

MOOC (*MASSIVE OPEN ONLINE COURSE*): RESPONDING EDUCATIONAL CHALLENGES IN THE FOURTH INDUSTRIAL REVOLUTION ERA

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Abstract: This article discusses the MOOC (*Massive Open Online Course*) platform for responding to educational challenges in the 4th Industrial Revolution. Connectivity was the key in the 4IR, hence the development of technology that occurred led to the impact of disruption in various fields including education. Education 4.0 aligns information technology as well as communication capabilities to create novel and innovative opportunities. One of the rising educational platforms is MOOC which is based online, has unlimited capacity, and is open to everyone. These advantages make MOOC the most excellent learning platform to master certain competencies and skills instantly and for free. Nevertheless, MOOC has developed and fulfilled the requirements of general learning, online learning, and MOOC-specific criteria-. Moreover, MOOC was initiated by experts from leading universities and has been attended by millions of participants and equipped with thousands of specialized learning programs. While the educational challenges in the 4IR require participants to have capabilities and skills in the mastery of data literacy, digital, and communication as well as 4C (critical thinking, creativity, collaboration, communication). Thus MOOC is the answer to the educational challenges in the 4IR by providing the learning that could be accessible, democratic, creative, innovative, and by anyone.

Keywords: *MOOC; Online Learning; The Fourth Industrial Revolution*

A. INTRODUCTION

In recent years, the development of communication, automation, and cyber technology have occurred rapidly. The existence of technology increasingly makes territorial boundaries between countries even more unclear, leading the world to a borderless state and makes it a huge imaginary village or global village (Pamungkas, 2015). The situation brings everyone into a virtual society, where all activities have been connected in the virtual world. It led to significant changes in the various settings of people's lives until the term of disruption was born, it means that the changes occurred massively in various fields.

In education areas, technology contributes to various educational processes. By helping with technology, it enables the presence of education that is easier to access effectively and efficiently. However, it cannot be denied that the development of technology brings not only massive changes in various fields but also challenges for the world of education. Because the changes that have occurred massively was changed the system and the arrangement that exists in both people and government lives socially or economically. Thus, the world of education has a great responsibility to prepare the generation would be ready for the challenges of the Industrial Revolution 4.0 and also be ready to build Society 5.0. The primed generation is not only required to be able to create and use various technologies but also required to be able to control and utilize technological development wisely in maintaining the survival of mankind.

Connectivity is the crucial needs in the 4IR era, hence the internet has become a part of Society 5.0 life. Based on those reasons, education that centered on using the internet and connectivity is a characteristic of educational needs in the community of the 4IR era. The education that is based online will be a strong fascination while also responding to the educational needs of the community. The current trend of online learning has reached many universities in various countries, one of its platforms is MOOC (Massive Open Online Course). Therefore, this article was compiled to provide scientific and rational reasons regarding the mode of online education by using the MOOC (Massive Open Online Course) platform to report educational challenges in the Fourth Industrial Revolution Era. The discussion consists of 3 points: educational challenges in the Industrial Revolution Era 4.0, MOOC (Massive Open Online Course), and how MOOC responding to the challenges of Education 4.0.

B. METHODS

This study applied library research, a series of activities related to library data collection methods, reading, recording, and processing materials (Zed, 2008). The data was collected in the document form. The documents are related to the topics of online learning, MOOC, and The 4IR Era, which contains books, research journals, and articles. The method of the discussion uses a *descriptive-analytical* method, namely explaining and elaborating on key ideas related to the topics was discussed. Then the data would be displayed and analyzed critically through primary and secondary resources of the topics.

C. RESULT AND DISCUSSION

1. The Educational Challenges in the Industrial Revolution 4.0 Era

The times rapidly continue to roll along with the rapid development in the field of technology. The development of technology has led the world to a significant change in all sectors of life. The presence of steam engines around the 1780s brought major changes in various sectors, both manufacturing, agrarian, and industrial, making it known as Industrial Revolution 1.0. Formerly around the 1870s, the presence of electricity and petroleum provided new changes by delivering faster performance in various industrial processes. Similarly, the creation of various modes of transportation using fuel oil is also a sign of the Industrial Revolution 2.0. Furthermore, in the early 20th century came various technologies, both information, and automation that marked as The Industrial Revolution 3.0. As for the subsequent discovery of the internet, it was the beginning of the birth of Industrial Revolution 4.0 focused on connectivity or also known as the Cyber-Physical System (CPS) (Gunawan, 2019). Incoming The Industrial Revolution 4.0, the role of technology is increasingly greater in various human activities and various sectors in its life.

The term Industry 4.0 was widely known in 2011 at *Hannover Fair* in Germany. The term describes how the revolution will happen significantly with the innovation and integration of physical and virtual elements that create new modes in industrial and manufacturing processes that can be built the smart factories (Schwab, 2016). Then the term Industrial Revolution 4.0 (The Fourth Industrial Revolution) refers to both smart machines and connected systems but more than that a wave of significant changes that combine technology and human interaction so that there are fundamental changes in various fields. Therefore, this era became widely known as the era of disruption because of the rapid changes.

Understanding the disruption could be defined by 4 characteristics that occurred *volatility*, *uncertainty*, *complexity*, and *ambiguity*. (Mukhlisin, 2019). In this era of disruption, the system that exists in society, companies, or other systems changes rapidly due to an update based on the cyber-physics system, such as the phenomena of online transportation, mobile banking, e-wallet, online shop, etc. Thus, conventional systems have been largely abandoned and changed to an online mode that has a faster and more efficient performance.

Industrial Revolution 4.0 not only affected the economic and social sectors but also affected the education sector resulting in the term "Education 4.0" (Hussin, 2018). The presence of education 4.0 is responding to the needs of Era 4.0. In Education 4.0, the integration of technology, information, communication, and automation form new and harmonious performance for providing new, creative, and innovative opportunities (Lase, 2019). The goal that education 4.0 wants to

achieve is to encourage students not only to learn skills and knowledge but also to identify learning resources so then they will be able to apply for long life education concept. So that education 4.0 emphasizes not only the mastery of skills and knowledge but also the ability to utilize various learning resources that exist to master a soft-skill. Thus, in the event of massive changes in the next few decades, individuals are capable and ready to survive and compete globally.

The nine characteristics of Education 4.0 are 1) learning without limited place and time; 2) more personalized learning; 3) students have the choice for determining how they learn; 4) more project-based learning; 5) students directly study into the field; 6) use logic-based analytical and reasoning capabilities; 7) evaluations are carried out variously based on the progress experienced by each student; 8) student aspiration is one of the factors that are considered to design, develop, and update the curriculum; and 9) students are more independent and responsible in their respective learning (Hussin, 2018). Based on these characteristics, education 4.0 is not only focused on giving knowledge cognitively but more broadly preparing and developing all the competencies and skills of students to face global changes.

In the world of education, the challenge of 4-IR is a phenomenon of disruption that occurs both in the way of learning, thinking, and acting in developing creative innovations in various fields (Yusnaini, 2019). Today's students take more advantages of technology in the learning process, especially as digital natives who are close to technology, they are required to master 3 imperative literacies, data literacy, technology literacy, and communication (human literacy) (Arifin, 2019). Besides, the student's mind and behavior have to be able to respond to the challenges of education in 4-IR. Therefore, learning should be designed to practice and develop 4C, critical thinking, creativity, collaboration, and communication to hone higher-order thinking skills.

2. MOOC (*Massive Open Online Course*)

MOOC was first introduced in 2006, although there were sources said that it was in 2008, but MOOC was widely used as a learning mode in 2012. That year, Stanford University offered three free courses organized by online mode: artificial intelligence, machine learning, and database introduction (Husna, 2019). MOOC can provide services with an unlimited number of participants and also provide a free access website. It has several advantages compared to conventional learning, one of the advantages is the materials and problems that are discussed interactively between students, educators, and assistants can be documented (Goh, 2016), making it possible to make storage for remaining in asynchronous mode. Also, MOOC is offered online and is available free of charge to everyone who is connected to the internet (Fajrillah, 2020). Some of these reasons may make MOOCs more familiar to be used as a learning platform for the community at large.

MOOC uses a digital-based website that enables a wide range of programs available - *platforms*- to provide education in a new paradigm without limited in areas and time zones. It is also open and free access so that the number of students reaches thousands of students (Voss, 2016). The term MOOC is actually still very widely understood because MOOC is still being developed, innovated, and researched. The MOOC definition of each constituent term is *Massive*; has unlimited capacity, *Open*; free of charge and open to everyone, *Online*; take place online, *Course*; systematic and structured learning (Kim, 2015). One of the definitions of MOOC in UNESCO exposure is as follows *Massive*, theoretically, it is designed with an unlimited number of participants, it means that the program is designed in such a way with all services that do not increase or decrease significantly by increasing the number of participants; *Open*, the program is provided for free and there are no specific qualifications to follow; *Online*, the entire course is provided online using the internet and supporting devices; *Course*, This program takes the form of a course which means offering a complete learning experience, which is structured, equipped with learning objectives, materials, assessment tools, quizzes, feedback, and also the certificate of graduation (UNESCO, 2016).

Providing a good quality platform, the elements have to be designed, developed, and continuously revised following the applicable qualifications and applied various analyses concerning the needs and changes of the times. The quality of MOOC can be seen in several aspects:

- a. Learning criteria in general, such as learning, in general, provided either online or offline has to contain the clear purpose of the learning process as well as the content of materials covering knowledge and skills.
- b. Specific criteria for online learning, learning materials have been designed with an adequate level of interactivity so that students can engage and test their knowledge, understanding, and skills periodically
- c. Specific criteria according to MOOC, are intended to provide learning that enables the interaction of associate people both educators, scientists, and others, students with others or students and educators to create motivation and attitude of learning.

In general, there are some differences between MOOC and MOUC (Mainstream Online University Courses), if MOUC has the most advanced qualifications for prospective students so that the number of students received is limited according to the university's capabilities, while MOOC does not any requirement because it is done by online and there is no special selection in the admission of participants so that the number of participants can reach thousands of people even is not limited. Besides, in MOUC participants are charged to follow the learning process, so that there is a responsibility from the provider and the instructor has the authority to conduct an evaluation. While in the MOOC, participants are free of charge and the evaluation system is carried out using a digital system that has been designed as well as peer evaluation by engaging fellow participants (Azevedo, 2017). Therefore, the presence of MOOC cannot replace the existence of MOUC, only MOOC allows learning to be accessed by anyone openly as a vehicle for learning, brainstorming, and experience that remains supported by the concept of a complete learning system.

Some advantages of MOOC are the unlimited time and study space, active learning, evaluation can be done variously, and there is direct feedback, providing educational equality to anyone without exception to bring together various layers of society (Aji, 2016). While some disadvantages of MOOC are highly risked in the evaluation that is carried out using digital systems, the authority of MOOC that is still questioned in its position at the education level (Guo, 2017), and the possibility of noise during the discussion forum takes place due to the lack of stable internet network so that it is not maximal in the reception and delivery of material. Dealing with the 4.0 era, the presence of MOOC is a quick answer that is easily accessible to help master certain skills so that students can deal with the challenges of the 4.0 era despite its obstacles should be fixed.

Siemens has classified MOOC types into 2 types, cMOOC, and xMOOC. Connectivism Massive Open Online Course (c-MOOC) emphasizes creativity, independence, and social networking, where students are required to actively develop materials that have been obtained in the form of application, development, or dissemination to empower generation and develop information. cMOOC was born out of constructivist learning theory with a process-oriented approach. In the learning process, cMOOC places students as creators and collaborators, and teachers as facilitators. So the learning process is more to the concept of sharing science with its evaluation in the form of feedback among fellow participants (Admiral, 2015). Thus the concept of cMOOC is known to be more modern and adaptive to the changing times.

While the Extension Massive Open Online Course (x-MOOC) seems more conservative, learning takes place through presentations, quizzes, and exams whose purpose is to transform knowledge (Ulrich, 2015). XMOOC was born from the theory of cognitive and behavioral learning with a goal-oriented approach. In the learning process, xMOOC places the teacher as the owner of the authority and is responsible for the learning, so that the student is portrayed as a passive recipient. The concept of learning is also more to transfer of knowledge by using media such as video, text, online articles, etc.

The examples of MOOC platforms that are currently widely accessed are Coursera, edX, and Futurelearn. Coursera was founded by professors at Stanford University, while edX is a non-profit portal initiated by Harvard University and MIT, while Future learn is an open university platform in the United Kingdom. Udacity is also a MOOC platform established privately by Sebastian Thrun, David Stevens, and Mike Sokolsky (Chen, 2013). In Indonesia, Massive Open Online Course (MOOC) is known as Open and Integrated Online Learning. The Ministry of Education has designed SPADA (Online Learning System) as one of the platforms that can be accessed by higher education participants to conduct lectures online. There is also a platform designed by UGM under the name

Focus Fisipol UGM, as well as another platform namely Indonesia-X which is a collaboration of several universities such as UI, ITB, ITS, and Ciputra University. The middle and basic level has been provided by Portal Rumah Belajar.

Several factors can influence the success of MOOC, that is 1) learning subjects have the same interests; 2) quality of online learning relevant to needs and up to date with the development of technology; 3) participant interaction is key; 4) the importance of content organizations as well as open access to find information for more contextual learning; 5) the duration of the study and graduation qualification so that participants can arrange themselves to meet the qualification (Azevedo, 2017). Based on these factors, it is necessary to improve and classify admissions by providers as well as the independence and discipline of learning participants.

Familiarly used, MOOC does not actually replace MOUC. Although it contains a variety of learning criteria both in general, online learning, and in special characteristics according to its characteristics, MOOC is just a quick and instant answer to the needs of mastery of certain skills or competencies in the Industrial Revolution Era 4.0 which is for free and widely accessible. Besides, the number of participants is unlimited, and also the absence of participant qualifications makes the evaluation measurable and results in certain achievements but the results cannot give the range or map of the learning changes that should occur continuously as has been designed at the conventional level of education. However, MOOC has given access to education for all and also provided a new option in online learning.

3. MOOC (Massive Open Online Course): Responding Educational Challenges 4.0

Toward an era of disruption that is rapidly and fundamentally changed in various fields, all individuals have to prepared for any possibilities that will occur in the future. Thus disruption in the world of education allows by changes to all current educational systems and structures and is replaced with new systems and structures that are suitable for the needs of the times. Thus, if the system, curriculum, and stakeholders in the world of education are not prepared for a change in the era of disruption, then the possibility of the current system is increasingly abandoned because the modern mode of education is increasingly diverse and innovative.

The real disruption is not only happening in the education system because it was entered the real of other lives and become part of the generation born in today's technological era. Today's younger generation is the digital native who has been familiar with the digital world since the beginning, so conventional fashion is no longer known to them. This is actually a challenge for educators who are still the digital immigrant generation that is a newbie to technology when they are in middle age. Therefore, a real effort is needed in trying to bring the learning needs of the digital generation with the quality of education that has to be mastered in the digital world.

Although born in the digital age, in fact, the current generation does not automatically master digital literacy. The competence of the digital era demands that each individual has the ability and mastery of 3 kinds of literacy, including data, digital, and communication. The three literacies are the main competencies in responding to various challenges and also preparing for competition in the 4.0 era. The ability to understand how applications and technologies work is a hardware competency, while the ability to understand, analyze, and utilize digital data is a software competency, and brain-ware capabilities, in this case, are needed in the form of design, communication, and tolerance capabilities.

Facing the demands of mastery of these three literacies, education at various levels and models is designed to accustom habits in students to think critically, be able to communicate and cooperate well, and have high creativity. Thus, in the face of the development of technology that occurred, students have prepared to control and utilize existing developments for good for both themselves and others to have the ability to survive in an era filled with change and uncertainty. In education, learning patterns today are more likely to be with digital-based learning by utilizing various platforms and websites available online. So that educational institutions take initiative and take effective steps by designing various modes of online and remote learning. Meanwhile, several universities both national and international have developed various e-learning formats to prepare for global challenges in Era 4.0.

MOOC (Massive Open Online Course) is one of the modes of online learning initiated by several universities in the world and is given widely for free. In this mode of online learning, there are several themes that participants can follow online and for free. For example, the Coursera platform provides online learning for language development, as well as the Indonesia-X platform that provides digital learning for the basics of software development. Coursera provides nearly 4000 specialization learning programs with the number of participants reaching millions of people (Corsera, 2020). On both platforms, students can know the goals that each theme, learning schedule, materials, and teaching materials want, including weekly or monthly evaluations. Even at the end of the study, if they have fulfilled the minimum criteria for achieving the results of the study, then participants are entitled to a certificate as proof of having participated in the study. So online learning on the MOOC platform is a complete and structured type of learning that has qualifications and learning objectives as well as learning in general.

In responding to the challenges of digital education in Era 4.0, MOOC is one of the right platforms in providing quality learning and can deliver students to master certain skills and competencies. Moreover, online mode is very accessible to anyone and can be followed from various places. Supporting by leading experts and universities both nationally and internationally makes MOOC an alternative education with a good education in Era 4.0. Besides, the era of disruption that brought about fundamental change will bring the world of education into the virtual world, so that the order of the conventional education system will most likely be disrupted by the times. Then education that can be accessed widely, for free, and accessible online is a new model to respond to the needs of the times. Then more people will choose an instant and free mode of education than have to join institutions and institutions for a long time and a considerable cost.

In 2018, more than 900 universities and 100 million students in the world joined MOOC (Classcentral, 2020). The phenomenon further makes it clear that MOOC learning mode is in high demand in era 4.0. Moreover, cMOOC types, where students will independently become contributors and creators, can also perform peer assessment so that communication skills, critical thinking, cooperation, and creativity will grow. So that they will be better prepared and master competence to face the era of disruption in 4.0. Here are MOOC development steps that in each step have a role to develop 4C (critical, creative, cooperation, communication).

The development steps are 1) *Task Definition*, in the first step of learning participants, is taught to have the ability to describe what to do in the form of descriptive, structured, or pointer work that has to be done. At this stage, participants are told to think critically about what to do and to be resolved systematically; 2) *Information Seeking Strategies*, the next step of learning participants is provided to create alternative strategies in getting the information needed in that case. At this stage, students are required to develop their creativity to find and create alternative strategies for obtaining information; 3) *Location and Access*, in this step learning participants, are directed to have the ability to find the source of what information is needed. At this stage, students are required to master data literacy to find the right information; 4) *Use of Information*, once it is known the source of information they will get, learning participants are given the provision to have the ability to use that information so that it can be useful to the audience. In this stage, students use data literacy to utilize the information that has been obtained to benefit many people; 5) *Synthesis*, this stage of synthesis is a stage that teaches learning participants in developing ways to end a problem; 5) *Evaluation*, this stage is to give participants a measure of learning how to make a decision and assess whether or not it works, whether or not a program is developed (Johan, 2016). Thus, through each stage of development, students are trained to master useful skills and literacy in the Industrial Revolution Era 4.0 so that they can face various challenges.

Furthermore, when it comes to learning approaches and theories, MOOC provides free access for anyone who intends and is interested in participating in learning without certain qualifications. This proves that the learning trend in Era 4.0 is more democratic learning, where students have freedom and creativity in building knowledge, finding information, or interacting with many parties as a learning resource. But as a consequence, students have responsibility, self-reliance, as well as discipline for the learning process so that the goal of learning remains well achieved.

D. CONCLUSION

The MOOC (Massive Open Online Course) platform is one of the alternatives to learning that is done to respond to the needs of learning that is widely reached, easily accessible, and followed by many people only through online mode so it will equip its students with objective skills on each expected learning theme. Therefore, the mastery of skills and literacy that is honed and grown in each learning process, as well as with the mastery of skills that suit the needs of the times, students can control and utilize technology for the common benefit to respond to the challenges of The Fourth Industrial Revolution. Thus, online learning using MOOC is expected to be more widely developed with a wide range of learning, specialization options, especially in Indonesia, so that more people can access learning to further increase knowledge and abilities in the face of various challenges in the Industrial Revolution Era 4.0.

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