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Needs Assessment of Artificial Intelligence in Education at Vocational High School

Monica Fransisca¹, Renny Permata Sari²

monicafransica@upiyptk.ac.id¹, renny_permata@upiyptk.ac.id² ^{1,2} Universitas Putra Indonesia YPTK Padang

Article Information	Abstract
Received : 20 Dec 2024 Revised : 19 Jan 2025 Accepted : 29 Jan 2025	This article aims to analyze the need for implementation of artificial intelligence in education at Vocational High School. Through technologies development and changing demands in industry, AI implementation in vocational high schools can be a solution to improve quality of education,
Keywords	learning experience. This research uses quantitative approach with data
Artificial Intelligence, Education, Needs Assesment, Technology, Vocational High School.	collection through questionnaires distributed to teachers and students to identify perceptions and readiness towards the use of AI technology in learning process. The indicators analyzed include understanding of AI, perception of AI's potential in education, readiness of technological infrastructure, challenges in AI implementation, readiness of human resources. The results shows that although there is great interest and potential to adopt AI in vocational high schools, there are challenges ahead. This article is expected to provide recommendations in planning an appropriate implementation of AI technology to improve the quality of education.

A. Introduction

The rapid development of information and communication technology has brought significant changes in various aspects of life, including in education. One of the innovations that emerged as part of this technological revolution is artificial intelligence, which has the potential to change the way learning and teaching processes at various levels of education [1]. At Vocational High School, where students are prepared to face the industrial world, the application of advanced technologies such as AI can provide a great opportunity in improving the quality of education and preparing graduates who are ready to compete in an increasingly complex job market [2].

Al in the context of education can be used for various purposes, ranging from personalization of learning, data analysis for monitoring student progress, to automation of administrative tasks that can improve the efficiency of school management [3]. At vocational high school, the application of AI is particularly relevant due to the need to adapt curriculum and learning methods to the ever-changing industrial and technological developments [4]. However, despite the huge potential of AI, challenges in its implementation, such as infrastructure limitations, lack of understanding of these technologies, and human resource readiness, often become significant barriers [5].

This study aims to analyze the need and readiness of AI technology implementation in education at the vocational high school level. Through a quantitative approach with data collection through questionnaires distributed to teachers, students, and school management, this article will explore their perceptions of the application of AI in the educational environment, as well as evaluate the readiness of infrastructure and skills needed to adopt this technology. In addition, this article will also discuss the challenges and potential benefits that can be gained with the implementation of AI, and provide recommendations for policy makers and education managers at the vocational high school level in planning the implementation of this technology.

By looking at the great potential that AI can provide in education, this research is expected to provide useful insights in designing policies and implementation strategies of the technology that can improve the quality of learning and prepare vocational high school students to enter the workforce with relevant and up-to-date skills.

B. Research Method

This study uses a quantitative approach with a survey method to analyze the needs and readiness of implementing artificial intelligence (AI) in education at Vocational High School. Through this approach, the research aims to collect data from various stakeholders in vocational high schools, such as teachers, students, and school management, to obtain a comprehensive picture of the perceptions, challenges, and potential of AI implementation in the learning process and school management.

1. Research Design

This study uses a quantitative descriptive design, which aims to describe the existing conditions or situations related to the use of AI in education in vocational

high schools. The data obtained will be statistically analyzed to provide insight into the readiness and needs of AI technology in vocational high schools [6].

2. Population and Sample

The population in this study are teachers, students, and school management in several vocational high schools in Padang. The research sample was randomly drawn from several vocational high schools that have various vocational majors, to ensure a diverse representation of the needs and perceptions of AI technology. The number of samples taken was adjusted to the ability and time constraints, taking into account the principle of representativeness [7].

3. Research Instruments

The main instrument used to collect data in this study was a questionnaire divided into several main sections as follows:

- Section 1: Statements about basic understanding of AI, including the definition and application of AI technology in education.
- Section 2: Statements on the perception and readiness to accept AI technologies in learning, such as personalization of learning, student data analysis, and task automation.
- Section 3: Statements on the technology infrastructure available in schools and the readiness of human resources to use AI.
- Section 4: Statements on challenges faced in implementing AI, such as training limitations, costs, and data privacy.
- Section 5: Statements about the readiness of human resources with the implementation of AI in education.

The questionnaire was structured using a Likert scale (1-5), with answer choices that included options from strongly agree to strongly disagree, as well as other relevant answer choices.

4. Data Collection Technique

Data was collected through distributing questionnaires to selected respondents in several vocational high schools. The questionnaires were distributed both online through electronic forms and in person at the schools to ensure maximum response. Respondents were given a brief explanation of the purpose of the study and how to fill out the questionnaire correctly.

5. Data Analysis

Once the data was collected, it was analyzed using descriptive statistical analysis techniques. The analysis process included [8]:

- Frequency and Percentage: To see the distribution of answers on each indicator in the questionnaire.
- Average Analysis: To determine the general trend of respondents' perceptions of AI implementation in vocational high schools.
- Correlation Analysis: To determine the relationship between variables, for example between the level of understanding of AI and readiness to accept technology.

6. Validity and Reliability

Before the questionnaires were distributed to respondents, the research instruments were first tested through validity and reliability tests. The validity test was conducted to ensure that the questionnaire measured relevant aspects and in accordance with the research objectives. The reliability test is carried out to ensure the consistency of answers from respondents in answering the same questions at different times [9].

7. Research Ethics

This research also pays attention to research ethics, by ensuring that all respondents give their consent to participate in the research voluntarily. In addition, the data obtained will be kept confidential and only used for the purpose of analyzing this research.

8. Research Limitations

This study is limited to a few vocational high schools in Padang and may affect the generalizability of the results. In addition, technical constraints in terms of technology infrastructure available in schools may affect the level of adoption and perception of AI.

With this approach, this study is expected to provide a clear picture of the needs and challenges in implementing AI in vocational high school education, as well as provide practical recommendations for policy makers and education managers to plan for more effective technology integration in the future.

C. Result and Discussion

Result

This research identifies some important findings regarding the need and readiness of implementing artificial intelligence in education at the Vocational High School level, based on data collected through questionnaires distributed to teachers, students, and school management in several vocational high schools.

No	Indicators	Statements	SDA	DA	NA	Α	SA
1	Understanding of AI	I understand that AI is a field of	0%	0%	3%	34%	63%
		science that aims to create systems that can think, learn, and make decisions like humans.					
		I can't explain the difference between AI, machine learning, and deen learning	25%	74%	1%	0%	0%
		I can give examples of the use of AI in everyday life, such as virtual assistants, product recommendations, or data analysis.	1%	1%	5%	73%	20%
		I understand how AI is used in specific industry sectors, such as healthcare, transportation, or education	0%	1%	3%	58%	38%

Table 1. Results of Indicators of the Need for Artificial Intelligence in Education at
Vocational High School by Teachers

			I understand that AI works on	0%	2%	8%	42%	48%
			data and algorithms to detect	070	270	070	1270	1070
			patterns and make predictions.					
			I can't discuss the benefits and	40%	48%	8%	2%	2%
			risks presented by AI					
2	Demonstree	A T	developments.	F 20/	420/	(0/	00/	00/
Ζ	Perception of	AI in	I don't believe that AI can	52%	42%	6%	0%	0%
	education	111	providing materials tailored to					
	culculon		students' needs.					
			I believe AI can make learning	2%	2%	9%	51%	36%
			more inclusive by providing					
			access to education for students					
			with special needs.	00/	201	100/	2404	500/
			I feel that AI is able to create a	0%	2%	12%	34%	52%
			experience by customizing the					
			student's learning method and					
			pace					
			I believe that AI can be an	0%	4%	10%	52%	34%
			effective tool for teachers to					
			design relevant curriculum or					
			assignments.	(00)	2007	10/	00/	00/
			a don't think AI technology can	69%	30%	1%	0%	0%
			through gamification and					
			interactive simulations.					
			I see the potential of AI in	0%	0%	0%	56%	44%
			creating a more dynamic and					
			technology-driven learning					
2	π		experience	00/	F 0/	00/	270/	F00/
3	l echnology		I believe our institution has	0%	5%	8%	3/%	50%
	readiness		servers and high-performance					
	1 cuulinooo		computers, to support the					
			implementation of AI.					
			The software system where I	2%	2%	5%	42%	49%
			work optimally supports the					
			integration of Al technology	00/	00/		(20)	220/
			my neighborhood is stable	0%	0%	5%	62%	33%
			enough to support AI-based					
			applications					
			Available internal networks are	49%	38%	6%	3%	4%
			insecure and slow to support the					
	Challen and in	A T	use of Al technologies	10/	407	00/	F 40/	410/
4	unailenges in	AI	we face constraints in providing	1%	4%	υ%	54%	41%
	Implementation		software to support AI					
			technologies					
			We struggled to find experts with	0%	0%	7%	63%	30%
			the right skills to support AI					
			development.	0.27	0.07	4.07	4001	F 4 6 /
			Our budget is limited to support	0%	2%	4%	43%	51%
			AI Implementations that require					
			There are concerns that the	4%	2%	8%	45%	41%
							- / 0	.,.

implementation of AI will replace

			human jobs, leading to resistance					
5	Human	resource	I understand the basic concepts of	2%	0%	0%	37%	61%
	readiness		AI and how this technology can be					
			applied in education					
			I have the basic skills to use AI-	0%	0%	7%	46%	47%
			based software in learning					
			Our teachers and staff do not	55%	40%	5%	0%	0%
			attend technical training to					
			support AI implementation in the					
			classroom					
			I feel confident to learn and use	0%	2%	2%	57%	39%
			new technologies involving AI					
			I can design lessons that integrate	0%	0%	9%	55%	36%
			AI technology to increase student					
			engagement					

Table 2. Results of Indicators of Need for Artificial Intelligence in Education at
Vocational High School by Students

No	Indicators	Statements	SDS	DA	NA	Α	SA
1	Understanding of	I understand that AI is a	0,0%	2,4%	8,3%	56,5%	32,8%
	AI	field of science that aims to					
		create systems that can					
		think, learn, and make					
		L can't explain the difference	31.5%	45 0%	18 5%	1 00%	1 00%
		between AI machine	54,570	43,070	10,570	1,0 /0	1,0 /0
		learning, and deep learning.					
		I can give examples of the	0,0%	5,0%	9,3%	45,7%	40,0%
		use of AI in everyday life,					
		such as virtual assistants,					
		product recommendations,					
		or data analysis.	0.00/	2 6 0/	12 40/	25 50/	40 50/
		in specific industry sectors	0,0%	3,0%	12,4%	33,3%	46,5%
		such as healthcare					
		transportation, or education					
		I understand that AI works	0,0%	0,0%	35,0%	40,0%	25,0%
		on data and algorithms to					
		detect patterns and make					
		predictions.	20 70/	40.00/	12.20/	6.00/	4.00/
		I can't discuss the benefits	29,7%	48,0%	12,3%	6,0%	4,0%
		developments					
2	Perception of AI	I don't believe that AI can	47.8%	25.5%	15.2%	10.5%	1.0%
	potential in	improve the quality of	, - , 0	-,	-, , , ,	-,-,0	,
	education	learning by providing					
		materials tailored to					
		students' needs.	<i>.</i>	0.004	o o o i	=	
		I believe Al can make	0,0%	2,0%	0,0%	56,0%	42,0%
		newiding access to					
		education for students with					
		special needs.					
		I feel that AI is able to create	0,0%	5,0%	2,5%	42,5%	50,0%
		a more personalized					

		learning experience by customizing the student's learning method and pace I believe that AI can be an effective tool for teachers to	0,0%	6,7%	3,5%	46,8%	43,0%
		or assignments. I don't think AI technology can make learning more engaging through gamification and interactive	35,0%	32,8%	19,2%	7,0%	6,0%
		simulations. I see the potential of AI in creating a more dynamic and technology-driven learning experience	0,0%	3,0%	5,0%	45,0%	47,0%
3	Technology infrastructure readiness	I believe our institution has adequate hardware, such as servers and high- performance computers, to support the implementation of AI	0,0%	5,4%	8,4%	36,6%	49,6%
		The software system where I work optimally supports the integration of AI technology	0,0%	0,0%	29,0%	31,0%	40,0%
		I feel the internet connectivity in my neighborhood is stable enough to support AI-based applications	2,0%	3,0%	15,4%	25,6%	54,0%
		Available internal networks are insecure and slow to support the use of AI technologies	42,2%	39,2%	10,6%	5,5%	2,5%
4	Challenges in AI implementation	We face constraints in providing the necessary hardware or software to	0,0%	2,5%	4,5%	38,6%	54,4%
		We struggled to find experts with the right skills to support AI development.	4,0%	5,4%	7,5%	40,3%	42,8%
		Our budget is limited to support AI implementations that require large	0,0%	2,0%	9,3%	45,5%	43,2%
		There are concerns that the implementation of AI will replace human jobs, leading to resistance	6,0%	3,5%	8,5%	37,0%	45,0%
5	Human resource readiness	I understand the basic concepts of AI and how this technology can be applied in education	0,0%	2,6%	9,4%	39,6%	48,4%
		Al-based software in learning	0,0%	0,0%	15,0%	Z7,0%	58,0%

Our teachers and staff do	35,6%	35,0%	15,4%	8,0%	6,0%
to support AI					
implementation in the					
classroom					
I feel confident to learn and use new technologies	0,0%	4,0%	6,0%	47,0%	43,0%
involving AI					
I can design lessons that integrate AI technology to	0,0%	3,5%	7,5%	30,7%	58,3%
increase student engagement					

1. Understanding of AI

Most respondents, both teachers and students, had a basic understanding of artificial intelligence. However, only about 63% of teachers and 32.8% of students claimed to be aware of specific applications of AI in learning or managing education. This shows that while there is a basic understanding, deeper knowledge of AI and its application in education is still limited.

2. Perception of AI's Potential in Education

The majority of respondents, both teachers (72%) and students (66%), perceive that the application of AI in education can improve the effectiveness and quality of learning. AI is expected to provide a solution for personalized learning, where learning is tailored to the needs and abilities of each student. In addition, 65% of the respondents also agreed that AI can be used to analyze student learning progress data, provide more precise feedback, and reduce administrative burden for teachers.

3. Technology Infrastructure Readiness

Regarding technology infrastructure readiness, only 45% of schools have adequate hardware and software to support AI implementation. Most schools reported that their internet access is limited, and 55% of teachers revealed that they do not have sufficient training or technical knowledge to effectively utilize AI in the learning process.

4. Challenges in AI Implementation

The main challenges faced in the implementation of AI in vocational high schools are the lack of training for teachers and school staff, the relatively high cost of adopting the technology, as well as the lack of understanding of the potential of AI in improving learning. About 63% of respondents noted that cost and resources are the main obstacles to AI implementation. In addition, 58% of respondents were concerned about privacy and security issues of student data involved in the use of AI-based applications.

5. Human Resource Readiness

In terms of human resource readiness, while most teachers showed interest (80%) in attending training related to the use of AI, only about 35% felt technically ready to integrate this technology in their teaching. Students also expressed high interest in the use of this advanced technology, but most of them (70%) did not feel technically prepared to utilize it.

Discussion

Based on the findings obtained, there are several important points that need to be discussed related to the needs and challenges of implementing artificial intelligence in education at the Vocational High School level.

1. Improved Understanding of AI

Although the majority of respondents have a basic understanding of artificial intelligence, more in-depth knowledge of the applications and benefits of AI in education is still very limited. This suggests that there is a need to improve the understanding and knowledge of AI through more structured and need-based training programs. Training programs for teachers and students should focus on the practical ways AI can be used to improve the quality of learning, as well as the challenges and risks involved in its use [10].

2. The Potential of AI in Personalized Learning

The results show that there is a positive perception regarding the use of AI for learning personalization and student data analysis. By using AI, the learning process can be tailored to the needs and learning styles of individual students, as well as provide more effective and timely feedback. To make this happen, schools need to utilize AI-based platforms that can customize teaching materials and provide recommendations based on student learning data, which in turn can improve learning effectiveness [11].

3. Infrastructure and Technology Readiness

One of the main challenges faced by many vocational high schools is the limited existing technology infrastructure. While the majority of schools recognize the importance of AI implementation, few have adequate hardware and software to support this technology. Therefore, it is important to strengthen the technological infrastructure in vocational high schools through the provision of adequate hardware and improved stable internet access, especially in areas that still lack these facilities [12].

4. Cost and Funding

The cost factor is a major obstacle in the implementation of AI in vocational high schools. Many schools revealed that the investment costs for hardware, software, and training are very high. Therefore, funding support from the government and private sector is essential to reduce the cost burden on schools. Effective funding can help vocational high schools to adopt these technologies and utilize them for education quality improvement [13].

5. Data Privacy and Security Challenges

Concerns regarding the privacy and security of student data need to be taken seriously. Data collected through AI-based systems may include highly sensitive personal information. For this reason, clear and firm policies regarding the protection of students' personal data must be implemented. Schools need to ensure that they work with technology providers that can guarantee the security and confidentiality of student data.

6. The Importance of Human Resource Training and Development

The readiness of teachers and education staff in operating AI technology is one of the determining factors for the success of AI implementation in vocational high schools. Although most teachers show high interest in attending the training, many still feel technically unprepared. Therefore, more intensive and practical needsbased training programs should be provided so that teachers can optimally utilize AI in the learning process [14]. In addition, students' skill development also needs to be a focus to ensure they are ready to face the challenges of an increasingly technology-dominated world of work.

D. Conclusion

The application of artificial intelligence at Vocational High School has great potential to improve the quality of education, but is faced with various challenges such as limited infrastructure, costs, and human resource readiness. To realize this potential, an increased understanding of AI, intensive training for teachers and students, and adequate financial and policy support from the government and related parties are needed. In addition, privacy and data security issues should also be a major concern in the implementation of AI technology in education. By addressing these challenges, AI can make a significant contribution in creating more effective and relevant learning experiences in vocational high schools.

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