

Improving the Capabilities of Depohar 80 Maintenance Personnel through Education 4.0 in Order to Support the Duties of the Indonesian Air Force

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ABSTRACT

The aim of this research is to explore how to improve the capabilities of Depohar 80 Maintenance Personnel through Education 4.0 in Order to Support the Duties of the Indonesian Air Force. The method used in this writing is a qualitative method. The results of this research show that the strategies implemented include developing a technology-based curriculum, providing adequate technological infrastructure, training trainers and facilitators, continuous evaluation and feedback, establishing learning communities, and using online resources and networks. Each of these strategies is designed to overcome obstacles faced by personnel in improving their technical skills and competencies, in accordance with capability theory which emphasizes the importance of education, work skills, experience, motivation and work ethic.

INTRODUCTION

Law of the Republic of Indonesia Number 34 of 2004 concerning the Indonesian National Army (TNI) mandates the TNI as the main component of national defense. The TNI has the main task of upholding state sovereignty, maintaining the territorial integrity of the Unitary State of the Republic of Indonesia (NKRI) based on Pancasila and the 1945 Constitution of the Republic of Indonesia (UUD 1945), and protecting the entire nation and all of Indonesia's territory from threats and disturbances to the integrity of the nation and state. The Indonesian Air Force (TNI AU) as an integral part of the TNI institution is tasked with carrying out defense duties in the air dimension, enforcing the law, and maintaining security in the airspace of national jurisdiction in accordance with the provisions of national law and ratified international law. In addition, the TNI AU also carries out the construction and development of air force forces and the empowerment of air defense areas. Depohar 80, as part of the Indonesian Air Force, has a crucial task in ensuring the readiness and operability of the main equipment of the air weapons system, especially the maintenance and repair of the heavy engine level AL-31F of Indonesian Air Force aircraft (Wijayanti, ND 2016). Optimizing the capabilities of maintenance personnel at Depohar 80 is very important to ensure that military equipment can operate properly, especially the readiness of aircraft in accordance with the established standards.

In the era of the Industrial Revolution 4.0, the development of information and communication technology has changed the job landscape in various sectors (Surani, D. 2019), including the military sector. Amidst the dynamics of technological developments, the Indonesian Air Force must continuously improve the capabilities of its personnel, including maintenance personnel at Depohar 80. Education 4.0 emerged as a strategic solution to improve the competence and skills of maintenance personnel at Depohar 80. Education 4.0 integrates information technology, online-based learning, artificial intelligence, and other technologies into the education system (Lase, D. 2019). With this approach, it is hoped that maintenance personnel can keep up with technological developments and acquire new skills effectively and efficiently. However, the challenges faced by Depohar 80 are not easy. The development of increasingly sophisticated technology and weapons systems demands an increase in the capabilities of maintenance personnel in a continuous (Hananda, ED, & Iskandar, YA 2024). There are various challenges that need to be overcome to ensure that Depohar 80 personnel have optimal capabilities in carrying out aircraft maintenance tasks to support TNI AU operations effectively. Depohar 80 personnel face obstacles such as a lack of in-depth understanding of maintenance procedures, limitations in mastering technology and English, and a learning system that is still conventional. The ability of personnel to master the aircraft engine Technical Order (TO) system is also a major concern, given the complexity of this system and the significant impact if an error occurs in maintenance (Komalasari, N. 2018). In addition, the lack of skills in using computers limits access to the latest information and technology that are essential in modern aircraft maintenance. Facing these challenges, education 4.0 offers a promising solution. Education 4.0 integrates advanced technologies such as artificial

intelligence, the Internet of Things, and cloud computing into the learning process, enabling access to more interactive and innovative learning resources. Thus, education 4.0 can provide solutions to the constraints of conventional learning systems and improve personnel skills in using computer technology (Mahmudah, FN, & Putra, ECS 2021). Education 4.0 can also help overcome English language limitations by providing a learning platform that supports foreign language learning more effectively.

Education 4.0 is very relevant to the essay topic on improving the ability of maintenance personnel at Depohar 80 TNI Angkatan Udara through Education 4.0. In the era of the Industrial Revolution 4.0, the development of information and communication technology is very rapid, and the TNI Angkatan Udara must continuously improve the ability of its personnel to keep up with this development. Education 4.0, with its approach that focuses on personalization and the use of technology, provides a solution to improve the competence and skills of maintenance personnel at Depohar 80. Through Education 4.0, maintenance personnel at Depohar 80 can utilize technology and their learning preferences to determine the most effective way to learn. They can form their own learning communities and use various online resources and networks to improve their understanding and technical skills. This approach also allows personnel to demonstrate their learning outcomes through appropriate methods and actively seek feedback, which is very important in improving the performance and operational readiness of the TNI Angkatan Udara. Education 4.0 provides flexibility and freedom for maintenance personnel to design their own learning paths, allowing them to overcome the limitations of conventional learning systems and improve their abilities effectively and efficiently. Thus, the implementation of Education 4.0 at Depohar 80 can better support the duties of the Indonesian Air Force and improve the readiness of national defense in facing challenges in the increasingly sophisticated and complex military era.

LITERATURE REVIEW

Ability Theory

Ability comes from the word "able" which means power (can, able) to do something, while ability means ability, skill, and strength (Big Indonesian Dictionary Compilation Team, 1989). In the context of psychology and management, ability refers to an individual's capacity to perform various tasks in a job. According to Chaplin, ability includes the power (strength) to perform an act, including skill, dexterity, talent, and ability. Payaman J. Simanjuntak (2005), individual performance is influenced by several factors that can be grouped into two main groups: individual ability/competence and motivation and work ethic. Ability indicators include; First, Work Ability and Skills. This includes technical and non-technical expertise possessed by individuals to carry out specific tasks in their jobs. Second, Education and Training. The level of education and training received by individuals greatly affects their capacity to carry out tasks effectively. Third, Work Experience. Broad and in-depth work experience can enrich individual abilities, enabling them to handle various work situations better. In the context of Depohar 80 TNI Angkatan Udara, the ability of maintenance personnel is crucial to ensure the operational readiness of TNI

AU aircraft. Given the importance of the maintenance and repair tasks of the AL-31F engine, AL-31F Engine. The AL-31F engine is a twin-shaft turbofan engine that is part of the Saturn AL-31 axial flow engine family. This engine was developed by the Lyulka design bureau in the Soviet Union, now NPO Saturn in Russia, initially as a 12.5-ton powerplant for the Sukhoi Su-27 long-range fighter aircraft, (www.globalsecurity.org).

Education Theory 4.0

Education theory 4.0 is the theory of education 4.0. Trilling and Fadel in Nusantara (2008), Education 4.0 emphasizes the placement of learners at the center of the educational ecosystem, empowering them to build individual paths towards desired outcomes. Education 4.0 creates a learning environment that is directly connected to learners, focused on them, demonstrated by them, and led by them. This paradigm emphasizes personalization in the learning process, giving learners full flexibility to become architects of their own learning paths, and providing the freedom to set, approach, and achieve their personal goals with a variety of choices.

METHODOLOGY

Creswell (2014) explains that the literature study research method is a research approach carried out by collecting and analyzing information from various literature sources that are relevant to the research topic. Therefore, this study uses a qualitative approach with a qualitative research design. This approach was chosen to gain an in-depth understanding of improving the capabilities of maintenance personnel at Depohar 80 through the implementation of Education 4.0, which aims to support the tasks of the Indonesian Air Force. The qualitative approach allows researchers to explore the experiences, views, and perceptions of research subjects in depth and holistically. The subjects of this study are maintenance personnel at Depohar 80, while the objects of research include the process and results of improving their capabilities through Education 4.0. The focus of this study is to identify, explore, and analyze how Education 4.0 is implemented and its impact on the capabilities of maintenance personnel at Depohar 80. In this study, data were collected from two types of sources: primary data and secondary data.

Primary data were obtained directly from the field through in-depth interviews with maintenance personnel at Depohar 80 and related parties in the implementation of Education 4.0. Meanwhile, secondary data were collected through document studies covering literature, reports, and official documents relevant to the research topic. Data collection techniques include interviews and document studies. Interviews were conducted in depth to obtain detailed information about the experiences, views, and perceptions of maintenance personnel related to the implementation of Education 4.0. Document studies were conducted by analyzing various documents related to Education 4.0, personnel capability improvement reports, and official documents from the Indonesian Air Force that were relevant to this study. Data obtained from interviews and document studies were then analyzed using qualitative data analysis techniques. This analysis process includes several stages, namely data

reduction, data presentation, and drawing conclusions. The first stage is data reduction, where the data obtained is filtered and simplified to focus on information relevant to the research objectives. The second stage is data presentation, where the data is arranged in a structured narrative form to facilitate understanding and interpretation. The last stage is drawing conclusions, where researchers make interpretations and conclusions based on the data that has been analyzed.

This process includes identifying patterns, themes, and relationships between data to answer research questions. The conclusions in this study are made based on an in-depth analysis of the data that has been collected. The steps in drawing conclusions include data triangulation, validation of findings, and formulation of conclusions. Data triangulation was conducted to verify the accuracy and consistency of the data by comparing the interview results with information from the document study. Validation of the findings was conducted by testing the findings through discussions with experts or practitioners in related fields to ensure that the conclusions drawn were reliable and valid. Finally, the formulation of conclusions was conducted by compiling clear and detailed conclusions based on the validated findings. This conclusion includes practical recommendations for improving the capabilities of maintenance personnel at Depohar 80 through Education 4.0.

RESEARCH RESULT AND DISCUSSION

Process Education for Personnel Maintenance Depot 80

In facing the challenges of the Industrial Revolution 4.0 era, Depohar 80 TNI Angkatan Udara needs to adopt an innovative educational approach to improve the capabilities of its maintenance personnel. The Education 4.0 Paradigm, which emphasizes on personalization, advanced technology, and learner-centered learning, provide the right framework to achieve these goals. The following discussion will describe how the maintenance personnel education process at Depohar 80 can be improved through implementation Education 4.0, with referring to on theory abilities that emphasize the importance of education, work skills, experience, motivation, And ethos Work. Based on results collection data Which obtained from Depohar 80 document (Depohar 80 Evaluation Report 2023), it is known that the condition of the Depohar 80 maintenance personnel's capabilities is: as follows:

- a. Lack of Understanding Deep to Procedure Maintenance
 1. Training Data. 60% of personnel have not received training in-depth continuation.
 2. Maintenance Error Incidents. There has been a 15% increase in maintenance error incidents in the last two years.
 3. Satisfaction Survey. 40% of personnel feel less confident in carrying out complex maintenance procedures.
 4. Duration Training Which Short. Training Which given only is basic and brief, so it does not cover deeper aspects. Lack of Opportunity for Practice. Limited opportunity for direct practice on the aircraft reduces in-depth understanding.
- b. Limitations in Control Technology and Language English

1. Technology Mastery. 70% of personnel are still unfamiliar with the use of the latest maintenance software.
 2. English language proficiency. Only 30% of personnel have sufficient English language skills to understand technical documentation.
 3. Use of Modern Devices. Use of maintenance devices modern only 40% due to limitations in mastery of technology.
 4. Access Limited to Technology. Limitations access to device and the latest technology hinders technological mastery.
 5. Limited English Courses. Lack of training programs Continuous English hinders the ability to understand technical documentation.
- c. System Study Which Still Conventional
1. Learning Methods. 80% of training still uses lecture and textbook methods.
 2. Participant Engagement. Only 25% of training participants felt actively involved in the learning process.
 3. Use of Technology in Training. The use of interactive technology in training is only 20%.
 4. Non-Interactive Learning Methods. Conventional methods are less effective in increase understanding and practical skills.
 5. Lack of Educational Technology Infrastructure. Facilities for Simulation and virtual reality are not yet widely available as is internet access.
- d. Limited Personnel Capability in Mastering the Aircraft Engine Technical Order (TO) System
1. Understanding of the Technical Order (TO) System. 50% of personnel have not mastered the aircraft engine Technical Order (TO) system adequately.
 2. Training Frequency. Training on the Technical Order (TO) is only held twice a year, which was deemed insufficient by the personnel.
 3. Error in Maintenance. There is an increase in errors in maintenance related to TO systems by 10% in the last year.
 4. Complexity of Material. The TO system of aircraft engines is very complex. and takes time to fully understand.
 5. Limited Specialized Training. Specialized training on TO systems is not provided routinely or in depth.

The current condition of the Depohar 80 maintenance personnel capability is not optimal due to several major constraints. Lack of in-depth understanding of maintenance procedures, limitations in mastering technology and English, a learning system that is still conventional, and limitations in mastering the aircraft engine TO system are challenges that need to be overcome. Improvement efforts through education 4.0 and the provision of more interactive and in-depth facilities and training are needed to optimize personnel capabilities and support the duties of the Indonesian Air Force effectively.

The above description is in line with the concept of 21st century skills conveyed by Triling and Fadel, as described by Nusantara (2008). In Triling and Fadel's view, specific skills are needed to face the challenges that arise in the 21st century. They emphasize that the modern world requires individuals to have a series of skills that are more complex and diverse compared to previous eras, considering the dynamics of globalization, rapid technological developments, and significant social changes. Triling and Fadel identify three main categories of skills that are essential to survive and succeed in the 21st century.

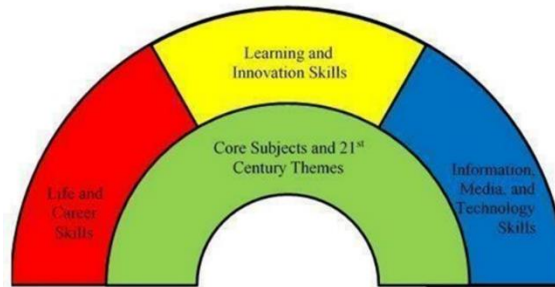


Figure 1. Rainbow Skills-Knowledge Century 21

Source: Trilling And Fadel in Archipelago (2008)

First , life and career skills (life and career skills). These skills include the ability to adapt and be flexible in the face of change, the ability to work effectively with others from diverse backgrounds, and the ability to manage oneself and one's career in a productive and ethical manner. In an era where traditional jobs are often being replaced by technology and rapidly changing work patterns, these life and career skills are becoming increasingly important. Individuals must be able to navigate the challenges of an increasingly competitive workplace, while maintaining a healthy work-life balance.

Second , learning and innovation skills . These skills emphasize the importance of creativity, critical thinking, collaboration, and communication in the learning and innovation process. In the 21st century, learning is no longer just about mastering basic knowledge, but also about how to apply that knowledge creatively to solve new problems. Innovation skills involve the ability to think outside the box, develop new ideas, and adapt to ongoing change. In this context, the ability to collaborate with others and communicate effectively is key to success in creating innovative solutions that are relevant to global challenges.

Third , information , media, and technology skills . These skills include the ability to access, analyze, and utilize information effectively from various sources. In the digital era, where information is available in large quantities and in a very fast time, the ability to sort out relevant and accurate information becomes very important. In addition, skills in using media and technology wisely are also an integral part of these skills. This includes an understanding of how technology affects communication, social relationships, and the way of working, as well as how to utilize technology to increase productivity and creativity. skill category the depicted by Trilling And Fadel in a scheme which known as the "rainbow of 21st century skills/knowledge" or 21st century knowledge-skills rainbow . This scheme provides a visual representation of how these skills relate to and support each other in the context of lifelong learning and professional development. The skills rainbow reflects not only the need for in-depth

knowledge in a particular area, but also the emphasis on the importance of soft skills that enable individuals to thrive in a variety of situations and changing environments.

Thus, the concept of 21st century skills proposed by Triling and Fadel asserts that to succeed in this modern era, individuals must develop not only technical skills, but also the ability to learn throughout life, innovate, and use technology wisely. This rainbow skills scheme serves as a comprehensive guide to education and personal development in the 21st century, preparing individuals to face an increasingly complex and connected world. Based on the description above, the analysis of the condition of the capabilities of Depohar 80 maintenance personnel in the context of optimizing capabilities through education in frame support task Indonesian National Armed Forces Force Air can outlined as follows:

- a. Personnel Skills and Knowledge . Based on the books read, optimization emphasizes achieving maximum results with efficient use of resources. In the context of Depohar 80 maintenance personnel, optimization means improving personnel skills and knowledge to the highest and most effective level. However, data shows that 60% of personnel have not received in-depth advanced training, and this has an impact on the lack of understanding of complex maintenance procedures. Increased incidence of maintenance errors by 15% in the last two years also reflects the lack of optimization in training and technical understanding. By applying the principles of education 4.0, which uses technologies such as AI, VR, and big data , the training process can be optimized to deliver better results. Technology This allows for more efficient learning, with interactive and personalized methods, so that personnel can master the necessary technical skills. with more fast And appropriate. By Because That, implementation education 4.0 is very important to optimize the capabilities of Depohar 80 personnel, so that they can carry out maintenance tasks with a higher level of accuracy and efficiency. From the description above, it can be seen that the skills and knowledge of personnel are important assets in the operation of Depohar 80. With a strong knowledge base, personnel can face aircraft maintenance challenges more effectively, reduce the risk of errors, and improve operational safety and reliability. In addition, continuously improved skills allow personnel to adjust self with development technology And procedure new, so stay relevant and productive amidst change the fast-paced aviation industry. Developing skills also opens up opportunities to expand the roles of personnel within the organization, allowing them to take on greater responsibilities and contribute more significantly. However, there are constraints, namely limitations in skills and knowledge can be a major obstacle for personnel in carrying out their duties properly. These limitations can come from from the lack of training, limited access to learning resources, or lack of practical experience. In addition, if skills are not updated according to new technological developments and procedures, personnel may face difficulties in adopting

innovation, which can hinder operational efficiency and increase the risk of errors.

- b. **Capability Enhancement Through Continuous Learning.** Capability theory highlights the importance of skills, education, training, and experience in determining individual performance. However, analysis of current conditions shows that 70% of personnel are still not familiar with the use of the latest maintenance software, and only 30% have adequate English language skills. This indicates that the technical capabilities of personnel are still far from optimal, which can hinder the implementation of tasks. maintenance tasks to the required standards. Education 4.0 offers a solution by providing a continuous and technology-based learning platform, enabling personnel to continuously improve their skills and knowledge. Training programs using advanced technology can be designed to gradually strengthen individual capabilities, improve technical competence, and enhance mastery English is essential to understand technical documentation. Besides That, More dynamic and interactive learning can also be achieved improve the motivation and work ethic of personnel, which will ultimately have a positive impact on their performance. From the description above, it can be seen that continuous learning offers a great opportunity to consistently improve personnel capabilities. With this approach, personnel can continue to hone their skills, adapt to new technologies, and learn the latest procedures. Continuous education also allows personnel to develop soft skills, such as leadership, time management, and communication, which are very important in a dynamic work environment. In addition, continuous learning can increase personnel motivation and engagement, because they feel supported in their career development. However, there are obstacles in implementing continuous learning, such as limited time and resources. Personnel may find it difficult to allocate time to ongoing training amidst the demands of daily work. In addition , organizations may face challenges in providing relevant and up-to-date training programs , as well as ensuring that all personnel own access Which equal to learning opportunities. Limitations budget Also Can become barrier in to fund program learning sustainable Which effective.
- c. **Operational Efficiency of Teaching and Learning Through Education 4.0.** Optimization theory and capability theory both point to the importance of efficiency in task execution. The conventional learning system and lack of facilities for simulation and virtual reality result in training that is less effective and less interactive. With only 25% of trainees feeling actively involved, there is an urgent need to update learning methods that are more in line with operational demands. Education 4.0, with a more modern and technology-based approach, can create a more interactive and effective learning environment. The use of simulation, virtual reality, and online learning platforms will allow personnel to train in more realistic and applicable conditions, thereby enhancing their practical skills. Thus, education 4.0 not only improving technical capabilities but also

contributing to the operational efficiency of Depohar 80 in supporting the tasks of the Indonesian Air Force. Education 4.0, which utilizes advanced technologies such as virtual simulation, online learning, and e-learning platforms, offers great opportunities to improve operational efficiency in teaching and learning. With this technology, personnel can access training materials anytime and anywhere, allowing for flexibility and personalization of learning. Education 4.0 also allows for more interactive and practical learning, which can improve understanding and retention of materials. Efficiency in learning can also translate into increased operational productivity, as personnel can more quickly and effectively master the necessary skills. However, the implementation of Education 4.0 also faces obstacles, especially related to the necessary technological infrastructure. Limited access to the necessary hardware and software, as well as a lack of technical support, can hinder the widespread adoption of Education 4.0. In addition, resistance to change from personnel who are accustomed to conventional learning methods can also be a challenge, as they may find it difficult to adapt to new technologies. Implementation costs are also an obstacle, especially if it requires a large investment in technological devices and digital curriculum development.

- d. Handling Capability Limitations in the Aircraft Engine TO System. One of the significant obstacles faced is the limitation in mastering the aircraft engine Technical Order (TO) system. Capability theory emphasizes that individual performance is greatly influenced by the training provided. However, with TO system training only held twice a year, many personnel find it difficult to master and implementing the right procedures. The complexity of the TO system requires a deep understanding, which unfortunately cannot be achieved with limited training. With education 4.0, TO system training can be strengthened through the use of technology Which allow learning more deep and sustainable. Through simulation Which repetitive and access easy to material digital-based training, personnel can continuously improve their understanding of the TO system, thereby reducing maintenance errors and improving operational safety. In the context of optimizing the capabilities of Depohar 80 maintenance personnel, the application of optimization theory and capability theory is very important. Education 4.0 offers the right approach to overcome the obstacles faced and increase operational efficiency and effectiveness. By integrating technology into the education and training process, Depohar 80 can optimize the capabilities of its personnel, ensure high operational readiness, and support the tasks of the Indonesian Air Force more effectively and efficiently. Overcoming the limitations of capabilities in the Technical Aircraft engine order (TO) offers an opportunity to improve operational reliability and efficiency. With a better understanding of the TO system, personnel can perform maintenance more accurately, reducing the risk of errors and improving flight safety. Training that focuses on mastery The TO system can increase the confidence of personnel and ensure that they can work according to

international standards. However, the constraints found are limitations in mastering the TO system which are often caused by complexity of the system itself and lack of adequate training. Complex TO systems require in-depth understanding and extensive practical experience, which may be difficult to obtain if training is not well structured. Limited time for training can also be a barrier, especially if personnel are already burdened with daily operational tasks. In addition, lack of technological support for TO simulations can slow down the learning process and increase the risk of errors in maintenance.

Based on these data, the analysis of the education process of Depohar 80 maintenance personnel. First, Determination of Material and Learning Objectives by Individuals. In the Education 4.0 paradigm, learners have the freedom to determine for themselves what material they want to learn and the learning objectives they want to achieve. At Depohar 80, this can be implemented by allowing maintenance personnel to choose training modules that suit their needs. For example, personnel who want to deepen their knowledge of engine maintenance AL-31F can choose modules that focus on the technical and operational aspects of the engine. Second, Learning Preferences and Technology. Education 4.0 emphasizes the use of individual learning preferences and technology in the learning process. For Depohar 80 personnel, this means they can utilize technologies such as e-learning, simulations, And reality virtual For learn procedure maintenance aircraft. This technology allows for more interactive and practical learning, where personnel can practice in a virtual environment that resembles real conditions. Third, Self-Learning Community. Forming self-learning community is one of the principles of Education 4.0. Depohar 80 personnel can form study groups consisting of fellow maintenance personnel, where they can share knowledge and experiences through social networking platforms such as Facebook, WhatsApp , or internal forums. This collaboration allows for rapid exchange of information and collective solutions. to the maintenance issues faced. Fourth, Online Resources and Networks. The use of online resources and networks is very important in Education 4.0. Personnel Depot 80 can utilise various source Power on line like video tutorials, technical articles, and maintenance manual databases available on the internet. They can also access online courses and webinars organized by industry experts to expand their knowledge of the latest maintenance technology. Fifth, Learning Support Methods and Tools. Education 4.0 provides freedom for learners to demonstrate their learning outcomes through various supporting methods and tools. Depohar 80 personnel can demonstrate their skills through real projects, maintenance simulations, or internationally recognized certifications. The use of technologies such as augmented reality can assist in understanding and demonstrating complex maintenance procedures.

The implementation of Education 4.0 in Depohar 80 will involve several strategic steps, namely as follows:

- a. Technology-Based Curriculum Development. Curriculum designed to include technology-based training modules such as e-learning, simulations, and augmented reality.

- b. Provision of Technology Infrastructure. Provision of hardware and software needed to support technology-based learning.
- c. Train Trainers and Facilitators. Train trainers and facilitators to use the latest educational technologies and support heutagogical learning .

By adopting Education 4.0, Depohar 80 can significantly improve the capabilities of its personnel, thus supporting the operational readiness and reliability of the Indonesian Air Force aircraft. Education 4.0 not only improves the competence technical, but also build critical thinking skills and adaptability of personnel in facing the challenges of future technology.

Strategy Improvement Ability Personnel Maintenance Depot 80 through education 4.0.

To ensure operational readiness and reliability of Indonesian Air Force aircraft, improving the capabilities of maintenance personnel at Depohar 80 is very important. Facing this demand, the Education 4.0-based strategy offers an innovative approach that utilizes advanced technology and personalization. learning. Referring to the ability theory that emphasizes the importance of education, skills, experience, motivation, and work ethic, the following discussion will outline various strategies that can be applied to optimize the competence of maintenance personnel at Depohar 80.

Theoretically, the term ability in this context refers to an individual's capacity to perform various tasks in a job. Chaplin, (2005) ability includes the power (strength) to perform an act, including skill, dexterity, talent, and ability. Payaman J. Simanjuntak (2005) stated that individual ability or competence is influenced by work ability and skills, education and training, and work experience. Motivation and work ethic also play an important role in individual performance. Improving Ability through Education 4.0. In the context of Depohar 80, improving the ability of maintenance personnel become very important For ensure readiness operational aircraft Indonesian National Armed Forces AU. Education 4.0, with a personalized approach and the use of technology, provides an effective solution to improve the competence and skills of maintenance personnel. On the other hand, discussions about this strategy have been conducted by other researchers. Previous research that has been conducted by researchers in various field provides relevant insights to develop strategies in the context of education and operations at Depohar 80, especially in facing the challenges of the Industrial Revolution 4.0 era and increasing operational readiness.

Suherman et al. (2020), This study highlights the importance of the professionalism of soldiers and maintenance facilities in improving the operational readiness of fighter aircraft missiles. Its relevance to the Depohar 80 strategy is to emphasize the need to develop the skills of maintenance personnel through continuing education and improving supporting facilities. This is in line with efforts to improve aircraft operational readiness by increasing personnel professionalism and optimizing maintenance infrastructure. Sabaruddin (2022), This study discusses the challenges and strategies of Indonesian education in facing the 4.0 era. Its relevance to the Depohar 80 strategy lies in the need to adapt the curriculum and learning methods that integrate advanced technology and the

Education 4.0 approach. This is important to ensure that Depohar 80 personnel have relevant skills and are ready to face the challenges of rapidly developing technology. Muhali (2018), This study explores the direction of education development in the Industrial Revolution 4.0 era, which emphasizes the importance of flexible and technology-based education. The relevance to the Depohar 80 strategy is the need for curriculum updates and technology-based training methods, such as e-learning. and digital simulation, to improve the efficiency and effectiveness of maintenance personnel learning. Idiajir & Daryati (2021), This study develops e-module-based learning in the soil mechanics practical course, which shows the importance of using digital media in practical learning. Its relevance to the Depohar 80 strategy is the application of e-module-based learning for aircraft maintenance materials, Which can improve understanding And skills practical personnel through more flexible and interactive access to training materials. Cayeni & Utari (2019), This study discusses the challenges faced by teachers in using technology in the Industrial Revolution 4.0 era. Its relevance to the Depohar 80 strategy is the need to support personnel in addressing new technological challenges, including providing the necessary training and support so that they can utilize technology in learning and maintenance operations effectively. Overall, these studies suggest that strategies that integrate educational technology, professional development, and maintenance facility improvements are key to improving operational readiness and training effectiveness at Depohar 80 in facing modern demands.

The analysis of the strategy for improving the capabilities of Depohar 80 maintenance personnel through education 4.0 is as follows:

First, Job Skills and Abilities. Education 4.0 allows personnel to access various training modules that suit specific needs. them. Technologies such as simulation and reality virtual can be used to provide practical experience in a safe and controlled environment. Through simulation, personnel can train maintenance procedures Which complex And understand the dynamics work engine aircraft in a way deep.

Second, Education and Training. Education 4.0 offers flexibility in the learning process, allowing personnel to learn according to their schedule and learning style. Online courses, webinars, and video tutorials can be accessed anytime and anywhere. just, give chance for personnel For Keep going enhance their knowledge and skills. The interactive online learning platform also allows personnel to collaborate and discuss with peers and industry experts.

Third, Work Experience. Education 4.0 supports project-based learning, where personnel can apply theoretical knowledge in a practical context. This not only improves technical skills but also enriches their work experience. Problem-based and project-based learning can help personnel understand and overcome real challenges they face in their daily maintenance tasks. Fourth, Motivation and Work Ethic. The heutagogical approach in Education 4.0 gives personnel greater autonomy and responsibility for their own learning. Thus, personnel feel more motivated and involved in the learning process. Learning communities formed through social networking platforms can also provide the support and encouragement needed to improve work ethic.

To implement Education 4.0 effectively in Depohar 80, several strategies can be applied:

- a. **Technology-Based Curriculum Development.** Design a curriculum that includes technology-based training modules such as e-learning, simulation, and augmented reality. These modules should be tailored to the specific needs of maintenance personnel and cover both technical and managerial aspects.
- b. **Provision of Technology Infrastructure.** Providing the hardware and software needed to support technology-based learning. This includes computers, simulation devices, high-speed internet access, and online learning platforms.
- c. **Train Trainers and Facilitators.** Train trainers and facilitators to use the latest educational technologies and support heutagogical learning. Trainers must be able to facilitate interactive and personalized learning, and provide constructive feedback.
- d. **Ongoing Evaluation and Feedback.** Provide mechanisms for ongoing evaluation and feedback. Personnel should be encouraged to seek feedback from coaches and peers and to use that feedback to improve their abilities.
- e. **Developing Learning Communities.** Encourage the formation of learning communities that allow personnel to share knowledge and experiences. Social networking platforms and internal forums can be used to support constructive collaboration and discussion.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis of the two problem formulations in this essay, it can be concluded as follows; First, Improving the capability of maintenance personnel at Depohar 80 TNI Angkatan Udara is crucial to ensure operational readiness and reliability, as well as the safety of TNI AU aircraft. Adopting the Education 4.0 paradigm offers an effective solution in this effort. Education 4.0, with its approach that focuses on personalized learning, the use of advanced technology, and the development of learning communities, provides the right framework to improve the competency of maintenance personnel at Depohar 80. Second, The strategies implemented include the development of a technology-based curriculum, the provision of adequate technology infrastructure, training of trainers and facilitators, continuous evaluation and feedback, the formation of learning communities, and the utilization of online resources and networks. Each of these strategies is designed to address the obstacles faced by personnel in improving their technical capabilities and skills, in accordance with the theory of capability that emphasizes the importance of education, work skills, experience, motivation, and work ethic. With this approach, maintenance personnel at Depohar 80 can access more interactive and in-depth training, acquire skills relevant to the latest technology, and continuously improve their performance through evaluation and constructive feedback. The implementation of Education 4.0 not only improves the technical capabilities of personnel but also builds their capacity to learn and adapt independently, in accordance with the demands of

the Industrial Revolution 4.0 era. Overall, through Education 4.0, Depohar 80 can achieve optimization of the capabilities of maintenance personnel, which will ultimately support the tasks of the Indonesian Air Force more effectively, improve the reliability and performance of aircraft, and ensure operational safety and success in carrying out missions that are vital to national defense.

ADVANCED RESEARCH

Further research on improving the capabilities of Depohar 80 maintenance personnel needs to be directed at implementing the Education 4.0 concept as a learning transformation strategy that is adaptive to the development of Indonesian Air Force defense equipment maintenance technology. In-depth studies can be focused on the integration of digital technology in the education and training process, such as the use of virtual reality (VR), augmented reality (AR), and learning management systems (LMS) to simulate complex maintenance scenarios interactively and efficiently. In addition, the development of a competency-based curriculum with a blended learning and microlearning approach will increase the effectiveness of technical knowledge transfer. Future studies also need to explore the use of big data and artificial intelligence in mapping training needs and developing career development programs that are in line with the development of defense equipment technology. Evaluation of the certification system, tiered training, and performance-based incentive schemes are important to ensure the motivation and professionalism of maintenance personnel. Collaboration between the Indonesian Air Force, vocational education institutions, and the defense industry must also be strengthened to create a sustainable education ecosystem. The results of this study are expected to be a reference in building a superior Depohar 80 personnel development model that is responsive to innovation and ready to optimally support the operational readiness of the Indonesian Air Force.

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