

Reorientation of Curriculum in the Face of Industrial Revolution 4.0

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ABSTRACT

This article aims to describe the reorientation of the curriculum in the face of the 4.0 industrial revolution. The industrial revolution affected the development of the world of education. The challenges of education in the industrial revolution era are in the form of changes in learning methods, patterns of thinking, and how to act of students in developing creative innovations in various fields. Therefore, it is necessary to reorient the educational curriculum to produce human resources who can face challenges. industrial revolution era 4.0. Revised the curriculum by adding five competencies possessed by students, namely, critical thinking skills, innovative creativity and abilities, good communication skills and abilities, cooperative abilities, and high self-confidence.

Keywords: curriculum, education change, reorientation of the curriculum, industrial revolution 4.0

1. INTRODUCTION

The development of the industrial revolution had an impact on the development of the world of education which could indirectly change the economic order that helped change the educational order. The industrial revolution 4.0 was known as the digital revolution and disrupted. Disruption is a fundamental change or in other words, can also be interpreted by innovation. With the development of digital technology, the movement and connectivity of humans and machines have become unlimited. In this era, various human activities experienced innovations that contained science and technology.

The disruption era requires students to be skilled in accordance with the times. These skills are able to think critically when solving problems, creative and innovative, and able to communicate and cooperate well. Dr. Cepi Riyana in a public lecture organized by P2MU and LP3 UM (2018) said that the challenge of education in the era of industrial revolution 4.0 was in the form of changes in the way of learning, thinking patterns, and how students act in developing creative fields of various fields [1]–[3]. This can reduce unemployment in Indonesia, especially in global market competition.

Through the above opinion, it can be seen that in the era of revolutionary industrial 4.0 world education must improve itself by adjusting the education curriculum and the development of the era [4]–[6]. Bureaucrats writing in kumparan.com (2018) suggested that many studies in

the field of curriculum implementation experienced degradation that came out of context and were no longer oriented towards achieving students' ability to understand science in the context of daily and living practices, but only around the target of achieving student competency, which is depicted on academic values.

Educational institutions have an important role in the past and the future for social development [7]–[10], while the curriculum used provides rules of discipline in preparing students for the profession that they will carry out in the future.

2. 4.0 INDUSTRIAL REVOLUTION

The industrial revolution is a socio-economic and cultural change that begins with significant technological progress. The industrial revolution first occurred in the 18th century when steam-powered machines were discovered. Steam engines make humans switch from animal power to production machines. The second industrial revolution took place in the era of 1870 when the industry turned to electricity which was able to create mass production. The third industrial revolution took place in the 1960s when electronic devices were able to automate production. And now, industry and manufacturing are facing the era of industrial revolution 4.0.

The industrial revolution was first known in Germany in 2011 which was marked by strong integration between the digital world and industrial production. The industrial revolution 4.0 is a digital era where all machines are

connected through internet or cyber system. The industrial revolution 4.0 has the potential to increase the level of global income and improve the quality of life for the world community. Besides, the increase in efficiency and productivity is higher, despite low prices and falling in various fields such as transportation and communication because price competition is getting higher.

This fourth industrial revolution is called the digital era because everything that is normally done by humans is replaced by technological sophistication. The internet is the biggest energy in the life of this era, where all information from various parts of the world can be accessed easily and quickly in seconds. Information and communication technology facilitate human relations such as face-to-face because it is not limited in their dimensions and time [7]. This also applies to traditional professions, so educational institutions experience increased demands to develop competencies that are not available in standard design education.

In the face of the all-technology 4.0 industrial revolution, human resource capabilities and skills are needed through education. Education is a driver in achieving high competitiveness and productivity by becoming a reliable operator and analyst in the face of this fourth industrial revolution.

The four pillars of education in the digital era formed by the UNESCO International Commission are learning to know, learning to do, learning to be, and learning to live together [11]. Learning to know means that students learn important science according to the level of education that is followed. Learning to do mean that students develop skills by using the knowledge they have with training so that students can solve life problems and challenges they experience. In learning to be, students learn to be intact individuals and can understand the meaning of life so they know what is best and should be done to live well. Whereas the learning together is that students can understand the meaning of living with others so that they can respect each other, respect each other. And understand the existence of dependency. Therefore, through the four pillars of education described above, students are expected to be able to become whole individuals, aware of all their rights and obligations, and master the knowledge and technology for the provision of their lives.

Education in schools must also pay attention to the applied curriculum and adjust to the development of this industrial revolution to prepare students when jumping into the field. The curriculum has an adjustment function, namely an educational tool that must be able to adjust to changes that occur in the environment. Besides, the curriculum also has a preparatory function, namely an educational tool that must be able to prepare students to continue their studies to the next level and prepare students to survive in the community if they cannot

continue their education. Of the two functions, the curriculum needs to be revised as a form of adjustment and preparation of students in the face of the 4.0 industrial revolution.

3. CURRICULUM REORIENTATION

Curriculum according to Gagne in [12] is a series of material units arranged in such a way that each unit is studied in full, with the terms of skills and abilities contained in the objectives of the previous unit must be mastered by the child first. Curriculum has several functions, namely, adjustment functions, integration functions, differentiation functions, preparation functions, selection functions, and diagnostic functions [13]–[15].

Adjustment function means that the curriculum as an educational tool must be able to direct students in adjusting themselves to their environment. The community environment is dynamic so students must have the ability to adjust to changes that occur in the environment. The function of integration means that a curriculum is an educational tool that must be able to produce a whole person in integrating with society because students are part of the community. The function of differentiation is the curriculum as an educational tool. By providing services to each student because students must have differences that must be appreciated and served well. The preparation function means that a curriculum is an educational tool that must be able to prepare students to continue their studies to the next level and prepare students to survive in society if they cannot continue their education.

The selection function means that a curriculum is an educational tool that must be able to provide opportunities for students to choose learning programs according to their abilities and interests. The selection function is related to the function of differentiation because when there are differences in students, students are given the opportunity to choose according to their abilities and interests. The diagnostic function means that a curriculum is an educational tool that must be able to help and direct students to understand and accept their potentials and weaknesses so they can develop strengths and improve their weaknesses.

By looking at the various functions described above, the curriculum needs a re-orientation to adjust to the development of the 4.0 industrial revolution. The authorized capital for acting in the industrial revolution era 4.0 is not only enough to use old literacy, namely reading, writing, and archiving) so that the curriculum needs a new orientation using new literacy but does not let go of old literacy. This is in line with the opinion of [2], [3], [7] that the new curriculum requires a transition from material-oriented knowledge and description assumptions to curricula based on information knowledge.

According to Aoun, in the Directorate General of Learning and Student Education (2018) new literacy in the face of this era is data literacy, technology literacy, and human literacy. Data literacy is related to the ability to read, analyze, and use information (Big Data) in the digital world. Data must be broadly understood, not only quantitative but also qualitative. Technology literacy is related to understanding the workings of machines that use technology applications (Coding, Artificial Intelligence, & Engineering Principles). Technology literacy is a follow-up of digital literacy which emphasizes the importance of introducing cyber media, social media, messaging services which are to be sorted and selected which trustworthy or not. While human literacy is related to the ability to communicate, collaboration, critical thinking, creative and innovation, human literacy is the output of data literacy and technological literacy [16].

The amount of unemployment that occurs at this time is not due to lack of education, but the profile of graduates with epochal developments is irrelevant. Therefore, the education curriculum in Indonesia requires the reorientation of using new literacy (data literacy, technology literacy, and human literacy) described above. In accordance with the opinion of Antonelly [7] that a new curriculum is needed in overcoming industrialization and decreasing standards of education, digitalization, and globalization by utilizing traditional academic skills, cultural and historical backgrounds of students, and design capacity to trigger students' minds and imagination so they can well adapt. Therefore, knowing the skills possessed by students and the existing learning model is very important to understand the potential and obstacles that might affect the use of the new curriculum.

4. CURRICULUM CHALLENGES AND STRATEGIES IN FACING THE AGE OF INDUSTRIAL REVOLUTION 4.0

Education is a strong foundation in shaping students to become intact human resources with the aim of humanizing humans, in this case, students. Technology development during the industrial revolution 4.0 is no longer a tool but has been embedded and becomes a necessity in people's lives. The challenge in the world of education in facing this era is the cultivation of educational values that need to be developed. With the rapid development of technology, in addition to the demands of children to be able to be competitive, there are also other things that need to be considered, namely the character of the child in selecting new information, which of course is not all in accordance with the Indonesian person.

Four educational evolution paradigms that can be found over the last two years, namely the education paradigm 1.0 using traditional expository models based

on writing and oral in making judgments, the education paradigm developing projects in groups by using open technology such as Arduino in the context of institutions and classrooms, the education paradigm 3.0 utilizes social networking in creating a more open environment to encourage creativity and participation of students, and the education paradigm 4.0 uses learning models that are tailored to the circumstances of students and their environment [17], [18].

The 4.0 technological revolution with all technology plays a major role in providing learning that supports students. So, learning will move towards individualization and student-centered because of artificial intelligence, analytic learning, and the Internet of things [19].

The values that need to be developed are: (1) learners are trained by working while learning so that thinking intelligence can be broadly developed, (2) fostering students' personalities to be dynamic, confident, brave, responsible, and independent, (3) lessons are not only given in-class hours, but also in every opportunity outside of school hours, and (4) provide a good example because by seeing for themselves directly tend to succeed in fostering the character of students [20].

Therefore, the school curriculum needs to be revised so that it is integrated with the conditions and changing times. The importance of ensuring future workers will be highly trained in facing emerging technologies and developing interdisciplinary skills that enable them to have reflective thinking [17], [19], [21], [22].

The biggest challenge for citizens is to use a variety of knowledge and skills in finding innovative solutions that are utilized by new technology [17]. So that graduates are needed to face these challenges by understanding the basic characteristics of education. Basic characteristics there are two, namely personalization and flexibility [17].

The challenges of the curriculum in the 4.0 industrial revolution must be accompanied by solutions to solve emerging problems. At present, the world of education is being intensified in preparing students as a generation that can survive and compete in the era of industrial revolution 4.0. According to the Secretary General of the Ministry of Industry, there are three important factors to encourage industrial growth, namely investment, technology, and human resources (HR). The investment and technology were acquired and purchased. Meanwhile, skilled human resources must be prepared by redesigning the curriculum that is tailored to industry 4.0. The curriculum and methods of education must adapt to the increasingly competitive business and industrial climate by using technology that can increase the efficiency and productivity of the national industry. From the statement, the curriculum needs to be re-analysed and revised so that students can become skilled human

resources according to the climate of the business and industrial world.

In line with Haris opinion, Minister of Education and Culture Muhadjir Effendy in PMBS (2018) said that in the face of the 4.0 industrial revolution, education in Indonesia requires a revision of the curriculum as capital to be able to compete. Revised the curriculum by adding five competencies possessed by students, namely, critical thinking skills, innovative creativity and abilities, good communication skills and abilities, cooperative abilities, and high self-confidence.

Critical thinking is logical and reasonable thinking by focusing on decision making in solving problems. Critical thinking is to reflect problems in depth, keep the mind open to a variety of different approaches and perspectives, distrust information that comes from various sources (oral or written), and think reflectively rather than only accept ideas from outside without significant understanding and evaluation [23].

One of the demands that the millennial generation needs in the industrial era 4.0 is positive critical thinking skills [24], [25]. This capability will be difficult to be replaced by technological developments. With critical thinking, students can evaluate each information carefully and logically for each decision. In the era of industrial revolution a lot of information entered from all corners of the world without a filter that limits students. Therefore, by strengthening critical thinking they are expected to be able to consider decisions that will be taken wisely.

Critical thinking in school is no longer an option but is expected to become a provision in the learning process in this era, so the bloom taxonomy that is applied to the learning process must be applied to a high level of thinking [24], [26]–[28]. The learning model is more directed at processes that emphasize critical thinking, namely the level C4 and above. So, the learning given to students is not only to know but to be implemented at school and outside of school. Students can be said to be able to think critically if they have a systematic, conscious way of thinking, and can distinguish between the wrong and the right.

The government has tried to incorporate critical thinking questions or HOTS (High Order Thinking Skill) into the national exam in 2018, but this has received many complaints from students because it is too difficult. Minister of Education and Culture said that it had prepared students to face the 4.0 industrial revolution by issuing HOTS questions. However, the Ministry of Education and Culture has not analyzed whether each school has implemented HOTS in the learning process so it is necessary to trace the extent to which the knowledge, understanding and ability to apply the learning concept by students to implement HOTS.

Other competencies that must be added in the

curriculum to face the industrial revolution 4.0 are creative and innovative. The ability to think critically will encourage the emergence of creativity [25], [29]. Creative is to give birth to ideas, concepts, hopes, new goals and new understanding of problems [30]. Creative is not far from innovative, where innovative people are certainly creative. Innovative according to the Big Indonesian Dictionary is to introduce something new. The millennial generation to create innovation, where innovation can be created if it has intrinsic motivation rather than extrinsic motivation. Intrinsic motivation has a very important role to play in the sustainability of the efforts needed to achieve results or creative products [30]. Motivation from within is motivation that is within oneself, while motivation from the outside is the motivation that comes from others.

So far, the curriculum in Indonesia, especially higher education, has put more emphasis on producing graduates who are ready to work. However, employment for human resources in the industrial revolution has been largely replaced by technology. For example, the bank employees needed are now getting smaller along with the proliferation of ATMs, mobile banking, and online banking. Technological advances are increasingly helping humans in banking activities because the services of ATMs etc. are not limited to space and time. Likewise in the mass media industry, now replaced by online media. Newspapers, magazines, and TV are taken by social media connected to the internet. The latest news on TV is losing fast with social media, so people prefer to search for news in online media. Of course, many dismiss human resources from various jobs.

With these problems, human resources are required to have creativity and innovation, because with these two assets, humans can not only have jobs but also can create jobs. Therefore, in addition to incorporating critical thinking, the curriculum must also include creative and innovative thinking so that high-level thinking skills of students can develop.

Some things that need to be taken care of in developing the creativity of students adhering to the IBM Executive School that the first to abandon the learning method which includes reading, teaching, testing, and memorizing [31]. The traditional method is quickly lost from the memories of students. Most education places too much emphasis on questions that have specific answers or one. Even though the key to creativity is to provide questions whose answers are many and not specified correctly or not specifically.

Second, realizing that we are not learning to be creative but we must be creative people through training that supports the development of creativity. For example, a marine to become a marine member does not study manually (reading), but through a variety of rigorous training in the training camp. Therefore, content standards and curriculum process standards must contain various ways and tactics in developing creativity by

replacing books and classes with puzzles wrapped through simulations and games.

Third, creativity related to the knowledge possessed by students and schools as a means to develop creativity possessed by students who may not yet realize what strengths they have. The IMB Executive School never blames students who answer incorrectly, but they respect the mistakes of students. Because according to them there are no bad and wrong ideas, but rather how they build and develop better ideas that are possessed by students.

Communicative is an ability that is good at talking or communicating with other people. The essence of communicative competence is to know the grammar and vocabulary of the language concerned, to know the rules of speech, to know how to use and respond to various actions and speech, and to know how to use language appropriately [32]. A person who has good communication skills and is skilled can face the times because of course, he has extensive knowledge so that he can understand and be understood when talking to other people. Technology does facilitate long-distance communication, but it is even more alarming because it loses touch and a sense of communication.

Effective communication requires interaction between two people or more in giving and receiving information equipped with a supportive attitude so that the information delivered can be received well. In this era there is communication through mobile, namely video calls, using video calls can certainly see the attitude of the giver and recipient of information. But the obstacle of a video call is that an unstable network can make the information not conveyed properly. Therefore, good communication is needed using messages before and after making a video call to unite the equation between the recipient and the informant.

Cooperative or in other words cooperation is a social nature that is part of people's lives in everyday life. Cooperation is to carry out activities together to achieve the desired goals together [33]. This competency must be instilled in students as a provision for themselves to cooperate outside of school. With good cooperation, activities can be overcome easily. Humans are social beings who will certainly interact with other humans.

The last competency that must be emphasized in the era of industrial revolution 4.0 is self-confidence. Confidence is a feeling that someone has in doing something. Self-confidence is an important aspect that must be owned by someone [34], [35]. With self-confidence, a person can actualize his abilities. Confidence can be influenced by the abilities and skills possessed. Therefore, students need to be invested in the nature of self-confidence so that they are able to actualize themselves according to their abilities. Confidence related to other competencies above. When students feel confident, then he will try to think critically, think creatively, and be innovative, communicative, and cooperative with other students, teachers, and other

people outside of school.

In accordance with the various opinions above, here are nine educational trends in the industrial revolution 4.0 according to [36], namely (1) learning that is conducted anytime and anywhere, (2) personalized learning for each student, (3) participants students have choices in determining how they want to learn, (4) students more often do project-based learning, (5) learners learn more directly, (6) students are required to think critically in conducting statistical analysis, (7) students' knowledge is tested when they work in the field, (8) the opinions of students will be considered in designing and updating the curriculum, and (9) students will become more independent.

5. CONCLUSION

The conclusion and suggestion from the explanation above are that the industrial revolution 4.0 also has an impact on the world of education so that the challenges of education in Indonesia are increasingly high. The strategy in dealing with these challenges is to reorient the educational curriculum by adjusting to the times. Curriculum revision emphasizes the addition of five competencies that students must have in order to be able to survive and compete in the industrial revolution 4.0. The five competencies that should be possessed by students, namely, the ability to think critically, have innovative creativity and abilities, good ability and communication skills, ability to cooperate, and have high self-confidence. With these five competencies, it is expected to reduce unemployment in Indonesia because these competencies are adjusted to the current situation.

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