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STUDENT READINESS IN FACING THE INDUSTRIAL REVOLUTION 4.0, EDUCATION 4.0, AND SOCIETY 5.0

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Abstract: *The industrial revolution 4.0 which is marked by the development of technology and information has an impact on education and people's lives. This study intends to know the understanding and readiness of students in facing the Industrial Revolution 4.0, Education 4.0, and Society 5.0. This research method is descriptive. The results showed that the majority of students had understood the industrial revolution 4.0, Education 4.0, and Society 5.0. The abilities that must be mastered by students are soft skills and hard skills. Students hone skills through social media, webinars, training, educational institutions, workplaces, communities, daily habits, student organizations, SMEs, and seminars.*

Keywords: *Industrial Revolution 4.0, Education 4.0, Society 5.0.*

INTRODUCTION

The era of the industrial revolution 4.0 was marked by the development of the internet which penetrated various fields of life. Industry 4.0 standards have revolutionized by integrating several technologies, such as artificial intelligence (AI), the Internet of Things (IoT), cloud computing, cyber-physical systems (CPSs), and cognitive computing. The main principle behind Industry 4.0 is to make the industry "smart" by connecting machines, and devices that can control each other (Kumar et al., 2021). The development of IT technologies and tools enables collaboration between various services or processes and products, information sharing, and monitoring of process performance (Cnrs, 2021). The revolution industry 4.0 concept introduces innovative technologies that propose new ways of connectivity and data management (Cloud Technologies) and new environments for knowledge sharing and training (Augmented and Virtual reality) in production. This effort is reshaping the current form of production machines and upgrading them to cyber-physical systems (Mourtzis et al., 2018).

Industry 4.0, which is the fourth industrial revolution, has a positive impact not only on the manufacturing process but also on the digital transformation of the organization. The main benefits of Industry 4.0 are increased operational efficiency, a high level of automation, and higher operational productivity and the main features of Industry 4.0 are production optimization & customization, automation & adaptation, automated data exchange, services, and human interaction. The benefits of industrial revolution 4.0 in knowledge, technology, and expertise make not only industrial companies have high ambitions to study relevant technologies, but also academics are interested in changing the educational curriculum. to incorporate and reflect new technologies, concepts, and paradigms (Tekinerdogan et al., 2019).

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Due to the industrial revolution, more and more highly qualified workers are needed, while the demand for unskilled workers is decreasing. Requirements on the competency profile of future changing workers must have broad and multidisciplinary knowledge of new and innovative technologies and the ability to introduce digital transformation in companies (Goldin et al., 2022).

Companies to survive in an increasingly competitive and global market need graduates who can manage change, a challenge facing 21st-century engineers. Engineering school graduates in this new era must be able to move from technology to solution and from solution to operations (Broo, Kaynak, & Sait, 2022). Realizing an industry 4.0 implementation project is strongly influenced by successful individual and organizational learning processes, namely the development of multidisciplinary strategies, and digitally supported work-integrated training or learning (Keller et al., 2021). This education system aims to accelerate a new and experienced workforce with innovative Industry 4.0 proposals, creating a sustainable environment that will accelerate its implementation in manufacturing (Mourtzis et al., 2018). The development of technological transformation in the field of education will require the support of the transition of teachers and students to a new worldview, which is suitable for the digital era (Tsybulsky & Levin, 2019). The shift from traditional teaching courses to the Education 4.0 framework requires careful design and a combination of traditional manufacturing techniques with the technology introduced by Industry 4.0 (Mourtzis et al., 2018).

Currently, education in Indonesia is entering the era of 4.0 or education 4.0 with online learning or using the internet as a liaison between teachers and students. The concepts proposed by Education 4.0 in higher education are: implementing new learning methods, innovative didactic, and management tools, and smart sustainable infrastructure especially equipped with new ICTs to improve knowledge generation and information transfer processes. The incorporation of these resources during the teaching and learning process will support the training and development of critical competencies that today's students want (Miranda et al., 2021).

Education 4.0 aims to create an educational paradigm that prepares the future workforce that includes competencies from technical, methodological, social, and personal skills. Education 4.0 concentrates more on interdisciplinary education and individual assessment that focuses on skills and learning progress (Goldin et al., 2022). Students must develop adequate integrated competencies in terms of knowledge, skills and attitudes that can be applied to industrial contexts (Gajek et al., 2022). This is because workers must be able to use new digital tools and continue to update their knowledge along with rapid technological advances (Goldin et al., 2022).

Specific skills for Industry 4.0 technologies that the education system needs to impart to their graduates need to take into account several modern educational trends which include:

opportunities to study at different times and places; personalized learning based on students' abilities; use of new learning tools, tools and resources; remote engineering laboratory; application of project-based and problem-based learning approaches; the use of experiential and collaborative learning; student involvement in curriculum design; and improving mentoring approaches (Centea et al., 2018).

The industrial revolution occurred because of the rapid development of information, technology, and social life so it not only had an impact on education but also on society. This is because with this revolution there are possibilities, opportunities, and advantages that arise economically, sociologically, and demographically for institutions or organizations (Calp & Bütüner, 2022). The latest revolution, Society 5.0 is one such example that focuses on making more use of technologies such as artificial intelligence (AI), cyber-physical systems, autonomous robots, 3D printers, cloud computing, and more, all of which are components of Industry 4.0 (Calp & Bütüner , 2022).

Society 5.0 was proposed by the Cabinet of Japan to balance economic progress with solving social problems in Japanese society. In general, the industrial revolution and society have interacted deeply with each other since the first industrial revolution (Huang, et al., 2022). “The idea underlying the Japanese Society 5.0 Program is that the rapid development of information technology now allows the combination of cyberspace – information – with physical space – the real world. The fusion of the two is the Cyber-Physical System (CPS), real-world objects that are enhanced and combined with information. This is expected to bring about big changes in society.” Therefore, it is necessary to change the current higher education system, which teaches to transfer information to knowledge, into the development of effective and secure collaboration capabilities with artificial intelligence (Nagy & Hajrizi, 2019).

The implementation of Society 5.0 is essentially an embodiment of parallel intelligence between the physical community and the virtual community (Wang et al., 2016). The purpose of using technology is to improve living conditions and ensure social development and a sustainable level of well-being by taking into account the interests of society (Calp & Bütüner, 2022). Education in the era of society 5.0, allows students in technology-integrated learning activities that have been designed to replace the role of educators or are controlled by educators remotely.

METHOD

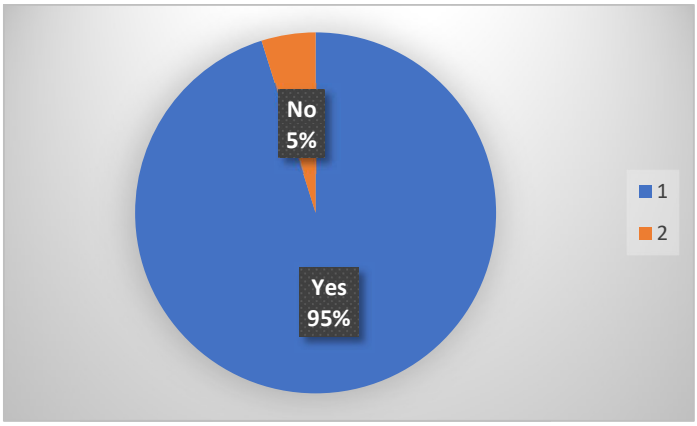
This research uses a descriptive method. The research wants to describe the understanding and readiness of students in facing the Industrial Revolution 4.0, Education 4.0, and Society 5.0. Data collection techniques in this study used a questionnaire. The resource persons are students. The resource persons in this study are students.

RESULT AND DISCUSSION

Technological developments have resulted in changes and adaptations in various fields including education. The existence of the industrial revolution 4.0 makes learning in universities adjust to integrating technology into learning. The system that integrates learning with technology in education 4.0. Education 4.0 is important to support students in facing the era of society 5.0 so that they can use technology to find solutions to problems and to improve the quality of human resources.

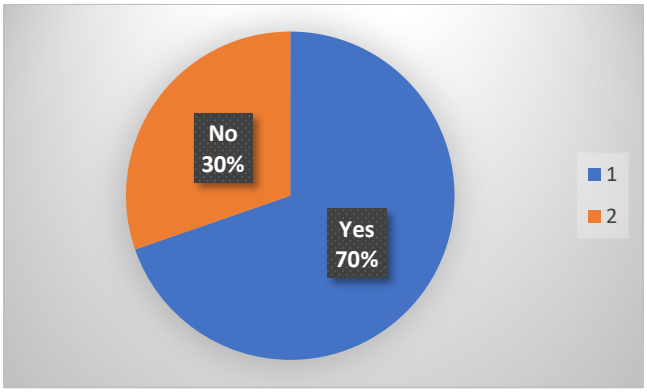
1. Students' understanding of the Industrial Revolution 4.0

Industrial revolution 4.0 changes the activities of various sectors with the support of technological developments. Students are prepared as well as possible to become qualified human resources and can keep up with existing developments. Students who know about the Industrial Revolution 4.0 out of 330 respondents, there are 314 students or 95%. Meanwhile, those who did not know about the Industrial Revolution 4.0 were 16 students, or 5%. The industrial revolution makes it easier for students with sophisticated technology to develop their skills.



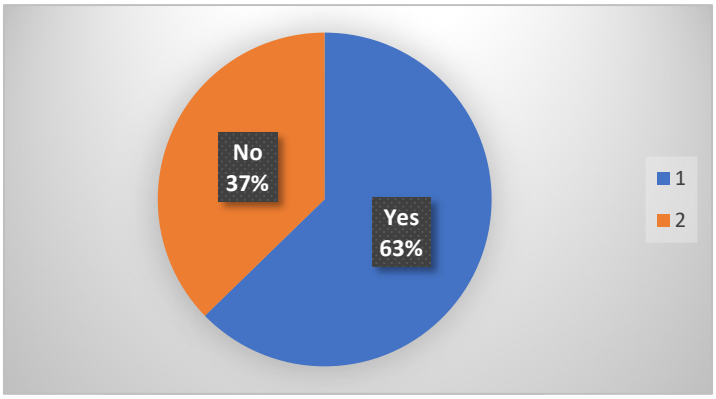
2. Students' understanding of Education 4.0

Education 4.0 is one of the responses to the industrial revolution 4.0. Education 4.0 integrates technology and the internet as a liaison between lecturers and students so that they need skills in using technology both in finding, managing, and conveying information. Students who know about Education 4.0 are 230 students or 70%. While those who do not know about Education 4.0 are 100 students or 30%.



3. Students' understanding of Society 5.0

Students the era of society 5.0 are expected to be able to take advantage of technology as a solution to a problem or another. Students in facing the era of society 5.0 are prepared to be able to develop critical and creative thinking skills as well as the ability to enrich literacy. Students who know about Society 5.0 are 207 students, or 63%. Meanwhile, those who did not know about Society 5.0 were 123 students, or 37%. Students in the era of society 5.0 will face learning that can be done anywhere and anytime.



4. Must-have skills

The abilities that students must master to face the Industrial Revolution 4.0, Education 4.0, and Society 5.0 are soft skills and hard skills. 10 skills that released by the World Economic Forum in the face of changes in 2022 and the following year, are:

a. *Complex problem solving*, namely the ability to think clearly and deeply about a problem by identifying, selecting information related to the problem, determining solution options and then evaluating them, and implementing options as solutions in overcoming problems.

b. *Critical thinking,* namely the ability to think critically and provide feedback accompanied by logical reasons.

c. *Creativity*, namely the ability to find something unique and original. It doesn't have to be completely new, but you can also develop what already exists.

d. *People management*, namely the ability to manage including leadership skills.

e. *Coordinating with others*, namely the ability to work together with others, both inside and outside the team.

f. *Emotion intelligence*, namely the ability to regulate emotions. This includes the ability to identify, manage and utilize emotions.

g. *Judgment and decision making*, namely the ability to make decisions under any conditions, including when under pressure.

h. *Service orientation*, i.e. The ability to serve, either for the company or customers without expecting mere rewards.

i. *Negotiation*, namely the ability to negotiate or bargain in aspects of work.

j. *Cognitive Flexibility*, namely the ability to transfer in thinking according to the necessary needs.

For students to be superior, creative, and innovative, the skills that must be mastered are the ability to think critically, an advanced mindset, a Growth Mindset and, good Mind Mapping abilities, polite ethics, cultured character, mentally strong and prosperous, and good decision-making skills. Other skills that must be possessed are computers, the internet, science and technology, skills, and socializing.

5. Resources to hone skills

Students can obtain information and hone their skills to support the Industrial Revolution 4.0, Education 4.0, and Society 5.0 from various sources. Students can hone skills from webinar sources, social media and YouTube, campuses, and the surrounding environment. Sources that are sought after are webinars, social media, and YouTube 67%. This is because of the ease of access and can be done anywhere and anytime. The ability obtained from the university is 27% and from the environment around 6%. Skills can be honed through training, the internet, formal and informal educational institutions, workplaces, communities, daily habits, student organizations, SMEs, seminars, and so on.

CONCLUSION

The majority of students already know about the industrial revolution 4.0, education 4.0, and society 5.0. The abilities that must be mastered by students are complex problem solving, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgment, and decision making, service orientation, negotiation, cognitive flexibility, advanced mindset, having a growth mindset and mental ability. Good mapping, ethics, cultured character, strong mentality, computer skills, internet, science and technology,

skills, and abilities in socializing. Students can hone skills through social media, webinars, training, educational institutions, workplaces, communities, daily habits, student organizations, UKM, and seminars.

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