Curricula:
Journal of Curriculum Development

Learning models innovation in Industrial Revolution 4.0 era

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ABSTRACT

The era of the Industrial Revolution 4.0 has created a shift in every dimension of life, one of which is the education dimension. In anticipating the rapid transformation that is taking place, education must always develop its competence and academic innovation. This study aims to analyze the education that occurs, the learning models used, as well as the innovative curriculum set in the era of the Industrial Revolution 4.0. The method used in this research is the literature study method. The data generated using this method were re-analyzed through the stages of reading and recording data as research material to processing the research materials. The study results show that the Industrial Revolution 4.0 era resulted in changes in human life patterns due to the influence of technological devices. This change underlies the design and establishment of a new innovative curriculum that is in accordance with the 4.0 revolution era. The 2013 curriculum as a complement to the previous curriculum is here to make education accustomed to the use of technological devices. Education as a place to educate the nation's successors needs to keep up with all the changes that occur so that learning can be obtained by students who are not left behind from the latest information.

ABSTRAK

Era Revolusi Industri 4.0 telah menciptakan pergeseran pada tiap dimensi kehidupan, salah satunya adalah dimensi pendidikan. Dalam mengantisipasi cepatnya transformasi yang terjadi, pendidikan harus selalu dikembangkan kompetensi serta inovasi akademisnya. Penelitian ini bertujuan untuk menganalisis pendidikan yang terjadi, model pembelajaran yang digunakan, serta kurikulum inovatif yang diterapkan di era revolusi industri 4.0. Metode yang digunakan dalam penelitian ini adalah metode studi pustaka. Data yang dihasilkan menggunakan metode tersebut, dianalisis kembali melalui tahapan membaca serta mencatat data sebagai bahan penelitian hingga mengolah bahan-bahan penelitian tersebut. Hasil penelitian menunjukkan bahwa era revolusi industri 4.0 berakibat pada perubahan pola hidup manusia dikarenakan pengaruh perangkat teknologi. Perubahan inilah yang mendasari perancangan dan penetapan kurikulum inovatif baru yang sesuai dengan era revolusi 4.0. Kurikulum 2013 sebagai penyempurnaan kurikulum sebelumnya hadir untuk membuat pendidikan yang terbiasa dengan penggunaan perangkat teknologi. Pendidikan sebagai tempat mendidik penerus bangsa perlu mengikuti segala perubahan yang terjadi supaya pembelajaran yang didapat peserta didik tidak ketinggalan dari informasi terbaru.

Kata Kunci: *Kurikulum; model pembelajaran inovatif; Revolusi Industri 4.0*

INTRODUCTION

The challenges and opportunities that arise in the era of Industrial Revolution 4.0 encourage innovation and creativity in various aspects of life. Connectivity, interaction, and digital systems have significantly increased in this era. This increase has led to increasingly blurred boundaries between humans, machines, and other resources. Consequently, information and communication technology have profoundly impacted various facets of life. One of the impacts observed in Indonesia is within the education sector. According to Lase (2019), Education 4.0 serves as a response to the needs arising in the context of the Industrial Revolution 4.0. This is because the fusion of humans and technology can lead to the innovative and creative generation of new opportunities. As a result, education in the Industrial Revolution 4.0 era is expected to shape an innovative, competitive, and creative generation.

Professor Klaus Schwab, a renowned economist from Germany, was the first to introduce the concept of Industrial Revolution 4.0. He elucidated this concept in his book entitled "The Fourth Industrial Revolution." Professor Klaus Schwab explained that Industrial Revolution 4.0 has the potential to alter patterns of living, working fundamentally, and social interactions with others (Lase, 2019). By considering the relationship between Education 4.0 and the Industrial Revolution 4.0, it is hoped that the government can reassess the relevance of education and employment to effectively respond to the changes, challenges, and opportunities of the Industrial Revolution 4.0 era, all while still prioritizing humanities aspects.

In the research conducted by Syamsuar & Reflianto (2019), titled " Pendidikan dan Tantangan Pembelajaran Berbasis Teknologi Informasi di era Revolusi Industri 4.0," the article elucidates Indonesia's readiness to address the educational challenges presented by the Industrial Revolution 4.0 era. It emphasizes the need for Indonesia to enhance the skills and capabilities of its human resources in harnessing advancements in digital technology. This involves preparing suitable curricula, ensuring educational readiness, and establishing the necessary facilities and infrastructure.

Furthermore, another study authored by Koesnandar (2020), titled "*Pengembangan Model Pembelajaran Inovatif Berbasis Teknologi Informasi Dan Komunikasi (TIK) Sesuai Kurikulum 2013*" underscores the importance of implementing various innovations that align with the 2013 curriculum. One such innovation involves the creation of an Innovative Learning Development service application.

This research stands apart from previous studies by emphasizing the development of innovative learning models that leverage technology tools. It delves into the educational landscape, the learning models employed, and the innovative curricula implemented in the Industrial Revolution 4.0 era context.

LITERATURE REVIEW

Industrial Revolution 4.0

The Industrial Revolution is characterized by very rapid changes in the manufacturing or production processes. During this era, manufacturing or production tasks, traditionally performed by humans, are gradually being replaced by machines due to technological advancements. Machine-produced goods carry higher commercial value (added value) (Suwardana, 2018).

Throughout its development, the Industrial Revolution has occurred in four distinct stages. The first is commonly referred to as Industrial Revolution 1.0, during which human civilization achieved the invention of the steam engine. Next came the Industrial Revolution 2.0, which transitioned from steam engines to electric-powered machines. The third stage is known as the Industrial Revolution 3.0, marked by the development of technology enabling automatic machines in production processes that can move and be controlled. Finally, the Industrial Revolution 4.0 emerged, characterized by advanced digital technology. In the 4.0 revolution, jobs previously reliant on human labor began to be replaced by digital technology, making human labor less essential (Sharma & Singh, 2021; Kurt, 2019).

The definition of Industrial Revolution 4.0 varies, partly due to ongoing research and development in this field. Industrial Revolution 4.0 refers to significant changes in how humans produce, communicate, and interact with rapidly evolving technology in today's era. Artificial intelligence, developed and produced by humans, is pivotal in connecting humans with machines. In essence, Industrial Revolution 4.0 is an industry that combines network technology with automation technology. According to Herman et al., cited in Sawitri (2019), Industrial Revolution 4.0 represents the era of digital industry where all parties collaborate and communicate directly, anytime and anywhere, using information technology such as the internet, CPS, IoT, and IoS to create innovations and optimize efficiency and productivity.

Any change inevitably has positive and negative impacts on human life, and the same holds for Industrial Revolution 4.0. Sawitri (2019) provides insights into the two impacts of Industrial Revolution 4.0.

The benefits of implementing the Industrial Revolution 4.0 model include:

1. Industrial Revolution 4.0 has the potential to empower individuals and communities, creating new opportunities for economic, social, and personal development.

2. It creates favorable conditions for people to work, especially in industrial activities.

3. Data and production facilities connected to the cloud also ensure better data security, organization, and conciseness.

4. The possibility of human error is reduced because a "controlled" computer can produce consistent work.

5. The system used may be more complex, enabling everything to be monitored and controlled directly.

Disadvantages of implementing the Industrial Revolution 4.0 model are:

1. Industrial Revolution 4.0 has the ability to reduce the need for human labor in the process, as everything is done automatically using machines.
2. Data security issues can arise when integrating new systems and increasing access to them.
3. Issues involving privacy, such as ownership of information and so on.
4. It still requires strict human control in the production process.

Learning Curriculum

In the realm of education, educational programs, commonly referred to as the curriculum, have become necessary as they can determine the direction and goals of education. The curriculum can be considered the heart of a school. According to Campbell-Phillip (2020), The curriculum directs the school in designing a learning program supported by human resources, namely qualified teachers and other relevant learning resources according to the needs of students and educational goals.. However, debates regarding the curriculum persist, raising questions about whether it solely refers to a course outline or encompasses all the experiences teachers provide to students throughout their education. The experiences students acquire from the programs offered by schools are diverse and extend beyond classroom learning, contributing to their development and influencing changes within them.

The curriculum is a structured and detailed plan to be implemented in an educational institution, to guide the learning process and provide direction for teachers and students regarding what to learn and how to implement it. According to Ronald C. Doll cited in Wirianto (2014), the curriculum is a plan that is offered and not imposed, meaning that the experiences the teacher provides are not necessarily the same as those offered. Therefore, the entire concept of general education can and should be ideal. The school curriculum should address needs, not just abilities. Thus, guidance and direction are not solely the responsibilities of teachers but also of schools, whose members include teachers, principals, and other staff involved in education.

Since 1945, the national education program or curriculum has undergone numerous changes. These changes are an inevitable result of the impact of alterations in the political, cultural, social, economic, scientific, and technological systems of our country's education system. As a set of educational plans, the school curriculum must dynamically evolve according to the needs and societal changes. While all national curricula are designed based on Pancasila and the Undang-Undang Dasar1945, the variation lies in the primary emphasis on educational goals and learning approaches to achieve or realize them. Curriculum changes are linked to specific educational objectives in each instance, aiming to advance national education (Wirianto, 2014).

Soetopo and Soemanto, cited in Lubis (2022), noted that factors considered to be determining factors for curriculum changes include:

1. The independence of several regions in countries around the world, it has made them aware that they have long been educated in a system that does not align with the ideals of an independent nation. Consequently, they have started to plan significant changes to the existing curriculum and education system.

2. The swift progress of science and technology has influenced various fields of knowledge taught in schools, prompting changes in the curriculum's content and implementation strategy.

Population growth in various countries around the world is increasing rapidly. Alongside this situation, the number of people in need of education is also rising. This necessitates a review of, and if necessary, modifications to the methods or approaches currently employed in education in order to meet the increasing educational demands.

Learning Model

As one of the main components in the learning process, the learning model holds a crucial position in guiding educators and students toward achieving the established educational goals. The learning model utilized during the learning interaction process serves as a bridge to facilitate changes in student behavior, both adaptively and generatively (Yazidi, 2014).

A learning model is a plan or framework that can be utilized to create a program or curriculum, design learning materials, and provide guidelines for guiding learning in the classroom or other educational settings. Learning models can be preferred, allowing teachers to select suitable and effective learning models to attain their teaching objectives (Hadiapurwa et al., 2021; Marsidin, 2022). According to Zubaedi, cited in Mirdad (2020), a learning model can be understood as a model used to formulate a curriculum, structure materials, and offer instructions to educators.

The role of the learning model concerning the Kurikulum 2013 is undeniably significant. As a national curriculum, the utilization of various learning models to support the continuity of this curriculum is of utmost importance for educators to consider. Given the urgency of incorporating models into a curriculum, the introduction of updates or innovations, particularly within the framework of the Kurikulum 2013, is necessary. The implementation of various innovations aligned with the Kurikulum 2013 should be pursued, with one such innovation being the creation of an Innovative Learning Development service application (Koesnandar, 2020).

METHODS

This article is the outcome of library research. As per Khatibah, library study, or library research, involves a systematic series of activities, including collecting library data, processing it, and drawing conclusions to address the problems at hand (Ramanda et al., 2019). A literature study is a research method employed to gather information and data by reviewing and exploring various books, journals, and documents, as well as other sources of data and information considered relevant to the research or study (Supriyadi, 2016).

The steps in library research, according to Kuhlthau as cited in Sari & Asmendri (2020), encompass the following:

1. Selecting a topic: This involves examining current phenomena under discussion.

2. Information Exploration: The author explores information by reading sources related to the chosen topic, such as journals or books.

3. Determining the research focus: After reviewing the information sources, the author defines the research focus in alignment with the chosen topic.

4. Collecting data sources: Research data is gathered by searching through pages providing information in journals and e-books. This is accomplished by entering keywords into search engines, such as Google Scholar and Sinta indexed journals.

5. Preparation of data presentation: The collected data is evaluated to obtain research data that aligns with the research topic and focus.

6. Compilation of reports: The article is prepared by analyzing the research data in a descriptive manner.

Topic selection is undertaken by examining current phenomena under discussion. The author explores information by reading sources relevant to the chosen topic, such as journals or books. After reviewing the information sources, the author determines the research focus in alignment with the chosen topic. Research data collection involves browsing pages of journal information providers by entering keywords into search engines like Google Scholar and Sinta-indexed journals. Subsequently, the author evaluates the data search results to acquire research data suitable for the research topic and focus. The article is then prepared by analyzing the research data descriptively.

RESULT AND DISCUSSION

The Industrial Revolution 4.0 impacted all aspects of life, including education. It commences with the digitization of the education system, which necessitates every component in education to adapt to the ongoing changes. The era of the Industrial Revolution 4.0 has brought about a shift in the competencies required by human resources. Consequently, education must make adjustments and enhance the relevance of education through innovative learning processes. This development should align with the ever-evolving needs and advancements in science and technology. Moreover, it should prioritize literacy and competence in the era of globalization.

Education in Era Revolusi Industri 4.0

In the era of Industrial Revolution 2.0, learning activities still did not incorporate the use of technology. However, with the advent of the Industrial Revolution 4.0, learning activities began integrating and utilizing technology. The Industrial Revolution 4.0 also positively impacts the world of education (Dewi & Fitria, 2019). As the learning system evolves, distance and territorial boundaries no longer hinder individuals from gaining knowledge and accessing the broader world. Nonetheless, there are negative consequences if we fail to address the current challenges, such as a lack of understanding about multicultural education, particularly among the younger generation. This could potentially lead to the erosion of the national identity of the Indonesian people (Ningsih & Rohman, 2018). The role

of education in the current era of Industrial Revolution 4.0 is to prepare a generation capable of interacting with individuals from diverse parts of the world. Ki Hajar Dewantara popularized the term "tri educational centers," which refers to the understanding that education occurs in three environments: family, school, and community. These three educational centers must collaborate to educate students (Zidniyati, 2019).

Innovation is the key to enhancing sustainable productivity, subsequently accelerating the nation's economic growth (Utami et al., 2019). Indonesia requires innovation in the educational sector in the current era of the Industrial Revolution (Rahim et al., 2019). One of the actions that can support the success of new learning strategies and techniques is the utilization of information technology.

The Ministry of Research, Technology, and Higher Education has presented five crucial elements that must be considered and implemented to bolster economic growth and enhance the competitiveness of the Indonesian nation in the era of the Industrial Revolution 4.0. These elements include a) the development of a more innovative learning system in higher education; b) the restructuring of institutional policies in higher education to be adaptive and responsive to the Industrial Revolution 4.0; c) the preparation of human resources, particularly lecturers, researchers, and engineers who are responsive, adaptive, and reliable in facing the challenges of the Industrial Revolution 4.0; d) breakthroughs in research and development that support the Industrial Revolution 4.0; and e) innovation breakthroughs and the strengthening of innovation systems to increase industrial productivity and foster technology-based startup companies.

Innovative Learning Models in the Industrial Revolution Era 4.0

Innovative learning can be defined as a form of learning designed to solve problems in new and creative ways. In this context, students can actively and happily engage in the learning process, leveraging their own potential and creativity, as there is no coercion for students to work. Only educators can guide students innovatively and organized (Umamah et al., 2019). Educators should implement creative and innovative learning methods to foster the development of creative students. Their students' achievements often measure the success of an educator in teaching. Innovative learning is devised with a focus on attaining educational goals. In the teaching and learning process, planning a learning program is of utmost importance as it determines the implementation and evaluation steps.

Mirdad (2020) outlined several characteristics of learning models, including:

1. Being rooted in educational theory and learning theories from specific experts.

2. Having specific educational missions or goals.

3. Serving as a guide for enhancing teaching and learning activities in the classroom.

4. Comprising elements such as a sequence of learning steps (syntax), reaction principles, social systems, and support systems. These four components offer practical guidance for teachers when implementing a learning model.

5. Yielding results, including the effects of learning and the consequences of guidance.

6. Incorporating instructional design based on the guidelines of the chosen learning model.

These learning models contribute to more effective and engaging educational practices. The Kurikulum 2006 (KTSP) continues to emphasize society's educational conditions, characteristics, and social culture. In contrast, the Kurikulum 2013 expects educators and students to use technological devices proficiently. The Kurikulum 2013 curriculum incorporates three learning models: Discovery Learning: The Discovery Learning model guides students to independently discover the concepts being taught, enabling them to acquire previously unknown knowledge (Liando, 2021). These learning models are integrated to facilitate more effective and engaging educational practices.

The Problem-Based Learning Model is an educational approach in which students engage in solving problems that arise in their everyday lives. Kamdi, as cited in Yuafian & Astuti (2020), described the problem-based learning model as a framework that involves students in addressing problems through several steps following the scientific method. This approach aims to equip students with the knowledge and related skills necessary to solve problems effectively. Delise, on the other hand, asserted that the Problem-Based Learning (PBL) model is specifically designed to assist educators in cultivating students' critical thinking abilities and problem-solving skills while they engage with the learning material. The primary objective of this learning model is to foster the development of students' cognitive processes in finding solutions.

The Project-Based Learning model, as described by Daryanto in Effendi et al. (2019), is an educational approach that employs projects as a platform for learning activities. In this context, students engage in activities such as discovery, assessment, interpretation, synthesis, and information creation to produce various forms of academic achievement. This learning approach utilizes problems as the initial step, allowing students to acquire new knowledge based on their experiences in practical activities. In essence, Project-Based Learning involves incorporating a project into the learning process, which can take the form of an individual project or a group project.

Innovative Curriculum in the Industrial Revolution Era 4.0

Learning is a fundamental aspect of today's society. Education's presence cannot be separated from the role of the curriculum, which serves as a system of rules governing the learning process. The curriculum's existence reflects the insights and expertise of educational figures who are considered competent in their fields. Consequently, the curriculum is regarded as a crucial tool in endeavors to enhance the quality of education (Achadah, 2020).

The curriculum must encompass numerous political interests, aspirations from diverse groups and ethnicities, as well as the desires of various other education stakeholders, including the community, students, and the state's educational mission for advancing national life and fostering national character (nation-building). To accommodate these varied aspirations and hopes, the school curriculum needs to be tailored to children's potential as educational subjects, enabling them to become the individuals envisioned and desired. In essence, the curriculum should be structured in a way that aligns with the expectations and aspirations of education stakeholders and aligns with meeting students' self-realization needs, cultural development, and community advancement (Fernandes, 2019).

The curriculum should be designed in synergy among the government, industry, and education. This synergy is essential to create a curriculum that connects and aligns educational institutions with the industrial world (Wardina et al., 2019). In the face of the Fourth Industrial Revolution era, the curriculum must be reimagined and improved. Education in the 4.0 era is crafted to prepare a new generation to develop the skills required to navigate dynamic technological advancements and an unpredictable world.

In delivering the learning process, the curriculum must effectively engage students in an interactive, innovative, inspiring, and enjoyable manner. It should motivate students to actively participate in learning and present challenges to encourage the development of talents and interests aligned with their psychological makeup.

Discussion

The curriculum is a comprehensive set of plans and arrangements on the attainment of learning objectives for graduates. It encompasses study materials, processes, and assessments as guidelines for organizing education. The curriculum comprises several interconnected elements forming a system. This curriculum system operates gradually, cyclically, and continuously (Tristaningrat, 2020). By comprehending and mastering the curriculum, educators can select and define the direction and objectives of learning and suitable teaching methods, learning techniques, learning resources, and assessment tools appropriate for the subject matter used in the teaching and learning process (Syam, 2019).

Adopting learning models such as discovery, problem-based, and project-based learning in schools and higher education institutions is expected to transform students' nature and mindset. Consequently, educational institutions must be capable of nurturing and harnessing students' interests, talents, and potential.

To confront the challenges of the Industrial Revolution 4.0 era, educational institutions have no choice but to systematically update and enhance their curriculum design by preparing the necessary tools within the school environment and the broader social context. This includes providing devices like computers and laptops that support the Kurikulum 2013 in the social environment, aiming to facilitate students' learning activities beyond the confines of the classroom. Systematic curriculum planning ensures that the educational process meets the desired expectations and goals. The curriculum serves as the initial blueprint for achieving educational objectives by describing the desired competencies for graduates (Nazila, 2019).

CONCLUSION

Essentially, the Era of the Industrial Revolution 4.0 demands that educators possess creativity and innovation skills for realizing and updating curriculum implementation. They also need to have sufficient skills to compete both locally and internationally. Furthermore, in the Era of the Industrial Revolution 4.0, students are expected to acquire 21st-century skills, which include critical thinking, creativity, innovation, collaboration, and high self-confidence. As a crucial component of education, the curriculum must be meticulously designed to compete effectively in the 4.0 Industrial Revolution Era. It must be capable of

addressing all the challenges and requirements of the broader community. Consequently, continuous updates and ongoing development of the curriculum are essential.

Learning is fundamentally an interactive process between educators and students, encompassing synchronous and asynchronous interactions. Due to these differing modes of interaction, various learning models are employed in learning activities. Within the curriculum, a range of learning models exist, each serving as a framework or pattern that guides learning planning. The selection and application of these learning models must aim to empower students to excel in the 4.0 Revolution Era. By choosing an appropriate learning model, educators can attain learning objectives with maximum efficiency, ensuring that the demands of education in the Industrial Revolution 4.0 are met and yield satisfactory results.

Hence, the careful selection and use of learning models in the learning process are pivotal, as they enable students to develop 21st-century skills in line with the Kurikulum 2013 or any curriculum designed to cater to the needs of the 4.0 Industrial Revolution Era. In future research endeavors, it is advisable to explore the implementation of prototype curricula in schools and higher education institutions. It would be beneficial to employ observation and interview techniques for more precise data collection, thereby enhancing the accuracy of research outcomes. Additionally, researchers should incorporate the latest reading materials to ensure that articles remain relevant to the current context.

AUTHOR'S NOTE

The author declares that there is no conflict of interest regarding the publication of this article. The author confirms that the data and content of the article are free from plagiarism.

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