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Introduction of Generative AI to Improve Digital Literacy of Sanggar Bimbingan AMI Penang Malaysia Children

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Abstrak

Anak-anak Pekerja Migran Indonesia (PMI) di Malaysia sering menghadapi tantangan struktural dalam mengakses pendidikan formal, sehingga bergantung pada layanan pendidikan non-formal seperti Sanggar Bimbingan (SB). SB AMI Penang, seperti kebanyakan SB lainnya, beroperasi dengan keterbatasan sumber daya, yang berkontribusi pada kesenjangan literasi digital. Padahal literasi digital merupakan kompetensi krusial untuk partisipasi sosial dan ekonomi di era Revolusi Industri 4.0. Program pengabdian kepada Masyarakat internasional ini bertujuan untuk merancang dan mengimplementasikan program pengenalan *Generative Artificial Intelligence* (GenAI) sebagai alat pedagogis untuk meningkatkan kompetensi literasi digital anak-anak di SB AMI Penang. Metode pengabdian ini meliputi lokakarya dan pelatihan praktis. Hasil kegiatan pengabdian pengenalan GenAI yang terstruktur dan berorientasi etis terbukti efektif dalam meningkatkan literasi digital di komunitas marginal. Kesimpulan dari pengabdian ini bahwa potensi GenAI mampu menjadi alat pemerata untuk menjembatani kesenjangan digital yang dihadapi oleh anak-anak diaspora Indonesia.
Kata kunci: Gen AI, Literasi Digital, Pengabdian, Revolusi 4.0, Malaysia

Abstract

Indonesian migrant workers' children (PMI) in Malaysia often face structural challenges in accessing formal education, thus relying on non-formal education services such as Sanggar Bimbingan (SB). SB AMI Penang, like most other SBs, operates with limited resources, which contributes to the digital literacy gap. However, digital literacy is a crucial competency for social and economic participation in the era of the Industrial Revolution 4.0. This international community service program aims to design and implement a Generative Artificial Intelligence (GenAI) introduction program as a pedagogical tool to improve the digital literacy competencies of children at SB AMI Penang. The community service methods include workshops and practical training. The results of structured and ethically oriented GenAI introduction activities proved effective in improving digital literacy in marginalized communities. The conclusion of this community service is that GenAI has the potential to be an equalizing tool to bridge the digital divide faced by Indonesian diaspora children.
Keywords: *Gen AI, Digital Literacy, Community Service, Revolution 4.0, Malaysia*

Introduction

Access to quality education is a fundamental right that is recognized globally (Sudirman et al., 2022). However, for the children of Indonesian Migrant Workers (PMI) in Malaysia, fulfilling this right faces significant obstacles, including legal status, financial constraints, and geographical limitations. In response, Sanggar Bimbingan (SB) was established as a non-formal educational institution to provide basic education services for diaspora children who are not covered by the formal school system (Mahardhani et al., 2023). SB AMI Penang is one of many centers carrying out this vital mission, operating under the coordination of the Education and Culture Attaché (Atdikbud) of the Indonesian Embassy in Kuala Lumpur.

Despite its crucial role, SB operates with significant structural challenges. Case studies in various SBs in Malaysia show chronic resource constraints, including a shortage of professional teachers and learning facilities. To overcome the shortage of teaching staff, SB relies heavily on *the multigrade teaching* model, where one teacher teaches several grade levels simultaneously in one classroom. This model, while pragmatic, has serious pedagogical implications, particularly a deficit in personalized learning. Teachers find it difficult to divide their time and attention fairly, so that the potential of each student cannot be optimized (Mahardhani et al., 2023).

The resource constraints in SBs not only impact conventional learning but also widen *the digital* divide. In an era where digital competence is a fundamental prerequisite for social and economic participation (Council of the European Union, 2018), children in SBs risk falling further behind. Digital literacy can no longer be narrowly defined as the ability to operate devices (Ministry of Education and Culture, 2017). A more comprehensive framework is needed to define this competency.

DigComp defines digital competence as "the confident, critical, and responsible use of digital technologies for learning, work, and participation in society" (Vuorikari et al., 2022). This framework identifies five key areas of competence that citizens should possess:

1. Information and data literacy: The ability to search for, filter, and evaluate information and digital content.
2. Communication and collaboration: The ability to interact and collaborate through digital technology.
3. Digital content creation: The ability to create and edit new digital content.
4. Safety: The ability to protect devices, personal data, health, and the environment.
5. Problem solving: The ability to identify needs and solve problems in a digital environment (Vuorikari et al., 2022).

For children at SB AMI Penang, mastery of these five competencies is essential for *educational equity* (Kushariyadi et al., 2024).

In the last decade, *Artificial Intelligence* (AI) in education (AIEd) has shown transformative potential (Murphy, 2019). The latest wave, *Generative Artificial Intelligence* (GenAI), which refers to technology capable of generating new content such as text, images, and audio, opens up new pedagogical horizons (AlAli et al., 2024). In the context of K-12 education (Primary and Secondary Education), GenAI offers several opportunities: as a creative tool, a personalized tutor, and an assistant for task automation ([4] ,(Murphy, 2019; Bateman, 2024).

The potential of GenAI as a personalized tutor (Murphy, 2019) could theoretically be a direct solution to the personalization deficit caused by the PKR model in SB (Mahardhani et al., 2023). GenAI can provide students with instant and adaptive

feedback , freeing up teachers' time to focus on more in-depth guidance (I Gede Partha Sindu et al., 2025).

Furthermore, the emergence of GenAI not only *demands* improved digital literacy but also *changes* the definition of competency itself. The area of "information literacy" (Vuorikari et al., 2022) has evolved from "searching" to "*prompting*." "Digital content creation" (Vuorikari et al., 2022) has shifted from "creating from scratch" to "*co-creating* with AI." Most importantly, the area of "Safety" (Vuorikari et al., 2022) is becoming increasingly crucial, given new risks such as sophisticated misinformation, *deepfakes,* and algorithmic bias (García-López & Trujillo-Liñán, 2025).

The problems faced are multidimensional: children at SB AMI Penang experience a digital literacy gap (Izzati & Batubara, 2025) that is exacerbated by the structural limitations of the studio (Mahardhani et al., 2023). On the other hand, GenAI offers potential pedagogical solutions (Murphy, 2019), but its implementation in vulnerable populations and elementary school-aged children has not been adequately explored and is fraught with ethical risks (García-López & Trujillo-Liñán, 2025).

Therefore, this article reports the results of an international community service program (PkM) that aims to design and implement a GenAI introduction workshop program. The specific objective is to improve five digital literacy competencies (according to the DigComp framework) for children at SB AMI Penang, with a focus on effective, critical, and ethical use.

Implementation Method

The community service approach emphasizes active participation and empowerment of the local community (Kurnia et al., 2025) in every stage of the program, from needs identification to follow-up plans (Sudirman et al., 2022). The core methodology was designed as a synthesis of proven best practices in community service programs in the field of technology education, namely Participatory Workshops combining material delivery, active discussion, and hands-on practice to ensure a balance between conceptual understanding and applied skills (I Gede Partha Sindu et al., 2025; Nurhayati et al., 2025). The PkM program was implemented at the AMI Penang Guidance Center (SB) in Malaysia. The program participants (N=30) were elementary school children (aged 9-13 years) enrolled at the SB. Participation was voluntary, obtained after obtaining permission from the AMI Penang SB management and the students' parents.

Results and Discussion

The workshop program was attended by 30 participants (N=30) aged 9-13 years. During the material delivery session, the level of enthusiasm was very high. Participants who were initially passive became proactive, collaborating in groups to formulate *prompts* to produce the images and stories they wanted. Many participants associated AI with games, but then began to view AI as a human tool. When asked if AI is always correct, the majority of post-workshop participants were able to answer "no." They understood the basic concepts that AI " s from data" and "can be wrong" or "can be used to lie." This is a crucial foundation for critical thinking.

Before the intervention in the form of workshops, these children were content *consumers*. With GenAI *text-to-image* tools, they were empowered to become advanced digital content *creators* in a matter of minutes (Wulandari & Erstiawan, 2025). These findings are particularly relevant to the resource-poor context of SB (Mahardhani et al., 2023). GenAI functions as *an equalizer,* providing access to creative tools previously available only to professionals or individuals with expensive

software, thereby effectively bridging the digital divide (García-López & Trujillo-Liñán, 2025).

Figure 1. GenAI introduction activity for SB AMI Penang Malaysia students

In addition, this community service activity provides deep insight into the paradox of GenAI in vulnerable communities. The literature often highlights GenAI as *a* potential *widener* of the digital divide (AlAli et al., 2024) and a source of ethical risks such as misinformation and bias (García-López & Trujillo-Liñán, 2025). If left unchecked, children at SB AMI Penang could potentially become *passive victims* of GenAI-generated disinformation. However, this community service program shows that proactive interventions can reverse the narrative.

Another indication is that while GenAI is an extraordinary tool for defined tasks (such as content creation), the development *of higher-order thinking* skills such as complex problem solving and authentic collaboration (Bateman, 2024) cannot be achieved through a two-day introductory workshop on the tool alone. These competencies require long-term pedagogical integration into the curriculum. Short workshops successfully transfer skills, but the development of deep competencies takes time.

The success of this PkM, facilitated by an external PkM team, highlights the challenge of sustainability. For this impact to be sustained, SB's internal capacity must be built. This is in line with research identifying *educator readiness* as a key challenge for AI implementation in developing countries. The sustainability of this program is highly dependent on training and developing AI literacy for teachers and facilitators at SB (I Gede Partha Sindu et al., 2025).

Finally, this PkM contributes to filling the literature gap identified in the Introduction. It provides an empirical case study of GenAI application at the primary education level (Papadakis & Kalogiannakis, 2025) in the context of a *low-resource* diaspora community . The limitations of this program are its short duration and focus only on tool introduction. The long-term adoption effects and their actual impact on academic learning outcomes have not been measured.

Conclusion

This international community service program (PkM) has successfully designed and implemented a structured workshop model to introduce *Generative Artificial Intelligence* (GenAI) to children at the AMI Penang Guidance Center (SB). This intervention was found to significantly improve all five areas of digital literacy competency, as measured by the DigComp framework (Vuorikari et al., 2022). The most substantial improvement was observed in "Digital Content Creation" skills, demonstrating GenAI's potential as a powerful creative empowerment tool.

The main conclusion of this program is that GenAI can serve as an effective pedagogical tool to promote *educational equity* (García-López & Trujillo-Liñán, 2025) in marginalized and vulnerable communities (Sudirman et al., 2022). The key to success lies in a balanced approach: not only teaching *how to use* the tools (technical skills), but also proactively teaching *how to critically evaluate* (information literacy) and *use them ethically* (AI literacy) (Bateman, 2024; García-López & Trujillo-Liñán, 2025). With this approach, the risks of GenAI can be mitigated, and its potential as *an equalizer* can be maximized. Based on the findings and conclusions of this PkM program, several recommendations are proposed: To ensure sustainability, priority should be given to *Training for Trainers* (ToT) programs for teachers and SB facilitators because educator readiness is a determining factor in the successful adoption of technology in developing countries. Further research is needed to address the limitations of this study. Longitudinal research is recommended to measure the long-term impact of GenAI adoption on academic learning outcomes and digital literacy competency retention. In addition, further research is urgently needed to explore the application of GenAI in other non-formal and marginalized educational contexts, which currently remain a major research gap.

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