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Ethical and Critical Literacy Training in the Utilization of Artificial Intelligence for the Development of Value-Based Learning

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ABSTRAK

Artikel ini merupakan kajian lanjutan kegiatan pengabdian kepada masyarakat yang menitikberatkan pada pelatihan literasi etis dan kritis dalam pemanfaatan kecerdasan buatan (Artificial Intelligence/AI) untuk memperkuat pembelajaran berbasis nilai di pendidikan menengah. Temuan ini menegaskan pentingnya literasipada pengukuran hasil pelatihan, penelitian ini menelaah bagaimana guru mengimplementasikan AI secara reflektif melalui pengembangan media pembelajaran dan praktik kelas. Kegiatan dilaksanakan di SMA Negeri 7 Yogyakarta pada tahun 2025 dengan melibatkan 35 guru lintas mata pelajaran. Pendekatan Project-Based Learning dan Participatory Action Research digunakan untuk mendorong pembelajaran berbasis pengalaman dan refleksi berkelanjutan. Hasil menunjukkan bahwa guru mampu mengembangkan dan memanfaatkan media pembelajaran berbasis AI secara bertanggung jawab. Temuan ini menegaskan pentingnya literasi etis dan kritis AI dalam mendukung transformasi pembelajaran yang bermakna dan berkelanjutan.

ABSTRACT

This article reports a follow-up community service study focusing on ethical and critical literacy training in the use of artificial intelligence (AI) to strengthen value-based learning in secondary education. Unlike prior studies that mainly assessed training outcomes, this study explores how teachers implement AI reflectively through the development of learning media and classroom practices. The program was conducted at SMA Negeri 7 Yogyakarta in 2025 and involved 35 teachers from diverse subject areas. Project-Based Learning and Participatory Action Research were applied to encourage experiential learning and continuous reflection. The results show that teachers were able to develop and responsibly utilize AI-based learning media. These findings highlight the importance of ethical and critical AI literacy in fostering meaningful and sustainable learning transformation.

INTRODUCTION

The rapid development of artificial intelligence (AI) has brought significant changes to the field of education, particularly in the development of adaptive, interactive, and learner-centered instructional media. Numerous studies have demonstrated that AI has the potential to enhance learning quality, student engagement, and creativity using digital content and intelligent learning systems (Chen et al., 2022; Solihat et al., 2024; Zhou & Peng, 2025). However, the integration of AI in educational contexts requires not only technical proficiency but also ethical and critical understanding to ensure that technology is used responsibly, contextually, and in alignment with

educational values. Therefore, strengthening teachers' AI competencies including pedagogical, ethical, and critical literacy aspects has become a key factor in supporting educational transformation in the digital era (Chiu, 2025; UNESCO, 2023). Several studies and community service initiatives have examined teachers' readiness and attitudes toward the use of AI in teaching and learning. The findings indicate that although teachers generally demonstrate positive attitudes and initial readiness, challenges remain in practical implementation, pedagogical decision-making, and the sustainability of AI use in classrooms (Suryani & Fitria, 2023; Alshorman, 2023; Azis, Rosad, & Yudhana, 2025; Ahmadi Fatalaki et al., 2025; Wintolo, Kusumaningrum, Funny, Mulyani, dan Nuryatno (2025)).

These challenges are not solely related to technical limitations but are also associated with insufficient critical AI literacy, including teachers' ability to evaluate content validity, identify potential algorithmic bias, and consider the ethical implications of AI use in instructional practices. This is further supported by evidence indicating that teachers' AI literacy and sustained mentoring significantly influence the responsible adoption of technology in education (UNESCO, 2021; Nugroho & Lestari, 2024). In the context of community service, most AI training programs for teachers have primarily focused on improving operational knowledge and measuring training effectiveness through pre-test and post-test approaches (Azis et al., 2025; Wulanda et al., 2025; Bahtiar et al., 2025). While such approaches are important for assessing learning outcomes, an overemphasis on cognitive and technical aspects may overlook the ethical and reflective dimensions of AI utilization. Moreover, follow-up studies that examine how teachers critically implement AI training outcomes in the form of instructional media products and authentic classroom practices remain relatively limited.

Therefore, this article is presented as a follow-up study to previous community service activities, focusing on the implementation and sustainability of AI utilization by high school teachers through the strengthening of ethical and critical AI literacy. The study emphasizes the development of AI-based learning media that are not only technologically innovative but also attentive to values, responsibility, and pedagogical relevance. The approaches employed include Project-Based Learning (PjBL) and Participatory Action Research (PAR), which actively engage teachers in reflection, decision-making, and real-world problem-solving processes. These approaches align with adult learning principles that emphasize experiential and context-based learning (Knowles et al., 2014) and are expected to encourage sustainable, ethical, and meaningful use of AI in secondary education. As previous research has shown, they foster logical and understanding skills and enhance digital literacy.

MATERIALS AND METHODS

This community service activity is designed to support the ongoing implementation of AI in developing learning media at the high school level. The implementation method is systematically designed to ensure the achievement of the activity's objectives, from the planning stage to the evaluation of implementation results and refers to relevant scientific practices in the context of teacher training and mentoring.

The activity design uses a Project-Based Learning (PjBL) approach combined with Participatory Action Research (PAR). The PjBL approach was chosen because it is effective in encouraging experiential learning and solving real problems through products produced by participants (Knowles et al., 2014; Chiu, 2015; Winiarti, 2016). Meanwhile, PAR is used to actively involve participants in the process of reflection, improvement, and continuous implementation of

training results (Dwivedi et al., 2020). The activity was carried out at SMA Negeri 7 Yogyakarta in 2025 involving 35 teachers from various subjects. Teachers act as subjects as well as active partners in the process of developing AI-based learning media, in line with the principle of empowerment in community service (Winiarti et al., 2018). The stages of activity implementation include four main stages.

1. The first stage is a needs analysis, conducted through group discussions and initial observations to identify teachers' AI literacy levels and needs in developing learning media (Alshorman, 2023; UNESCO, 2023).
2. The second stage is technical mentoring, where participants are introduced to various generative AI tools that can be used to develop learning media, such as infographic creation, digital modules, automated learning videos, and adaptive question banks. The mentoring is conducted in stages and contextually, according to the subject matter taught by the teacher (Suryani & Fitria, 2023; Solihat et al., 2024).
3. The third stage is project-based product development. At this stage, each teacher is required to produce at least one AI-based learning media ready for use in the classroom. This process is intensively mentored to ensure the media's suitability to learning objectives and student characteristics (Bahtiar et al., 2025; Buchori et al., 2025).
4. The fourth stage is implementation and reflection, namely the use of AI learning media in the real learning process in the classroom and teacher reflection on the benefits and challenges of its use (Zhou & Peng, 2025).

The instruments used in this activity included: an observation sheet for the implementation of usable learning media, a rubric for assessing the quality of learning media products, and a teacher reflection guide regarding experiences using AI. These instruments were designed to assess the usability, pedagogical relevance, and sustainability of AI-based learning media (UNESCO, 2021; Saqr et al., 2024). The data obtained were analyzed using a qualitative descriptive approach. The analysis focused on the characteristics of the resulting learning media products, the level of AI adoption in learning practices, and teacher reflections on the effectiveness and ease of use of AI technology. This approach was used to obtain a comprehensive picture of the implementation of AI training outcomes in the context of community service (Rad & Rad, 2025; Rakuasa et al., 2024).

RESULT AND DISCUSSION

The interactive nature of the workshop implementation, as shown in Figures 1, provides important contextual support for the empirical findings of this study. The observed participant engagement during hands-on activities reflects the effectiveness of experiential learning in fostering not only technical understanding but also ethical awareness. Through guided facilitation and open discussion sessions, participants were encouraged to question the reliability, limitations, and potential biases of AI-generated outputs. This process supports the study's findings that ethical and critical perspectives can be effectively cultivated when AI literacy is framed as a reflective practice rather than a purely technical skill.

Figure 1. Participants engaging in hands-on AI-assisted learning activities during the workshop session

The mentoring results showed that all participants successfully produced at least one AI-based learning media product relevant to the subjects they taught. The resulting products varied in form, complexity, and pedagogical objectives.

Table 1. Types of AI-Based Learning Media Produced by Teachers

No	Types of AI-Based Learning Media	Number of Teachers	Percentage (%)
1	Interactive learning infographics	28	80.0
2	AI-based digital module	22	62.9
3	Automated learning videos	19	54.3
4	AI-based adaptive question bank	15	42.9

The results in Table 1 show that AI-based infographics are the most widely developed product due to their ease of use and flexibility in integrating them into learning. Meanwhile, AI-based adaptive question banks remain the least developed product due to their need for deeper pedagogical and technical understanding.

After the development phase, teachers were encouraged to implement the created media into real-life classroom learning. Observations and reflections presented in Table 2 indicate that most teachers had attempted to integrate the AI media into their teaching and learning activities.

Table 2. Level of Implementation of AI Learning Media by Teachers

Implementation Category	Number of Teachers	Percentage (%)
Used regularly in class	14	40.0
Used occasionally	13	37.1
Used for lesson preparation	6	17.1
Not yet used	2	5.8

The data in Table 2 shows that 77.1% of teachers have used AI-based learning media directly in their teaching, either routinely or occasionally. This finding indicates a relatively high level of adoption following training and mentoring. Teacher reflections indicate that the use of AI provides several key benefits, including time efficiency in preparing materials, increased variety of learning media, and increased student interest and engagement during learning. However, teachers also identified several challenges, such as limited devices and internet connectivity, and the need for advanced AI literacy.

The results of this activity indicate that the project-based mentoring approach is not only effective in improving teachers' conceptual understanding of artificial intelligence, but also in developing their ability to use AI ethically and critically in learning practices. This is reflected in the variety of AI-based learning media successfully developed by teachers during the mentoring, as shown in Figure 2. Through active involvement in media design and production, teachers act not only as technology users but also as pedagogical decision-makers who consider the context, learning objectives, and educational values. This finding aligns with research confirming that the success of AI integration in education is strongly influenced by teacher readiness and ongoing, competency-oriented pedagogical support (Alshorman, 2023; Chiu, 2025).

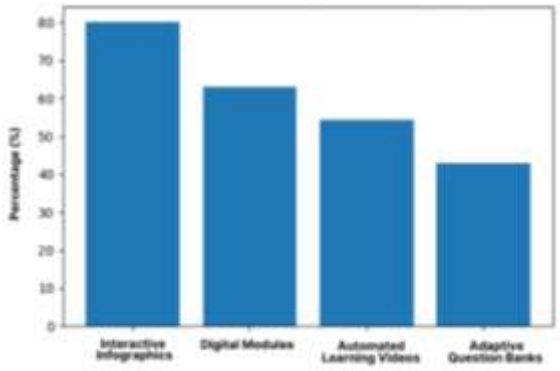

Figure 2. Distribution of AI-Based Learning Media Developed by Teachers

The high number of successfully developed learning media—including AI-based infographics, adaptive digital modules, automated learning videos, and AI-assisted question banks—demonstrates that AI serves as an enabler in teachers' creative processes. The distribution of media types produced by teachers, as shown in Figure 1, indicates that visual and interactive media are the dominant choices because they are considered most relevant to student characteristics and learning needs. In addition to technical aspects, the mentoring process also encourages teachers to critically evaluate AI output, including adapting content to the curriculum and students' socio-cultural contexts, as well as mitigating potential information bias. This reinforces the findings of Chen et al. (2022) and Zhou and Peng (2025) that reflective and responsible use of AI can enhance student engagement and learning experiences. In terms of adoption, most teachers have integrated AI-based learning media into the learning process, albeit at varying levels of intensity. These adoption levels are visually depicted in Figure 3, which shows that most teachers are in the active adoption category, while others are still in the exploratory stage. This variation reflects differences in teachers' AI literacy levels, particularly in ethical and critical aspects, such as the ability to validate content, maintain the originality of materials, and consider the implications of AI use for student learning independence. These findings suggest that project-based mentoring is more effective than one-way training because it allows teachers to learn through hands-on experience and ongoing reflection. This approach aligns with the

principles of adult learning, which emphasize contextual and needs-based learning (Knowles et al., 2014).

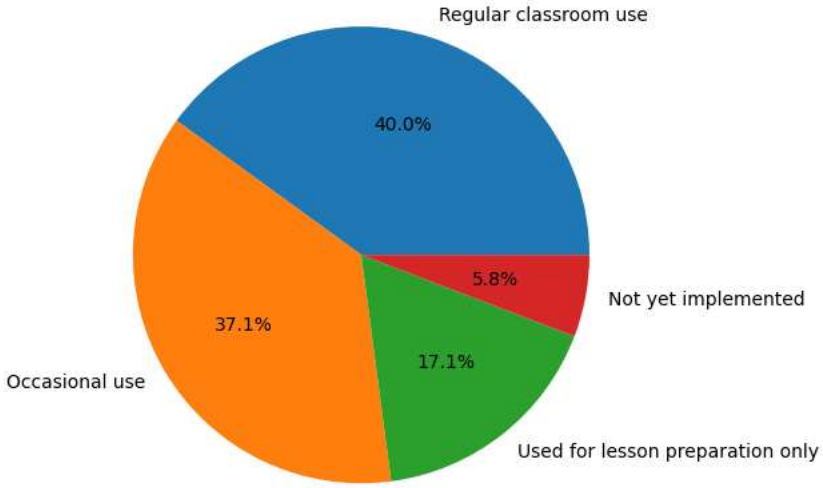

Figure 3. Level of Implementation of AI-Based Learning Media

However, Figure 2 also shows that a small proportion of teachers have not yet directly implemented AI media in their lessons. Identified barriers include limited infrastructure, concerns about the ethical aspects of AI use, and the need for continued mentoring. This situation confirms that the successful use of AI in education cannot be separated from the support of an ecosystem that includes school policies, technological readiness, and the ongoing strengthening of ethical and critical literacy. This finding is consistent with UNESCO recommendations (2021, 2023), which emphasize the importance of a human-centered approach in the digital transformation of education. Overall, the integration of empirical data presented in Figures 1 and 2 strengthens the argument that community service based on implementation mentoring plays a strategic role in developing teachers' AI literacy, which is not only technical but also ethical and critical. This approach enables teachers to develop innovative AI-based learning media that are both value-based and innovative, thus supporting a sustainable and meaningful transformation of technology-based learning at the secondary education level.

CONCLUSION

This community service activity demonstrates that ethical and critical literacy training in the use of artificial intelligence can improve the capacity of high school teachers not only in technical aspects, but also in reflective and responsible pedagogical decision-making. Through a Project-Based Learning and Participatory Action Research approach, teachers successfully developed various AI-based learning media and integrated them into learning practices sustainably, as demonstrated by the variety of products and high adoption rates. These findings confirm that project-based mentoring plays a strategic role in building teachers' AI literacy oriented towards values, ethics, and real-world learning contexts. Thus, community service activities that emphasize ethical and critical AI literacy not only support learning innovation but also strengthen the transformation of secondary education towards a human-centered and sustainable approach.

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