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Enhancing The Readiness of Vocational High School Students in Facing the Era of Digitalization and Artificial Intelligence

Peningkatan Kesiapan Siswa Sekolah Menengah Kejuruan dalam Menghadapi Era Digitalisasi dan Kecerdasan Buatan

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Abstract

Digitalization and the development of artificial intelligence (AI) have driven significant transformations in the global workforce structure. Vocational High School (VHS) graduates face serious challenges in an increasingly dynamic industrial landscape, such as a high risk of unemployment due to a mismatch between their skills and industry needs. This article discusses the implementation of community service activities aimed at improving vocational high school students' readiness to enter the digital-based world of work through a participatory educational approach. These educational activities were conducted at a private vocational school in Sleman, Yogyakarta. The method used included participatory educational outreach, whose activities were analyzed descriptively. The results indicate an increase in students' understanding and readiness to integrate technical and non-technical skills, as well as an increased awareness of the importance of reskilling and upskilling. The majority of students are immediately oriented towards work after graduation and demonstrate a positive perception of their technical competencies, although they still need to strengthen their interpersonal and adaptive skills.

Keywords: Vocational Education; Digitalization; Artificial Intelligence.

Abstrak

Digitalisasi dan perkembangan kecerdasan buatan (*Artificial Intelligence*/AI) telah mendorong transformasi yang signifikan dalam struktur tenaga kerja global. Lulusan Sekolah Menengah Kejuruan (SMK) menghadapi tantangan serius di tengah lanskap industri yang semakin dinamis, seperti tingginya risiko pengangguran akibat ketidaksesuaian antara kompetensi yang dimiliki dengan kebutuhan industri. Artikel ini membahas pelaksanaan kegiatan pengabdian kepada masyarakat yang bertujuan meningkatkan kesiapan siswa SMK untuk memasuki dunia kerja berbasis digital melalui pendekatan edukasi partisipatif. Kegiatan edukasi tersebut dilaksanakan di salah satu SMK swasta di Sleman, Yogyakarta. Metode yang digunakan berupa penyuluhan edukatif partisipatif, dengan analisis kegiatan dilakukan secara deskriptif. Hasil kegiatan menunjukkan adanya peningkatan pemahaman dan kesiapan siswa dalam mengintegrasikan keterampilan teknis maupun nonteknis, serta meningkatnya kesadaran akan pentingnya *reskilling* dan *upskilling*. Sebagian besar siswa berorientasi untuk langsung memasuki dunia kerja setelah lulus dan menunjukkan persepsi positif terhadap kompetensi teknis yang dimiliki, meskipun mereka masih perlu memperkuat keterampilan interpersonal dan kemampuan beradaptasi.

Kata kunci: Pendidikan Vokasi; Digitalisasi; Kecerdasan Buatan.

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INTRODUCTION

The digital transformation marked by the advancement of automation and artificial intelligence (AI) technologies has significantly altered the structure of various sectors of the global economy, industry, and workforce. Advances in digital technologies such as artificial intelligence, blockchain, big data, and the internet of things (IoT) are essential for efficiency and productivity across various fields and are increasingly being integrated into production and industrial processes (Adhikari & Chanda, 2024). Digitalization is also driving fundamental changes in production processes and patterns of labor interaction (Dianty, 2024). Many administrative and routine jobs are beginning to be replaced by automated systems, requiring workers to upgrade their skills to remain employable in the digital age. For example, clerical jobs such as administrative work and similar jobs are at risk of being replaced by AI if workers do not enhance their skills. Therefore, the capacity building is essential to prevent skill mismatches, job loss, and unemployment among low-skilled workers (Charpied, 2025).

Reskilling is a process undertaken by the business world to enhance the workforce's skills by teaching them new things related to their jobs. This adaptation is widely practiced by the business world due to new demands arising from technological disruption. Reskilling can be achieved through various processes such as training, certification, and professional development with specific assessment related to the job designation. The primary benefit of reskilling for employees is related to skill development aligned with new technological advancements. While for industry, it offers cost efficiency in recruiting new workers. Upskilling is the process of continuously improving skills that aim to enable the workforce to keep pace with industry trends that are becoming automated due to AI (Charpied, 2025; Thaba & Nkadimemng, 2026).

Changes in the labor market structure pose a real challenge for vocational education graduates. One form of vocational education in Indonesia at the secondary level is the Vocational High School. VHS graduates are expected to develop the ability to adapt to rapid changes in technology and the current job market, as shifts in the labor market structure will significantly impact their employment prospects after graduation (Andriansyah & Kamalia, 2021). VHS graduates have opportunities to enter new fields such as robotics and digital services. This aligns with several studies showing that technological transformation increases demand for skills that support AI such as digital literacy (Purnama & Susanti, 2024), interpersonal skills (Savero & Turangan, 2025), problem solving (Alongkrontuksin et al., 2024) and collaborative abilities, which are key factors in the competitiveness of future job seekers (Barmada et al., 2024).

Vocational education is designed to produce graduates who are ready to enter the workforce in specific fields. For example, many vocational high schools in Indonesia produce graduates in the field of technology and engineering with majors like vehicle engineering, mechanical engineering, heavy equipment engineering, and electrical engineering. However, according to data from the *Badan Pusat Statistik* (BPS), VHS graduates still face a relatively high risk of unemployment compared to graduates from other educational tracks in 2025. Based on the open unemployment rate (*Tingkat Pengangguran Terbuka*/TPT), many vocational high schools graduates have not yet been optimally absorbed into the workforce which make the efforts to address unemployment among its graduates a matter that must be addressed immediately (Hermawan et al., 2023; Suripto et al., 2024).

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The urgency of implementing this activity is based on various findings from previous research. The ability to adapt to technological changes is a key factor in improving employment opportunities for vocational high school graduates (Andriansyah & Kamalia, 2021; Hermawan et al., 2023; Suripto et al., 2024). Vocational high school graduates still have a relatively higher open unemployment rate compared to graduates of other educational programs. Therefore, digital literacy (Purnama & Susanti, 2024), problem solving (Alongkrontuksin et al., 2024), interpersonal skills (Savero & Turangan, 2025), and collaboration are essential to support skills for enhancing the competitiveness of the future workforce (Barmada et al., 2024). These studies indicate that in addition to hard skills or technical abilities learned through the vocational education curriculum, adaptive skills also play a significant role for vocational graduates.

This community service activity was carried out at a private vocational high school in Sleman Regency, Daerah Istimewa Yogyakarta Province. Based on initial coordination with the school (our partner), it was found that the readiness of students (prospective graduates) to face the digital era is still limited to mastery of hard skills, as opposed to the soft skills that are increasingly in demand by industry. Furthermore, the majority of students are not yet aware of the importance of reskilling, upskilling and lifelong learning as means to enhance competitiveness, and there remains a lack of educational activities specifically addressing the impact of digital transformation on career opportunities for vocational high school graduates. Therefore, a collaborative community services team from both the International Relations Programs at the Universitas Pembangunan Nasional Veteran Yogyakarta and Universitas Riau designed an educational intervention through community service activities that emphasize raising awareness, digital literacy, and work readiness as strategic steps in preparing vocational high school prospective graduates to face the increasingly dynamic changes in the global labor market. The objective of this initiative is to bridge the gap and address the challenges posed by changes in the labor market structure resulting from digitalization and AI developments.

This article will discuss how educational activity to enhance vocational high school graduate's understanding of the digital era and AI disruption are carried out through constructive outreach that emphasizes participatory, dialogic, and reflective approaches. The activities do not merely focus on one-way delivery of material but also actively engage students through probing questions and interactive discussions to assess their skill readiness and work mindset. Through this approach, students are encouraged to understand their opportunities in the future job landscape and develop adaptive attitudes forward. Evaluation is conducted through follow-up questions at the end of sessions to assess changes in perception and readiness.

IMPLEMENTATION METHODS

This community service activities employed an educational approach in the form of a workshop titled "Challenges Facing Vocational School Graduates in the Digital and Artificial Intelligence Age" to enhance the understanding and preparedness of prospective graduates at a vocational high school in Sleman, Yogyakarta, as they navigate the era of digitalization and artificial intelligence after graduation. The activity was conducted through educational sessions that combined material presentation, discussion, and reflexive session. The implementation consisted of three stages: 1) the preparation stages involved coordination

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with school management and material development aligned with students' competencies in robotics and electrical engineering; 2) the implementation stage which include presentations and material delivery related to global structure of workforce and strategies for workforce readiness in the AI era; 3) the evaluation stage including follow-up questions to assess changes in participants' understanding. Data were collected through observation and by comparing responses during discussion sessions.

Our partner in this community service activity was SMK Muhammadiyah Prambanan Sleman which is located in Sleman Regency, Daerah Istimewa Yogyakarta Province. As a vocational high school, the school offers a vocational program that is designed to produce graduates who are ready to enter the workforce such as robotics and mechanical engineering. A total of nearly 50 participants took part in the events which consisted of students, accompanying teachers, and a team of lecturers as organizers. The speakers for this workshop were a team lecturer from the International Relations Program at Universitas Pembangunan Nasional Veteran Yogyakarta and the Department of International Relations at Universitas Riau. In the first session, the speaker spoke about global transformation of the workforce due to AI disruption to labor market structure. The second speaker covered tips and strategies for vocational students to navigate the era of AI by focusing on enhancing adaptive skills.

The community service activity was conducted in three phases: the pre-activity, implementation, and evaluation phase. During the pre-activity stage, the community service team coordinated with the partner school to discuss the implementation schedule, target participants, and activity requirements. Next, the team developed workshop materials tailored to the participants characteristics and current trends in digital transformation to ensure that the content was contextually suitable. After the plan and preparation is completed, the team implemented the activity in a workshop titled *"Challenges Facing Vocational School Graduates in the Digital Age,"* which was held on Thursday, February 5th, 2026 in the school venue. Evaluation during the workshop was conducted through reflexive discussion with participants. Follow-up questions were asked to assess changes in participant's understanding of digital challenges, hard and soft skill development, and students' readiness to embrace AI.

RESULTS

1. Implementation

The activity began with an initial coordination process between the community service team from International Relations of Universitas Pembangunan Nasional Veteran Yogyakarta and Universitas Riau along with the representative from the vocational school prior to the implementation of the workshop. The meeting served as a preparatory step to align perspectives regarding the workshop' objectives, target participants, content, and technical aspects of implementing the event at the intended school. In the initial communication, we discussed students' needs, the alignment of the themes with vocational competencies (in this case robotics and electrical engineering), and the forms of learning interaction to be used so that the material would be easy to understand by students. In addition, the school teachers provided input regarding students' characteristics and learning conditions which allow the team to tailor their outreach approach to be more contextual.

The material development is based on the needs and readiness of the students. The materials such as power point presentations are designed around three complementary main

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focuses: 1) transformation of the global workforce; 2) strengthening soft skills and world mindset; and 3) strategies to prepare for digitalization and AI. These materials were presented by expert speakers from both universities. Each speaker addressed a different topic, focusing on how the labor market is changing due to digital transformation, as well as strategies for students to navigate these challenges.



Figure 1. Coordination between the team from the International Relations Program at UPN Veteran Yogyakarta, Department of International Relations of UNRI, and School Representatives Prior to The Implementation of Students Workshop

The first session explores the connection between AI disruption and the global labor market structure. The key drivers of transformation in the workforce include technological advancements as well as the emerging of virtual workspaces that fundamentally eliminate geographical barriers to work. Examples of such jobs include remote working, gig economy, and digital jobs, which are now booming because of the 5.0 industry. Such work models are increasingly being adopted, particularly in the education and marketing sectors. Furthermore, globalization has increased labor mobility, highlighting the need to build more adaptive ecosystems. However, in many developing countries, access to technology remains uneven. The resulting digital divide poses a major challenge to labor absorption, particularly in rural and remote areas.



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Figure 2. First session presentation about the transformation of the global workforce by Dr. Anik Yuniarti, M.Si from the Program Study of International Relations at UPN Veteran Yogyakarta

One strategy that vocational high school students can adopt to navigate the era of digitalization and AI is to combine both hard and soft skills. Both are equally important because machines and technology are not yet capable of generating original ideas and new solutions. Furthermore. Machines cannot collaborate in multidisciplinary teams or clearly communicate their ideas. Even though they are capable of analyzing complex problems and evaluating them, they are not yet able to make decisions that are contextually right. Therefore, prospective graduates must be prepared to adapt to change, learn new things, and continue to develop themselves throughout their careers.



Figure 3. Presentation on Strategies to deal with AI disruption by Dr. Yusnarida Eka Nizmi, S.IP., M.Si from the Department of International Relations UNRI

Other topics covered in the educational session included initiatives and creativities. Initiatives encourage individuals to continue learning and developing themselves, while creativity enables them to innovate in the face of technological challenges and industry competition. In addition, time management skill is also a crucial aspect of the fast-paced, goal-oriented modern workplace. Vocational school graduates who can set priorities, work efficiently, and meet deadlines will be viewed as more professional and reliable. These combinations will strengthen the competitiveness of vocational high school graduates as they enter a dynamic and competitive digital workforce.

Vocational high school graduates must master and develop a variety of relevant hard and soft skills from an early stage with the aim to improve work quality and build students' confidence in completing tasks. Based on the human capital theory introduced by Gary Becker, which emphasizes the importance of education and training as a form of investment in enhancing the value of individuals as human resources, formal education, training, and work experience are key components in developing the competencies required in the workforce. Investment in human capital reflects the need to develop individuals who are adaptable, productive, and innovative in a fast-changing world (Assabul & Puspasari, 2025). In this theory, people are the investment capital, so training and the development of various skills are forms of investment expected to yield returns in the future. Individuals who possess a diverse range of skills including both hard and soft skills also have greater opportunities to

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secure employment and earn higher salaries in the labor market. Becker also states that individuals with work experience play a crucial role in the workplace. Companies are much more likely to retain productive employees compared to those who lack skills or adaptive training.



Figure 4. The Second Speaker gives presentation on strategies to navigate AI disruption

2. Challenges

There were a few challenges identified during the implementation. First, time constraints prevented a more in-depth discussion of developments in AI and various digital career opportunities among students. Second, participants' initial levels of understanding regarding the transformation of the workforce varied considerably, so the speakers had to adjust the pace of their presentations to ensure all participants could follow the discussion effectively. Third, the event did not include quantitative evaluation tools such as questionnaires or written tests, so that the data was primarily collected through observation, reflexive sessions, and brief question and answer sessions. These challenges provide important insights for future community service initiatives to ensure that the impact of such events can be evaluated in a more measurable way.

3. Evaluation

The evaluation process was conducted through follow-up questions to assess changes in participants' understanding. Data were collected through observations of participation and comparisons of response before and after the activity, then analyzed using qualitative descriptive methods to assess improvements in students' readiness to enter the digital workforce. The community service team recorded every question and response posed by both the resource persons and the students. In general, vocational high school students who received material related to graduate readiness in the era of digitalization and AI.

Work Orientation

The majority of vocational high school students (around 70 percent) stated that they want to enter the workforce immediately after completing their education at vocational high school. This aligns with the nature of vocational education where the curriculum is designed to prepare graduates to be job-ready. Meanwhile, a small percentage of students aspire to become entrepreneurs or continue their studies at a university to enhance their academic

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and professional competencies. These findings indicate that the majority of students view vocational high school as a direct pathway to the job market and strengthening their readiness for the workforce both in terms of technical skills and soft skills that is crucial in the learning process.

Perceptions of the expertise possessed by students

Most students have a positive perception of the skills they are currently developing in vocational school. This was evident from the results of interactive discussions during the educational sessions, in which students felt that the skills they currently possess are sufficient to enter the workforce. Most students express confidence in their skills in the fields of electrical engineering and robotics. These fields are among the fastest-growing sectors in the era of digitalization and artificial development which offer numerous opportunities for the workforce. Additionally, the internship experience gained by vocational high school graduates further reinforces their positive perception of their skills. However, the demands of the workforce in today's digital world require not only hard skills but also interpersonal skills such as communication, the ability to adapt to new environments, leadership skills and problem solving. This positive perception equips students with the foundation to face post-graduation challenges in the future.

DISCUSSION

Developing the skills needed to enter the workforce is also crucial for strengthening vocational high school students' readiness to face the world of AI and digital technologies. Posekany (2025) investigates the combination of knowledge and skill sets in the fields of robotics and AI, and the results show that this can serve as a catalyst for students' learning experiences in vocational schools. Hands-on practice during school empowers students to become more adaptable and critical thinkers. In other VHS majors like animation, technical competencies and creativity significantly impact employability (Mardi et al., 2025). This indicates that the development of digital skills is crucial for enhancing students' readiness for the job market. Interestingly, these digital skills still largely focus on the use of AI applications in education. A study conducted by Annuš (2025) shows that vocational high school students at different levels use different AI tools for their study. In this context, ChatGPT is the most widely used. Annuš (2025) suggests that excessive use of AI tools increases the risk of overreliance and overdependence among students. Therefore, educators must play a crucial role in shaping students' awareness of the responsibility of using AI.

The readiness of vocational school students in Indonesia to face digital and AI challenges in the workplace is the result not only of the complexity of curriculum design but also of efforts to bridge the gap in digital and AI-related skills. Several studies have shown that more than 70% of vocational education teachers, particularly in developing countries, still have low competencies, especially those regarding ICT, content creation, and digital security (Widiyanti et al., 2020). These limited skills among vocational teachers impact students' technological competencies in securing future employment careers. The factors contributing to teachers' low digital competencies can be divided into two categories: internal and external factors such as limited access to the internet and digital infrastructure, insufficient government training, and a lack of confidence among teachers in embracing opportunities in the digital and AI era (Xayakot et al., 2024). The relationship between the competencies of vocational education and the readiness of prospective graduates to enter the workforce is

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crucial. Focusing on these competencies can support students' opportunities to compete in the fast-paced era of AI. Moreover, teachers' competencies can be enhanced through the development of innovative instructional models that combine project-based learning with the Technological Pedagogical Content Knowledge approach (Mabiling & Guevarra, 2025). The readiness of VHS graduates is closely linked to teacher competence and opportunities to learn about and practice using AI and digital tools. Without strengthening teachers' capacity and competence in digital technology and AI, students will struggle to meet the demands of future jobs.

Another significant factor in supporting students' readiness to face digital and AI challenges for their future careers is how curriculum and industry alignment work in synergy. A study conducted by Saryadi et al. (2024) examined the "link and match" policy in industry-based classes and its impact on improving the competencies and employability of vocational high school (VHS) graduates. Their study indicated that industry must play an active role in engaging with and committing to providing input for curriculum development to ensure it remains relevant to industry needs. When the policies are implemented, the results show that they can positively influence learning outcomes in vocational schools. Participating students gain hands-on learning experiences in a work environment. This aligns with a study by Zustina et al. (2024), which recommends that vocational education curricula should involve schools, industry, teachers, as well as practitioners and school instructors. Curriculum adaptation in vocational education has a direct impact on reducing skill gaps among graduates. According to Qu & Binti Zaini (2025), one of the biggest challenges in addressing digital transformation is that traditional curricula are slow to respond to change, thereby leaving the graduates unprepared for a job market.

The challenges faced by vocational education schools in Indonesia and developing countries in general are related to weak infrastructure, economic and gender disparities, and gaps in digital literacy. In terms of infrastructure, schools and facilities supporting vocational and digital training in rural areas remain very limited. In Indonesia, for example, support for digital infrastructure remains concentrated in urban areas despite high demands in rural regions. These limitations stem from the region's highly diverse geographical distribution, limited budget allocation policies, and various other factors that contribute to the digital divide between rural and urban areas (Duanmu et al., 2025). Therefore, Ndjama & Mokoena (2026) suggests that enhancing digital literacy in VHS in rural areas could be one of the solutions. His study identifies four types of the digital divide: physical, access, skills, usage, and internet connectivity. This digital improvement must be carried out collaboratively among four stakeholders which are the vocational institution along with industry partners, the government, and the community.

The digitalization of the economy and the development of AI are closely related to the field of international relations, as both transcend national borders and shape new patterns of interdependence among state actors, non-state actors, and multinational corporations. International relations studies also examine how cross-border data flows, digital trade, and economic platforms influence various factors such as national sovereignty and competition among global powers within the framework of political economy. In this context, international relations studies are particularly concerned with the role of international organizations in the governance of AI, especially in addressing structural challenges such as the risk of entire categories of mid-skill workers being replaced by AI automation (Santoro & Stone, 2026).

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Various regional and global frameworks, such as the European Union (EU) AI Act, are being implemented as regulations to balance the acceleration of AI with the labor market in major regions like Europe. Discussions regarding the legal framework for AI use, employment, data protection, ethics, and accountability are increasingly being implemented in countries with robust legal systems. However, despite those achievements, many developing countries have yet to prioritize the development of AI regulation within their legal systems, resulting in limited readiness for the young generation to enter job markets in the AI era (More et al., 2025).

Another important aspect to consider in supporting VHS student's readiness to enter the workforce in the AI era is upskilling and reskilling strategies. These strategies are crucial for creating opportunities for graduates and vocational high school graduates in an AI-driven industry. Currently, many employers have adopted skill-based hiring for AI roles, and this trend has accelerated, particularly since the post-pandemic period. A study conducted by Mulyono et al. (2025) suggest that VHS curriculum should integrate their psychomotoric skills with industry demands through upskilling, as these psychomotor skills significantly strengthen technical competencies. These competencies can directly help students in specific career paths, strengthen their problem-solving abilities, and facilitate their adaptation to the digital era (Arfandi et al., 2026). Furthermore, Bone et al. (2025) suggest that skill-development strategies such as internships, on-the-job training, MOOCs, micro-certificates, and online training be used to train and enhance the skills of prospective workers.

Some limitations regarding the readiness of VHS students entering the job market include a lack of understanding of how work readiness is fostered through an AI-based curriculum. Research in this area remains limited to short-term cross-sectional studies only where lacking the longitudinal studies that focused on AI literacy, technical and psychological adaptation, or career outcomes themselves. In addition, misalignment between industry and academia creates challenges for VHS graduates to fulfill labor demand through mismatches that arise from persistent gaps between VHS curriculum and the actual skills required by employers. This problem stems from insufficient collaboration between involved stakeholders in the curriculum design so that it has become rigid and static, lacking the inclusion of AI-related soft skills (Rifai et al., 2026).

CONCLUSION

The era of digitalization is marked by the development of automation and AI technologies that are impacting various industries and economic sectors. Digitalization and AI are causing shifts and changes in the structure of the workforce. Changes in job structures continue to indicate a demand for labor in the global job market. However, most jobs will change and require workers to be AI-adaptive and competent to remain relevant in the digital era. This context has a significant impact on VHS students and graduates because they are one of the potential labor for specific job roles in the industry. Therefore, job readiness has become a crucial factor, as there is often a disconnect between industry demand and the competencies among VHS students. Moreover, in the age of AI, some fundamental shifts are required, particularly related to robust curriculum design, teacher competencies, supportive infrastructure, and strong regulations to bridge the gap between the future labor supply and industry needs.

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ETHICAL APPROVAL

This community service activity was conducted as an educational workshop that did not involve any clinical trial, biomedical process, or use of identifiable data from individuals. The evaluation was based mainly on observations and participants' responses during interactive discussion sessions related to digitalization, artificial intelligence, skill development, and work-readiness among others. No individual level of identifiable information is disclosed in this paper. Permission and coordination with the partner institution was done before conducting the activity. Since it was a community service and educational activity and not a human-subjects study, ethical approval was not requested formally for this activity.

CONFLICT OF INTEREST

The authors hereby declare that there is no conflict of interest, financial or otherwise, which may have affected the development, conducting, evaluating, interpreting, and reporting of this community service activity.

DATA TRANSPARENCY

The authors hereby certify that the methods of evaluation and analysis are transparently stated in this paper. The data for the evaluation were mostly based on the observations, responses to the discussions, and follow-up questions made during the education event. Since the participants in the study were vocational high school students and the study did not collect data at the individual level, the individual participant data cannot be made publicly accessible. The relevant data are provided in this paper. More methodological details may be sought from the corresponding author upon reasonable request.

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This community service activity has not received any funding from any external sources. The activity was carried out with institutional resources and/or those of the authors.

STATEMENT ON THE USE OF AI

The use of generative artificial intelligence tools was only for assisting with language editing, grammar editing, and clarity enhancement of the manuscript. The use of AI tools was not to fabricate, manipulate, or create any research data, participant responses, research finding, figures, and conclusions. Any academic decision made by the authors is the sole responsibility of the authors regarding the accuracy, originality, and integrity of the manuscript.

AUTHOR CONTRIBUTION

All authors participated in interpreting the findings of the activity, critically reviewing the manuscript, approving the final version of the manuscript, and being responsible for all aspects of the work.

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