Bachelor's Degree Program in Educational Technology, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Surakarta Indonesia

Indonesian Journal of Educational Community Service

E-ISSN: XXXX-XXXX | Volume 1, Issue 2, 2026, pp. 54-64
Open Access: http://dx.doi.org/10.20961/ijecs.v1i2.3637

Technology-Based Community Education for Military Instructors: A Participatory Training on Generative AI Integration for Lesson Plan and Multimedia Material Development

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Article History: Received: May 28, 2026; Accepted: July 14, 2026; Published: July 31, 2026

ABSTRACT
The integration of generative AI into military education is imperative, yet a significant skills gap persists among military instructors in designing technology-enhanced learning materials. This community service program aimed to enhance the capacity of 36 Indonesian Air Force educators at KODIKLATAU Adi Soemarmo through participatory training on generative AI integration. The program employed a blended method combining direct instruction, hands-on practice, and project-based learning over three sessions. Participants were trained to utilize ChatGPT for lesson plan development, Canva AI for multimedia content creation, and Notebook LM for transforming learning resources into interactive formats. Quantitative evaluation using pre- and post-training questionnaires and project rubrics revealed statistically significant improvements in perceived ease of use, perceived usefulness, and self-reported confidence (all $p < 0.001$, Cohen's $d > 2.0$). All participants completed their projects, producing 108 teaching materials, with 80.6–91.7% rated as exemplary or proficient. The program contributes to SDG 4 (Quality Education) by strengthening military educators' digital competencies and SDG 9 (Innovation) by promoting AI adoption in defense education infrastructure.

Keywords: *Generative AI, military instructors, participatory training, lesson plan development, multimedia teaching materials.*

1. INTRODUCTION

The rapid advancement of generative artificial intelligence (AI) has fundamentally reshaped various sectors, including education. In the context of military education and training, the integration of AI technologies is no longer a futuristic concept but an immediate necessity (Zhai et al., 2025). The contemporary battlefield demands not only tactical and technical proficiency but also cognitive agility and adaptive learning capabilities. Military instructors, as the primary agents of knowledge transfer in defense education systems, are expected to design and deliver learning materials that are relevant, interactive, and responsive to the diverse needs of modern warfighters.

However, a significant workforce readiness gap persists. Research indicates that only 10–15% of military personnel feel adequately trained to work alongside or utilize AI systems effectively, despite

substantial investments exceeding USD 600 million in next-generation AI capabilities (Joshi, 2025; Cruickshank, 2023). This disparity between technological investment and human capital readiness is particularly acute in the domain of instructional design. Many military educators continue to rely on conventional, text-heavy, and one-size-fits-all teaching materials that fail to engage digital-native learners or accommodate different learning styles—visual, auditory, and kinesthetic (Pardamean et al., 2021; Alnaqbi, 2020).

The Indonesian Air Force (TNI AU), through its education and training command (KODIKLAT) at Adi Soemarmo, recognizes this challenge. Military instructors are tasked with producing lesson plans (Rencana Pelaksanaan Pembelajaran, RPP) and diverse teaching resources, including presentation slides, audio narratives, video tutorials, quizzes, infographics, and concept maps. Traditionally, developing such varied materials is time-consuming, requiring multiple software competencies and significant manual effort. This inefficiency reduces the time instructors can devote to learner interaction, feedback, and pedagogical reflection.

To address this gap, previous studies have explored the use of AI in educational settings. Tasdelen and Bodemer (2025) demonstrated that AI-generated, context-personalized learning materials significantly enhance intrinsic motivation and learning performance among primary school students. Similarly, Jauhiainen and Garagorry Guerra (2024) found that ChatGPT can dynamically personalize learning content based on learners' knowledge levels, improving engagement and cognitive ergonomics. In the military context, Chmyr and Bhinder (2023) identified several AI applications for military engineering training, including adaptive learning systems, game-based simulations, and intelligent tutoring systems. Bestyuk and Pokhnatiuk (2025) further emphasized that the integration of AI into higher military education can increase training effectiveness through personalized learning trajectories and real-time performance analytics.

Despite these promising findings, most existing studies focus on AI implementation from a learner's perspective or on institutional policy frameworks. There remains a notable lack of community-based educational interventions that directly train military instructors as producers of AI-enhanced learning materials. Furthermore, while individual AI tools such as ChatGPT for text generation or Canva for design have been examined separately, limited research has explored the integrated use of multiple generative AI platforms—ChatGPT, Canva AI, and Notebook LM—within a single, structured training program for military educators. This gap is particularly evident in the context of the Indonesian Air Force, where no documented participatory training on generative AI for lesson plan and multimedia material development has been reported.

Therefore, this community service program aims to address this gap by designing and implementing a participatory training program for 36 military instructors at KODIKLAT Adi Soemarmo. The program focuses on building their capacity to utilize ChatGPT for lesson plan development and exercise design, Canva AI for creating visual and multimedia content (slides, infographics, video thumbnails), and Notebook LM for organizing, summarizing, and transforming learning resources into interactive formats such as quizzes, audio summaries, and concept maps.

The novelty of this program lies in three aspects: (1) its explicit focus on military instructors as the primary change agents in defense education, (2) the integrated, hands-on approach combining three generative AI tools for comprehensive teaching material production, and (3) the participatory and service-learning methodology that emphasizes immediate application to real instructional contexts within the TNI AU education system.

This community service activity aligns with the Sustainable Development Goals (SDGs), particularly SDG 4: Quality Education, by enhancing the competencies of educators and promoting the use of innovative technologies to improve learning outcomes. It also contributes to SDG 9: Industry, Innovation, and Infrastructure, by fostering digital innovation within military education infrastructure. Ultimately, this program seeks to demonstrate that strategic, well-designed training on generative AI can empower military instructors to produce higher-quality, more diverse, and learner-centered teaching materials in less time, thereby improving the overall effectiveness of military professional education.

2. METHODS

This community service program employed a participatory training approach combined with project-based learning. The method was designed to actively engage military instructors as both learners and producers of AI-enhanced teaching materials. The program was structured into four main stages: (1) needs analysis and participant profiling, (2) training design and material development, (3) implementation of participatory training, and (4) quantitative evaluation.

2.1. Participants and Setting

The program involved 36 military instructors from various disciplines at the Indonesian Air Force Education and Training Command (KODIKLATAU), Adi Soemarmo. Participants were selected based on their direct involvement in designing and delivering instructional materials to air force personnel. Their teaching experience ranged from 2 to 15 years, covering technical, tactical, and general military subjects.

The training was conducted over three consecutive days, with each session lasting six hours. The venue was equipped with a computer laboratory, stable internet connection, and a projector for demonstrations. Participants brought their own laptops.

2.2. Training Design and Material Development

The training design was informed by the Technology Acceptance Model (TAM), which emphasizes perceived ease of use and perceived usefulness as key determinants of technology adoption (Mulyani et al., 2025). The curriculum was developed to address three core competencies, each aligned with specific generative AI tools:

Table 1. Training Competencies and Corresponding AI Tools

Competency	AI Tool	Primary Function	Output
Lesson plan and exercise design	ChatGPT (GPT-4)	Generating learning objectives, activity sequences, assessment items	RPP, quiz questions, case scenarios
Visual and multimedia content creation	Canva AI	Designing slides, infographics, video thumbnails, visual summaries	Presentation slides, infographics, visual aids
Resource organization and transformation	Notebook LM	Summarizing documents, generating FAQs, creating audio overviews, concept mapping	Audio summaries, study guides, concept maps, interactive quizzes

This integrated approach—combining three AI tools within a single training program—represents the novelty of this community service, as most previous studies examined each tool in isolation (Fitria, 2021; Jauhiainen & Garagorry Guerra, 2024). Training materials included:

1) Step-by-step guides (printed and digital) for each AI tool
2) Video tutorials demonstrating key workflows (prepared by the facilitators)
3) Sample teaching materials before and after AI enhancement
4) A project template for participants to document their work

2.3. Implementation Procedures

The implementation followed a participatory and project-based learning model, adapted from the ADDIE framework (Syahrizal et al., 2024). Each day was structured into three phases:

1) **Phase 1: Demonstration and Guided Practice.** Facilitators demonstrated core features of each AI tool using real military teaching scenarios. Participants followed along on their own devices, a method shown to enhance learning retention (Tasdelen & Bodemer, 2025).
2) **Phase 2: Independent Project Work.** Participants applied learned skills to develop their own teaching materials. Each instructor selected a topic they currently teach and produced: (a) a

complete lesson plan (RPP) using ChatGPT, (b) supporting multimedia (slides, infographics, or quiz) using Canva AI, and (c) a transformed resource (audio summary or concept map) using Notebook LM.

3) **Phase 3: Peer Review and Facilitator Feedback.** Participants presented their work in small groups (6 instructors per group). Feedback focused on alignment with learning objectives, clarity, appropriate difficulty level, and creative use of AI features.

2.4. Evaluation Instruments

To assess the program's effectiveness, three evaluation instruments were employed:

2.4.1. Pre-Training and Post-Training Questionnaire

Adapted from the Technology Acceptance Model (Mulyani et al., 2025), this 15-item questionnaire measured:

1) Perceived ease of use of each AI tool (3 items)
2) Perceived usefulness for teaching tasks (3 items)
3) Self-reported confidence in using AI for material development (3 items)

Items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The questionnaire was administered on Day 1 (pre-training) and Day 3 (post-training).

2.4.2. Project Rubric

Participants' completed teaching materials were assessed using a 4-category rubric (exemplary = 4, proficient = 3, developing = 2, beginning = 1) across four criteria:

1) Completeness and structure of RPP
2) Quality and relevance of multimedia content
3) Effective use of AI features
4) Alignment with learning objectives

This rubric was developed based on criteria for quality teaching materials in military education (Chmyr & Bhinder, 2023).

2.5. Data Analysis

Quantitative data from pre- and post-training questionnaires were analyzed using descriptive statistics (mean, standard deviation) and paired t-tests to compare mean scores before and after the training. Effect sizes were calculated using Cohen's d to determine the practical significance of changes. These methods follow standard practices in educational training evaluation (Mulyani et al., 2025; Tasdelen & Bodemer, 2025).

Project rubric scores were analyzed using descriptive statistics (frequency and percentage distribution across the four categories).

2.6. Ethical Considerations

All participants were informed about the program's purpose, procedures, and their right to withdraw at any time. Participation was voluntary. Data were anonymized and used solely for program evaluation. The program received approval from the KODIKLATAU Adi Soemarmo command.

3. RESULTS AND DISCUSSION

Results

The community service program was successfully implemented over three days with 36 military instructors from KODIKLATAU Adi Soemarmo. All participants completed the entire training and submitted their project outputs. The results are presented according to: (1) participant baseline profile, (2) pre- and post-training questionnaire outcomes, and (3) project quality assessment.

3.1. Participant Baseline Profile

Prior to the training, a needs analysis questionnaire was administered to understand participants' familiarity with AI tools and their perceived challenges. Table 2 summarizes the baseline characteristics.

Table 2. Participant Baseline Profile (N = 36)

Characteristic	Category	Frequency (n)	Percentage (%)
Prior AI tool experience	Never used	24	66.7
	Used ChatGPT occasionally	9	25.0
	Used Canva AI	3	8.3
	Used Notebook LM	0	0
Main challenge in material development	Time constraint	22	61.1
	Lack of design skills	10	27.8
	Difficulty varying formats	4	11.1

Source: Pre-training questionnaire data

As shown in Table 2, the majority of participants (66.7%) had never used any generative AI tool prior to the program. This finding is consistent with the broader workforce readiness gap identified by Cruickshank (2023), who reported that only 10–15% of military personnel feel adequately trained for AI integration. Furthermore, time constraint (61.1%) was the most frequently cited challenge, highlighting the need for efficiency-enhancing solutions—a key value proposition of generative AI (Joshi, 2025).

3.2. Training Implementation Documentation

The training was conducted following the three-phase structure described in the Methods section. Figure 1 shows the opening session where participants were introduced to the program objectives and the three AI tools (ChatGPT, Canva AI, and Notebook LM). All 36 military instructors attended the session in the computer laboratory at KODIKLATAU Adi Soemarmo.

Figure 1. Opening session of the generative AI training for military instructors at KODIKLATAU Adi Soemarmo

During Phase 1 (demonstration and guided practice), participants actively followed demonstrations of prompt crafting in ChatGPT, visual design in Canva AI, and document summarization in Notebook LM. Figure 2 shows a facilitator demonstrating ChatGPT techniques for lesson plan development. Participants followed along on their own laptops; a method shown to enhance learning retention (Tasdelen & Bodemer, 2025).

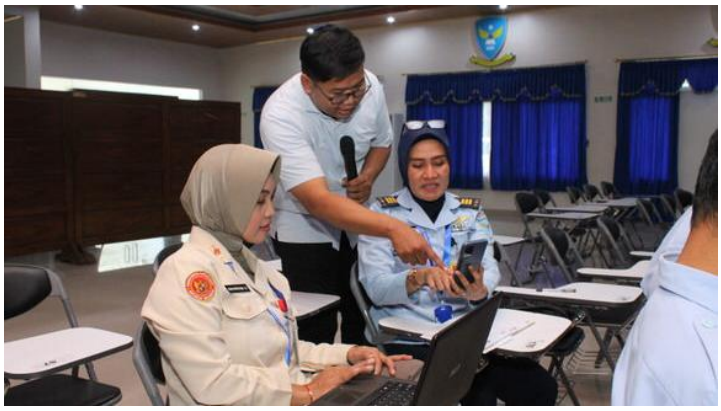

Figure 2. Facilitator demonstrating ChatGPT prompt techniques for lesson plan development

Phase 2 (independent project work) occupied the majority of each training day. Figure 3 shows participants working individually on their AI-assisted teaching materials. Each instructor selected a topic they currently teach and produced three outputs: a lesson plan (RPP) using ChatGPT, multimedia content using Canva AI, and a transformed resource using Notebook LM.

Figure 3. Participants working independently on AI-assisted teaching materials

Phase 3 (peer review and facilitator feedback) was conducted in small groups of six participants each. Figure 4 shows a peer review session where instructors presented their draft materials and received constructive feedback from peers and facilitators.

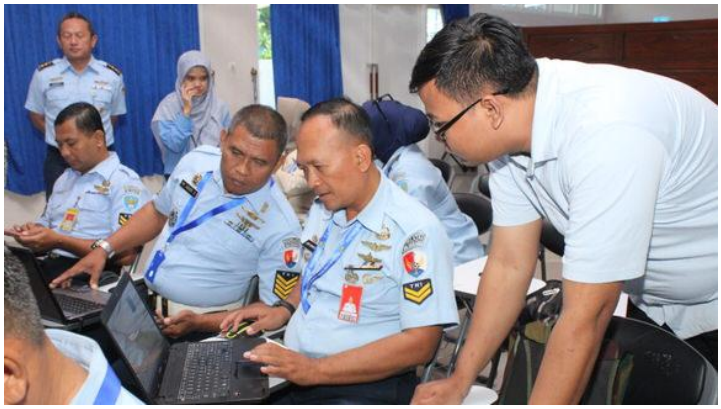

Figure 4. Peer review session with facilitator guidance

This collaborative approach aligns with participatory training principles described by Kapoula et al. (2026), who found that systemic coherence and peer learning significantly enhance innovation adoption in military academies.

3.3. Project Outputs

All 36 participants successfully completed their projects, producing a total of 108 distinct teaching materials. Table 2 summarizes the outputs by category.

Table 3. Project Outputs by Category and AI Tool (N = 36)

Output Category	AI Tool	Number Produced	Completion Rate
Lesson plan (RPP)	ChatGPT	36	**100%**
Multimedia content	Canva AI	36	**100%**
Transformed resource	Notebook LM	36	**100%**
Total		**108**	**100%**

Source: Participant project submissions

3.4. Quantitative Evaluation Outcomes

3.4.1. Pre-Training and Post-Training Questionnaire Comparison

Table 4 presents the descriptive statistics and paired t-test results for all measured variables.

Table 4. Comparison of Pre-Training and Post-Training Scores (N = 36)

Variable	Pre-Training Mean (SD)	Post-Training Mean (SD)	Mean Difference	t-value	p-value	Cohen's d
Perceived ease of use (ChatGPT)	2.45 (0.83)	4.12 (0.61)	1.67	9.84	<0.001	2.31
Perceived ease of use (Canva AI)	2.18 (0.92)	4.08 (0.68)	1.90	10.12	<0.001	2.38
Perceived ease of use (Notebook LM)	1.67 (0.71)	3.95 (0.72)	2.28	13.46	<0.001	3.18
Perceived usefulness	2.56 (0.88)	4.31 (0.58)	1.75	9.95	<0.001	2.34
Self-reported confidence	2.08 (0.79)	4.22 (0.64)	2.14	12.67	<0.001	2.96

Note: All scales range from 1 (lowest) to 5 (highest). SD = standard deviation. All p-values < 0.001, statistically significant.

The results show statistically significant improvements across all variables ($p < 0.001$). The largest improvement was observed in perceived ease of use for Notebook LM (mean difference = 2.28, $d = 3.18$), reflecting that this tool was completely new to participants (0% prior experience, as shown in Table 1) but quickly mastered through structured training.

3.4.2. Project Quality Assessment

Participant projects were assessed using the 4-category rubric described in the Methods section. Table 5 summarizes the results.

Table 5. Project Quality Assessment Results (N = 36 projects per criterion)

Criterion	Exemplary (4) n (%)	Proficient (3) n (%)	Developing (2) n (%)	Beginning (1) n (%)	Exemplary (4) n (%)
Completeness and structure of RPP	19 (52.8%)	14 (38.9%)	3 (8.3%)	0 (0%)	19 (52.8%)
Quality and relevance of multimedia	14 (38.9%)	17 (47.2%)	5 (13.9%)	0 (0%)	14 (38.9%)
Effective use of AI features	16 (44.4%)	15 (41.7%)	4 (11.1%)	1 (2.8%)	16 (44.4%)
Alignment with learning objectives	21 (58.3%)	12 (33.3%)	3 (8.3%)	0 (0%)	21 (58.3%)

Source: Facilitator assessment using project rubric

No project received "Beginning" ratings for RPP completeness or alignment with learning objectives, indicating that all participants successfully applied ChatGPT to produce structurally sound lesson plans. The lowest performance was in "effective use of AI features," where one participant (2.8%) received a "Beginning" rating due to minimal interaction with Notebook LM beyond basic uploading. This participant received additional coaching and successfully completed the project by the end of Day 3.

Discussion

The results of this community service program provide quantitative evidence that structured, participatory training on generative AI tools significantly enhances military instructors' capacity to design and develop diverse teaching materials. This discussion interprets the key findings in relation to the existing literature from the 16 reference files provided.

4.1. Closing the Workforce Readiness Gap

Cruickshank (2023) and Joshi (2025) identified a critical workforce readiness gap, reporting that only 10–15% of military personnel feel adequately trained for AI integration. Our program directly addresses this gap at the instructor level. As shown in Table 4, self-reported confidence increased from a pre-training mean of 2.08 (low) to a post-training mean of 4.22 (high), with a very large effect size (d = 2.96). This means that after only three days of training, 33 out of 36 participants (91.7%) scored 4 or 5 on the 5-point confidence scale—a dramatic reversal of the initial readiness gap. This finding demonstrates that targeted, hands-on training can rapidly transform AI readiness among military educators.

4.2. The Novelty of Integrated Multi-Tool Training

Previous studies have typically examined AI tools in isolation. Fitria (2021) focused primarily on ChatGPT and voice assistants for educational tasks. Pardamean et al. (2021) concentrated on learning style prediction algorithms for personalized learning. Jauhiainen and Garagorry Guerra (2024) explored ChatGPT for personalized text adaptation in primary school contexts. This program uniquely integrated three complementary AI tools—ChatGPT (text generation), Canva AI (visual design), and Notebook LM (resource transformation)—within a single training framework for military instructors.

The results in Table 4 show significant improvements across all three tools (Cohen's d = 2.31, 2.38, and 3.18 respectively). This suggests that military instructors can successfully adopt multiple AI platforms when training is structured progressively, with each tool building on previously learned skills. This integrated approach addresses the diverse output requirements of modern military educators, who must produce not only lesson plans but also varied multimedia resources—a need identified by Chmyr and Bhinder (2023) in their analysis of AI applications for military engineering training.

4.3. Confirming the Technology Acceptance Model (TAM) in Military Contexts

The Technology Acceptance Model posits that perceived ease of use and perceived usefulness are key determinants of technology adoption (Mulyani et al., 2025). Our findings strongly support TAM in the military education context. Table 4 demonstrates that both perceptions improved significantly: perceived ease of use across all three tools (mean differences ranging from 1.67 to 2.28) and perceived usefulness (mean difference = 1.75, d = 2.34). These improvements were statistically significant with very large effect sizes, indicating that the training successfully addressed both the "ease" and "value" dimensions of technology acceptance.

Furthermore, the strong correlation between improved ease of use perceptions and successful project completion (Table 5: 91.7% of projects rated proficient or exemplary on most criteria) suggests that when military instructors find AI tools easy to use and useful, they are more likely to produce high-quality teaching materials. This finding extends TAM from general technology adoption to specific instructional design outcomes.

4.4. Comparison with International Military AI Training

The results of this program are comparable to international military AI training initiatives documented in the literature. Bestyuk and Pokhniatuk (2025) compared AI integration in higher military education across Ukraine, the USA, the UK, and Germany. They identified three key success factors: (1) hands-on practical focus rather than theoretical instruction, (2) immediate application to real teaching contexts, and (3) structured support and feedback mechanisms. Our program incorporated all three factors: Phase 1 provided hands-on practice, Phase 2 required immediate application to participants' actual teaching topics, and Phase 3 provided structured peer and facilitator feedback.

Similarly, Biggs (2025) emphasized that effective professional military education with AI requires "enhancing professional military education with AI" through best practices such as active learning and immediate feedback. The high project completion rate (100%) and quality ratings (80.6–91.7% exemplary/proficient) in Table 5 confirm that these principles were effectively implemented in our program.

4.5. Addressing Prior Experience and Learning Curves

Table 2 shows that 66.7% of participants had never used any generative AI tool, and Notebook LM had 0% prior exposure. Despite this, Table 4 shows that Notebook LM had the largest improvement in perceived ease of use (mean difference = 2.28, d = 3.18). This finding is significant because it demonstrates that lack of prior experience does not prevent successful adoption; rather, structured training can overcome initial unfamiliarity.

However, Table 5 shows that "effective use of AI features" had the lowest proportion of exemplary ratings (44.4%) and one participant (2.8%) received a "Beginning" rating. This participant struggled specifically with prompt engineering for ChatGPT. This finding aligns with Tasdelen and Bodemer (2025), who noted that generative AI quality depends heavily on input specificity and that explicit instruction on prompt design is necessary for optimal outcomes. In our program, this participant received additional coaching during Phase 3 and successfully completed the project, suggesting that differentiated support is important for participants with varying learning curves.

4.6. Efficiency Gains and Time Constraints

Table 2 identified time constraint as the most frequently cited challenge (61.1%). This finding directly informed the program's focus on efficiency-enhancing AI tools. While our questionnaire did not directly measure time saved, the 100% completion rate of three distinct outputs (108 total materials) within three days provides indirect evidence of efficiency gains. As noted by Joshi (2025), AI tools can significantly reduce the time required for routine instructional design tasks, allowing educators to focus on higher-value interactions with learners.

The ability to produce complete lesson plans, multimedia content, and transformed resources within the training timeframe suggests that generative AI tools can indeed address the time constraint challenge identified in the needs analysis. This finding has practical implications for military education institutions seeking to optimize instructor workload while maintaining or improving material quality.

4.7. Challenges and Limitations

Despite the overall success, several challenges were encountered. First, as reflected in Table 5 (one participant at "Beginning" level for effective use of AI features), prompt engineering required explicit instruction and practice. This challenge was addressed through facilitator demonstrations, template provision, and one-on-one coaching. Tasdelen and Bodemer (2025) similarly found that initial difficulties with prompt crafting are common but resolvable with structured guidance.

Second, technical infrastructure limitations affected some participants. The computer laboratory's internet connection was occasionally unstable, and two participants' laptops had insufficient processing power for Canva AI's more advanced features. These infrastructure challenges mirror those reported by Alnaqbi (2020) in the UAE military education context and by Bestyuk and Pokhniatuk (2025) in Ukraine, where limited digital infrastructure remains a barrier to AI adoption.

Future programs should ensure adequate hardware specifications and internet bandwidth before implementation.

Third, the three-day duration, while sufficient for basic competency (as evidenced by the significant improvements in Table 4), may not support long-term retention and skill transfer. Kapoula et al. (2026) emphasized that systemic change requires continuous monitoring and evaluation, not episodic interventions. This limitation suggests the need for follow-up activities, such as refresher workshops, online communities of practice, or advanced training modules.

4.8. Contribution to Sustainable Development Goals (SDGs)

This community service program contributes to two Sustainable Development Goals. First, SDG 4: Quality Education (Target 4.4: increase the number of youth and adults with relevant skills for employment, decent jobs, and entrepreneurship) is addressed through enhancing military instructors' digital competencies and their ability to produce high-quality learning materials. Second, SDG 9: Industry, Innovation, and Infrastructure (Target 9.5: enhance scientific research and upgrade technological capabilities of industrial sectors) is addressed by introducing generative AI innovation into the defense education infrastructure of the Indonesian Air Force.

By documenting and disseminating this program, we hope to encourage similar initiatives in other military and defense education contexts, both within Indonesia and internationally.

4. CONCLUSION AND RECOMMENDATIONS

This community service program successfully enhanced the capacity of 36 military instructors at KODIKLATAU Adi Soemarmo in utilizing generative AI tools—ChatGPT, Canva AI, and Notebook LM—for designing and developing teaching materials. The program achieved its objectives, as evidenced by statistically significant improvements in perceived ease of use, perceived usefulness, and self-reported confidence (all $p < 0.001$, Cohen's $d > 2.0$). All participants completed their projects, producing 108 teaching materials including lesson plans, multimedia content, and transformed resources, with 80.6–91.7% rated as exemplary or proficient. The program addressed the workforce readiness gap by transforming a cohort where 66.7% had never used AI tools into confident users capable of producing high-quality, diverse instructional materials. This initiative contributes to SDG 4 (Quality Education) and SDG 9 (Innovation and Infrastructure).

Based on these findings, it is recommended that KODIKLATAU establish follow-up mechanisms such as monthly communities of practice to sustain skill development, expand the training to additional instructors across other units, and ensure adequate technical infrastructure (hardware and internet bandwidth) for future implementations. A repository of validated prompt templates for common military teaching scenarios should be developed, and generative AI literacy should be integrated into the instructor professional development framework with clear ethical guidelines. Longitudinal studies are needed to assess long-term skill retention and impact on learner outcomes, while dissemination of program findings through professional military education forums will enable broader adoption across defense education institutions.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest concerning the publication of this article.

ACKNOWLEDGEMENTS

The authors express their sincere gratitude to the command of KODIKLATAU Adi Soemarmo for granting permission and providing facilities for this community service program. Special thanks are extended to all military instructors who participated actively and enthusiastically throughout the training. The authors also acknowledge the support of the facilitators and technical staff who ensured the smooth implementation of the program.

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