learning, a rethinking of human-machine hybrid work. To cope with these pervasive challenges, education must prepare teachers to educate learners to function effectively. A wider change in higher education systems is needed to respond to the increased use of digital learning technology in education. All institutions need to work together to ensure that digital education and a blend of human teachers with robotic teachers to provide quality education for all.

Keywords: Higher Education, Digital Teacher, Fourth Industrial Revolution, Digital Education, Digital Learning

INTRODUCTION

We are entering a new era called the fourth industrial revolution. We have already seen major advancement in technology, the future advancement will see the refinements of technology STAARA (Smart Technology, Artificial Intelligence, Automation, Robotics & Algorithm). The Fourth Industrial Revolution is transforming our world at a staggering pace, with never-before dreamt of innovation accelerating the move away from mechanical and analogue electronic technology towards STAARA. The effect will have on educational requirements could well be profound, with over one-third of the skills considered important in today's workforce predicted to change (Teaching for the Future, 2017). The greatest benefits of the digital revolution will stem from ease of information access never before has so much information been available to so many. The traditional teaching and learning methods cannot face the current challenge due to technological development (Muthuramana *et al.*,

2020). Higher education institutions (HEIs) advancements in technology have brought both opportunities and challenges to education and learning (Veersamy *et al.*, 2020). Unfortunately, the teaching of these skills has not yet been widely embraced by educators. There remains a wide generational gap between students and teachers on the use and valuation of information technologies (Giedd, 2012). The impact of digital era in teaching and learning is rapidly becoming one of the most important and widely discussed phenomenon in the recent years (Kalolo, 2019; Georgsen and Zander, 2013).

The coronavirus pandemic of became a push factor that can help everyone to better understand that all the attributes of higher education. Digitalization in higher education allows streaming lectures online or enables professors and students to interact in the virtual environments but not everyone is ready for this. clearly,

many traditional principles of academic life will have to be reshaped due to our recent experience with the COVID-19 pandemic. While some of us are afraid of moving away from the status quo, others are willing to undertake this path. The longer this shutdown is going to last, the smaller is the probability that the 'digital revolution' in academia and higher education will be reversed after the return to normal. (Strielkowski, 2020). Education systems recognize the importance of teaching based on digitally assisted methods, but practically, only 25% of the teaching staff use digital assisted methods in working with the beneficiaries of the training (Cosmulese *et al.*, 2019). Educators need to investigate the future to determine what should be done to be relevant and serve society in the future (Ally, 2019). The education system will be preparing learners for jobs that do not exist today because of emerging technologies, information explosion, and the fourth industrial revolution. The demand for lifelong learning is growing significantly around the world since to get meaningful jobs citizens need to obtain current and relevant education (Kolenick, 2018). As a result, countries are starting to implement digital learning technology to educate their citizens for success in the 21st century.

Purpose

According to Mitra (2014), education will be self-organizing, and technology will play a major role in the delivery of education and in providing support to learners. Additionally, learning will move toward individualization and learner-centeredness because of artificial intelligence, learning analytics, and the Internet of things (Chai and Kong, 2017). One of the key changes on the educational market was the appearance of new global players focused on information and communication technologies that actively promote the idea of "technological learning". Higher education now faces a new competition the international online universities and massive online courses which can remotely train several students, inaccessible to conventional educational institutions (Sakhapov and Absalyamov, 2018).

The impact of fourth industrial revolution on education sector will be huge. There are many forces that are placing a sense of urgency on the education system to transform itself for the future, which will drastically change the role of the teacher. Some of these forces include the Fourth Industrial Revolution (Schmidt, 2017; World Economic Forum, 2017) are innovative pedagogies (Mahauad *et al.*, 2018), information explosion due to the increasing use of the internet (Reyna *et al.*, 2018), lifelong learning (Berry, 2018), artificial intelligence (Schmidt, 2017), and the move to open education resources (Williams, 2018). This paper will focus on the intensity of the technology that shapes the future of education in the fourth industrial revolution and to

understand the competencies expected for the teachers of the future in the digitalize era.

Literature Review

Human history is experiencing a new phase; fourth industrial revolution. Industry 4.0 is currently on the rise yet; it is still unclear what Industry 4.0 brings to digital industry. However, Industry 4.0 related components clearly forming digital revolution; big data, artificial intelligence and IoT (Internet of Things) based connectivity (Roblek *et al.*, 2016). The fourth industrial revolution will bring lots of specializations and professions and could cause a fundamental change education and the organization of the educational process (Sakhapov and Absalyamov, 2018). The main question that worries the global educational system is "How the process of transformation of the traditional model of education in the era of the fourth industrial revolution would happen?"

According to the World Economic Forum (2017), the fourth industrial revolution is changing the world because new technologies that combine the physical, digital, and biological worlds are impacting all disciplines, economies, and industries. To cope with these pervasive changes, education, towards the year 2030, must prepare teachers to educate learners to function effectively in the fourth industrial revolution (Ally, 2019). Fourth industrial revolution in which machine intelligence and, more broadly, technology, are transforming almost every field of human endeavor three major challenges in the next ten years (LeBlanc, 2018) such as the need for a coherent learning eco-system in which learners move in and out over a lifetime; shifting from traditional education to curated and customized learning finely tuned to what a learner needs at the time of engagement, robustly supported by technology and rethinking education and curriculum for a world of human-machine hybrid work, in which whole job categories (and thus majors) are taken over by machines.

Society desperately needs higher education to play its critical role maybe the leading role in sorting out the future of work and the implications for the world at large, for humanity itself. Overall, based on the current literature review, it is evident that fourth industrial revolution readiness is an urgent matter and one of the leading factors to success is to identify current readiness and prepare effective education towards Industry 4.0. The most accessible type of education for wide range of population will become mass trainings with the use of new technological solutions such as personalization of educational trajectories, the artificial intelligence as a teacher, e-learning technologies and simulators, information educational environment. Expensive high intensity "live" education, based on personal interaction with highly qualified teachers and collective creative

work, the formation and development of teams, will become more and more elitist, which will increase social inequality of the population (Sakhapov and Absalyamov, 2018).

DISCUSSION

Old pedagogical methods of instruction are becoming increasingly redundant as the demand for interactive learning increases. Universities must reflect the input of business and government advisory councils in their curricula. As far as the classroom is concerned, it is detrimental to conserve the belief that traditional pedagogical approaches, in which students are passive recipients of knowledge, favors the development of the critical thinking and pro-activity in high demand by employers. A learning environment that is participatory and interactive is necessary, with a rejection of spoon-fed information and an enabling of students to take charge of their own learning. All are key to the formation of the professional citizenry of the future (Teaching for the Future, 2017). Higher education lags far, far behind. Textbooks and teachers may gradually lose the position of the main sources of knowledge. Information, which is being updated and widening very fast, tends to be presented in interactive multimedia formats; traditional libraries are being replaced by knowledge databases in media formats (Sakhapov and Absalyamov, 2018). The role of teachers soon may be passed to virtual tutors. The role of gaming environments and augmented reality in educational activities is growing. Although learner-centered education is being practiced today, emerging technologies will make learning in the future adaptive and more individualized because of the use of smart learning technologies (Gros, 2016). This will allow learners to learn at their peak learning times rather than going to a specific location at a specific time to learn. Some learners' have their peak learning time in the evening while others have theirs in the early morning. since learning materials will primarily be in digital format, learners will be able to use the technology to access learning materials, transforming the teacher's role into a facilitator of learning (Ally, 2019).

With technology constantly changing work, people will need to go in and out of a learning eco- system in which colleges and universities and conventional degrees will be only one part of the larger whole. There will also be micro-credentials, just-in-time learning, immersive simulations in which mastery can be gained and quickly demonstrated. However, there is heartening progress on many fronts. Competency-based education (CBE) is gaining greater support and shifts the focus of our work to outcomes, outputs, and what students can do with what they know. That is a paradigm shift for higher education. Replacing the transcript holding monopoly of higher education with a blockchain inspired global and secure

ledger for learning, students will own their competency and credential transcripts. Students will come to own their competency and credential transcripts and share them via a global and secure "ledger" once blockchain or other crypto-currency inspired platforms end the transcript-holding monopoly of higher education. The question for institutional leaders is how to prepare their colleges and universities to not only survive but thrive in that coming eco-system (LeBlanc, 2018).

Students enter the institutions on their terms, journey along a learning path of our design, schedule their learning to align with the calendars and clocks, and often navigate frustrating bureaucratic processes that are more designed for the purposes than their needs. There is a lot of work for higher education to sort out what skills and what new skills need to be taught. Majors, often seen as being tied to jobs, will need to be reconsidered. Many will go away. Almost certainly, no matter the major or the desired field of work, our graduates will need to be facile with the powerful AI tools that will inform every form of work, even the creative arts (LeBlanc, 2018). Among the technological innovations that could radically change education, we can list the Internet of things, automatic semantic translators, high-level artificial intelligence, 3D printing, biotechnologies, massive brain computer interfaces etc. The development of brain computer interfaces and the creation of appropriate network protocols can become the basis of the cognitive revolution in learning and a new generation of internet, neuronet, that will involve both body and consciousness of people in a single communication. Soon, educational practices may include biometric devices to track activity and physical characteristics of the student, to correct the methods and speed of learning and to plan individual educational programs (Sakhapov and Absalyamov, 2018).

A new model of education, where the line between classroom and independent work disappears, suggests the continuous availability of a tutor via interactive learning resources and, in the future, a learning artificial intelligence system. Massive open online courses are mode of competitive training, where only focused and independent activity of the pupil determines the efficiency and effectiveness of the process. Further education development will go in the direction of its division. The most accessible type of education for wide range of population will become mass education with the use of new technological solutions such as personalization of educational trajectories, the artificial intelligence as a teacher, e-learning technologies and simulators, information educational environment. (Sakhapov and Absalyamov, 2018). The learners of the current generation are smarter, fastest, and most tolerant history of diversity, so schools and universities will have to adapt to their style of reaction, the teacher has become a facilitator of learning. A wider change in pre-university and higher education systems is needed to respond to

the increased use of digital technology in education. Digital devices are more mobilizing and motivating in triggering learning than old intellectual tools (LeBlanc, 2018). The digital era will call for “digital” teachers who must adapt to education in the future.

Future will require that teachers be trained to use digital technology to provide virtual education to learners in remote areas and for nomadic learners (Dyer, 2016). With technology, the learners, rather than the teachers, are at the center of learning; they develop their knowledge base and create an understanding of the world by being active learners (Anagün, 2018). Accessibility and flexibility of learning opportunities means that learners can decide when and where to learn (Ally, 2019). The use of digital technologies has helped to reconfigure attitudes towards learning, seen as a process that follows the individual only along the educational path, in a life-long process. Indeed, people need to continue to develop and renew their skills and knowledge to keep up with the constant innovations and new developments in the digital world (Catalano, 2019)

Professional development will be increasingly important for teachers in the digital age in order that they may stay abreast of quality and flexible education strategies for more sophisticated learners (Ally, 2019). The digital era will offer the opportunity for each learner to make progress in self-earning, individualized and contextualized, the educational programs proposed by the higher education institutions will be designed with respect to the age and individual peculiarities. The future of education must consider digitization even if any technological progress is huge (Catalano, 2019). The digital teacher must be able to educate students in a virtual environment using emerging digital technologies (Campbell and Cameron, 2016). With the increasing use of digital technology and a global movement toward the use of open education resources (OER), learners will satisfy their information needs from digital sources rather than be obliged to rely on a single teacher (Ally, 2019). Learners today are the “always-on” generation. Emerging technologies in education, such as those mentioned above, allow learning spaces to exist anywhere and anytime. Teachers and their systems must be prepared to educate the current and upcoming generations of learners who are technology literate and have experience playing digital games and viewing high quality videos. Teachers of the future must learn to be comfortable using educational games and social media as innovative and interactive strategies for teaching (Crompton et al, 2018).

In order to prepare learners to function in the 21st century, teachers in the digital age should also be prepared to develop the “whole” learner. Ferrández-Berruero and Sánchez-Tarazaga (2014) identified four competency areas for teachers that include subject competency, methodological competency, social competency, and personal competency. Ultimately, the World Economic Forum foresees that teacher will need to

adapt to artificial intelligence and robotics in order to successfully make the transition to teach successfully and appropriately in the fourth industrial revolution (World Economic Forum, 2017). The potential upsides of the technologies are enormous and include phenomenal educational opportunities (Giedd, 2012). Further research is needed to identify the skills needed for the digital age and to predict where shortcomings may occur. To support the specific changes to this phase, all higher education institutions need to work together to ensure that digital education, in its broadest sense, facilitates the accessibility and social insertion of individuals.

CONCLUSION

Thus, occurring under the influence of the fourth industrial revolution, social and industrial transformations define new trends of development of modern education. The emergence of new forms of organization of production put forward new requirements for competencies of graduates of educational institutions, changing the meaning and content of the education. There is a new transnational market outside the education system, which can replace the traditional educational system and introduce new standards rather quick (Sakhapov and Absalyamov, 2018). More student-centered collaboration between university and industry can be encouraged to face the fourth industrial revolution. In the future, with artificial intelligence, robotics, and internet of things in the fourth industrial revolution, human teachers may co-teach with robotic teachers (Ally, 2019). Future research will determine the role of the human teacher in such a relationship. Perhaps, soon, blended education will refer to the blending of human teachers with robotic teachers to provide quality education for all.

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