

# Leveraging Artificial Intelligence in Web Development to Optimize Marketing Strategies for Vocational Student Products

Frinto Tambunan<sup>1\*</sup>, Junerdi Nababan<sup>2</sup>, Mutiha Aristo Ravel<sup>3</sup>, Tri Budiarti Damanik<sup>4</sup>, Alwin Fau<sup>5</sup>

Universitas Satya Terra Bhinneka, Medan, Indonesia<sup>1,2,3,4,5</sup>

[frinto\\_tambunan@satyaterabhinneka.ac.id](mailto:frinto_tambunan@satyaterabhinneka.ac.id)<sup>1\*</sup>, [junerdi@satyaterabhinneka.ac.id](mailto:junerdi@satyaterabhinneka.ac.id)<sup>2</sup>,

[mutihaaristo@satyaterabhinneka.ac.id](mailto:mutihaaristo@satyaterabhinneka.ac.id)<sup>3</sup>, [tridamanik@satyaterabhinneka.ac.id](mailto:tridamanik@satyaterabhinneka.ac.id)<sup>4</sup>,

[alwinfau@satyaterabhinneka.ac.id](mailto:alwinfau@satyaterabhinneka.ac.id)<sup>5</sup>



## Article History

Received on 10 May 2026

1<sup>st</sup> Revised on 18 May 2026

2<sup>nd</sup> Revised on 25 May 2026

3<sup>rd</sup> Revised on 29 May 2026

Accepted on 03 June 2026

## Abstract

**Purpose:** This community service initiative aimed to assist students at *Sekolah Menengah Kejuruan (SMK) Sultan Iskandar Muda* in enhancing their digital competencies, specifically by developing professional Artificial Intelligence (AI) driven marketing websites to showcase their creative outputs. This research addressed the technical programming barriers that frequently hinder vocational students from marketing their work professionally through digital platforms.

**Methodology:** Employing a quasi-experimental approach with a pretest-posttest design, this study involved 70 students from grades XI and XII. The intervention consisted of intensive training and hands-on practice in constructing marketing sites using Artificial Intelligence tools.

**Results:** The findings revealed a statistically significant improvement in student comprehension, as evidenced by an increase in the mean scores from 53.5 to 82.8. Furthermore, all participants successfully deployed aesthetic and functional marketing websites.

**Conclusions:** This study demonstrates that AI integration effectively mitigates coding complexities for vocational students, allowing them to prioritize digital business strategies and creative development.

**Limitations:** The constraints identified included limited on-site mentoring duration and suboptimal Internet stability, which impacted cloud-based data synchronization during practical sessions.

**Contributions:** This study provides a strategic reference for vocational institutions to design modern and innovative entrepreneurship curricula aligned with the demands of the digital transformation era.

**Keywords:** *Artificial Intelligence, Digital Competence, Digital Entrepreneurship, Vocational Education, Web Development*

**How to Cite:** Tambunan, F., Nababan, J., Ravel, M. A., Damanik, T. B., Fau, A. (2026). Leveraging Artificial Intelligence in Web Development to Optimize Marketing Strategies for Vocational Student Products. *Yumary: Jurnal Pengabdian Kepada Masyarakat*, 6(4), 197-208.

## 1. Introduction

Rapid digitalization across all industries is reshaping what employers seek in today's job market. As we move from Industry 4.0 into Society 5.0, vocational students including those at SMK Sultan Iskandar Muda need to be highly comfortable with advanced digital tools ([Adigun, Ajani, & Enakrire, 2024](#); [Anshar, 2025](#); [Aulia & Yulianto, 2025](#); [Gao, Wang, Xie, Hu, & Hu, 2023](#)). Artificial Intelligence (AI)

has completely changed the business landscape, making marketing and customer interactions much more personalized and data-driven ([Davenport, Guha, Grewal, & Bressgott, 2020](#); [Mariani, Perez-Vega, & Wirtz, 2022](#)). Thus, learning to use these technologies is no longer just an extra perk for students; it is an absolute necessity if they want to build stable, future-proof careers. Bringing AI into vocational classrooms is a practical way to help graduates stay competitive globally, transforming them from passive observers into active builders in a tech-driven economy ([Elnaffar, Rashidi, & Abualkishik, 2025](#); [Macar et al., 2023](#); [Mafrukhah & Lisana, 2026](#)).

In practice, vocational students often create excellent physical or creative products, but their marketing methods remain outdated. A major reason is the steep learning curve of traditional coding; learning complex programming languages to build a website is often too intimidating and time-consuming for students ([Aulia & Yulianto, 2025](#); [Dobson & Karkalas, 2026](#); [Jaswita & Dewintasari, 2025](#)). Without a clean, professional online store, students struggle to sell their work independently, which keeps them dependent on conventional, sometimes scarce, jobs ([Huang and Rust, 2021](#)). AI can be a game-changer, lowering the technical entry barrier and giving students the confidence to build their own platforms ([Lopes, Gomes, Farinha, & Sampaio, 2026](#)). This is why hands-on, highly practical training sessions are so important they help close the digital gap and directly improve students' future earning potential ([Paul et al., 2024](#); [Santati, Saftiana, Mavillinda, & Ghasarma, 2022](#)).

Thanks to modern AI web-building platforms, creating a high-quality website is now a matter of minutes rather than weeks of coding ([Halik, 2025](#); [Pohjalainen and Vepsäläinen, 2026](#)). Websites are no longer just static digital brochures; they are smart tools that can track and interpret customer needs. To thrive in this environment, young people need strong digital literacy skills. This outreach initiative at SMK Sultan Iskandar Muda focused on empowering students by teaching them to use accessible AI-powered web design tools. Our goal was simple: to turn these students from casual Internet users into active digital creators who can market their creations globally. Mastering these tools gives them a distinct professional advantage as they step into a rapidly evolving job market ([Bayu Sinta, Hanifah, & Harjanti, 2026](#); [Paul et al., 2024](#)).

The products made in the workshops at SMK Sultan Iskandar Muda have great commercial potential, but they often sit on shelves because of weak branding and marketing ([Suhendah, Jennifer, Goh, & Heni, 2025](#); [Wardhanie & Lebdaningrum, 2023](#)). To bridge the gap between high-quality production and weak sales channels, realistic, technology-driven solutions are required. Providing students with the tools to run their own marketing sites allows their products to reach customers far beyond their local neighborhoods. A professional-looking website builds trust with online buyers and makes buying simple and secure ([Ekasari, Algiranto, & Rezki, 2025](#); [Menon & Shilpa, 2023](#)). Building this online presence does more than help individual students; it breathes new life into the school's own business units and helps vocational products compete in Indonesia's growing e-commerce space ([Hakim et al., 2022](#); [Matlubah, Herowati, & Novita Punggeti, 2025](#)).

Vocational schools must adapt quickly to new technological trends if they want their curriculum to remain relevant ([Ekasari et al., 2025](#); [Masnia, Saputri, Kamsurya, & Tuhu, 2025](#); [Pohjalainen & Vepsäläinen, 2026](#); [Wijaya et al., 2024](#)). The ultimate goal is to train graduates who are not just users of digital tools but who can actively use AI assistants to solve real-world problems ([Permana & Sahara, 2021](#); [Yanti, Siswadi, Maulana Wahyu, Arianti, & Frederik Dony, 2025](#)). Combining basic web design concepts with AI has proven to be a great way to spark curiosity and make technology feel less intimidating ([Liu et al., 2024](#); [Nasution, 2026](#)). Connecting hands-on vocational skills with modern IT tools is key to improving school quality. Therefore, our training program on using AI in web development to boost marketing strategies for student products was timely. This joint effort helps build a strong digital mindset, providing students with the flexibility and skills they need to navigate a changing economy.

## **2. Methodology**

### **2.1 Research Design**

This community service project used a quasi-experimental approach with a one-group pretest-posttest design to measure the effectiveness of the technology training in a vocational school setting. This design allowed us to directly compare the students' technical skills before and after the training sessions at SMK Sultan Iskandar Muda. We divided data collection and tracking into two main steps.

1. **Diagnostic Phase (Baseline Assessment):** We started by running a written pre-test to determine what the students already knew about web development and AI. Alongside these numbers, we also observed the engagement and curiosity of the students during their first few hands-on tasks. This diagnostic step was crucial for identifying the main mental and technical hurdles that usually make coding difficult for vocational learners.
2. **Training and Evaluation Phase:** After assessing the baseline, we implemented an intensive training program focused on using AI-based web-building tools. The sessions adopted a 'low-code/no-code' approach, allowing students to build fully functional websites without the need to learn complex coding syntax from scratch. We then administered a post-test and graded their final websites to measure the extent of their skill improvement. This step-by-step design ensures that our findings are backed by solid, real-world data.

### **2.2 Participants**

The participants of this study comprised 70 students from grades XI and XII at SMK Sultan Iskandar Muda. Given the disparate levels of prior exposure to web development and Artificial Intelligence (AI) assistants among the cohort, a personalized mentorship approach was adopted to ensure equitable learning outcomes. The diverse backgrounds of the participants underscore the versatility of AI technology in accommodating various vocational specializations. To optimize the pedagogical process, a supportive and collaborative learning environment was cultivated, facilitating an effective transfer of technological knowledge while maintaining high levels of student engagement. Furthermore, strict ethical protocols were observed regarding data privacy; all participant identities were anonymized, and personal information was treated with the utmost confidentiality and utilized exclusively for the longitudinal analysis of academic progress.

### **2.3 Materials and Learning Content**

The instructional design of the training program was centered on integrated AI-assisted web development, structured into a comprehensive curriculum to ensure a holistic understanding of the modern digital ecosystem. Pedagogical materials were categorized into the following core modules:

1. **Foundational Web Architecture and AI Integration:** An introductory module covering web mechanics and the strategic role of Artificial Intelligence in accelerating the development lifecycle.
2. **Prompt Engineering for Web Construction:** Advanced techniques for formulating linguistic instructions to guide AI models in synthesizing coherent website structures and content conceptualization.
3. **Fundamental Web Technologies (HTML/CSS):** Introduction to the underlying skeletal framework of AI-generated code, empowering students to execute granular manual modifications and ensure design integrity.
4. **AI-Generated Multimedia and Copywriting:** Leveraging generative AI assistants for the synthesis of high-fidelity visual assets and persuasive marketing narratives (copywriting).
5. **No-Code/Low-Code AI Platforms:** Practical implementation of AI-driven web builders to facilitate rapid and instant website deployment through automated interfaces.
6. **Functional Interactivity and Logic:** Integration of interactive components, such as contact forms and product galleries, utilizing AI-assisted logic to enhance User Experience (UX).
7. **Web Deployment and Hosting Protocols:** Systematic procedures for publishing digital platforms on live servers to ensure global accessibility and market readiness.

This modular approach was designed to transition students from a theoretical understanding to full-stack digital execution through the synergy of human creativity and machine intelligence.

## **2.4 Training Procedure**

The execution of this community service program followed a systematic procedural framework categorized into five distinct operational stages.

1. **Preparatory Phase and Instructional Design:** This initial stage involved developing comprehensive pedagogical resources, including simplified modular guides, interactive presentation materials, and structured practical exercises. A rigorous technical audit was conducted to ensure that the institutional hardware and network infrastructure were fully optimized for real-time interaction with Artificial Intelligence (AI) platforms.
2. **Diagnostic Assessment (pre-test):** Prior to the intervention, a diagnostic instrument was administered to establish a baseline of the participants' cognitive starting point. This assessment focused on quantifying students' prior knowledge of web development architectures and their familiarity with Generative AI tools (Large Language Models such as ChatGPT).
3. **Technological Intervention (Immersive Hands-on Training):** The core of the program centered on an experiential learning model, which was subdivided into two pedagogical components.
  - a) **Modeling and Demonstration:** Instructors demonstrated the nuances of Prompt Engineering, illustrating how to synthesize linguistic instructions to elicit high-quality design layouts and marketing copy from AI models.
  - b) **Autonomous Application:** Participants engaged in a production-based session in which they constructed digital marketing platforms for school-specific products. During this phase, the students iteratively refined their prompts to achieve optimal aesthetic and functional website outcomes.
4. **Summative Evaluation (post-test):** A summative assessment was conducted following the practical intervention. This stage was designed to evaluate the shift in the participants' competency levels and measure the enhancement of their self-efficacy in utilizing AI technologies for academic and entrepreneurial purposes.
5. **Data Synthesis and Outcome Verification:** The final stage involved a comparative analysis between the pre- and post-test datasets to determine the statistical significance of the learning gains. Furthermore, a technical review of the students' digital outputs (websites) was performed to validate the practical efficacy of the training in enhancing digital proficiency.

## **2.5 Data Collection Instruments**

To ensure a comprehensive evaluation of the intervention, data were systematically gathered using a multidimensional instrumentation approach, as described below.

1. **Cognitive Assessment Scales (Pre-test and Post-test):** A dual-phase assessment instrument was used to quantify the shift in students' theoretical and practical understanding of web development paradigms and Artificial Intelligence (AI) concepts. The instrument comprised a combination of multiple-choice items and structured short-answer questions, specifically validated to assess core competencies in algorithmic logic and AI-driven application workflows.
2. **Observation Framework for Behavioral Engagement:** Systematic observation protocols were employed to monitor and evaluate student participation during practical training modules. These instruments allowed for a qualitative assessment of students' technical engagement, problem-solving persistence, and collaborative dynamics during the hands-on sessions.
3. **Perceptual Feedback Survey:** At the end of the program, a Likert-scale and open-ended feedback questionnaire was administered. This instrument was designed to elicit student perceptions regarding the pedagogical efficacy of the training, the usability of the AI tools provided, and the program's overall impact on their professional confidence.

The synthesis of these quantitative and qualitative instruments provided a robust dataset for evaluating both the learning outcomes and instructional quality of the community service program.

## **2.6 Hardware and Software Used**

The training implementation utilized several hardware and software tools, including:

1. **Hardware**
  - a) Personal Computers used by participants
  - b) LCD Projector for presentation and demonstrations

- c) Internet connection for accessing learning resources
- 2. Software
  - a) Visual Studio Code as the code editor
  - b) Google Chrome (Google LLC) web browser for accessing online resources and demonstrations
  - c) Microsoft PowerPoint (Microsoft Corporation) for training presentations

These tools were selected because they are widely available and suitable for beginner-level programming education.

## **2.7 Data Analysis**

### *2.7.1 Data Analysis Procedures*

The collected data were analyzed using descriptive statistical techniques to evaluate the efficacy of the intervention. A comparative analysis of pre- and post-test scores was conducted to quantify the enhancement in students' technological competencies. The analytical focus remained on measuring significant shifts in cognitive understanding of Artificial Intelligence (AI) paradigms and practical web development proficiencies. Program effectiveness was determined by the normalized gain scores between assessments, complemented by a qualitative thematic analysis of student engagement and participation levels observed during the intervention.

### *2.7.2 Research Design*

This study adopted a quasi-experimental approach utilizing a One-Group Pretest-Posttest design. To ensure robust data triangulation, we integrated this with a survey-based methodology. Structured questionnaires were deployed to gather longitudinal quantitative data regarding students' technical capabilities and psychological perceptions of AI integration before and after the pedagogical intervention.

### *2.7.3 Technical Specifications (Hardware and Software)*

To ensure experimental replicability, the following standardized technical environment was established.

1. Hardware: Institutional laboratory workstations (PC/laptop) equipped with stable high-speed broadband connectivity.
2. Interface: The Google Chrome browser was used as the primary web-based interface.
3. Generative AI Assistants: OpenAI's ChatGPT and Google Gemini were employed for prompt engineering guidance and logical scaffolding in this study.
4. AI Web Development Platforms: Durable AI and Wix ADI were used as the primary no-code/low-code AI development environments.
5. Data Collection Tools: Google Forms were used for the systematic distribution and management of digital assessment instruments.

### *2.7.4 Theoretical Framework and Experimental Conditions*

The study was conducted within a controlled computer laboratory environment, assuming baseline digital literacy among all participants. The research is theoretically grounded in constructivism, emphasizing "learning by doing, where students synthesize technological knowledge through immersive experiences. Furthermore, the Technology Acceptance Model (TAM) was used as a conceptual lens to evaluate students' perceived usefulness and ease of use of AI tools in the context of digital entrepreneurship.

### *2.7.5 Research Instrumentation and Validation*

The primary research instrument consisted of a structured questionnaire that underwent content validity verification by subject matter experts. The instrument covers critical indicators, including foundational web development competencies, AI-driven logical reasoning and operational efficiency using digital tools. Instructional materials were systematically curated into a digital module to ensure synchronized access for all 70 participants throughout the sessions. We analyzed the pre- and post-test scores using descriptive and inferential statistics.

First, we calculated basic numbers, such as minimum, maximum, mean, and standard deviation, to determine the overall growth of our 70 students. Second, to prove whether the improvement was statistically significant, we performed a paired-samples t-test. The mathematical formula for the t-statistic is as follows:

$$t = \frac{\bar{D}}{SD\sqrt{n}} \quad (1)$$

Where  $\bar{D}$  is the average difference between the pre-test and post-test scores,  $^{SD}$  is the standard deviation of those differences, and  $n$  is the total number of students ( $n = 70$ ). The null hypothesis ( $H_0$ ) assumed the training would make no difference ( $\mu_{\text{post}} - \mu_{\text{pre}} = 0$ ), while the alternative hypothesis ( $H_a$ ) was that scores would improve ( $\mu_{\text{post}} - \mu_{\text{pre}} > 0$ ), tested at a significance level of  $\alpha = 0.05$ . We also calculated normalized gain scores ( $g$ ) and performed a thematic analysis on the students' written feedback to understand how they felt about the usefulness and ease of use of the AI platforms. This analysis was based on constructivism ("learning by doing") and the Technology Acceptance Model (TAM).

### 3. Results and Discussions

#### 3.1 Results

This project aimed to combine basic web design concepts with AI tools to provide vocational students with a solid digital skill set. We evaluated the program's success using a mix of pre- and post-tests, live observations, and student feedback. A total of 70 students from grades XI and XII at SMK Sultan Iskandar Muda participated in the study. Before the sessions began, we used a pre-test to measure their baseline understanding of website structures, layout designs, and generative AI tools. After the classes ended, they took a post-test to measure their learning gains. Our operational plan progressed through two main phases:

1. Preparation and Design Phase: We worked closely with the school administration, created easy-to-follow slides and guides, and designed the test questions. The curriculum was written to break down complicated web-building steps into simple, bite-sized tasks, making it easy for beginners to understand how AI can accelerate their creative work.
2. Interactive Learning and Practice Phase: The training combined short lectures, live walk-throughs, and hands-on practice. In the classroom sessions, we discussed the importance of digital skills today and how AI is changing different jobs. The practical tasks focused on basic web design rules, such as page hierarchy, writing good marketing text, and making layouts look professional.

In the final phase, students used AI web builders to create live marketing pages for products made in their school workshops, helping them apply what they learned to a real-world business scenario.



Figure 1. Training session

Figure 1 shows during training, used a flexible teaching style that moved quickly from theory to live demonstrations and then to practice. In the lecture portion, students learned why digital skills matter and how AI can make daily work faster and easier. The instructors explained how websites are structured and demonstrated how "prompt engineering" works. The showed them how to write clear and specific instructions so that AI tools would generate the exact layout and text they needed to achieve their marketing goals. Next, the students jumped into the practical phase, building their own websites using AI-based web builders. With instructors walking around to help, the students chose layouts, added features, and uploaded images of their school products. aExplained the basic computer logic behind

these tools, showing how AI reads text prompts to construct web elements. This hands-on practice at SMK Sultan Iskandar Muda gave students a clear look at how professional digital tools operate, helping them understand the logic and efficiency of AI-driven web design.



Figure 2. Students practicing coding

Figure 2 shows the final part of the program, focused on measuring students' progress. The post-test assessed their understanding of web design concepts and their comfort level in using AI assistants. We analyzed the data to determine whether our teaching methods met our goals. The test scores showed clear and impressive improvement. Before the training, most students had almost no experience with website structures or AI. However, their skills shifted dramatically after the classes. Students at SMK Sultan Iskandar Muda were able to use AI tools independently to build and launch clean marketing sites. Comparing the pre- and post-test scores showed a massive jump in their skills, proving that AI-assisted learning is a highly effective way to teach tech skills in vocational schools. The detailed scores are presented in Table 1.

Table 1. Students' Understanding Before and After the Training (n = 70)

No	Assessment Indicator	Pretest Mean Score	Posttest Mean Score	Improvement
1	Understanding of basic concepts of website structure and layout	54	79	+25
2	Knowledge of instruction techniques ( <i>prompt engineering</i> ) for AI assistants	50	82	+32
3	Understanding of visual elements and digital marketing content writing	52	83	+31
4	Skills in operating AI-based website builder platforms	49	81	+32
5	Understanding of basic Artificial Intelligence (AI) concepts in web development	56	85	+29
6	Awareness of AI implementation in the creative industry and everyday life	60	87	+27

Based on the empirical evidence presented in Table 1, all measured comprehension indicators exhibited a positive upward trend following the intervention. The most substantial gains were identified in the domains of prompt engineering techniques and operational proficiency within AI-driven web development platforms, both of which demonstrated a significant increase of 32 points each. This phenomenon suggests that the immersive, hands-on instructional approach effectively facilitated a deeper understanding of digital architecture and command-based technological workflows among students at SMK Sultan Iskandar Muda. By bypassing the traditional barriers of manual coding, AI-integrated pedagogy allows students to achieve a higher level of technical mastery within a compressed timeframe. To provide a more granular evaluation of the participants' academic trajectory, the descriptive statistics for the pre-test and post-test scores are meticulously summarized in Table 2. The

shift in these performance metrics underscores a robust correlation between pedagogical intervention and enhancement of students' technical self-efficacy and digital literacy.

Table 2. Distribution of Students' Pretest and Posttest Scores (n = 70)

Test Type	Minimum Score	Maximum Score	Mean Score	Standard Deviation
Pretest	40	68	53.5	7.2
Posttest	72	92	82.8	5.6

The descriptive statistics presented in Table 2 reveal that the baseline mean score (pre-test) was 53.5, reflecting limited prior proficiency in programming paradigms and Artificial Intelligence (AI) conceptual frameworks among the participants. Following the pedagogical intervention, the mean post-test score increased significantly to 82.8. This substantial growth in average performance serves as empirical evidence of the training program's efficacy in successfully enhancing students' cognitive grasp of the instructional materials. Furthermore, a critical analysis of the data distribution showed that the standard deviation decreased from 7.2 to 5.6. This reduction indicates greater homogeneity in students' comprehension post-intervention, suggesting that the instructional model not only elevated individual knowledge levels but also effectively minimized the achievement gap among students. The narrowing of the variance implies that the AI-assisted learning approach provided equitable benefits across the student cohort. The comparative trajectory of these learning gains is visually corroborated in Figure 3, which illustrates the clear disparity between the initial baseline and the post-intervention outcomes."

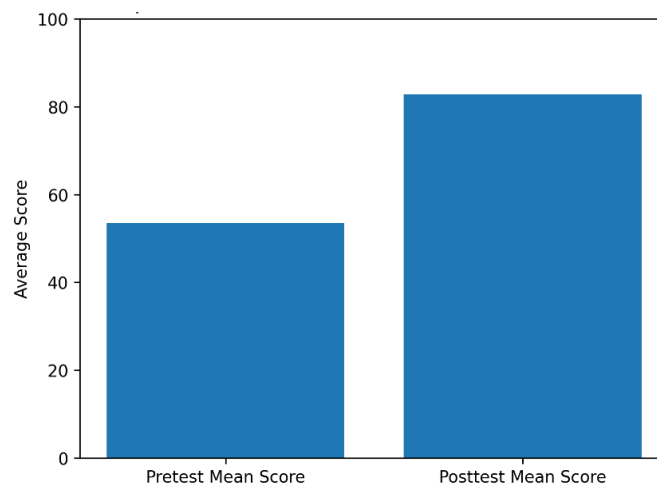


Figure 3. Comparison of pretest and post-test mean scores

The visual representation in Figure 3 shows a tangible enhancement in student learning outcomes following the completion of the intervention. These results corroborate the hypothesis that integrating foundational web development with Artificial Intelligence (AI) through a structured pedagogical framework significantly bolsters students' technological competencies. Beyond the quantitative metrics, qualitative classroom observations revealed a high degree of enthusiasm and active engagement among the students at SMK Sultan Iskandar Muda during the practical web construction module. Participants demonstrated a proactive learning stance by experimenting with various prompt engineering iterations, displaying profound intellectual curiosity regarding the application of AI-driven web solutions to real-world marketing challenges for school-based products.

This heightened engagement suggests that the shift from abstract coding to AI-assisted logic significantly reduces cognitive barriers and fosters a more exploratory learning environment. Furthermore, participant feedback underscored the perceived utility and engagement of the training program. A significant portion of the cohort expressed a heightened interest in pursuing advanced studies in web development and artificial intelligence, indicating that the program served as a successful catalyst for long-term academic and professional aspirations in the digital domain."

### **3.2 Discussion**

The findings of this study underscore that the integration of foundational web development and Artificial Intelligence (AI) through experiential learning frameworks significantly bolsters the technological competencies of vocational students at SMK Sultan Iskandar Muda. The substantial escalation in post-intervention assessment scores indicates a profound enhancement in students' cognitive grasp of web structural logic and the strategic application of AI assistants. These results align with prior research, emphasizing that digital education is a critical driver of fostering higher-order thinking skills, including critical and creative reasoning.

Engaging in web construction necessitates logical thinking, systematic market analysis, and synthesizing effective digital solutions competencies that are increasingly indispensable in the contemporary global workforce. Furthermore, this study corroborates the previous literature highlighting the efficacy of AI-driven tools in technological education. By mitigating the 'syntax barrier' associated with traditional coding, AI-integrated pedagogy enables novice developers to prioritize design conceptualization and digital marketing strategies over the intricacies of complex programming languages.

A pivotal aspect of this intervention is the successful embedding of AI literacy into the vocational curriculum. Given AI's pervasive influence across global sectors, ranging from healthcare to e-commerce, introducing these technologies at the vocational level empowers students to understand the architecture of intelligent and efficient information systems. The high level of student engagement observed during the hands-on learning sessions further validates the superiority of experiential approaches for teaching multifaceted technological concepts. Direct participation in constructing landing pages allowed students to bridge the gap between theoretical constructs and practical applications, particularly in User Interface (UI) design and computational problem-solving.

However, the implementation was not without challenges. The initial cognitive load associated with mastering prompt engineering logic proved to be demanding for students with limited prior digital exposure. Additionally, temporal constraints limited the exploration of advanced web development frameworks and more nuanced AI applications. Despite these limitations, this study demonstrates that targeted technological outreach programs serve as vital supplements to formal vocational curricula, providing practical learning experiences that are often absent in conventional academic settings.

## **4. Conclusions**

### **4.1 Conclusion**

This project was designed to boost the digital skills of vocational high school students by introducing AI-assisted web development into the classroom. The results prove that the training program successfully improved students' understanding of basic web design and AI tools. The clear jump in test scores shows that students at SMK Sultan Iskandar Muda gained real and practical skills in writing AI prompts, designing web layouts, uploading visual media, and launching live sites. They walked away with a better grasp of how AI can be used in modern businesses. Ultimately, this hands-on model shows how schools can successfully teach complex technology skills to prepare students for today's digital workplace.

### **4.2 Research Limitations**

Notwithstanding the favorable outcomes observed, this study is subject to several inherent limitations that warrant consideration. First, the temporal constraints of the training program precluded a more exhaustive exploration of advanced programming frameworks and sophisticated Artificial Intelligence (AI) architectures. Consequently, the depth of technical mastery achieved was restricted to foundational application. Second, the heterogeneity of the participants' prior digital literacy and programming exposure introduced a potential confounding variable that may have uniquely influenced individual learning trajectories and post-intervention performance. Furthermore, because this study focused on a specific cohort from a single vocational institution, the generalizability of the findings to broader educational settings or different geographical contexts may be limited to some extent. Future research should aim to implement longitudinal studies with larger, more diverse populations and extended

instructional durations to further validate the long-term pedagogical impact of AI integration in vocational education.

### 4.3 Suggestions and Directions for Future Service

Build upon the findings of this study, several avenues for future research are recommended. Subsequent programs should consider extended and more comprehensive instructional durations to facilitate the integration of advanced programming paradigms and a more nuanced exploration of sophisticated Artificial Intelligence (AI) architectures. Furthermore, to enhance the external validity and generalizability of the results, future studies should involve larger multi-institutional cohorts across diverse vocational landscapes.

Beyond immediate technical gains, future investigations must adopt a longitudinal perspective to evaluate the enduring impact of AI-assisted pedagogy. Specifically, research should focus on the long-term correlation between AI literacy and students sustained technological self-efficacy, intrinsic learning motivation, and professional career readiness in the evolving digital ecosystem. Such longitudinal data would provide critical insights into the sustainability of technology-driven vocational interventions in securing a competitive edge for graduates in the global labor market.

### Acknowledgement

The authors wish to extend their profound gratitude to Universitas Satya Terra Bhinneka and the Institute for Research and Community Service of Universitas Satya Terra Bhinneka for their invaluable institutional support and for providing the necessary facilities to conduct this community service initiative. Express our sincere appreciation to the administration and faculty of SMKS Sultan Iskandar Muda for their exemplary cooperation and strategic partnership throughout the program. Furthermore, we are deeply grateful to the student participants, whose enthusiastic engagement and active contributions were fundamental to the successful realization of this study. This collaborative endeavor was made possible by the collective commitment of all stakeholders involved.

### References

- Adigun, G. O., Ajani, Y. A., & Enakrire, R. T. (2024). The intelligent libraries: Innovation for a sustainable knowledge system in the fifth (5th) industrial revolution. *Libri*, 74(3), 211-223. doi:<https://doi.org/10.1515/libri-2023-0111>
- Anshar, D. (2025). Vocational high school students' marketing strategies in socio-economic development using digital technology in the 21<sup>st</sup> Century Era. *Mimbar Ilmu*, 30(3), 536-548. doi:<https://doi.org/10.23887/mi.v30i3.103505>
- Aulia, C., & Yulianto, A. (2025). Perancangan sistem informasi e-commerce dan branding digital PT. Trimitra Surya Cemerlang menggunakan metode prototype. *REMIK: Riset dan E-Jurnal Manajemen Informatika Komputer*, 9(4), 1201-1212. doi:<https://doi.org/10.33395/remik.v9i4.15070>
- Bayu Sinta, T., Hanifah, H., & Harjanti, H. (2026). Literasi digital upaya pencegahan kenakalan remaja di era teknologi. *Jurnal Pengabdian Masyarakat Sabangka*, 5(02), 911-917. doi:<https://doi.org/10.62668/sabangka.v5i02.2230>
- Davenport, T., Guha, A., Grewal, D., & Bressgott, T. (2020). How artificial intelligence will change the future of marketing. *Journal of the Academy of Marketing Science*, 48(1), 24-42. doi:<https://doi.org/10.1007/s11747-019-00696-0>
- Dobson, L.-R. T., & Karkalas, S. (2026). *Exploring Minimally Intrusive GenAI Scaffolding for Introductory Programming Education*. Paper presented at the Proceedings of the 2026 14<sup>th</sup> International Conference on software and information engineering. doi:<https://doi.org/10.1145/3789595.3789611>
- Ekasari, A., Algiranto, A., & Rezki, A. (2025). Development of PBL-Based Learning tools integrating local wisdom through lesson study at SMAS Plus Muhammadiyah Merauke. *Mitra Abdimas: Jurnal Pengabdian kepada Masyarakat*, 5(1), 42-47. doi:<https://doi.org/10.57251/mabdimas.v5i1.1724>

- Elnaffar, S., Rashidi, F., & Abualkishik, A. Z. (2025). Teaching with AI: A systematic review of chatbots, generative tools, and tutoring systems in programming education. *arXiv preprint arXiv:2510.03884*. doi:<https://doi.org/10.48550/arXiv.2510.03884>
- Gao, B., Wang, Y., Xie, H., Hu, Y., & Hu, Y. (2023). Artificial Intelligence in advertising: advancements, challenges, and ethical considerations in targeting, personalization, content creation, and ad optimization. *Sage Open*, 13(4), 21582440231210759. doi:<https://doi.org/10.1177/21582440231210759>
- Hakim, L., Junaidi, J., Fidiyanti, E., Deni, A., Regitasari, M., Husna, A., Khotimah, K. (2022). pemberdayaan masyarakat melalui penyuluhan peningkatan kinerja UMKM dan pendampingan pembuatan NIB. *Jurnal Pengabdian kepada Masyarakat Nusantara*, 3(1), 394-400. doi:<https://doi.org/10.55338/jpkmn.v3i1.358>
- Halik, S. A. (2025). Pengaruh Lingkungan keluarga dan motivasi berwirausaha terhadap minat berwirausaha mahasiswa. *RIGGS: Journal of Artificial Intelligence and Digital Business*, 4(2), 198-206. doi:<https://doi.org/10.31004/riggs.v4i2.479>
- Huang, M.-H., & Rust, R. T. (2021). A strategic framework for artificial intelligence in marketing. *Journal of the Academy of Marketing Science*, 49(1), 30-50. doi:<https://doi.org/10.1007/s11747-020-00749-9>
- Jaswita, D., & Dewintarsi, A. (2025). Transformasi strategi pemasaran digital di era AI : Tinjauan literatur atas inovasi teknologi dalam e-commerce B2B di Indonesia. *Jurnal Ekonomi, Manajemen, Akuntansi dan Keuangan*, 6(3), 9. doi:<https://doi.org/10.53697/emak.v6i3.2557>
- Liu, Z., Gearty, Z., Richard, E., Orrill, C. H., Kayumova, S., & Balasubramanian, R. (2024). Bringing computational thinking into classrooms: A systematic review on supporting teachers in integrating computational thinking into K-12 classrooms. *International Journal of STEM Education*, 11(1), 51. doi:<https://doi.org/10.1186/s40594-024-00510-6>
- Lopes, J. M., Gomes, S., Farinha, L., & Sampaio, C. (2026). Empowering digital entrepreneurship intention: Unveiling the Role of Education. *Journal of the Knowledge Economy*. doi:<https://doi.org/10.1007/s13132-026-03179-0>
- Macar, U., Castleman, B., Mauchly, N., Jiang, M., Aouissi, A., Aouissi, S., Clark-Sevilla, A. (2023). Teenagers and artificial intelligence: Bootcamp experience and lessons learned. *arXiv preprint arXiv:2312.10067*. doi:<https://doi.org/10.48550/arXiv.2312.10067>
- Mafrukhah, E., & Lisana, L. (2026). Adoption of artificial intelligence in Vocational High Schools: A systematic review of teachers' perspectives. *Sinkron : Jurnal dan Penelitian Teknik Informatika*, 10(1), 665-575. doi:<https://doi.org/10.33395/sinkron.v10i1.15701>
- Mariani, M. M., Perez-Vega, R., & Wirtz, J. (2022). AI in marketing, consumer research and psychology: A systematic literature review and research agenda. *Psychology & Marketing*, 39(4), 755-776. doi:<https://doi.org/10.1002/mar.21619>
- Masnia, M., Saputri, V., Kamsurya, R., & Tuhu, D. M. S. (2025). Peningkatan literasi numerasi siswa SMA melalui pembinaan AKM untuk Mencapai sekolah berkualitas. *Yumary: Jurnal Pengabdian kepada Masyarakat*, 6(2), 437-449. doi:<https://doi.org/10.35912/yumary.v6i2.3231>
- Matlubah, H., Herowati, H., & Novita Punggeti, R. (2025). Upaya menanamkan literasi lingkungan siswa MDT Raudhatul Muhtadiin, Sumenep. *Yumary: Jurnal Pengabdian kepada Masyarakat*, 5(4), 867-875. doi:<https://doi.org/10.35912/yumary.v5i4.3787>
- Menon, D., & Shilpa, K. (2023). "Chatting with ChatGPT": Analyzing the factors influencing users' intention to Use the Open AI's ChatGPT using the UTAUT model. *Heliyon*, 9(11), e20962. doi:<https://doi.org/10.1016/j.heliyon.2023.e20962>
- Nasution, S. D. (2026). Pelatihan optimalisasi AI dalam penerbitan artikel pada Jurnal Bereputasi. *ORAHUA : Jurnal Pengabdian Kepada Masyarakat*, 3(02), 11-17. doi:<https://doi.org/10.70404/orahua.v3i02.625>
- Paul, J., Ueno, A., Dennis, C., Alamanos, E., Curtis, L., Foroudi, P., Wirtz, J. (2024). Digital transformation: A multidisciplinary perspective and future research agenda. *International Journal of Consumer Studies*, 48(2), e13015. doi:<https://doi.org/10.1111/ijcs.13015>
- Permana, R. A., & Sahara, S. (2021). Review analisis produk marketplace online pada algoritma support vector machine. *Jurnal Ilmiah Informatika*, 6(1), 50-58. doi:<https://doi.org/10.35316/jimi.v6i1.1227>

- Pohjalainen, P., & Vepsäläinen, J. (2026). Artificial intelligence for web development: Perspectives from the industry. *AI Magazine*, 47(1), e70051. doi:<https://doi.org/10.1002/aaai.70051>
- Santati, P., Saftiana, Y., Mavillinda, H. F., & Ghasarma, R. (2022). Peningkatan literasi teknologi informasi bagi perangkat Kelurahan di lingkungan Kecamatan Ilir Barat Dua Kota Palembang. *Yumary: Jurnal Pengabdian kepada Masyarakat*, 2(4), 175-188. doi:<https://doi.org/10.35912/yumary.v2i4.1037>
- Suhendah, R., Jennifer, J., Goh, E., & Heni, H. (2025). Edukasi pelatihan sistem penjurnalan perusahaan dagang untuk Siswa-Siswi SMA. *Yumary: Jurnal Pengabdian kepada Masyarakat*, 5(4), 877-889. doi:<https://doi.org/10.35912/yumary.v5i4.4378>
- Wardhanie, A., & Lebdaningrum, K. (2023). Pengenalan aplikasi desain grafis figma pada siswa-siswi Multimedia SMK PGRI 2 Sidoarjo. *Yumary: Jurnal Pengabdian kepada Masyarakat*, 3(3), 165-174. doi:<https://doi.org/10.35912/yumary.v3i3.1536>
- Wijaya, M. C., Yapinus, P. P., Loekito, J. A., Tanubrata, M., Lehman, A. S., Cheol, S. M., & Wong, K. (2024). Pengenalan teknik komputer bagi Siswa SMAK 4 BPK Penabur Jakarta. *Yumary: Jurnal Pengabdian kepada Masyarakat*, 4(4), 541-549. doi:<https://doi.org/10.35912/yumary.v4i4.2653>
- Yanti, M., Siswadi, S., Maulana Wahyu, A., Arianti, A. O., & Frederik Dony, S. (2025). Pemberdayaan berbasis masyarakat melalui produksi makanan berbahan baku ikan. *PaKMas: Jurnal Pengabdian Kepada Masyarakat*, 5(1), 55-62. doi:<https://doi.org/10.54259/pakmas.v5i1.3213>