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COVID-19 and its Impact on Education: Challenges from Industry 4.0

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ABSTRACT

The industrial revolution is now entering its fourth phase. The rapid development of science and technology has a big impact on human life. Many conveniences and innovations are obtained with the support of digital technology. Education today is a phenomenon that responds to the needs of the industrial revolution with new curriculum adjustments according to the COVID-19 situation. The curriculum is able to open the window of the world through its grasp for example utilizing the internet of things (IoT). On the other hand, teachers also get more references and teaching methods. For the education sector, the presence of industry 4.0 is expected to be able to realize smart education through enhancing and equalizing the quality of education, expanding access, and relevance in realizing world-class. To realize this learning interaction is carried out through blended learning, project-based learning, and flipped classroom (public interaction and digital interaction) so that these challenges can be overcome in order to prevent the impact of pandemic transmission.

Keywords: industry 4.0, curriculum, knowledge, technology, COVID-19

INTRODUCTION

Corona Virus Disease (COVID-19) has invaded 180 countries, infected around 6.5 million people, and killed more than 383,000 (as at 3 June 2020). This pandemic outbreak, has implications for the health sector, exhausting the health care system, disrupting the education system, bringing harm to business and the economy, and several other fields (WHO, 2020).

This also applies to education. With the abolition of face-to-face learning as normal, learning at home through certain applications, online lectures, guidance, and online seminars are examples of educational services that accelerate the application of education in the revolutionary 4.0 era. How not, both teachers, and students, are encouraged to understand at least the use of digital technology. On the other hand, students are also forced to explore technology, information, and channel their creativity through innovations in given tasks (Theffidy, 2020).

Long before the industrial revolution, known as the pre-revolution, where all the activities carried out manually by human hands without the aid of machines. Only around the 17th and 18th centuries, the industrial revolution began with

the appearance of the industrial revolution 1.0 (the presence of factories and the discovery of steam power by scientists). Then, the 2.0 industrial revolution around the mid-18th century (the use of electricity, the presence of car production), and the industrial revolution 3.0 since 1960 (explosion of digital information, computers, and smartphones). Then, industry 4.0 comes to replace the previous one which is marked by physical cyber and manufacturing collaboration (Hermann et al., 2016; Schwab, 2016).

Industry 4.0 is characterized by an increase in digitalization of manufacturing driven by four factors (increased data volume, computational power, and connectivity; the emergence of analytics, capabilities, and business intelligence; the occurrence of new forms of interaction between humans and machines; and improvements in digital transfer instructions to the physical world, like robotics and 3D printing). In principle, Industry 4.0 is the integration of machines, workflows, and systems by implementing intelligent networks to control each other independently (Lee et al., 2013; Lifter & Tschienner, 2013; Maria et al., 2019).

Industry 4.0 not only provides opportunities but also challenges for millennials. The progress of science and technology as a trigger for the industrial revolution was also

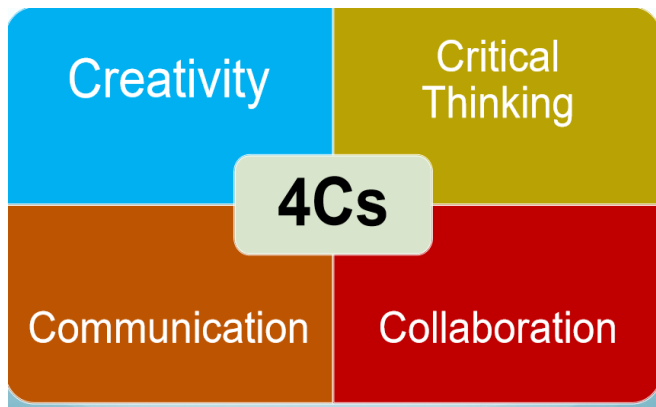


Figure 1. Skills in the era of distraction

followed by demands for increasingly high competition. This shifting situation is also seen in the learning curriculum in schools to tertiary institutions, which forces some teachers and the academic community to change patterns. The education system that was carried out throughout the country long before this global pandemic still met in person, now inevitably they have switched to online media (such as Zoom, Google Meets, and other supporting applications). To minimize the spread of COVID-19, governments around the world have also implemented various rules so that people don't meet as often as possible and avoid direct physical contact with lockdown, social distancing, and psychical distancing policies. It is well-intentioned so that they can also continue to carry out their activities (for example for the education sector). For this reason, it is interesting for us to present the extent of the impact of COVID-19 for education in the revolutionary 4.0 era.

INDUSTRIAL CHALLENGES 4.0

Mapping the challenges of industry 4.0 to prevent various impacts on people's lives, for example, the problem of unemployment. The number of unemployed people globally by 2018 is expected to reach 204 million with an additional increase of 2.7 million (ILO, 2017).

In addition, challenges that are not less severe are issues of information technology security, reliability, and stability of production machines, lack of adequate skills, reluctance to change by stakeholders, and loss of many jobs due to change into automation (Sung, 2017; Hecklau et al., 2016; Kagermann et al., 2013; Kohler & Weisz, 2016).

The focus of expertise in the 21st-century education sector currently includes creativity, critical thinking, communication, and collaboration (4Cs). Not only for students, teachers, and the academic community must also be prepared to face these skills. What is shown in **Figure 1** can require them to be able to possess these skills, if not supported by teachers and lecturers?. They must also have strong core competencies and have soft skills in 4Cs. The role is expected to strengthen character, provide passion, and inspire. This is a role that technology cannot replace. Having educational competence, competence in studies, digital endeavors, competencies in the era of globalization, and interaction in learning is certainly a

necessity that is considered a carrying capacity (Zezulka et al., 2016; Baur & Wee, 2015).

EDUCATION IN DIGITAL ERA

Industry 4.0 is one of the implementations of the Germany 2020 modern technology which is implemented through the improvement of manufacturing technology, the creation of a framework, and strategic policies. Characterized by the presence of robots, artificial intelligence, machine learning, biotechnology, blockchain, internet of things (IoT), and driverless vehicles. The field of education is closely related to this revolution which can be utilized to support learning patterns, thinking patterns, developing creative and innovative innovations from students to produce the next generation of people who are superior and able to compete (Qin et al., 2016; Schwab, 2016).

This era of disruption is to illustrate various ways to integrate cyber technology both physically and non-physically in learning. Education in question is a phenomenon that responds to the needs of the industrial revolution by adjusting the new curriculum in accordance with the current situation. The curriculum is able to open windows of the world through grips such as utilizing the internet of things (IoT). On the other hand, teachers also get more references and teaching methods (Klarner et al., 2013).

However, this did not escape the challenges for teachers to implement it. At least, there are 4 competencies that are expected to be possessed by teachers. First is critical thinking and problem-solving skills. Is the ability to understand a problem, get as much information, so it can be elaborated and bring up various perspectives to solve problems. They are expected to be able to mix learning and export these competencies to students. Second, namely communication and collaboration skills. These skills are not immune to information technology-based abilities, so teachers can apply collaboration in the teaching process. Third, the ability to think creatively and innovatively. It is hoped that new ideas can be applied by teachers in the learning process so that it spurs students to think creatively and innovatively (for example in doing assignments using technology and information). Fourth, technology and information literacy. Teachers are expected to be able to obtain many references in the use of technology and information to support the teaching and learning process (Drath & Horch, 2014).

COVID-19 AND EDUCATION SERVICE

With the deadly disease caused by COVID-19, many countries actually extend work from home (WFH) and work system adjustments. This does not mean that public services will be removed, whether related to the scope of goods, services, or administration. There is a need for direct emphasis by those concerned when announcing the existence of special policies relating to the adjustment of work systems and implementation of COVID-19 prevention protocols. Service can be done online or if there is a service manual that must

implement measuring the temperature of service users, keep a distance, provide a place to wash hands, and hand-sanitizer.

Of course, adjustments are needed in implementing changes to the education system. However, it is inevitable that this outbreak will be one of the drivers of implementing the system. On the other hand, besides being demanded to understand technology and information, certainly, there are problems that arise from adequate infrastructure (Zainurossalamia et al., 2020). For example, students from underprivileged families do not all have laptops and smartphones, so policies should pay attention to this. Schools and colleges must provide assistance for those who have been recorded by obtaining subsidies, special assistance, and other problem-solving. In addition, the government must ensure that at least the internet is available to remote areas, in order to reach them in the learning process (Munandar et al., 2020).

SYSTEM OPPORTUNITIES AND ADJUSTMENTS

Behind this outbreak, students are required to be able to adapt and take advantage of the educational situation by implementing IoT. They can develop their creativity and innovation through collaboration, individual assignments, and certain useful projects in the future.

Individual assignments by making posters and videos about COVID-19 prevention appraisal or doing assignments according to the educational curriculum by utilizing technology and information, so that they have many references and can utilize digital technology. Certain projects, for example, develop the ability to create applications to help online public service systems (without requiring service users to go to service locations). This might be possible, for example, the Online Single Submission (OSS) implemented by several countries. It is not impossible for students to realize online applications that facilitate the process of providing public services.

In the end, the outbreak of COVID-19 and the progress of the digital era can be applied with certain adjustments without putting aside things that need more technical attention, for example, the impact and weaknesses. Instead, the demands of the role of students are expected to be able to bring positive change in the middle of the situation through the understanding given by the instructor. It is time for the form of collaboration to provide open opportunities for all parties, especially from the education sector.

CONCLUSION

The world has concentrated and has a target in responding to the industrial development of the industrial revolution 4.0, especially in the education sector. In its implementation, there are still many obstacles and need to work hard in realizing roadmap 4.0. There are obstacles to its implementation due to uneven infrastructure, changes in people's mindset, and difficult situations due to COVID-19. There is support from policies in the education sector, it is also necessary to learn to

follow about changes in that era in the planning of disruption strategies by creating new jobs and competitiveness that can only be built in new ways. For this reason, there needs to be enthusiasm and positive intention for the advancement of education.

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