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Curriculum development based on industrial revolution 4.0 at the Toyota Indonesia community academy: A case study

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Abstract
The objective of this research is to provide an in-depth explanation of the development of a curriculum centered around the fourth industrial revolution at the Toyota Indonesia Community Academy.
The research was carried out utilizing descriptive qualitative research at the Toyota Indonesia Community Academy. The informants in this research study included the director of the community academy, the deputy director of curriculum, the deputy director of student affairs, and the head of the teaching factory unit. Information was gathered through interviews, observations, and documentation analysis. The acquired data is subsequently evaluated using the methodology outlined by Miles and Huberman, which includes the stages of data collection, data condensation, data display, and conclusion.
The findings of the research are as follows: (1) The Competency Standards for Graduates of the Toyota Indonesia Community Academy Diploma in Two Four-Wheeled Vehicle Assembly Operations Management defines the role of an operator in the four-wheeled vehicle assembly production process at a level equivalent to KKNI level four. (2) The Toyota Indonesia Community Academy collaborates with the industry to build the agreed Competency-Based Learning. (3) The curriculum structure and learning system have undergone various improvements. These include organizing the courses for each semester in a systematic sequence, starting with fundamental courses and incorporating introductory courses. (4) The viability and efficacy of a curriculum based on Industrial Revolution 4.0 can be observed through indicators such as a 100 percent employment rate for graduates within three months, consistent recruitment, increasing interest from prospective students each year, and the alignment of knowledge and connections with industry requirements.

Keywords: Community College, IR 4.0 based curriculum, industrial revolution 4.0

Introduction

Indonesia's population is at 273.8 million individuals, according to the World Economic 2021 report. Out of the entire population, a notable demographic advantage is the high proportion of individuals in the productive age range (15-64 years), which accounts for 69.35 percent. Meanwhile, the non-productive age composition, consisting of children and the elderly, makes up 30.65 percent (BPS data 2021).
According to the Indonesian Minister of Manpower, a significant issue in the field of vocational higher education is the disparity between the skills and qualifications needed by industries and those possessed by graduates from academic institutions. During the era of the Fourth Industrial Revolution, the skills of graduates are generally not aligned with the requirements of the business world in the industrial sector. The essential qualities encompass continuously updated skills, wide knowledge, and a positive mindset.
The curriculum is the central component of education, and its implementation must adapt to changes and advancements in technology, value systems, culture, and community requirements. This aligns with Maskyur's assertion that the curriculum is designed to be adaptable, specifically to address certain requirements at a given time. In order to ensure that adjustments and curriculum development remain adaptable to various contexts and conditions, it is crucial that they are dynamic and do not necessitate a lengthy waiting period of several years. (Masykur, 2019) [17]. Modifications have been implemented in the national curriculum to align with contemporary advancements.
The competences required in the Industrial Revolution 4.0 include technology literacy, data literacy, human literacy, and the capacity to interpret trends and changes over time. Technological advancement involves the cooperation of an intelligent system with humans or artificial intelligence, using cyber physical systems or the internet of things (IoT). By harnessing the power of these intelligent devices, we may achieve greater synergy and efficiency in our surroundings (Rada, 2017).
Presently, the sector absorbs less than 20 percent of graduates from Diploma One and Diploma Two programs. According to Kholid (2019), employers hired individuals with a D3 degree at a rate of 35 percent, individuals with an S1 or Diploma four degree at a rate of 28 percent, individuals with a Diploma two degree at a rate of 19 percent, and individuals with a Diploma one degree at a rate of 18 percent (Kholid, 2018) [15].
Community colleges prioritize the cultivation of skills, knowledge, and work attitudes in their educational curriculum, similar to graduates of independent campus learning programs (Rahmawanti and Nurzaelani, 2022). The Toyota Indonesia Community Academy (AKTI) is a Community Academy (AKOM) that implements a curriculum aligned with the principles of the Industrial Revolution 4.0. Its graduates have a 100 percent employment rate in the industry. The AKTI curriculum is adaptable and responsive to technology advancements. Building on the accomplishments at AKTI, the author conducted qualitative research to build a curriculum centered around the Industrial Revolution 4.0.

Researchers argue that in light of this occurrence, it is imperative to create an educational program centered around the Fourth Industrial Revolution. The Toyota Indonesia Community Academy (AKTI) is an educational institution that has successfully integrated a curriculum that aligns with the needs and demands of the business. This college implements a dynamic curriculum that is founded on the principles of the Fourth Industrial Revolution (IR 4.0) in its learning process. The Toyota Indonesia Community Academy will conduct research efforts to design a curriculum centered around the Industrial Revolution 4.0.

According to the given description, the researcher aims to address four objectives as follows

1. To determine the Competency Standards for Graduates throughout the Industrial Revolution 4.0 period at AKTI
2. To develop the Learning Outcomes of AKTI graduates in the context of the Industrial Revolution 4.0.
3. To ascertain the curricular framework and educational methodology centered around the Fourth Industrial Revolution at AKTI.
4. To assess the viability and efficacy of the curriculum created at AKTI.

Research Method

Research Type

This study aims to provide a comprehensive description of the curriculum creation process at AKTI, focusing on the industrial revolution 4.0. The research will employ a qualitative descriptive approach. Qualitative descriptive research is a type of research that utilizes qualitative data and presents it in a descriptive manner. This research is frequently employed to analyze phenomena, events, and social situations. Qualitative descriptive research is employed to investigate a natural phenomenon in which the researcher plays a crucial role as the primary instrument (Sugiyono, 2013) [35].

Qualitative research seeks to provide a detailed and precise description of natural or human-engineered events, focusing on their characteristics, quality, and interrelationships. This research frequently examines how researchers construct perceptions, ideas, beliefs, or views of the individuals under study, providing detailed explanations in full phrases (Sugiyono, 2013) [35].

Research Location and Time

When picking the place, researchers need to take into account the research objectives and topic (Saldana, 2011, p. 74) [32]. The Toyota Indonesia Community Academy (AKTI) was selected as the research site due to its implementation of an IR 4.0 curriculum, which is backed by *Dunia Usaha Dunia Industri* (DUDI) and ensures that all graduates are fully employed. Graduates possess the capability to effectively navigate and adjust to the fast-paced nature of the business world, namely in the industrial sector. Users who have graduated from AKTI have experienced the advantages generated by this vocational college, enabling them to enhance company efficiency. Graduates of AKTI possess exceptional character and possess a high level of talents. Given the aforementioned situation, the researcher aims to further investigate methods for enhancing the curriculum at AKTI in order to provide competitive outcomes.

The investigation was conducted between August 1st and October 1st, 2023. The research activities were segmented into distinct stages, including preparation, data gathering, analysis, and report production.

Data Source

In this study, the concept of population is not employed; instead, the data is derived from the social situation. The components of a social situation consist of location, participant, and action. The three individuals have a strong synergy and engage in frequent interaction. Qualitative research involves researchers immersing themselves in specific social contexts and conducting observations and interviews with individuals who possess a comprehensive understanding of the topic (Sugiyono, 2016) [36].

Nugrahani (2014) [26] identifies many data sources in qualitative research, such as documents or archives, informants, actions or events, locations, or sites of occurrences, as well as photos, objects, and information. Based on the opinion, the researcher identified the data sources in the following manner:

Place

Place refers to a location that offers a visual representation in either dynamic or static states. In this context, the researcher gathers data in the form of corroborating documents, the surrounding environment, circumstances, and the prevailing values within AKTI.

Actor

Actors, also known as personnel, are individuals who provide information or act as informants through interviews, oral communication, or written means. The author used a nonprobability sampling technique to select personnel, wherein each member of the population is not afforded equal opportunity. Sugiyono (2016) [36] states that this method of data collecting involves purposeful sampling and snowball sampling. The primary data sources for this research are the Director, Deputy Director of Public Relations, Deputy Director of Curriculum, Head of Student Affairs Unit, and Head of Teaching Factory (TEFA) Unit.

Activity

Activity refers to any and all actions or events that take place within the AKTI environment. Observed actions encompass several forms of written documentation, such as photographs, videos, or other textual materials.

Data Collection Technique

Observation

Observation is the act of attentively perceiving and retaining information about events, places, objects, and recorded images. The researchers observed the graduation rejuvenation process at the Toyota Indonesia Community Academy, which involved the following stages.

The researcher conducted casual observations of the community college by personally meeting with the director. During this preliminary research phase, the researcher engaged in a discussion with the deputy director and the head of the public relations section, and subsequently submitted a formal request for permission to conduct the research.

In August 2023, the researcher conducted an observation as part of the research. The researcher visited the Toyota Indonesia Community Academy in person to directly

engage with informants who were relevant to the research in order to collect data firsthand.

Interview

The researchers conducted interviews with pertinent informants, specifically: the community academy director, deputy director or head of public relations unit, deputy director or head of student affairs unit, and head of teaching factory unit.

Documentation

Documentation might be acquired either from informants or from the government. The researchers got the documentation study from data collected by community colleges. This data included IR 4.0 curriculum documents, MoUs, graduation statistics, alumni tracking data, and research-supporting activities at community colleges.

Findings and Discussion

The Toyota Indonesia Community Academy (AKTI) operates under the supervision of the Toyota Indonesia Foundation (YTI), established on October 27, 2015, on a one-hectare plot of land in the Karawang West Java Industrial Estate (KJIE) Industrial Area. AKTI's slogan is "Responsive, Agile, and Resilient". This college was established with the primary objective of upholding the dedication of PT Toyota Motor Manufacturing Indonesia (PT TMMIN). The development of AKTI is expected to enhance the caliber of community academy graduates, thereby enhancing their skills and competences required for a workforce that is aligned with industry, particularly in the era of Industrial Revolution 4.0.

Curriculum Development

The development of the curriculum at AKTI includes the participation of several stakeholders, such as government officials, other vocational universities, DUDI, and parents. The IR 4.0 Curriculum at AKTI is distinguished by its comprehensive coverage of industrial culture, encompassing an introduction to the Industrial Revolution from IR 1.0 to IR 4.0. This includes an in-depth exploration of the defining features of each stage of the industrial revolution, as well as the technological advancements and work attitudes associated with them. Another notable feature is the inclusion of an Internet of Things (IoT) course, which includes project-based learning and the use of IoT technology in the AKTI building and its simulators. The incorporation of technology is readily apparent upon entering the AKTI premises, since there is a facial recognition system that captures personal information, measures temperature, and records attendance. This system is connected to an internet server for data storage and analysis. Data is stored in the cloud and linked to classes and information in the Academic Administration System (SIAKAD). AKTI incorporates theoretical concepts into its courses and applies them in real-life building projects, allowing students to fully experience the intricacies of technology while studying at the AKTI campus. The initial observation upon entering the AKTI campus was the abundance of available technology.

The outcomes of the Focus Group Discussion (FGD) conducted with industry representatives consist of a competency model that is necessary for DUDI. This model includes both general competencies and specialized capabilities for each study program. Generally, DUDI necessitates graduate proficiencies that encompass knowledge, skills, and attitude. The necessary knowledge competencies include theoretical productivity, applied mathematics, fundamental industry knowledge, language proficiency, physics, systems management, comprehension of 4C (Communication, Collaboration, Critical thinking, and Creativity), productivity, ICT (Information, Communication & Technology), and safe riding practices. The necessary skill capabilities include proficiency in the relevant major, computer literacy, familiarity with basic industry practices such as occupational safety and health, knowledge of kaizen principles, understanding of industrial relations, and proficiency in foreign languages. The necessary attitude competency encompasses the implementation of fundamental industry principles, including the five core values of discipline, honesty, responsibility, cooperation, and empathy, as well as the 6S culture, which entails exhibiting a smile, greeting others, being polite, and demonstrating enthusiasm.

In addition, the curriculum at AKTI follows a mutually adaptable approach, which means that it is executed by making changes and adjustments based on the needs of the community as users of the graduates (Masykur, 2019) [17].

Curriculum Implementation

Within the IR 4.0 curriculum, there is a dedicated course on the Internet of Things (IoT). AKTI provides an IoT laboratory that is utilized by students at various levels, including IoT Basic utilizing Arduino, Intermediate, and Advanced. The simulator is connected to the Laboratory, which also incorporates IoT intricacies. Upon entering the room, both students and lecturers are required to utilize a facial recognition device. The data captured by the device is then seamlessly integrated with SIAKAD, a system that manages attendance records. In order to enhance students' work attitudes in addressing the behavioral problems associated with the Fourth Industrial Revolution (IR 4.0), such as communication, collaboration, and critical thinking (3C), students are assigned project-based learning (PBL) exercises. In addition to participating in PBL, students also engage in competitive skills competitions, where they inwardly prepare to outperform their peers.

In order to enhance students' work attitudes in addressing the behavioral problems associated with the Fourth Industrial Revolution (IR 4.0), such as communication, collaboration, and critical thinking (3C), students are assigned project-based learning (PBL) exercises. There are other specific instances of this project-based learning (PBL), such as the PBL IoT smart watering project. This project involves using an Internet of Things (IoT) application to automate the process of watering plants in the cafeteria garden located in the AKTI campus area. During this educational experience, students are organized into project teams under the guidance of professors who give certain themes and tasks for the duration of the project. In addition to the smart watering theme, there is another theme called IoT Robot scanning UV. This theme involves increasing UV levels in a space to decrease the presence of viruses and bacteria.

Graduate Evaluation

Conducting evaluations is crucial to ensure that the output of graduates is of high quality, competent, and meets the

expectations of the industrial sector. These evaluations should be performed periodically, following a set time frame. AKTI conducts an evaluation procedure to assess if the output and outcomes of users in the industry meet expectations and are competent, in accordance with DUDI. This evaluation is done through interviews conducted during company visits to monitor industrial work practices.

The curriculum of the Diploma program is implemented according to the Semester Credit Unit (SKS) system, which has been created by the Ministry of Research, Technology, and Higher Education. During its development, the following provisions are made:

Developing Graduate Profiles/Graduate Competency Standards at the Toyota Indonesia Community Academy

The graduate profile serves as the foundation for selecting the program. This graduate profile outlines the necessary skills and abilities expected by DUDI, as well as the projected requirements for future needs analysis. The graduates of the TOPKR 4 Diploma 2 study program are qualified to work as operators or junior technicians in the automotive manufacturing production process, at a level equivalent to KKNI 4.

Developing Graduate Learning Achievements (CPL)

The Toyota Indonesia Community Academy focuses on the development of the agreed Competency Performance Level (CPL) by collaborating with the industry. This collaboration emphasizes the enhancement of soft skills, also known as body and mind development, which is inspired by the Toyota Technical Skill Academy in Japan. AKTI students engage in robotic competition activities to develop adaptable, nimble, and resilient soft skills. The aim is to apply the attributes of the fourth industrial revolution (IR 4.0), namely the 3C qualities of being Connected, Creative, and Confident. Participated in multiple tournaments in both national and international events. Since 2022, the Swiss Confederation government has encouraged Swiss contact institutions chosen by them to participate in the curriculum development process through the Skills for Competitiveness (S4C) program.

Curriculum Structure of the Four-Wheeled Vehicle Assembly Operations Study Program (TOPKR 4)

Once the curriculum has been confirmed and is ready for implementation, the Toyota Indonesia Community Academy establishes a supporting ecosystem that emphasizes a link and match approach with the industry. Presently, the AKTI curriculum development is more commonly referred to as Development a Curriculum (DACUM), aligning with the specific intricacies of the business. The campus infrastructure, workshops, and laboratories are designed to cater to the needs of the industrial world. This includes organizing layouts, deciding work outfits, and providing personal protection equipment such as glasses, helmets, and safety shoes. Additionally, industrial culture training is also provided.

Evaluation of the Feasibility and Effectiveness of the D2 TOPKR4 Study Program Curriculum

a. Complete dedication to working in the industrial sector.
b. The industrial sector is actively hiring once more, or on an ongoing basis, in response to the impressive performance of graduates employed in various organizations.
c. The demand for potential community college students is growing annually.
d. Students can use the skills and abilities they acquire at community institutions to companies.
e. Graduates are prepared to immediately start working at the organization without requiring extensive retraining.

This assessment served three primary functions: firstly, to assess progress; secondly, to make necessary revisions to the plan; and thirdly, to refine the overall process. If the evaluation results are favorable, then the curriculum is aligned with the plan. If the evaluation results are not satisfactory or if there are concerns about failure, and if there are reasons indicating that the feasibility and effectiveness results have deviations, issues, or obstacles, then it is advisable to explore alternative methods (Ratnawulan & Rusdiana, 2014).

Conclusion

The author draws several key conclusions based on the conducted research as follows

1. Competency Standards for Graduates or Profile of the Toyota Indonesia Community Academy in Diploma Two Operations for the assembly of four-wheeled vehicles Management at the level of KKNI four is comparable to an operator who can adapt to the advancements of the Fourth Industrial Revolution.
2. AKTI incorporates industry collaboration into the learning outcomes of its graduates, focusing on the development of soft skills, also referred to as body and mind development. This approach is inspired by the Toyota Technical Skill Academy in Japan. In order to develop adaptable, flexible, and resilient soft skills that align with the demands of the Fourth Industrial Revolution (IR 4.0), AKTI students actively engage in a range of competition events at both national and international levels.
3. AKTI implements a curriculum structure and learning system that involves organizing courses each semester in a systematic manner. This includes offering general basic courses as well as introductory courses on IR 4.0 topics such as green technology, information technology, and operational technology 4.0. The learning process incorporates the use of the synergy project-based learning method with TEFA.
4. Periodic assessments are conducted to evaluate the viability and efficacy of the IR 4.0-focused curriculum at AKTI. The viability and performance of the program can be assessed based on the current success indicators, which include a 100 percent employment rate for graduates within three months and ongoing enrollment of students in their final semester. Additionally, the program consistently recruits from AKTI every year.

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