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GOOGLE GEMINI AND PROMPT ENGINEERING TRAINING FOR AI AND DIGITAL LITERACY

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ABSTRACT

The rapid adoption of generative artificial intelligence in education requires structured digital literacy, yet many vocational students still need guidance on productive and ethical AI use. This community service program introduced Google Gemini as a learning assistant to Mechanical Engineering students at SMK Angkasa Husein Sastranegara, Bandung. Using a Bring Your Own Device approach, the workshop combined concept delivery, hands-on prompt-engineering practice, and guidance on the “5 Golden Rules” of ethical AI interaction. A pre-test on general AI and digital literacy was completed by 45 participants, while 39 participants completed a post-test focused on operational AI competencies. The pre-test mean was 85.0%, with 82.2% of respondents scoring at least 75. In the post-test, 37 of 39 respondents (94.9%) scored at least 75, with a mean score of 94.4%, meeting the predefined post-test competency criterion. The strongest post-test performance was observed in prompt engineering and AI-output verification, while personal-data protection and human accountability showed comparatively lower, although still high, performance. Because the pre-test and post-test assessed related but distinct competency dimensions and involved different numbers of respondents, their results were interpreted descriptively rather than as a direct measure of learning gain. The findings indicate a high level of achievement on the AI and digital literacy competencies assessed in the post-test.

Keywords: artificial intelligence literacy, Google Gemini, prompt engineering, vocational education, ethical AI use

1. INTRODUCTION

The integration of Artificial Intelligence (AI) into daily life has accelerated exponentially, shifting from a complementary skill to a foundational digital competence required across all professional sectors (We Are Social & Meltwater, 2024). In the educational landscape, generative AI offers unprecedented opportunities as a personalized learning assistant capable of distilling complex concepts, accelerating literature discovery, and boosting overall academic productivity (Mustafa et al., 2024). However, this rapid technological adoption introduces critical challenges if not accompanied by adequate digital literacy (Kasneci et al., 2023). Without structured guidance, students are prone to misusing AI for instant gratification, such as copying answers without cognitive processing. This tendency ultimately degrades critical thinking, fosters absolute technological dependency, and raises ethical concerns (Casal-Otero et al., 2023). Therefore, establishing a robust framework for ethical and responsible AI utilization is highly urgent, particularly for vocational high school students who are preparing to enter a highly digitized workforce.

The target partner for this Community Service (PkM) program is Angkasa Husein Sastranegara Vocational High School (SMK), specifically focusing on students in the Mechanical Engineering study program. This geographical proximity provides a significant advantage for the community service team to conduct intensive and sustainable mentoring. While the school's infrastructure includes smart TVs in classrooms to support visual demonstrations, direct digital interaction remains a challenge. Consequently, this program optimized a Bring Your Own Device (BYOD) approach, utilizing the students' personal smartphones and cellular data to ensure practical, hands-on engagement with AI tools.

Preliminary observations and situational analyses conducted during the pre-activity phase revealed significant gaps in the students' digital readiness. Initially, the students demonstrated a lack of fundamental knowledge regarding the productive application of AI in academic settings. Classroom dynamics were marked by fluctuating engagement; several students exhibited low focus and lethargy, while disparities in device ownership initially hindered participation. However, a profound shift occurred when the team introduced a practical stimulus: hands-on *prompt engineering* to design educational posters. This interactive intervention instantly transformed the classroom atmosphere, generating immense enthusiasm and active participation. This stark contrast between a high eagerness for applied technology and the absence of foundational AI literacy highlights a critical vulnerability. Left unaddressed, this literacy deficit exposes students to the risks of consuming and spreading disinformation (Rojas-Estrada et al., 2024), compromising personal data security (Republic of Indonesia, 2022), and committing unintentional academic misconduct.

To bridge this gap, the community service team designed a targeted training intervention centered exclusively on the **Google Gemini** platform. Gemini was selected as the most viable solution for the partner's infrastructure because it is a lightweight, web-browser-based platform that functions optimally on smartphone screens without requiring heavy software installations. Positioned as a "digital backpack," Gemini was utilized to assist mechanical engineering students in querying technical references, synthesizing dense vocational materials, and stimulating problem-solving creativity. By integrating smart TV demonstrations with individual smartphone practice, the team explicitly embedded the principles of ethical AI use aligned with global standards (UNESCO, 2021). This framework was distilled into the "5 Golden Rules" for AI interaction: (1) utilize AI as a learning facilitator, not a cheating mechanism; (2) maintain critical reasoning as the primary driver; (3) uphold academic integrity; (4) independently fact-check AI-generated outputs; and (5) strictly safeguard personal data privacy in digital spaces.

Ultimately, this community service program aims to support responsible AI use by emphasizing continuous digital education as an important component of digital literacy in the AI era. The targeted outcomes include demonstrating students' AI literacy through practical activities involving generative AI as a learning support tool rather than as a replacement for human reasoning (Kasneci et al., 2023). The practical prompt-engineering intervention was designed to engage non-ICT vocational students in active learning while making use of available personal devices (BYOD).

2. METHOD OF IMPLEMENTATION

This community service activity used a descriptive quantitative approach to document participants' performance before and after the training. A pre-test was administered before the learning session to describe participants' initial understanding, followed by learning materials and hands-on practice. After the practical activities, a post-test was administered to assess the competencies addressed by the training. Because the pre-test and post-test instruments assessed different competency dimensions, their results were not treated as directly comparable measures of learning gain. The evaluation therefore focused on the predefined post-test competency criterion and on descriptive patterns within each assessment.

2.1 Location and Time

The community service activity was conducted at SMK Angkasa Husein Sastranegara, located at Jalan LETTU SUBAGIO No. 22, Cicendo District, Bandung City, West Java Province. The location was reached by motor vehicle using the fastest available route from the service team's location to the school. The activity was held on August 12, 2026, and took place in the Multipurpose Building of SMK Angkasa Husein Sastranegara. The venue was selected as it provided sufficient space to support the delivery of materials, practical sessions, and other activities involving the participants throughout the program.

2.2 Target Audience

The target audience of this community service program consisted of 50 students from two Grade XI classes in the Mechanical Engineering program at SMK Angkasa Husein Sastranegara, Bandung. The participants comprised male and female vocational high school students with basic experience in using computers and internet-based applications. This group was selected as the target audience because the program focused on strengthening students' ability to use generative artificial intelligence as a learning support tool within a vocational education context.

2.3 Service Method

The community service activity was implemented as a training workshop combining guided tutorials, hands-on practice, and group mini-projects through a project-based learning approach. The activity began with participant registration, an orientation on the program objectives, and a pre-test to identify participants' initial understanding of artificial intelligence and digital literacy. The training then continued with the delivery and demonstration of materials covering generative artificial intelligence, prompt engineering, information verification, misinformation awareness, and digital security. Google Gemini was introduced as the primary AI tool to support students' learning activities through direct practice using their smartphones. Participants subsequently worked in small groups to apply the materials through prompt-engineering exercises and the development of digital literacy products, including educational infographics, research-based essays, and interactive learning media using Google Gemini. The activity concluded with presentations of the mini-projects, followed by the administration of the post-test, a participant feedback questionnaire, and the closing session. Throughout the practical activities, the community service team acted as facilitators by assisting participants with technical difficulties and reinforcing the responsible and ethical use of artificial intelligence.

2.4 Success Indicators

The success indicator of the activity was operationalised through the achievement of the predefined post-test competency criterion. The program was considered to meet this criterion when at least 75% of post-test respondents obtained a score of at least 75 on a scale of 100. This indicator was intended to describe the level of competency demonstrated by respondents on the AI and digital literacy dimensions assessed in the post-test, including conceptual understanding, practical application, and responsible use of artificial intelligence (Ng et al., 2024; Yang et al., 2025; Zhang et al., 2025). Normalized gain was not designated as a success indicator because the pre-test and post-test instruments were not equivalent and assessed different competency dimensions.

2.5 Evaluation Method

The evaluation of the community service program was conducted using a descriptive quantitative approach to describe participants' understanding and competencies before and after the training. Prior to the training, participants completed a pre-test consisting of 16 multiple-choice questions covering foundational concepts of artificial intelligence, basic digital literacy, and ethical use of AI, including the Five Golden Rules and data protection. Following the training activities, participants completed a post-test through Google Forms consisting of 10 multiple-choice questions that focused on operational competencies in AI and digital literacy, such as prompt engineering, verification of AI-generated information, data protection, and human responsibility in AI-assisted decision-making (Hassan et al., 2021).

The two assessments were designed with different numbers of items and different competency focuses, and they were completed by different numbers of respondents, with 45 participants completing the pre-test and 39 completing the post-test. These differences were taken into consideration in interpreting the evaluation results, so the pre-test and post-test findings were presented as independent descriptive indicators rather than as directly comparable measures of individual learning gain. Consequently, normalized gain and direct statistical comparisons between the two assessments were not calculated because the instruments did not measure equivalent competency dimensions. The group mini-projects and participant feedback were also documented as supplementary information to provide a broader description of the implementation and participants' responses to the activity.

3. RESULTS AND DISCUSSION

3.1 Initial Artificial Intelligence Literacy

The initial assessment was conducted through a pre-test to describe participants' baseline understanding of artificial intelligence and digital literacy prior to the training. Of the 50 students targeted in the activity, 45 participants completed the pre-test, yielding a response rate of 90%. The results showed a mean score of 85.0 with a standard deviation of 16.1, indicating that participants generally demonstrated a relatively strong initial understanding of the competencies assessed. A total of 37 out of 45 participants (82.2%) obtained scores of at least 75. These findings provide a descriptive overview of participants' baseline knowledge prior to the training and serve as reference data for interpreting the subsequent post-test results.

3.2 Implementation of the AI Literacy Workshop

The AI literacy workshop was conducted in a single session on Wednesday, 12 August 2026, at SMK Angkasa Husein Sastranegara, Bandung, and was attended by 50 students from the Grade XI Mechanical Engineering classes. The activity was facilitated by the community service team from the School of Information Technology, Universitas Logistik dan Bisnis Internasional (ULBI), under the supervision of Dr. Syafrial Fachri Pane. The session began with participant registration and the administration of the pre-test, followed by the delivery of materials covering the fundamentals of artificial intelligence, the ethics and risks of AI misuse, the Five Golden Rules of AI interaction, the Digital Backpack concept, and the "You're the Pilot, AI is your Co-Pilot" principle.

Following the material delivery, participants received demonstrations and practical guidance on the use of AI tools for learning. The demonstration focused on the construction of effective prompts using the R-T-C-O formula (Role, Task, Context, Output) through Google Gemini. NotebookLM was also introduced as a supplementary document-grounded learning assistant to support students in organizing and understanding learning materials. The facilitators also emphasized responsible AI use by introducing the principles of ethical AI interaction, verification of AI-generated information, and protection of personal data. The demonstration and practical activities were conducted using the available presentation facilities and participants' devices.



Figure 1. Material presentation session on the application of artificial intelligence for students, SMK Angkasa Husein Sastranegara, Bandung

The activity continued with an interactive question-and-answer session in which participants were invited to discuss their experiences using AI tools and to respond to the material presented during the workshop. The session then concluded with a group documentation activity involving the participants and the community service team. The activity was carried through the final session, covering the sequence from the initial assessment and material delivery to practical demonstrations, discussion, and closing activities.



Figure 2. Service team and student participants of the PKM “Optimalisasi Kecerdasan Buatan sebagai Media Pembelajaran Literasi Digital”, SMK Angkasa Husein Sastranegara, Bandung, 12 August 2026

3.3 Post-Test Results and AI and Digital Literacy Competency Achievement

The post-test was administered after the training to describe participants' competencies in artificial intelligence and digital literacy following the workshop. The assessment consisted of 10 scored multiple-choice items covering practical and responsible AI use, including the Zero Trust principle, verification of AI-generated information, protection of personal data, supplementary use of NotebookLM as a document-grounded AI tool, prompt-engineering principles, human responsibility for AI-assisted decisions, mitigation of AI-related misinformation and deepfakes, and the appropriate use of AI as a learning support tool. These competencies represent several dimensions of responsible AI and digital literacy, including human agency, critical evaluation of information, and safe and ethical use of AI (Miao et al., 2024; Miao & Holmes, 2023; Cosgrove & Cachia, 2025).

A total of 39 participants completed the post-test via Google Forms, obtaining a mean score of 94.4% (SD = 11.9), with individual scores ranging from 40.0% to 100.0%. Of these 39 respondents, 37 (94.9%) achieved a score of at least 75, indicating that the predefined post-test competency criterion was met among the respondents assessed after the training. The descriptive results of the pre-test and post-test assessments are summarized in Table 1.

Table 1. Descriptive Summary of Pre-Test and Post-Test Results

Metric	Pre-Test (Baseline)	Post-Test (AI & Digital Literacy Competency)
Instrument focus	General AI concepts, digital literacy, ethics (16 scored items)	Practical AI and digital literacy competencies, including responsible AI use, prompt engineering, information verification, data protection, and AI-assisted learning (10 scored items)
N (respondents)	45	39
Mean score	85.0%	94.4%
SD (Standard Deviation)	16.1	11.9
Score range (min–max)	37.5–100.0%	40.0–100.0%
Participants scoring $\geq$ 75	37/45 (82.2%)	37/39 (94.9%)

The comparison in Table 1 should be interpreted descriptively because the two assessments were not equivalent. The pre-test consisted of 16 items focusing primarily on foundational AI concepts, digital literacy, and ethical principles, whereas the post-test consisted of 10 items focusing on practical AI and digital literacy competencies. In addition, the number of respondents differed between the two assessments, with 45 participants completing the pre-test and 39 completing the post-test. Therefore, the difference in mean scores between the two assessments does not constitute a direct measure of individual learning gain.

The item-level results provide additional information about the competencies demonstrated in the post-test. As presented in Figure 3, Question 6 recorded the highest percentage of correct responses, with all 39 participants (100.0%) answering correctly. Questions 1, 2, and 5 were each answered correctly by 38 participants (97.4%), while Question 9 was answered correctly by 37 participants (94.9%). Questions 4, 7, and 10 each achieved 92.3%, whereas Questions 3 and 8 recorded the lowest percentage of correct responses at 89.7%, although the majority of participants still answered these items correctly.

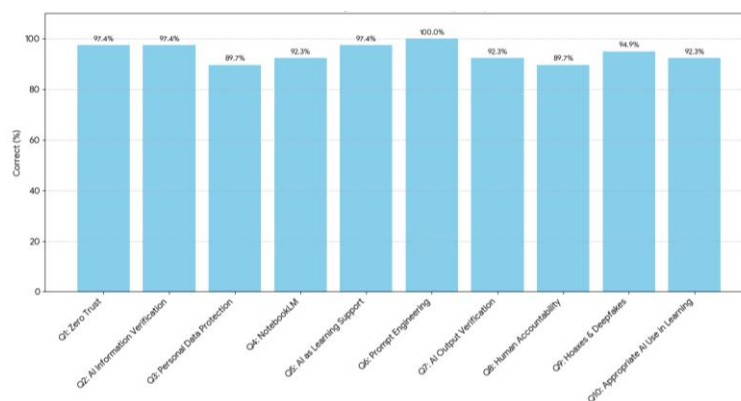


Figure 3. Percentage of Correct Responses for Each Post-Test Item

The item-level findings suggest that participants demonstrated strong performance across the assessed AI and digital literacy competencies, particularly in basic prompt-engineering principles and the verification of AI-generated information. The comparatively lower results on the items related to personal-data protection and human responsibility indicate areas that may require further reinforcement in subsequent training activities. These findings are interpreted as descriptive evidence of the competencies demonstrated in the post-test and not as evidence of a causal improvement resulting from the training.

3.4 Achievement of the Predefined Post-Test Competency Criterion

The success of the community service activity was assessed descriptively based on the predefined post-test competency criterion. The results showed that 37 of 39 post-test respondents (94.9%) obtained a score of at least 75, exceeding the predetermined criterion requiring at least 75% of post-test respondents to achieve a score of 75 or higher. This finding indicates that the predefined post-test competency criterion was achieved for the competency dimensions assessed in the post-test.

However, this result should not be interpreted as evidence of a direct increase in individual learning outcomes, given that the pre-test and post-test instruments differed in the number of items, content focus, competency dimensions assessed, and number of respondents. Accordingly, the findings provide a descriptive indication of the competencies demonstrated by participants after the training rather than a causal measurement of the training effect. On this basis, normalized gain was not calculated, as doing so would require comparable pre-test and post-test measures.

4. CONCLUSION

The community service program introduced vocational high school students to the responsible and productive use of artificial intelligence through a workshop combining conceptual explanations, practical demonstrations, prompt-engineering exercises, and discussions on ethical AI use. Google Gemini was introduced as a learning support tool, with activities centred on prompt construction, verification of AI-generated information, protection of personal data, and human responsibility in AI-assisted learning.

The evaluation results showed that 37 of 39 post-test respondents (94.9%) achieved a score of at least 75, exceeding the predefined success criterion requiring at least 75% of respondents to achieve a minimum score of 75. The post-test also demonstrated strong performance across the assessed AI and digital literacy competencies, particularly in prompt-engineering principles and verification of AI-generated information. Personal-data protection and human responsibility in AI-assisted decision-making, while still achieving high percentages of correct responses, emerged as areas that may warrant further reinforcement in subsequent activities.

These findings should nevertheless be interpreted descriptively because the pre-test and post-test instruments differed in the number of items, content focus, competency dimensions, and number of respondents. Therefore, the results do not provide a direct or causal measure of individual learning improvement, and normalized gain was not calculated. Future community service activities may strengthen the training through scenario-based exercises focusing on sensitive-data identification, independent verification of AI-generated information, and decision-making processes in which students remain responsible for evaluating, modifying, or rejecting AI-generated recommendations.

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