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A REVIEW OF CHALLENGES AND OPPORTUNITIES OF EDUCATION IN THE FOURTH INDUSTRIAL REVOLUTION

Hamis Juma, Dr G. S. Patel

PhD Scholar
University School of Psychology, Education & Philosophy
Gujarat University
380009 Ahmedabad - Gujarat, India
Email: Hamisj10@gmail.com
Mobile: +918128738762
ORCID: 0000-0003-0946-463X

Assistant Professor, A.G. Teachers College
380009Ahmedabad - Gujarat, India
Mobile: +918238038696
Email: drganpatspatel@gmail.com

Abstract

In the fourth industrial revolution, digital technology floods our daily lives in every aspect as it has never happened. The fourth industrial revolution has advanced technologies that fundamentally transformed how we interact with each other so in education as well as how learners learn and the teaching technologies. This article explored the challenges and opportunities of the fourth industrial revolution in education. The article is based on documentary survey study on work that has been done on the fourth industrial revolution and education. The findings of the study indicated the challenges to the adoption of the fourth industrial revolution in education are social injustice, lack of funding and research, digital literacy of teachers and lack of clear policy. The findings also suggest the opportunities available are personalization of learning and flexibility of learning, change in assessment, interdisciplinary learning, and removal of class boundaries. Moreover, using the opportunities brought by the fourth industrial revolution, education system and change education delivery to transform education and equip learners with skills ready for the fourth industrial revolution.

Keywords: *Teacher Education, Online Learning, Fourth industrial revolution, higher education, the future of education*

INTRODUCTION

The Fourth Industrial Revolution has not only changed the technologies, it has changed the process in education delivery and the need for new skills. In the fourth industrial revolution, there have been advances in technologies like portable devices, virtual realities, the Internet of things and Augmented reality which has transformed education by changing lesson delivery in classrooms.

According to Sharma (2019) changes brought by the fourth industrial revolution instigates the need for teachers who understands the technology and can work creatively and innovatively to teach. Further, digital technologies need teachers who are considered a digital refuge, to have skills to teach-learners 'digital natives' who have been raised in the digitalised world (Khoza, 2021).

Moreover, Reaves (2019) enlightens that the fourth industrial revolution disrupted jobs needs an individual initiative to be relevant. On the same, Sharma (2019) stressed the importance of teachers to prepare students following the fourth industrial revolution needs. Agumba & Akala (2021) explain the challenges associated with traditional teaching and how we can expand to the new methodologies in teaching. This paper has explored the existing challenges and opportunities that are in the fourth industrial revolution and its impact on teacher education.

LITERATURE

The fourth industrial revolution provided the world with affordances of increased connectivity and the development of advanced digital networks. These advancements changed the interaction among humans and machines and respectively impacted the education system. The changes cannot be avoided rather harnessed its

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opportunities and prepare learners to be more relevant in the job of work to balance the development with enough workforce (Lase, 2019). Also, Manda & Dhaou (2019) suggest that teachers have digital literacy to succeed in adopting the changes and transformations.

The possibilities of the advancement of technology in the fourth industrial revolution are built up from the previous industrial revolutions. However, Kayembe & Nel (2020) assert that these possibilities are facing challenges that were not faced in the previous eras as well and will need new ideas on dealing with them. Hence, the environment of the fourth industrial revolution needs today's teachers to acquire new ways of teaching and new skills to connect with learners.

Further, Elayyan (2021) explained how the education system is linked to the fourth industrial revolution and can be separated from the fast changes that are happening in other sectors. Referring to World Economic Forum (2018) report, more than 60% of students in schools today will work in jobs that don't exist yet. This provides an avenue for teachers and other educational stakeholders to think about the future of education that can help students.

Moreover, the educational research indicates that the fourth industrial revolution provides learners with digital tools that they can use in transformation and learning to become relevant and have educational experiences to work in the fourth industrial revolution and produce a good outcomes (Sharma, 2019). However, to reach that stage of transforming learners, Kayembe & Nel (2020) argue that it's the universities and colleges that must be forefront in skills development, and when a university cannot adopt the pace then learners will not acquire them.

Additionally, Lase (2019) suggest that the change in education is necessary for all educational components and not just teaching methodology. The change should include the concept of education, curriculum, technology integration and more importantly teacher development. Without competent and digitally literate teachers the changes cannot be implemented in education.

METHODOLOGY

This study adopted the documentary survey methodology in completing the analysis. The literature data were searched from online open journal repositories, books and reports that have been recently published on the fourth industrial revolution and education.

The journals and reports were searched online for the relevance of the fourth industrial revolution and education. The abstract of the journals and reports were scanned to see the relevance. Only journals that had relevance in the abstract or has keyword fourth industrial revolution and education were included in the review in the first cycle.

The journals that had either of them were screened for the second cycle to see if they can contribute to the review and if the sector discussed can be of benefit to the review. Also, reports and journals that had been published before 2018 were left out and only those published from 2018 were included in this review. In total 17 journals and reports were included in the discussion of this review.

RESULTS AND DISCUSSION

The Fourth Industrial Revolution and Education

Each Industrial Revolution impacted human life and changed how humans interacted with the environment. The Fourth Industrial Revolution is changing at a fast pace ten the previous revolutions and the community must adapt quickly (Shahroom & Hussin, 2018). With such a fast pace in development and digitalization of every aspect of life, Sharma (2019) discusses the need for the community to adapt and understand the risk of not being ready in the ever-changing world. Sharma (2019) argues that we need to adapt to proper knowledge that will lead to creativity and innovation in education and be ready for new approaches in education.

In the First Industrial Revolution human communities developed the mechanisation of agricultural activities and steam engines were invented. The First Industrial Revolution saw communities develop living standards and urbanisation. The Second Industrial Revolution world witnessed development in steel chemicals and the invention of electricity which changed how many businesses were operating and expansion of businesses. The Third Industrial Revolution was dominated by the development of energy and the use of electronics. The fourth industrial revolution is witnessed having a vast development of digital technologies built from the previous revolutions (Haron, 2018; Kayembe & Nel, 2020).

Moreover, education has passed four main stages as the industrial revolutions, in each revolution education has a unique characteristic differentiating it from other revolutions. In the first revolution education was based on memorization and practice, in the second revolution learning through the internet, the third revolution was on knowledge and labour and the fourth is how education is used to create changes (Sharma, 2019). Further, the in Fourth Industrial Revolution education is complex compared to other revolutions and dominated by massive digitalization, which required to set of skills (Kayembe & Nel, 2020).

World Economic Forum (2018) prediction of jobs to be done by 65% children doesn't exist today ultimately informs how educational specialists need to change the practice. Agumba & Akala (2021) denotes the concern

on increasingly future demands by the acquisition of new teaching methodologies which is directly relating to teachers' preparation to teach in the fourth industrial revolution. Teachers must not only know how to teach content as it were before, integrate the knowledge collaboratively.

Furthermore, Kayembe & Nel (2020) added that a new set of skills is needed in the fourth industrial revolution that requires to implement, management, and working with technology. Moreover, Agumba & Akala (2021) are explaining the new set of skills to go beyond basic literacy and enable learners to solve complex problems relating to the fourth industrial revolution. Partnership for the 21st century categorised the skills into broad categories; life, learning and literacy which all falls into cognitive and practical skills (Alakrash & Razak, 2022).

Challenges

The fourth industrial revolution has changed how people were used to living and caused challenges. The technology change is potentially riskier to enforcing the social injustice between the haves and have nots, not all community members could afford digital technologies to have access to the affordances of the fourth industrial revolution. The community that cannot afford new advanced technologies were being left behind and create an education gap, and intensify gaps left by other industrial revolutions like communities lacking clean water, electricity and internet access (Kayembe & Nel, 2020; Zervoudi, 2020).

Further, lack of funding and research will negatively impact the implementation in the least developed countries. In the least developed countries, their economy doesn't allow to have huge budget expenditure in the education sector, to date they are still struggling to have the subsidy, grant funds or loans from foreign countries. The challenge brought by the fourth industrial revolution is needing high investment in education to fund research and affordances of new technologies (Kayembe & Nel, 2020)

Moreover, Mpungose (2020) raised the issue of knowledge of teachers as the challenge to the adoption of the fourth industrial revolution in most of the countries. The teachers' digital literacy is needed while the countries are adopting the new technologies in teaching and learning. The teachers are facing new distraction, new students and new skills that are ever-changing. Also, Haron (2018) found out the digital competency of teachers is limited to the adoption of new technologies, and Elayyan (2021) discovered the gap of digital literacy between the pre-service and in-service teachers not to be significant. However, Alakrash & Razak (2022) argued that teachers can adapt to the fourth industrial revolution and digital literacy has a small role to play. Furthermore, Kim (2021) connected teachers' digital literacy to parents' readiness to use the digital tools in learning and their negative attitude towards using the digital devices for learning and seeing students playing when performing school activities on their devices while at home.

Another challenge is the public policy on the fourth industrial revolution and new technologies. The fourth industrial revolution brought changes that are not reflected in the policies of the governments. The ability of the institutions to adopt the new technologies depends much on governments directives through police. According to Zervoudi (2020) for the institutions to quickly adopt the new technologies, the policies should explicitly address the new technologies. Further, the policies could enable higher education institutions being able to respond to the question of the fourth industrial skill needs with fluidity and flexibility. Shahroom & Hussin (2018) added that the policy address of the fourth industrial technologies adoption will create enabling environment for universities to fit in the fourth industrial revolution ecosystem through innovative curriculum and delivery.

Also, technological challenges are among the challenges to adopt the practices of digitalization in the fourth industrial revolution. Most of the developing countries are confronted by poverty and cannot attain the infrastructure to support the new technologies. Some of the countries still had no access to electricity to the majority of their citizens or reliable internet, and the fourth industrial revolution technologies are driven by connectivity and advanced technologies (Manda & Dhaou, 2019). On the same, Alakrash & Razak (2022) found out that the teachers are finding it hard to connect to learners with limited access the majority of their learner's face.

Additionally, another considerable challenge is the issue of data privacy and security of data collected as raised by Manda & Dhaou (2019). Still, communities are not aware or know how to protect themselves online, and how their data can be used. However, the challenges are there, but still, the parents, learners, teachers and institutions need to adopt the technologies brought by the fourth industrial revolution.

Opportunities

However, there are challenges in the adoption of the technologies related to the fourth industrial revolution in education, there are as well opportunities that can act as a catalyst for the adoption of the digital technologies in education. The fourth industrial education makes education smart, virtual with the digital revolution creating several benefits to the education system. A good example can be seen from the practices done during the Covid-19 outbreak when the traditional classroom could no longer serve the need of times. Sharma (2019) explains that with digital technologies teachers no longer teach classes, they teach students and led to personalized learning which is the essential feature of education in the fourth industrial revolution. In using digital technologies, students can get connected and get in touch with parents, teachers and admin and be able to directly be involved in their learning compared to before and now learning has become dynamic.

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Moreover, with digitized devices, every learner has their own profiles showing progress and are of difficulties. The learners' profile enables learning to be customized and personalized to reach the desired level, and it is easy to know how to help a learner using the achievement in the level reached (Sharma, 2019) and support the learner with more opportunities on how to learn better (Elayyan, 2021). With personalization, cramming and memorization is no more a working methodology as information is everywhere, and students must learn how to use that information creatively in the desired setting (Khoza, 2021). The fourth industrial revolution is changing the classroom to be more conforming to the learner and not the system (Shahroom & Hussin, 2018).

Classroom walls are no longer viable in the fourth industrial revolution as learners can interact and learn from anywhere and anytime with no boundaries. Students can interactively learn with different paces and interactively with personalized content (Elayyan, 2021; Sharma, 2019). The technology has removed the class boundaries and provided affordance for the traditional classes to be digitized. The policy makers can use that to supplement the learning and plan more on how the devices can receive tax exemption for many schools and learners to afford distant learning (Alakrash & Razak, 2022).

The fourth industrial revolution and new classroom setting require new strategies in measuring skills. Traditionally, learners were required to sit for a summative examination for their learning progress to be measured. However, with digital technologies the learners can be progressively assessed using their digital profiles, activities they are engaged in after learning, a collaboration they are doing with fellow class members and how they create new knowledge from the existing lessons. Formerly, students were assessed in comparison to a large group of learners but the fourth industrial revolution advocated for personalization and taking account of learners individually. A learner will be assessed on the progress made from the initial point and not how others are doing, and one class may have the different tests in one subject for every individual learner. Further, with the digital affordances, the curriculum may be integrated to have a non-biasing evaluation and improve the testing and assessment practices (Elayyan, 2021; Kim, 2021; Sharma, 2019). With the technologies and change in structure in assessing learners, the education system can use the same to improve the learners' skills and ensure they are assessed well to fit for the new jobs.

With the vast development of mobile devices technologies, the fourth industrial revolution is offering the affordances of flexible and accessible learning. Mobile devices, tablets and personal computers have been witnessed providing teachers and learners access to creating and sharing the learning inside and outside the classroom. Further, the devices made it possible to empower teachers how to personalize subjects to teach and analyse individual students. However, teachers need to have more skills that can make them utilize the devices to match the skills of learners who are digital natives (Sharma, 2019). Moreover, the devices have well increasingly resulted in more learners adopting open courses and learning at their convenience while working and earning. The government must figure out a way of solving internet connectivity issues to ensure that 50% of globally disconnected people are getting connected to have an equal society in provision of education (Shahroom & Hussin, 2018).

Moreover, with the shift to the skills needs in the fourth industrial evolution jobs, there is an opportunity to have interdisciplinary teaching instead of single subjects as it is done in most of the current education. The fourth industrial revolution need is not subject-specific skills in most cases, but the application and creation of the knowledge obtained in personal experiences. Teachers knowledgeable in the subject can design teaching that suits learners to have integration of skills and develop higher thinking skills and inquiry. Further, interdisciplinary teaching will lead to collaborative working culture for both teachers and learners and embed the collaboration, problem-solving and inquiry to learners by using the experience gained (Agumba & Akala, 2021; Khoza, 2021).

Furthermore, the fourth industrial revolution offers the education sectors to be transformed and led the digital economy by attracting more partnerships (Kayembe & Nel, 2020; Nor Asmawati et al., 2020). Education in the fourth industrial revolution should aim at ensuring learners can use experience learned to adapt well and made sense of the world and be able to transform the community in a globalised digital world (Agumba & Akala, 2021). To be relevant in the fourth industrial revolution will depend on how fast the country is using the opportunities available to transform the education sector and be able to change the skills of the working population to match the needs of the fourth industrial revolution.

CONCLUSION

The fourth industrial revolution breakthroughs in technologies can never be compared with other industrial revolutions, although it is built from the previous revolutions. The fourth industrial revolution is fast and has massive digitalization that makes the world in the best possible way. Education, like other sectors have been disrupted the speed it the technologies in the fourth industrial revolution exponentially. Education in the fourth industrial revolution remains a centre where all technologies revolve, by preparing learners who can provide manpower and skilled personnel into various social and economic sectors. Education has to creatively and innovatively harness the opportunities brought by the fourth industrial revolution for the betterment of the community (Lase, 2019). The governments on the other hand must ensure they enact friendly policies to the making of digital tools to be used in education and where possible to exempt taxes for equal access of the

devices, provide connectivity to the internet and create policies that explicitly address the fourth industrial revolution to be adopted in educational institutions.

Moreover, the opportunities indicate the readiness of learners who are digital natives into the fourth industrial revolution education. Teacher competencies in digital literacy should be emphasized to be relevant to teaching in the fourth industrial revolution (Aprianti & Sahid, 2020). To ensure teachers spearhead the head, both in-service and pre-service teachers need to be accommodated with relevant skills to teach in the fourth industrial revolution. Teacher competence should continue to be the subject of research and analysis, and it should be developed and updated. Therefore, pre-service teachers and in-service education should focus on understanding and applying teacher competencies. The future will be different from the past and present in some respects. Therefore, teachers need new competencies to overcome all these changes, and it is necessary to redefine teacher competencies.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest to report regarding the present study.

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