

# Empowering Indonesian Vocational Students with Artificial Intelligence Awareness: Challenges and Career Opportunities

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**Abstract** – Artificial intelligence (AI) has emerged as one of the most transformative and influential technological advancements, significantly impacting sectors like healthcare, finance, and education in the rapidly evolving digital era. However, vocational high school students often have limited knowledge about AI, primarily due to the superficial coverage of AI in their curriculum and the lack of resources and trained educators. This study aimed to assess the effectiveness of an intervention designed to enhance AI awareness and understanding among vocational high school students. A comprehensive program was implemented, involving initial assessments, interactive face-to-face training sessions, and facilitated group discussions. Descriptive analysis using statistical methods was employed to compare pretest and posttest data, revealing significant improvements in students' knowledge and attitudes towards AI. For example, the average score for the question "I know what Artificial Intelligence is" increased from 1.77 to 2.93, while "I can name an example of an AI application" rose from 1.76 to 2.85. Additionally, students showed increased awareness of AI's impact on future careers and a greater interest in learning more about AI, with scores rising from 2.20 to 2.85 and 2.48 to 2.96, respectively. The intervention proved effective in significantly enhancing students' understanding and attitudes towards AI, highlighting the value of targeted educational programs. By addressing gaps in AI education and fostering a proactive learning environment, the approach equips students with the knowledge and skills necessary to thrive in an AI-driven job market. This comprehensive strategy not only prepares students for future career challenges but also empowers them to leverage AI technology for career advancement.

**Keywords:** Artificial Intelligence; Vocational Student; AI Challenges; AI Opportunities; Career

## 1. INTRODUCTION

In the rapidly advancing digital age, artificial intelligence (AI) has become one of the most transformative and influential technological innovations. AI's reach extends across various industry sectors, including legal, manufacturing, healthcare, finance, and education, significantly enhancing efficiency and revolutionizing traditional processes [1]-[3]. For example, in healthcare, AI improves diagnostic accuracy and tailors personalized treatment plans, while in finance, it optimizes trading strategies and manages risks [4]. The advent of AI presents both challenges and opportunities that the younger generation, especially vocational high school students who are on the brink of entering the workforce, must comprehend [5].

Vocational high school students, despite their technical training, generally have limited knowledge about AI [6]. Their understanding is often superficial, lacking insight into practical applications and the implications for their future careers [7]. Several factors contribute to this limited awareness. Firstly, many students are only familiar with AI in a broad sense and do not understand its practical applications or its future career implications [8]. Secondly, the current vocational high school curriculum does not specifically include AI topics, resulting in a lack of comprehensive knowledge of this critical technology [9]. According to the International Society for Technology in Education (ISTE), many educational institutions, particularly in developing regions, face challenges in integrating modern technologies into their curricula [10]. Thirdly, resources such as books, modules, and training on AI are scarce in vocational high schools, and

teachers often lack the skills to effectively teach AI concepts. This lack of resources and training opportunities leaves students ill-prepared for the realities of an AI-driven job market.

Several initiatives have been undertaken to address these gaps, but their scope and sustainability have often been limited. Some schools have organized workshops and online training sessions on technology, including AI [11]-[13]. However, these events are typically one-time occurrences and do not provide continuous learning opportunities, thus limiting their long-term impact. Additionally, some vocational high schools have partnered with technology companies to offer brief training sessions or industry visits [14]-[16]. Although beneficial, these activities are often unstructured and not uniformly available across all schools [17]-[18]. There have also been attempts to use online modules and courses to introduce AI to students. However, issues such as limited internet access and low student motivation for self-directed learning have hindered their effectiveness.

To address these challenges and enhance AI awareness and understanding among vocational high school students, a comprehensive approach is proposed. This approach involves conducting initial assessments to measure students' awareness of AI before starting the program. The assessment results will inform the design of a program tailored to meet the specific needs of the students [19]. It also includes organizing in-depth, interactive face-to-face training sessions on AI, covering basic AI concepts, practical applications, and industry case studies to provide a thorough understanding. Additionally, group discussions and case studies will be facilitated to help students apply AI concepts in real-world contexts, fostering critical thinking and problem-solving skills.

Successful implementation of this program requires collaboration with various stakeholders. Vocational high schools and their teachers will serve as primary facilitators, providing logistical support and ensuring active student participation. Support from the government and educational authorities is crucial for legitimizing the program and providing necessary resources. Technology companies can contribute by offering expert mentors, learning resources, and internship opportunities for students. Universities and research institutions can assist in curriculum development and provide speakers and trainers for the program.

To ensure the program's effectiveness and sustainability, several strategic steps will be undertaken. These steps include conducting initial assessments to gauge students' AI awareness and knowledge levels, developing a structured and comprehensive material and learning modules, conducting interactive face-to-face training sessions using engaging and practical teaching methods, organizing group discussions and case studies facilitated by teachers and AI experts to deepen students' understanding, performing periodic evaluations to assess the program's effectiveness and make adjustments based on feedback from students and teachers, and establishing and maintaining partnerships with relevant stakeholders to ensure ongoing support and program development.

By systematically addressing the existing gaps in AI education and fostering a proactive learning environment, this approach aims to equip vocational high school students with the knowledge and skills needed to thrive in an AI-enhanced world. This comprehensive strategy not only prepares students for future career challenges but also empowers them to leverage AI technology for career advancement.

## **2. IMPLEMENTATION METHOD**

The clarity and coherence of a program's objectives, methods, and material are crucial for the success of educational initiatives, particularly when introducing complex subjects like Artificial Intelligence (AI) to vocational high school students. Clear objectives provide direction and purpose, while engaging methods and relevant content ensure effective learning and retention of AI concepts.

### **2.1 Program Target**

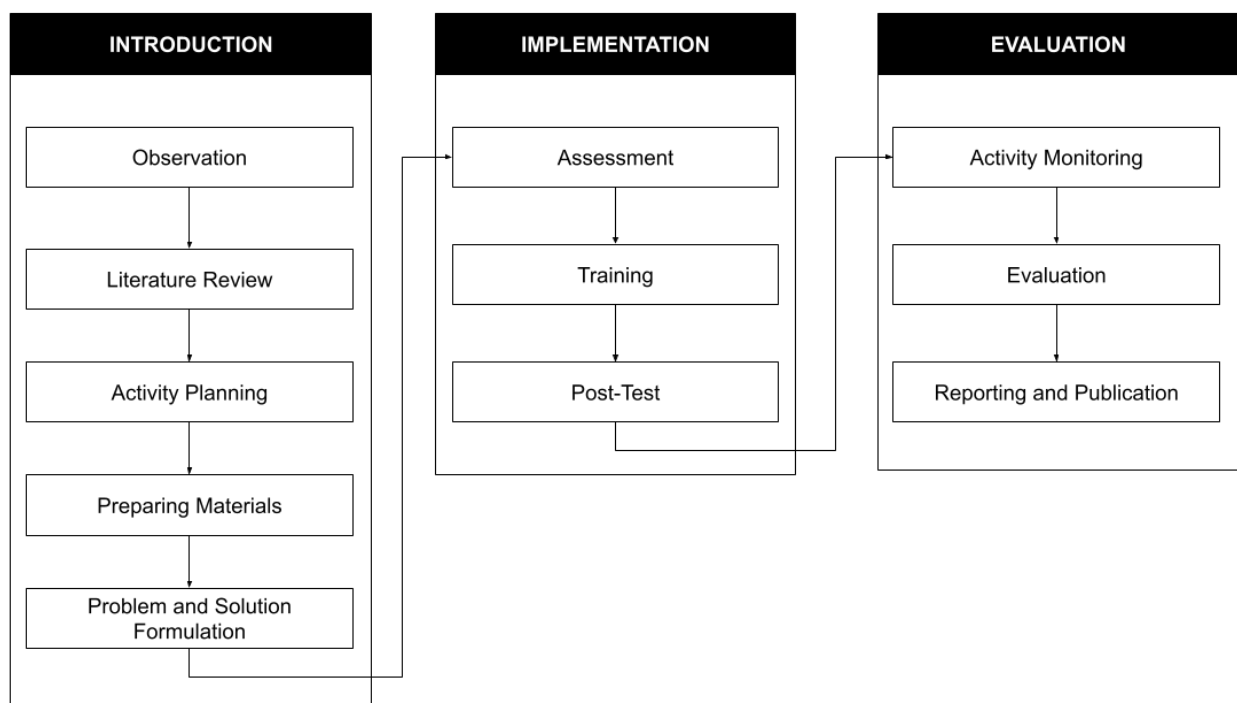
The selected target audience is SMK Negeri 1 Sedayu, a vocational high school offering various majors [20]. This training program is specifically aimed at the computer network and telecommunication engineering of the 11th grade.

## 2.2 Activity Method

The implementation methods of the program consist of several key components. First, an initial observation is conducted to measure the students' awareness and understanding of AI before the program begins. A literature review is then carried out to develop a structured and comprehensive curriculum and learning modules, covering AI introduction, practical applications, and case studies.

Following this, detailed activity planning and material preparation are undertaken. The program implementation involves interactive and in-depth face-to-face training sessions facilitated by teachers and AI experts, along with group discussions and case studies to help students apply AI concepts in real-world contexts. As part of the evaluation, the training activities are regularly monitored, and post-tests are conducted to assess the program's effectiveness.

The results and feedback are compiled into reports and published. The community service roadmap can be seen in Figure 1.



**Figure 1.** The Community Service Roadmap

In the assessment component of the program was designed to measure students' current understanding and awareness of Artificial Intelligence (AI), as well as their career aspirations and perceptions regarding the impact of AI on their future. The questionnaire included the following questions.

- a. What is your desired career/profession after graduation?
- b. I know what Artificial Intelligence (AI) is.
- c. I can name one application of Artificial Intelligence.
- d. Artificial Intelligence will affect my future career.
- e. I have used an application that employs AI technology.
- f. I know the main challenges associated with using AI in the workplace.
- g. I am interested in learning more about Artificial Intelligence.
- h. I can name one job field that will be greatly influenced by AI.
- i. I know the skills needed to work with Artificial Intelligence.
- j. I can name one important skill to learn related to AI.

- k. My school provides enough information about AI and related career opportunities.
- l. I have attended training or courses related to AI.
- m. I know what I will do after graduation (Work/College).
- n. I am unsure about what I will do after graduation.
- o. After graduation, I will pursue a career in line with my major.
- p. I know how AI works.
- q. AI poses a threat to the future.
- r. I already have the desire to pursue further education/training to improve my skills.

The assessment aims to establish a baseline understanding of students' AI knowledge and perceptions. This helps tailor the program to address knowledge gaps and align with their career aspirations and interests. By evaluating their awareness of AI applications and its career impact, the program emphasizes the importance of AI education. The assessment also gauges students' readiness for further AI-related learning, ensuring they are prepared for technological advancements.

Training sessions, held in classrooms, include lectures, Q&A, and group discussions. Lectures provide foundational AI knowledge and industry applications, engaging students with complex concepts. The Q&A segment allows students to clarify doubts and deepen their understanding. Group discussions and case studies help students apply theoretical knowledge to real-world scenarios, enhancing critical thinking and problem-solving skills.

The evaluation phase compares students' knowledge and perceptions before and after the training using identical pre- and post-tests. This method directly measures the impact of the training. Statistical analysis of test results assesses the program's effectiveness in improving students' understanding of AI, its applications, and related career opportunities.

The evaluation of the training program's effectiveness will be conducted by comparing pre-test and post-test results using the descriptive analysis [21]. This non-parametric test is suitable for analyzing the ordinal data collected from the Likert scale responses, which include options like "strongly agree", "agree", "disagree", and "strongly disagree" [22]. Participants will fill out the same questionnaire before and after training, and their responses are converted into numerical values for analysis with Likert Scale values based on Table 1.

**Table 1.** Likert Scale Conversion Table

Response	Value
Strongly Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

The differences between the pre-test and post-test results were evaluated using descriptive analysis to provide a detailed understanding of the changes in students' knowledge and perceptions of AI. Descriptive analysis involves summarizing the basic features of the data, providing simple summaries about the sample and the measures. This method allows for a comprehensive overview of the changes in students' responses before and after the training.

Descriptive statistics, such as mean, median, mode, standard deviation, and frequency distributions, were used to analyze the Likert scale data [23]. These statistics helped to identify trends, patterns, and shifts in the students' attitudes and knowledge regarding AI. For instance, the mean scores for each question were calculated and compared between the pre-test and post-test to determine the overall improvement in students' understanding and attitudes.

Furthermore, frequency distributions were used to observe the number of students who shifted their responses from one category to another (e.g., from "disagree" to "agree"). This detailed breakdown provided insights into specific areas where the training was most effective

and highlighted aspects that might require further emphasis in future training programs. The final step in community service is reporting and publication.

### **2.3 Training Material**

The training materials for AI introduction and implementation include the following.

- a. The Urgency of AI
- b. Understanding AI
- c. Component of AI
- d. How AI Works
- e. Applications of AI in Various Industries
- f. Challenges in Using AI
- g. Opportunities in Using AI
- h. Types of Jobs in The AI Field
- i. Efforts to Improve Skills in the AI Field

Explaining AI to vocational high school students is critical due to its growing impact across industries [24]. The urgency of AI education lies in preparing students for a future where AI is ubiquitous. Understanding AI, its components, and how it works provides a foundational knowledge necessary for navigating the technological landscape.

Applications of AI in various industries illustrate its versatility and potential, highlighting opportunities for career growth and innovation [25]. Addressing the challenges in using AI, such as ethical considerations and data privacy, ensures students are aware of the complexities and responsibilities involved [26]. Highlighting opportunities in AI, including the creation of new job roles, emphasizes the career potential in this field [27]. Discussing the types of jobs available in AI helps students identify potential career paths and motivates them to pursue relevant skills [28].

Finally, efforts to improve skills in the AI field, such as continuous learning and specialized training, are essential for maintaining competitiveness and adaptability in an ever-evolving job market. This comprehensive understanding equips vocational students with the knowledge and skills needed to succeed in a future increasingly dominated by AI technologies.

## **3. RESULTS AND DISCUSSION**

### **3.1 Assessment**

The assessment results reveal significant gaps in the awareness and understanding of Artificial Intelligence (AI) among Indonesian vocational students, underscoring the challenges they face and the opportunities available to empower them in an AI-driven future. The low score of 1.77 in basic knowledge of AI indicates that students have limited understanding of the concept, which could hinder their engagement with AI in both academic and professional contexts. Similarly, the 1.76 score for recognizing AI applications shows that students struggle to identify real-world examples, pointing to a need for practical integration of AI concepts into their curriculum.

The perception of AI's career impact, reflected in a moderate score of 2.20, suggests students are aware of AI's influence but are unclear on how it will reshape job markets and the necessary skills. Their experience with AI-powered tools, with a score of 2.16, indicates some exposure, but students often fail to recognize AI's role in these technologies, highlighting the need for more hands-on engagement. A low score of 1.40 for awareness of AI-related challenges, such as ethical dilemmas and data privacy concerns, shows that students are largely unfamiliar with the complexities AI brings to the workplace. Despite these knowledge gaps, the relatively high interest in learning about AI (2.48) presents a valuable opportunity to engage students through targeted workshops and courses.

The lowest score of 1.16 for understanding the workplace impact of AI reveals that students are unaware of the industries most affected by AI, suggesting the need for case studies

in key sectors like manufacturing and healthcare. A score of 1.32 in AI-related skills further illustrates the students' unfamiliarity with the necessary competencies such as data analysis and machine learning, emphasizing the importance of adapting vocational training programs. Similarly, the 1.16 score for identifying key AI skills reflects their lack of guidance on the essential technical and soft skills for AI careers.

The very low score of 1.04 for school support in AI learning reflects the perception that schools are not providing enough resources or information on AI-related opportunities, indicating a need for enhanced AI education. Participation in AI training, with a score of 1.68, shows limited engagement, likely due to a lack of available programs or awareness. Additionally, the uncertainty around career planning post-graduation, with a score of 1.48, suggests inadequate career guidance, particularly regarding AI's impact on various industries.

The 1.64 score for uncertainty about future plans underscores the need to provide students with clearer pathways to AI-related careers. Commitment to their major, scoring 1.52, indicates a tendency to pursue careers in their field, but this could shift with increased AI awareness. Although students have a slightly better understanding of AI operations (2.24), deeper practical learning is still required. The low score of 1.28 for concerns about AI's future risks reflects a generally positive attitude, which can be leveraged to increase engagement. Lastly, the very low willingness to upskill (1.16) highlights the importance of promoting the benefits of AI skills to motivate further learning.

### **3.2 Face to Face Training**

Face-to-face training held on June 10, 2024 at SMKN 1 Sedayu Bantul, Yogyakarta, was the main component of this community service activity. This activity took place from 07:30 AM to 10:30 AM and involved grade 11 students as participants. This training aims to improve their skills and knowledge through direct interaction between teachers and participants. The training was opened by the head of the study program from SMK Negeri 1 Sedayu as shown in Figure 2.



**Figure 2.** Opening of Training by the Head of the Vocational School Study Program

The training was attended by 36 grade 11 students, showing a high level of attendance and enthusiasm. The session was characterized by many questions from the students, indicating a strong interest and desire to understand the material more deeply. The material presented covered both theoretical and practical aspects, accompanied by hands-on practical sessions that supported the understanding of the theory through real applications. The presentation of the material is shown in Figure 3.



**Figure 3.** Presentation of Artificial Intelligence Material

The instructors involved are experts in their fields, using interactive teaching approaches to maximize student engagement and understanding. This face-to-face training provides an opportunity for students to interact directly with experts, allowing them to get immediate answers to questions that arise during learning. The training went smoothly and received a lot of attention from the participants. Training participants and instructors can be seen in Figure 4. The advantages of this format include the instructor's ability to directly customize teaching methods based on student responses and needs.



**Figure 4.** Training Participants and Instructors

Apart from getting positive responses from participants, the training received positive responses and appreciation from the deputy principal. Photos of the instructor and deputy principal can be seen in Figure 5.



**Figure 5.** Photos of The Instructor and Deputy Principal

### 3.3 Evaluation

To evaluate the effectiveness of the intervention on students' understanding and attitudes towards Artificial Intelligence (AI), a descriptive analysis was conducted using statistical methods. The analysis compared pretest and posttest average scores, converted to a 4-point Likert scale, for each question. The results of the pretest and posttest transformation into Likert scale data are shown in Table 2.

**Table 2.** Average Pretest and Posttest Score

Statement	Average Pretest Score	Average Posttest Score
I know what Artificial Intelligence is	1.77	2.93
I can name one example of an Artificial Intelligence application	1.76	2.85
Artificial Intelligence will influence my future career	2.20	2.85
I have used applications that use Artificial Intelligence technology	2.16	3.04
I know the main challenges associated with using Artificial Intelligence in the workplace	1.40	2.84
I am interested in learning more about Artificial Intelligence	2.48	2.96
I can name one area of work that will be greatly influenced by Artificial Intelligence	1.16	2.33



I know the skills needed to work with Artificial Intelligence	1.32	2.22
I can name one important skill to learn related to Artificial Intelligence	1.16	2.00
My school provides enough information about Artificial Intelligence and related career opportunities	1.04	1.96
I have attended training or courses related to artificial intelligence	1.68	2.00
I already know where I will do after graduating from school (work/college)	1.48	2.41
I am unsure about what I will do after leaving school	1.64	2.07
After graduating from school, I will pursue a career according to my major	1.52	2.15
I know how artificial intelligence works	2.24	2.93
Artificial intelligence endangers the future	1.28	2.19
I already have the desire to take part in education/courses/training to improve my skills	1.16	2.11

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The results indicate a significant improvement in students' knowledge and awareness of AI. For instance, the average score for the question "I know what Artificial Intelligence is" increased from 1.77 to 2.93, and "I can name an example of an AI application" rose from 1.76 to 2.85. This demonstrates enhanced basic understanding and recognition of AI applications among students.

Questions related to the impact of AI on future careers also showed notable increases. The average score for "AI will influence my future career" improved from 2.20 to 2.85, reflecting a heightened awareness of AI's relevance to their professional paths.

Additionally, students reported increased usage and comprehension of AI technologies. The question "I have used applications that use AI technology" saw an increase from 2.16 to 3.04, and "I understand the main challenges related to using AI in the workplace" went up from 1.40 to 2.48. These findings suggest that students are more familiar with and better understand the challenges of AI technology post-intervention.

The intervention also fostered a greater interest in further learning about AI, with the average score for "I am interested in learning more about AI" rising from 2.48 to 2.96. Furthermore, students reported feeling more informed by their schools about AI and related career opportunities, although this area showed more modest gains. The score for "My school provides enough information about AI and related career opportunities" increased from 1.04 to 1.96.

In terms of future planning, students felt more certain about their post-graduation plans. The question "I know what I will do after graduation (work/college)" saw an increase from 1.48 to 2.41, indicating clearer post-school trajectories.

### **3.3 Challenge**

In conducting this assessment, several challenges were encountered that highlighted areas for potential improvement and future expansion. Firstly, the number of participants was relatively

small, which may affect the generalizability of the findings. To obtain a more comprehensive understanding, future assessments should aim to include a larger and more diverse participant pool. Additionally, the current assessment primarily involved students from a specific vocational background. Expanding the participant base to include students from different academic disciplines and majors could provide a broader perspective on the understanding and perceptions of AI. Another challenge was the nature of the assessment as a one-time activity. For more impactful results and sustained learning, it would be beneficial to implement a series of continuous activities. Regular workshops, follow-up sessions, and periodic assessments can help reinforce learning and track progress over time. Lastly, incorporating practical demonstrations of how AI works can significantly enhance students' understanding and engagement. Demonstrations and hands-on workshops that showcase AI applications and their real-world impact can provide students with a deeper, more practical insight into the field. Addressing these challenges can enhance the effectiveness of future assessments and educational initiatives, providing students with a richer and more comprehensive learning experience.

## **4. CONCLUSION**

The intervention proved to be effective in significantly enhancing students' understanding and attitudes towards Artificial Intelligence. There were notable improvements in basic AI knowledge, awareness of AI applications, and recognition of AI's impact on future careers. Students also showed increased interest in AI, felt better informed by their schools, and had clearer post-graduation plans. These results underscore the value of targeted educational interventions in improving AI literacy among students.

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