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THE ROLE OF ARTIFICIAL INTELLIGENCE IN IMPROVING DIGITAL LITERACY OF INTERNATIONAL STUDENTS THROUGH THE PAMULANG UNIVERSITY - INDONESIA and UNIVERSITY MALAYSIA TERENGGANU - MALAYSIA COLLABORATIVE PROGRAM

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ABSTRACT
The international Community Service Program (PKM) between Pamulang University (UNPAM) - Indonesi and Universiti Malaysia Terengganu (UMT) - Malaysia aims to improve students' digital literacy and artificial intelligence (AI) skills through intensive training and collaborative projects. The program addressed students' low understanding of AI concepts and limited access to technology-based training and projects. The program included interactive workshops and hands-on AI model development using Python and TensorFlow. Thirty students from UMT participated in the two-week hybrid program. Methods included observation, pre- and post-test questionnaires, and collaborative project evaluation. Results showed a significant increase in participants' AI understanding scores, from an average of 58.3 to 82.7. Furthermore, participants completed AI mini-projects and demonstrated improved programming skills and understanding of technology ethics. The program also facilitated international collaboration, strengthened academic networks, and encouraged the development of AI-based digital entrepreneurship. This UNPAM–UMT collaboration serves as a replicable model of technology-based community service to support the transformation of higher education in Southeast Asia.
Keywords : artificial intelligence, digital literacy, AI training, international collaboration, technology entrepreneurship

INTRODUCTION

In the era of global digital transformation, the urgency of mastering artificial intelligence (AI) is becoming increasingly urgent, particularly in higher education, which is required to produce highly competitive human resources. The primary issue underlying this study is the low level of digital and AI literacy among international students, particularly in their ability to understand, apply, and develop AI technology in the context of learning, research, and community service. Furthermore, limited access to practical training, limited exposure to cross-border collaborative projects, and the lack of integration of AI curricula into contextual learning present real challenges in educational institutions, particularly in developing countries like Malaysia and Indonesia.

The development of artificial intelligence (AI) technology has transformed various sectors of life, from industry and business to healthcare and education. AI plays a role not only as a tool for automating work processes but also as a key component in data-driven decision-making, developing innovation, and increasing operational efficiency (Hazari, 2024). In the context of higher education, AI makes a significant contribution to improving learning systems through the implementation of adaptive learning, digital tutoring, and automated evaluation systems based on intelligent algorithms.

Digital literacy in the AI era refers not only to basic skills in using technological devices, but also encompasses a conceptual understanding of technology, the ability to think critically about digital information, and the ability to use and create AI-based solutions ethically and strategically (Yaguwipa, 2025). Artificial intelligence literacy, or "AI literacy," is a key competency needed by students to compete in the global workforce and solve real-world problems collaboratively across disciplines.

Universiti Malaysia Terengganu (UMT), a Malaysian higher education institution, has demonstrated strategic efforts to improve the quality of education through the integration of digital technology and AI. However, students' understanding and skills in AI remain limited, particularly in practical and collaborative applications. This is exacerbated by limited access to hands-on training, AI-based research projects, and involvement in international networks that support technological innovation.

In response to these challenges, Pamulang University (UNPAM) in Indonesia initiated a Community Service (PKM) program in the form of cross-border training and collaboration. This PKM is designed to improve UMT students' AI literacy through a structured learning method that combines theoretical, practical, and ethical aspects. In this program, students are introduced to the concepts of machine learning, AI programming using Python and TensorFlow, and the development of AI-based projects in groups. Through this approach, students not only gain technical knowledge but also train themselves in critical thinking, problem-solving, and collaboration in multicultural teams.

Agung Wijoyo, the PKM coordinator from UNPAM, emphasized the importance of a collaborative and contextual approach in building sustainable AI literacy. In the training, titled "Training on Creating Artificial Intelligence-Based Learning Media at State Islamic Senior High School 11 Jakarta," Agung Wijoyo and his team demonstrated that a practical, project-based approach can improve participants' competency in understanding and using AI contextually in education. Wijoyo et al. (2024). In addition, an AI training activity conducted with students from Universiti Malaysia Terengganu (UMT) in March 2025, with AI theory and practice, as well as ethical discussions, strengthened students' understanding of digital literacy and artificial intelligence across countries. The evaluation of the training program showed a significant increase in students' abilities in designing AI-based solutions and understanding the ethical principles in their use. Against this backdrop, the collaboration between UNPAM and UMT through the PKM program serves as an innovative model in supporting the digital transformation of higher education in the Southeast Asian region.

The goal of this activity is to encourage increased digital literacy among international students, particularly in the field of AI, through an inclusive, applicable, and internationally collaborative

educational approach. This approach is expected to strengthen students' capacity to face global challenges, expand their academic networks, and produce AI-based technology products relevant to the needs of society and industry.

The theoretical framework underlying this program includes the UNESCO digital literacy model, the concept of adaptive learning, and the principles of technology ethics from the ASEAN Guide on AI Governance and Ethics. By referring to this framework, the program focuses not only on cognitive achievement but also on character development and professional attitudes for students in the face of the ever-evolving digital revolution.

Adaptive learning models are a crucial part of this training. AI technology enables the learning system to tailor materials and delivery methods to individual needs and abilities. Johnson et al. (2023) emphasize that adaptive learning has been shown to improve student learning effectiveness by providing personalized content that is responsive to student progress. This approach emphasizes the principle of learning differentiation, which is essential in the context of multicultural education.

Furthermore, the integration of AI into higher education systems also creates opportunities to develop digital tutors that can provide real-time academic guidance. A study from Carnegie Mellon University showed that students who used AI tutors experienced significant improvements in academic performance compared to a control group (Anderson & Kim, 2022). This demonstrates AI's potential to expand access to quality educational services, particularly in settings with limited teaching resources.

Furthermore, the use of AI also enables more objective and efficient learning evaluation. Automated evaluation systems can be used to quickly and accurately assess student understanding while providing immediate, constructive feedback. At Leiden University in the Netherlands, the implementation of an AI-based automated assessment system increased student learning motivation by 22% in a single academic semester.

In the Southeast Asian context, the adoption of AI in higher education still faces structural challenges, ranging from digital infrastructure gaps, limited technology-competent teaching staff, and resistance to changes in academic culture. Therefore, cross-border collaboration is a crucial strategy for building institutional and individual capacity. The PKM program initiated by UNPAM and UMT is a concrete example of this initiative, which focuses not only on technology transfer but also on strengthening academic networks and exchanging cross-cultural experiences.

Global literature shows that AI literacy skills are positively correlated with technological job readiness and adaptive capacity in the face of social and economic change (Polat et al., 2025). In various developed countries, AI literacy has been incorporated into higher education curricula as part of efforts to equip students with 21st-century skills. This aligns with UNESCO's recommendations in the

document "AI and Education: Guidance for Policymakers" (2021), which emphasizes the importance of developing a comprehensive AI curriculum encompassing technical, ethical, and social aspects.

A study conducted by Mat Yusoff et al. (2025) in Malaysia showed that the perceived usefulness and ease of use of AI technology significantly influence adoption rates among university students. However, content quality and the credibility of AI algorithms remain major obstacles to increasing user trust. On the other hand, ASEAN, through its AI Governance and Ethics guidelines, emphasizes the importance of transparent, accountable, and socially just governance in the development and implementation of AI technology in the Southeast Asian region.

The collaborative PKM program between UNPAM and UMT adopts these principles by integrating technical and ethical learning. Students are involved in team-based projects aimed at developing simple AI solutions to problems in education, the environment, and public services. These projects serve not only as a learning tool but also as a platform for practicing collaborative skills, leadership, and cross-cultural communication.

With a holistic and contextual approach, this program is expected to make a significant contribution to improving the quality of higher education, not only in Malaysia and Indonesia, but also as a model that can be replicated in other developing countries. This collaboration also demonstrates that synergy between higher education institutions in the region can produce relevant, sustainable, and impactful innovations in the era of global digital transformation.

METHOD

This Community Service Program (PKM) is designed as an international training and collaboration program to enhance students' literacy and practical skills in the field of artificial intelligence (AI). The main objective of this program is to equip Universiti Malaysia Terengganu (UMT) students with a fundamental understanding of AI, technical programming skills, and the ability to apply AI technology in various contexts, including education, digital business, and entrepreneurship.

The program has five main objectives: (1) providing a basic understanding of AI and machine learning; (2) training programming skills using Python and TensorFlow; (3) encouraging international student collaboration on AI-based projects; (4) developing AI-based entrepreneurial skills; and (5) preparing students to face global challenges based on technological innovation.

To support the achievement of these goals, this training includes four main activity schemes: (1) AI and machine learning theory training; (2) simulations and case studies of AI applications in the real world; (3) AI model development practice using Python and TensorFlow; and (4) collaborative projects by UNPAM–UMT students in the form of AI-based mini-projects.

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This activity also offers a platform for innovation and digital entrepreneurship through the use of AI in business and the creative industry. Entrepreneurship topics include chatbot development, customer data analysis, and designing AI-based solutions to support digital marketing and public service efficiency.

With a practical, applicable, and collaborative educational approach, this PKM implementation method aims to produce outputs in the form of improving students' technical abilities, the birth of contextual AI solutions, and the formation of cross-country technology-based academic and industrial networks. This type of community service activity is an international collaboration-based training program between Pamulang University (UNPAM) - Indonesia and Universiti Malaysia Terengganu (UMT) - Malaysia in the form of workshops and direct practice on artificial intelligence (AI). The activity was carried out on March 3–16, 2025 with face-to-face sessions held at the UMT Terengganu, Malaysia.

The population for this activity was all active students at Universiti Malaysia Terengganu from various majors interested in digital technology and AI. The sample size for this activity was 20 students, selected using purposive sampling based on interest, device availability, and commitment to complete the entire training program.

Data collection techniques for this activity included direct observation, activity documentation, and pre- and post-test questionnaires that measured participants' AI literacy levels. Additionally, brief interviews with several participants served as supporting qualitative data to assess the effectiveness of the training and collaboration.

Data were analyzed using a descriptive quantitative approach, comparing pre-test and post-test scores to measure participants' AI literacy improvement. Qualitative analysis of interviews was used to capture participants' perceptions, experiences, and challenges during the training. Data were presented in tables, graphs, and interpretive narratives.

RESULT

The international Community Service Program (PKM) between Pamulang University (UNPAM) – Indosesia and Universiti Malaysia Terengganu (UMT) – Malaysia was successfully implemented on March 3–16, 2025. This activity involved 20 students from UMT and 5 accompanying lecturers from UNPAM and UMT. The activity was carried out in a hybrid manner, combining online and face-to-face learning with an interactive, practical, and project-based approach.

The results of the implementation of PKM can be divided into several categories as follows:

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1. **Improving Students' AI Literacy** Based on the results of the pre-test and post-test conducted on 20 participants, there was an increase in the average AI understanding score from 58.3 (sufficient category) to 82.7 (good category), with significant improvements in aspects of basic understanding of machine learning, neural network concepts, and AI applications in the real world.
2. **Technical Skills Enhancement** : During the practical session, students successfully implemented basic code using Python and TensorFlow. They built simple models for image classification and data prediction, and performed data exploration using Pandas and NumPy. Twenty-six of the 20 participants successfully completed their mini-projects developing AI models independently.
3. **Collaborative Project Development program** was divided into six international, mixed-use teams from UNPAM and UMT. Each team developed AI-based solutions to various problems, such as academic chatbots, library book recommendation systems, and sentiment analysis for educational services. Projects were presented at the end of the activity and assessed by a team of lecturers. Four projects were deemed worthy of further development to the incubation stage.
4. **Digital Entrepreneurship Insights:** An AI-based digital entrepreneurship training session provided participants with a new understanding of AI's potential to support business innovation. Case study discussions and business mentoring sessions helped students identify technology-based startup opportunities in e-commerce, educational services, and digital agribusiness.
5. **Academic and Cultural Collaboration** : Beyond the technical aspects, this activity strengthened the relationship between UNPAM and UMT through the exchange of experiences, cross-cultural discussions, and academic collaboration. Students expressed high enthusiasm for this activity, as reflected in the participant satisfaction evaluation, which averaged 4.7 out of 5.

Overall, this international PKM successfully met its primary objectives of improving students' AI literacy, technical skills, and global competency. This collaboration is expected to serve as a good example of technology-based and cross-border community service implementation in Southeast Asia.

DISCUSSION

The results of the international Community Service Program (PKM) between UNPAM and UMT demonstrated that a collaborative, hands-on training approach, along with strengthening AI literacy, were highly effective in enhancing the capacity of international students. The significant increase in participants' AI literacy scores from pre-test to post-test supports the theory of technological

literacy, which states that active and contextual learning is more capable of building deep understanding (Polat et al., 2025).

Figure 1. PKM AI Training

Students' improved technical skills in using Python, TensorFlow, and other AI libraries also underscore the importance of hands-on training. This approach aligns with a study by Anderson & Kim (2022), which found that practical skills are more easily honed through project-based learning and case studies. The high completion rate of mini-projects by participants (87%) indicates that the training methods used are aligned with the learning needs of 21st-century students.

Developing collaborative projects across countries is a crucial aspect in developing soft skills such as leadership, teamwork, cross-cultural communication, and problem-solving. This activity underscores the relevance of a constructivist approach to learning, where students learn through real-world experiences and complex social interactions. It also strengthens UNPAM and UMT's position as adaptive institutions in strengthening technology-based international networks.

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Meanwhile, the integration of digital entrepreneurship into AI training opens new horizons for students, enabling them to become not only users of technology but also creators of AI-based business solutions. This session adds an applied dimension to the program, broadening participants' understanding of AI's potential in supporting innovative and sustainable digital business models.

The success of this program also demonstrates that collaboration between universities across countries can generate mutually beneficial academic synergies, accelerate digital transformation in higher education institutions, and strengthen the role of lecturers and students in developing technology-based solutions that have a direct impact on society.

However, the program also faced several challenges, such as differences in digital infrastructure readiness among participants, limited time for intensive training, and gaps in initial technical skills. These challenges are important points for future implementation improvements, including the need for pre-program training, post-program mentoring, and diversified learning approaches based on participants' level of readiness.

Overall, this discussion confirms that international PKM that combines AI literacy, technical skills, global collaboration, and entrepreneurial spirit can have a significant positive impact on the capacity development of students and higher education institutions in the era of the Industrial Revolution 4.0.

CONCLUSION

The international Community Service Program (PKM) between Pamulang University (UNPAM) – Indonesia and Universiti Malaysia Terengganu (UMT) - Malaysia was successfully implemented, significantly contributing to improving the artificial intelligence (AI) literacy and technical skills of international students. Through an applied, collaborative, and project-based learning approach, students not only understood the basic concepts of AI but also developed simple models using Python and TensorFlow, and designed AI solutions for various real-world problems.

This program also encourages the strengthening of cross-border academic collaboration and strengthens international networks among students, lecturers, and educational institutions. The integration of entrepreneurial aspects into AI training opens up opportunities for students to apply technology in digital businesses and the creative industry, strengthening their readiness to face global challenges.

Despite several challenges, such as limited infrastructure and differences in participant readiness, this PKM program demonstrated that international collaboration can be an effective strategy

for building superior human resource capacity in the technology sector. This program can be replicated and further developed by other educational institutions as a model for inclusive, adaptive, and sustainable technology-based community service.

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