

Optimizing soft skill development in vocational high schools by utilizing artificial intelligence

Asep Amam¹, Adang Effendi¹, Ai Tusi Fatimah¹, Rifa Rifatul Manjilah¹, Muhammad Naufal Rahman¹ ¹Department of Mathematics Education, Universitas Galuh, Indonesia

Abstract

This community service initiative was aimed at enhancing the soft skills of students at the State Vocational High School (SMKN) 1 Rajadesa, Indonesia by using artificial intelligence. The program was attended by 27 students specializing in accounting. The mentoring process began with coordinating with partners to determine the timing and location of the research, prepare activity guidebooks, and create assessment tools to measure the improvement in soft skills before and after the mentoring. The mentoring included introducing ChatGPT as an artificial intelligence tool for solving mathematical problems. The soft skills developed for students included critical thinking, creativity, communication, cooperation, adaptability, problem-solving, problem identification, and independent learning. Based on the pre-and post-mentoring assessments, 67% of students had high soft skills, 29% were at a moderate level, and 4% were at a low level. On average, students could use ChatGPT to comprehend concepts and understand mathematical problem-solving steps. This community service positively impacted mathematics students at SMK Negeri 1 Rajadesa for further utilization of artificial intelligence by students in mathematics learning. A follow-up assessment to track the long-term effects of the program on the students' performances, career prospects, and overall well-being needs to be done.

Keywords: Artificial Iintelligence; ChatGPT; Mathematical problem-solving; Soft skills

Corresponding author: Asep Amam Department of Mathematics Education Universitas Galuh JI. R.E. Martadinata No. 150 Ciamis Email: <u>amam@unigal.ac.id</u> Article history Received August 29, 2024 Revised September 23, 2024 Accepted September 30, 2024 Published Online September 30, 2024 Cite this article:

Amam, A., Effendi, A., Fatimah, A. T., Manjilah, R. R., & Rahman, M. N. (2024). Optimizing soft skill development in vocational high schools by utilizing artificial intelligence. *International Journal of Community Service & Development*, 2(1), 25-32.

INTRODUCTION

Artificial Intelligence (AI) is increasingly used in vocational education to enhance teaching efficiency and student skills. AI-based adaptive learning programs can customize the curriculum and offer automated feedback, enabling teachers to concentrate on student development (Suparyati et al., 2023). In Central Java, the introduction of AI in teaching factory learning has facilitated the creation of an online learning management system that integrates various e-learning functions (Wahjusaputri et al., 2024). AI tools are also being incorporated into English language learning to cultivate soft skills such as communication, employers highly valued, which are highly valued by employers (Borkovska et al., 2024). Specifically, AI technology has effectively enhanced students' English job interview skills, providing flexibility, accuracy, and immediate feedback (Pertiwi & Kusumaningrum, 2021). These uses of AI in vocational education illustrate its potential to improve technical and soft skills, thereby better preparing students for the changing job market.

The use of AI in mathematics classes is possible because the school has very supportive internet facilities and fairly good electronic devices. Teachers still prioritize classical learning as they believe that students' capacity to understand concepts, So far, AI has not been used in mathematics learning by either teachers or students at SMK Negeri 1 Rajadesa. especially basic mathematical concepts is not good enough. The use of AI is very feasible, considering that all students bring smartphones to school.

Research findings suggest that AI is emerging as a powerful tool in mathematics education, offering potential benefits to both teachers and students (Stefanova & Georgiev, 2024). AI applications can contribute to developing analytical thinking and problem-solving skills, which are essential in the 21st

century (Turğut et al., 2023). This technology provides opportunities to diagnose individual learning problems and offer personalized support, potentially maximizing students' learning performance in mathematics (Hwang & Tu 2021). Although there are some drawbacks, they are generally outweighed by the benefits (Turğut et al., 2023). Research in this area explores multiple dimensions, including application domains, participants, research methods, technologies adopted, and the role of AI in mathematics education (Hwang & Tu, 2021). As AI advances, it has the potential to transform mathematics teaching and learning, although further investigation is needed to fully understand its impact and optimize its integration into educational practices (Stefanova & Georgiev, 2024).

Based on the analysis of conditions at SMK Negeri 1 Rajadesa and research facts that show the many roles of AI in supporting students' soft skills, mentoring students in utilizing AI is considered necessary. Thus, this community service was aimed at improving SMK students' understanding of AI and its potential in developing soft skills, helping SMK students utilize AI to solve mathematical problems. This community service was expected to improve the readiness of SMK students to face challenges in the world of work and become successful individuals in the future.

METHODS

The community service program consisted of three stages: preparation, implementation, and program evaluation. The program involved twelfth-grade students from SMK Negeri 1 Rajadesa who were majoring in accounting, with a total of 27 students participating. In the preparation stage, the community service team, comprising three lecturers and two students, collaborated with teachers at SMK Negeri 1 Rajadesa to determine the time and location for the program. The team also developed a program guidebook and designed instruments to assess students' soft skills before and after their participation. The implementation phase commenced with an opening activity to introduce the program to the principal, deputy principal, teachers, and students. Subsequently, the team assessed the students' soft skills. The soft skills evaluated included critical thinking, creativity, communication, cooperation, adaptability, problem-solving, problem identification, and independent learning.

In the core session of the community service program, students were introduced in depth to the concept of artificial intelligence (AI) and the importance of soft skills in the digital era. The community service team provided a live demonstration of the use of ChatGPT, a sophisticated AI language model, as a tool for solving problems. To optimize student understanding, the team provided challenging math problems. Furthermore, students were invited to actively compare the problem-solving results generated by ChatGPT with the results of their work. Through this activity, it was expected that students would understand the potential of AI in supporting the learning process and improving critical thinking and problem-solving skills. In addition, this activity also aimed to equip students with 21st-century skills that were relevant to current technological developments.

To evaluate the effectiveness of the community service program in improving students' soft skills, the community service team conducted a re-measurement at the end of the program. The instruments used in this final measurement were the same as the instruments used at the beginning of the program, allowing for a valid comparison. The measurement results were then analyzed quantitatively using N-Gain to measure the improvement in students' soft skills. Based on the N-Gain value, the improvement in students' soft skills was categorized into three levels, namely high, medium, and low. Thus, it would be known more specifically to what extent this program has succeeded in improving students' soft skills. This categorization became an important benchmark in evaluating the success of the community service program.

RESULTS AND DISCUSSION

This section provides a discussion of the activities of the community service program which consisted of three main stages, namely preparation, implementation, and evaluation. The results and discussions presented in the preparation stage were the structure of the program guidebook, student soft skill measurement instruments, and materials presented to students. The results and discussions presented in the implementation stage were the activities of assisting students in utilizing AI, especially chatGPT. The results and discussions presented in the evaluation stage were the results of the analysis of student soft skills and partner satisfaction with this program.

Program Preparation

The community service team had successfully created a program guidebook with the main structure of an introduction, an explanation of soft skills, an explanation of the use of chatGPT for solving mathematical problems, a schedule of activities, and an evaluation. The guidebook played an important role in implementing community services by providing practical strategies, resources, and information for program implementation (Marshall, 2006). Figure 1 below is the cover of the program guidebook with the theme "Assistance in the Use of Artificial Intelligence to Optimize the Soft Skills of SMK Students".



Figure 1. Program Guide Book Cover

The tool for assessing students' soft skills included seven indicators as outlined in Table 1. These indicators were developed based on research on measuring soft skills. The SKILLS-in-ONE questionnaire was created to assess 13 general soft skills in education and demonstrated strong construct validity and reliability (Escolà-Gascón & Gallifa 2022). Additionally, the Kirkpatrick Assessment Model was used to evaluate soft skills among technology students, and it revealed a good overall level in four categories (Mohamed et al., 2019)

Table 1. Student soft skill measurement indicators

Indicator	Description
Critical Thinking	The ability to analyze information, solve problems, and make decisions in a logical and
	structured manner.
Creativity	The ability to generate new ideas, find innovative solutions, and develop creative solutions
	to various problems.
Communication	The ability to convey information, exchange ideas, and collaborate with others effectively.
Collaboration	The ability to work together with others, share responsibilities, and achieve common goals.
Adaptability	The ability to adapt to change, learn new things, and apply new knowledge in different situations
Problem Solving	The ability to identify problems, analyze the causes of problems, and find effective
	solutions
Self-Learning	The ability to learn independently, seek information, and develop new knowledge without
	having to be helped by others

Optimizing soft skill development in vocational high schools by utilizing artificial intelligence

The program provided an introduction to essential work skills for vocational high school students, focusing on mathematical problem-solving and preparation for the evolving world of work. Students need to master the use of AI as a problem-solving tool. The program covered probability, and students were given mathematical problems related to probability.

Program Implementation

The implementation of the community service program began with a lively opening ceremony (Figure 2). The opening ceremony aimed to provide an overview of the program, as well as introduce the service team to all participants, including the principal, vice principal, teachers, and students of SMK Negeri 1 Rajadesa majoring in accounting. The atmosphere of the event was even more lively with the signing of the Implementation Agreement between the Mathematics Education Study Program of Galuh University and SMK Negeri 1 Rajadesa. This signing was an important moment that marked the start of official cooperation between the two institutions to improve the quality of education in schools. Through this collaboration, it was expected that the community service program could run smoothly and provide significant benefits for all parties involved.



Figure 2. Program Opening

The core activities of this community service program were the presentation of materials and the direct practice of using artificial intelligence (AI), especially ChatGPT. As seen in Figure 3, students seemed very enthusiastic about participating in each session. The materials presented by the community service team succeeded in arousing students' interest in learning about AI technology. After the presentation of the materials, students were allowed to directly interact with ChatGPT to solve various problems, especially in mathematics. With guidance from the community service team, students enthusiastically explored the various potentials offered by ChatGPT to help them understand difficult concepts and find innovative solutions. The enthusiasm of these students showed that they were very open to new technologies and willing to develop 21st-century skills.



Figure 3. Core Program Activities

One of the main objectives of this community service program was to improve students' soft skills, especially critical thinking skills. As depicted in Figure 3, students were trained to analyze information generated by ChatGPT in depth. By comparing various information obtained from different sources, students were invited to evaluate the credibility of the information and construct logical arguments. In addition, ChatGPT also acted as a trigger for the emergence of new, creative ideas. Through interaction with ChatGPT, students could develop broader perspectives and find innovative solutions to complex problems. Critical and creative thinking skills were essential for solving mathematical problems, especially in primary and secondary education. These skills enabled students to analyze information, draw conclusions, and generate new ideas when solving math problems (Ida et al., 2021).

This program was designed to enhance students' problem-solving skills. With the assistance of ChatGPT, students could grasp the steps involved in solving previously challenging probability problems. ChatGPT offered clear and structured guidance, making it easy for students to follow the problem-solving process. Additionally, this program encouraged students to work together with their peers to complete the assigned tasks. Through collaboration, students could exchange and share ideas, ultimately finding the most effective solutions. Communication and teamwork skills are highly valuable in today's professional world, so it's essential to develop them early on. Specifically, Mathematical Communication Skills were crucial for students to express, analyze, and evaluate mathematical ideas (Rohid et al., 2019). Figure 3 shows the enthusiasm of students in participating in the entire series of community service activities. They actively provided arguments and solved various digital-based mathematics problems that were given.

In today's advanced digital era, the ability to adapt to new technologies is crucial. This program provided students with the necessary skills to utilize AI technology effectively. ChatGPT, for instance, was a rapidly developing example of AI technology. By learning to use ChatGPT, students acquire new knowledge and develop the ability to be independent learners. They can autonomously search for information and enhance their knowledge without always relying on teachers. Additionally, one of the most important soft skills in mathematics is solving problems with effective solutions. This program was expected to be able to improve the vocational high school students' problem-solving skills and prepare themselves to be more prepared to face the world of work and industry.

Program Evaluation

Based on the results of measuring students' soft skills before and after participating in the program, it can be concluded that this program succeeded in significantly improving students' soft skills. This is evidenced by the data presented in Figure 4, which shows an increase in the percentage of students in the high category after participating in the program. This significant increase is inseparable from the activeness and skills of students in utilizing ChatGPT. With the help of ChatGPT, students could easily access information, analyze data, and solve various mathematical problems, both individually and in groups. Students' ability to utilize this AI technology not only improves mathematical concept skills, but also develops various soft skills such as critical thinking, problem-solving, and creativity. The results obtained from this program showed that the integration of AI technology in the learning process could be an effective solution to improve the quality of education.



Figure 4. Student Soft Skill Improvement Category

After the series of core activities of the community service program were completed, a joint reflection session was held between the service team, students, and teachers. This reflection session was aimed to comprehensively evaluate the implementation of the program, from the preparation stage to the implementation. With this reflection session, it was expected that constructive input and feedback could be obtained from all parties involved. Figure 5 provides a visual depiction of the warm and interactive atmosphere in the reflection session. Through this reflection session, it was expected that the advantages and disadvantages of the program could be identified so that they could be used as considerations for improving the program in the future. In addition, the reflection session was also the right moment to share experiences and best practices, so that it could enrich the knowledge and skills of all parties involved.



Figure 5. Reflection activities

The evaluation of the implementation of this community service program received a positive response from teachers and the principal of SMK Negeri 1 Rajadesa. They appreciated the efforts that had been made in introducing and developing the use of technology, especially artificial intelligence, in the learning process. The teachers and principals hoped that the good cooperation between the university and the school would continue to support the further development of the use of technology in the school environment. In addition, they also hoped that teachers and students could continue to explore the potential of AI technology to improve the quality of learning and achieve more optimal results. The full support from the school was a motivation for the community service team to continue to innovate and develop programs that were more relevant to the needs of today's education world.

CONCLUSION

This community service program succeeded in achieving its main objective, which is to improve soft skills to support mathematical problem-solving skills. Through the use of artificial intelligence technology, especially ChatGPT, students were not only able to solve mathematical problems more effectively but also developed various important soft skills such as critical thinking, problem-solving, communication, and collaboration. The enthusiasm of students participating in this program showed that they are very open to innovation in learning. The evaluation results showed a significant increase in students' soft skills, especially in the ability to analyze information, evaluate arguments, and find creative solutions. This proved that the integration of AI technology in mathematics learning could be an effective solution to improve the quality of education and prepare students to face challenges in the digital era.

Limitations and Future Direction

This community service program has several limitations. The use of artificial intelligence is currently still limited to ChatGPT, so the potential for other AI utilization has not been fully explored. In addition, the material provided is also focused on probability material, while the scope of broader mathematics material still needs to be developed. Program participants are also still limited to accounting students. For future development, this program needs to expand the scope of AI utilization by involving various other types of AI models. The material provided also needs to be adjusted to the needs of the business world and

industry that continues to grow. Thus, this program can provide broader benefits for students and the community in general.

Acknowledgments

Thank you to the Lembaga Penelitian dan Pengabdian Kepada Masyarakat (Institute for Research and Community Service) of Universitas Galuh for providing internal funding for Universitas Galuh in 2024.

Statement and Declarations

The author is a community service team that carries out the entire series of programs. There is no conflict of interest in this program and publication.

REFERENCES

- Borkovska, I., Kolosova, H., Kozubska, I., & Antonenko, I. (2024). Integration of AI into the Distance Learning Environment: Enhancing Soft Skills. *Arab World English Journal* 1(1), 56–72. doi: 10.24093/awej/chatgpt.3.
- Escolà-Gascón, Á., & Gallifa, J. (2022). How to Measure Soft Skills in the Educational Context: Psychometric Properties of the SKILLS-in-ONE Questionnaire. *Studies in Educational Evaluation*, 74. doi: 10.1016/j.stueduc.2022.101155.
- Hwang, G. J., & Tu, Y. F. (2021). Roles and Research Trends of Artificial Intelligence in Mathematics Education: A Bibliometric Mapping Analysis and Systematic Review. *Mathematics*, 9(6).
- Ida, S., Aziz, R., & Irawan, W. H. (2021). Critical and Creative Thinking Skills to Solving Math Story Problems in Elementary School Students. *Jurnal Tatsqif*, 19(2). doi: 10.20414/jtq.v19i2.4069.
- Marshall, S. (2006). Learning through Serving: A Student Guidebook for Service-Learning Across the Disciplines (Review). *Journal of College Student Development*, 47(4). doi: 10.1353/csd.2006.0049.
- Mohamed, H., Judi, H. M., & Jenal, R. (2019). Soft Skills Assessment Based on Undergraduate Student Perception. Asia-Pacific Journal of Information Technology & Multimedia, 8(1). doi: 10.17576/apjitm-2019-0801-03.
- Rohid, N., Suryaman, S., & Rusmawati, R. D. (2019). Students' Mathematical Communication Skills (MCS) in Solving Mathematics Problems: A Case in Indonesian Context. *Anatolian Journal of Education*, 4(2), 19–30. doi: 10.29333/aje.2019.423a.
- Stefanova, T., & Georgiev, S. (2024). Possibilities For Using Ai In Mathematics Education. *Mathematics and Education in Mathematics*, 53, 117–25. doi: 10.55630/mem.2024.53.117-125.
- Suparyati, A., Widiastuti, I., Saputro, I. N., & Pambudi, N. A. (2023). The Role of Artificial Intelligence (AI) in Vocational Education. Jurnal Ilmiah Pendidikan Teknik Dan Kejuruan, 17(1). doi: 10.20961/jiptek.v17i1.75995.
- Turğut, Ş., Turğut, B., Orhan, H., Soylu, A., Çetin, E., İl, E., & Müdürlüğü, M. E. (2023). Current and Advanced Academic Studies in Educational and Social Sciences A Review on the Use of Artificial Intelligence Applications in Mathematics Education. Academic Studies in Educational and Social Sciences, 1(1), 1–12.
- Wahjusaputri, S., Nastiti, T. I., Bunyamin, B., & Sukmawati, W. (2024). Development of Artificial Intelligence-Based Teaching Factory in Vocational High Schools in Central Java Province. *Journal* of Education and Learning (EduLearn), 18(4), 1234–45. doi: 10.11591/edulearn.v18i4.21422.