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Artificial Intelligence Literacy and Its Implementation among University Students

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ABSTRACT

This research aims to overviewof the level of artificial intelligence (AI) literacy and to explore the practices of its implementation among university students. The method used was mixed methods, combining quantitative and qualitative approaches. Quantitative data were collected through a Likert-scale-based questionnaire adapted from the Multidimensional AI Literacy Scale (MAILS) instrument, while qualitative data were obtained through in-depth interviews. The research subjects consisted of 46 individuals, with 7 of them serving as interview respondents. The analysis results showed that the average score of students' artificial intelligence (AI) literacy was 66.83, which fell into the moderate category. A total of 30.43% of university students were in the high category, 58.70% in the moderate category, and 10.87% in the low category. The highest score was found in the evaluation indicator (71.3%), followed by the ethics of AI use (67.61%), both of which were in the moderate category. The lowest scores were found in the AI usage indicator (65%) and AI detection (65.43%). The interview results revealed that the implementation of artificial intelligence (AI) literacy among university students was still not optimal. This was reflected in their shallow understanding, not optimal usage, low detection ability, evaluation that was not conducted automatically, and ethical awareness that was situational and inconsistent. In conclusion, university students' artificial intelligence (AI) literacy needs to be comprehensively strengthened to align with the demands of current technological developments.

Keywords: literacy, artificial intelligence, university students

INTRODUCTION

The emergence of the digital era has made digital literacy and artificial intelligence (AI) literacy mutually supportive and really important skills in the field of education. Digital literacy is the ability to access, evaluate, use, and produce information through digital technology[1]. Meanwhile, artificial intelligence (AI) literacy refers to a set of competencies that includes understanding, using, evaluating, creating, and having ethical awareness regarding artificial intelligence systems and technologies. This form of literacy allows individuals to interact critically, productively, and responsibly with AI-based technologies in daily life, education, and the professional world[2],[3]. This literacy comprises five main aspects (indicators), namely: understanding artificial intelligence (AI), which refers to the ability to comprehend the basic concepts, definitions, and potential of AI technology; using artificial intelligence (AI), which refers to the ability to effectively utilize AI technology in various life contexts; detecting artificial intelligence (AI), which refers to the ability to recognize and distinguish whether a system, output, or application is generated by or uses AI technology or not; evaluating artificial intelligence (AI), which refers to the ability to assess the reliability, effectiveness, and risks of the AI systems being used; and the ethics of using artificial intelligence (AI), which refers to the awareness of the ethical implications of using AI in society and personal life.

Then,[4]expanded the definition of artificial intelligence (AI) literacy by emphasizing the importance of understanding human interaction with AI, from input and processing to the resulting output. The definition by[4]also indicates that AI literacy not only includes technical abilities but also critical awareness of the limitations and potential biases that may arise in the use of such technology.

The development of artificial intelligence (AI) technologies such as ChatGPT, Gemini, and similar platforms has significantly transformed the dynamics of higher education[5],[6]. University students no longer face significant difficulties in understanding learning materials or completing complex academic tasks. Various assignments that require higher-order thinking skills, ranging from summarizing readings, constructing arguments, and writing essays, can now be accomplished with the assistance of artificial intelligence (AI) technology.

The significant development in artificial intelligence (AI) technology should be followed by AI

literacy skills and ideal implementation practices among university students. However, preliminary findings among students of the Indonesian Language Education Study Program at Universitas Sembilanbelas November Kolaka showed that most university students do not have an adequate understanding of the basic concepts of artificial intelligence (AI) or the principles of its proper use. Many of them use artificial intelligence (AI) merely as a technical assistance tool, without understanding how the technology works, its functions, or its limitations. Based on a preliminary survey of 60 university students, 85% of respondents reported using artificial intelligence (AI) to complete academic assignments; however, only 15% or 9 individuals verified or reassessed the answers generated by AI. In addition, it was frequently found that university students were able to complete academic tasks with the assistance of AI, yet in actual practice, they did not truly understand the content, logic, or relevance of the answers produced by AI. Many university students tended to copy the answers from AI directly without conducting any evaluation process of the provided responses.

Based on these preliminary findings, there is an indication of a problem in the form of low artificial intelligence (AI) literacy among university students of the Indonesian Language Education Study Program, which affects the practice of using AI in an unwise and academically irresponsible manner. As a solution, efforts are needed to comprehensively measure the level of AI literacy among university students, as well as to understand how it is applied in academic activities.

Based on the background outlined above, this study aims to describe the level of artificial intelligence (AI) literacy and to analyze the implementation practices of AI literacy among university students of the Indonesian Language Education Study Program. This study presents a novelty value as it focuses on university students from a non-technical discipline, who have rarely been the subject of research in the field of AI literacy. In addition, a mixed-methods approach is employed in this study to explore the data more holistically, not only from a quantitative perspective but also from the actual implementation practices carried out by the university students.

RESEARCH METHOD

1. Approach and Type of Research

This study used a mixed methods approach, which is a combination of quantitative and qualitative methods within a single study to obtain a deeper and more comprehensive understanding of the issues being examined[7],[8].This approach was chosen because the research not only focuses on measuring the level of artificial intelligence (AI) literacy in numerical terms but also on understanding the actual implementation practices of AI by university students in the academic context.

The type of this research is descriptive-exploratory, which is a research design aimed at systematically and factually describing the phenomenon being examined and exploring aspects of the phenomenon that are not yet widely known[9][10].The focus of the study is to describe the level of AI literacy among university students of the Indonesian Language Education Study Program and to explore its implementation practices.

2. Research Subjects

The subjects in this study were 46 university students in their second semester of the Indonesian Language Education Study Program at Universitas Sembilanbelas November Kolaka, with 7 of them selected as interview respondents.

3. Research Instrument

The instrument used in this study was an artificial intelligence (AI) literacy questionnaire adapted from the Multidimensional AI Literacy Scale (MAILS) instrument. The questionnaire consisted of 10 Likert-scale (1–5) items representing five main indicators, namely:

Table 1. Indicators of Artificial Intelligence (AI) Literacy

Indicator	Description
Understanding AI	The ability to understand the basic concepts of artificial intelligence (AI) and explain how AI works.
Using AI	The ability to utilize artificial intelligence (AI) in academic activities.
AI Detection	The ability to recognize and distinguish between outputs generated by artificial intelligence (AI) and those that are not.
AI Evaluation	The ability to assess the credibility and reliability of outputs and to maintain personal responsibility for AI-generated outputs.
AI Ethics	The ability to be aware of and consider social impacts such as plagiarism, potential bias, and possible inaccuracies, when using artificial intelligence (AI) technology responsibly.

4. Data Sources

The data sources in this study were the results of the AI literacy questionnaire and the in-depth interviews with university students. The questionnaire was created in the form of a Google Form consisting of 10 AI literacy statements constructed based on each indicator. The questionnaire was then distributed online. Responses to each item in the questionnaire were structured using a 1–5 Likert scale, ranging from strongly disagree to strongly agree (1–5)[11].Furthermore, to obtain more comprehensive results, an additional instrument in the form of an in-depth interview guide was also used. The interviews were conducted using a semi-structured approach to further explore the implementation practices of artificial intelligence (AI) literacy among university students[12].

5. Data Collection Technique

Data collection was carried out through the distribution of questionnaires using Google Forms and in-depth interviews.

6. Data Analysis Technique

a. Quantitative Data Analysis

The data from the questionnaire were analyzed using descriptive statistics to obtain a general overview of university students' artificial intelligence (AI) literacy, based on the following calculation:

1) The distribution of survey score results was obtained by first normalizing each respondent's total score from the Likert scale to a 0–100 scale, to determine the score range, including maximum and minimum values, as well as the overall average score. The score normalization was carried out using the following formula[13]:

$$Final\ score = \frac{total\ score\ obtained}{maximum\ possible\ score} x100$$

Note:

Maximum possible score = number of statement items × maximum score on the Likert scale.

After all scores were normalized, the overall average score was then calculated using the following formula[14]:

$$\bar{X} = \frac{\sum x_1}{n}$$

Description:

$\bar{X}$: mean (average)

$\sum x_1$: sum of all data

n : number of data points

The next step is to classify the categories of artificial intelligence (AI) literacy based on the percentage categories as shown in Table 2 below:

Table 2. Categories of University Students' AI Literacy Score Percentages[15]

Respondent Score	Category
75–100	High
56–74	Moderate
31–55	Low

Then, the data were also analyzed in the form of percentages based on the number of respondents in each category. The formula used is as follows:

$$P = \frac{f}{n} X100\%$$

Description:

P : percentage of respondents per category

f : number of data in each category

n : total number of categories

2) The distribution of the average scores of university students' artificial intelligence (AI) literacy for each indicator was calculated using the following formula[16]:

$$\bar{X}_k = \frac{\bar{X}_1 + \bar{X}_2 + \bar{X}_3 \ldots . x_n .}{n}$$

Description:

$\bar{X}_k$: average score per indicator

$\bar{X}_1 + \bar{X}_2 + \bar{X}_3 \ldots . x_n \bar{x}_1$

average scores of each statement within the indicator

n : number of statements in the indicator

b. Qualitative Data Analysis

The interview data were analyzed using a thematic approach. The steps included: data reduction, which involved selecting important information from the interview transcripts; data presentation in the form of narrative summaries; and drawing conclusions, which involved linking the interview findings with the survey data[17] as well as various relevant research findings.

RESULTS AND DISCUSSION

1. General Overview of University Students' Artificial Intelligence (AI) Literacy

a. Distribution of University students' Artificial Intelligence (AI) Literacy Scores

Based on the results of the data processing on university students' artificial intelligence (AI) literacy, the findings can be presented as follows:

Table3. Artificial Intelligence (AI) Literacy Scores of University Students

Descriptive Statistics	AI Literacy Score (Scale of 100)	Category
Minimum	32	Low
Maximum	86	High
Average	66.83	Moderate

Based on Table 3 above, the average artificial intelligence (AI) literacy score of university students was 66.83, which falls into the moderate category. This indicates a significant variation in the mastery of AI literacy among university students.

The categories of university students' AI literacy scores are presented in Table 4 below:

Table4. Categories of University Students' AI Literacy

Category	Number of University Students	Percentage (%)
High	14	30.43
Moderate	27	58.70
Low	5	10.8

Based on Table 4 above, 30.43% or 14 university students fall into the high category, 58.7% or 27 university students are in the moderate category, and 10.8% or 5 university students are in the low category. In the high category, university students show a more comprehensive mastery of artificial intelligence (AI) literacy. They are not only capable of functionally using artificial intelligence (AI) technology but also understand the basic working mechanisms of AI systems, can critically evaluate outputs, and consider the ethical aspects and social implications of its use. This is attributed to several factors, such as high learning motivation, exploratory experience with AI technology, availability of personal devices (such as laptops and internet connection), and involvement in extracurricular activities that introduce AI-based technology practically.

Meanwhile, the moderate category describes that the majority of university students have acquired an adequate basic understanding of the main principles of artificial intelligence (AI) and the ability to use AI tools such as Chat GPT, Meta AI, and Google Gemini. They have begun to understand the importance of evaluation and ethical aspects in the use of this technology, although such understanding remains limited and not yet thorough. Additionally, most university students possess the ability to critically assess the quality of AI-generated responses, but this ability has not yet developed optimally. University students in the moderate category are influenced by several factors, including:

1) There is a gap in access to technology, such as personal computers (laptops) or adequate internet connections, which remains an obstacle for the majority of university students. Interview results support this finding, as most university students reported not having personal laptops as a means for independent exploration of artificial intelligence (AI) technology.
2) Disciplinary background. University students in the Indonesian Language Education Study Program come from a non-technical discipline. Non-technical study programs such as language education often face challenges in mastering artificial intelligence (AI) literacy[18]. This is because education curricula, particularly in Indonesian language education, usually focus on developing conceptual understanding, communication skills, critical thinking, and analysis of language and culture, so technology and artificial intelligence (AI) are not the main components of the study program curriculum. As a result, university students tend to have limited exposure to the basic concepts of artificial intelligence (AI), its practical applications, and ethical issues related to this technology.
3) The absence of practical training and habituation in the use of artificial intelligence (AI) within the academic context, particularly in the Indonesian Language Education Study Program, has resulted in AI literacy not developing comprehensively. Consequently, university students may often use AI technology in academic settings but have not yet fully mastered it.

This finding aligns with the results of a study conducted by[19], which stated that artificial intelligence (AI) literacy among university students tends to be heterogeneous or varied, influenced by several possible factors such as exposure to technology, individual interest, and educational curriculum. Although the majority of university students have acquired AI literacy skills, some university students remain in the low category. This is because university students tend to have limitations in various aspects of AI literacy. They have not yet understood the basic concepts of artificial intelligence (AI), are less familiar with using AI-based tools, and show difficulties in evaluating and detecting biases or errors in AI-generated outputs. This condition may be caused by limited access to technology, low exposure to artificial intelligence (AI), a lack of interest in technology topics, and insufficient learning support from the academic environment. Based on interview results, some university students in this category reported that they do not have personal laptops and rely solely on public facilities, resulting in very limited skills for independent exploration and practice. The differences in literacy levels are influenced by various factors such as access to technology, the background of the study program, and the lack of systematic integration of artificial intelligence (AI) material into higher education curricula, particularly in non-technical study programs such as Indonesian Language Education.

b. Distribution of Scores Based on Artificial Intelligence (AI) Literacy Indicators

Further analysis conducted by the researchers based on the five main indicators of AI literacy, namely: understanding, using, detecting, evaluating, and ethical use of artificial intelligence (AI), revealed the following results:

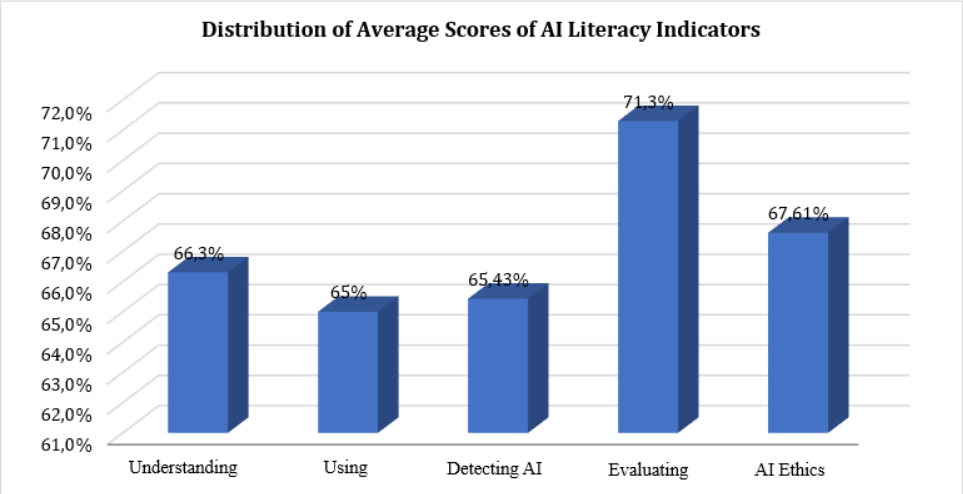

Figure 1. Distribution of Average Scores of AI Literacy Indicators

Based on Figure 1 above, the highest average score was found in the evaluation indicator at 71.3%, which falls into the moderate category. In this indicator, university students tend to assess the outputs of artificial intelligence (AI), such as the accuracy of answers or the conformity of responses to the given instructions. This indicates that university students have increased awareness of the importance of information accuracy in an academic context. This value suggests that university students have likely become accustomed to verifying the answers provided by artificial intelligence (AI). Meanwhile, the artificial intelligence (AI) ethics indicator scored 67.61%, placing it in the moderate category, reflecting university students' knowledge regarding responsibility and academic integrity aspects in the use of AI technology. In other words, university students have also shown an understanding of plagiarism, misuse of information, and the importance of using AI technology responsibly and fairly.

The scores on these two indicators suggest that university students have developed an awareness of the values of evaluation and social responsibility in the use of artificial intelligence (AI) technology, although they have not yet reached an ideal level. The finding that the evaluation indicator received the highest score in this study contrasts with the results of research by[20], which stated that the evaluation aspect often receives the lowest scores in surveys and assessments. This discrepancy is attributed to the high level of complexity and the need for higher-order thinking skills, which remain underdeveloped in studies on literacy.

Meanwhile, the indicators with the lowest scores were using at 65.0% and detecting at 65.43%, both falling into the moderate category. These values indicate that university students have not yet fully mastered the technical aspects of usage nor the ability to recognize outputs generated by artificial intelligence (AI).

The indicator of using artificial intelligence (AI) reflects how well university students are able to functionally utilize AI technology, particularly in supporting academic activities. The lower score in this aspect indicates that the ability to use AI is still basic and has not developed to a higher level, such as using AI to construct arguments, synthesize information, or apply it to more complex academic tasks.

The low score on the AI detection indicator reflects university students' weak ability to distinguish between human-generated outputs and those produced by artificial intelligence (AI). This poses a considerable challenge in the current era, where generative technologies such as ChatGPT and similar platforms are increasingly capable of producing text that resembles human writing in terms of style, structure, and cohesion.

In general, the weaknesses in these two indicators show that university students' technical and analytical abilities regarding artificial intelligence (AI) remain weak. This potentially positions university students as passive users. One possible factor influencing this low ability is the lack of direct experience in using AI in real contexts or academic activities, thereby limiting university students' capacity to effectively detect and use AI in academic settings[21].

Furthermore, the lack of in-depth conceptual understanding of artificial intelligence (AI) also became a distinct challenge. This is evident from the understanding indicator of artificial intelligence (AI), which only scored 66.3% and falls into the moderate category. This score indicates that university students possess a basic

understanding of AI, such as recognizing the terminology and general functions of this technology. However, their understanding does not yet encompass deeper conceptual aspects, such as the working principles of AI algorithms, the importance of input data in generating outputs, and the decision-making logic used by artificial intelligence (AI).

This limitation indicates that university students' conceptual literacy regarding artificial intelligence (AI) remains at the introductory level and has not yet developed toward critical and applicative understanding. One possible cause is the lack of systematic integration of AI material into the formal curriculum of the Indonesian Language Education Study Program. As a result, university students do not acquire a strong conceptual foundation to thoroughly understand this technology.

This finding aligns with studies [22], [23], which state that although university students are aware of the importance of ethics and academic responsibility in the use of artificial intelligence (AI), they still experience difficulties in optimizing AI usage and face challenges in detecting differences between human-generated and AI-generated content. This highlights the need for more comprehensive educational interventions so that university students not only become ethical users of AI but also acquire conceptual and technical mastery to optimally utilize this technology in academic contexts.

2. Implementation of Artificial Intelligence (AI) Literacy among University Students

Based on qualitative data from interviews, the following presents the results of thematic analysis on the implementation of AI literacy among university students.

a. Understanding Artificial Intelligence

Based on the interview data, it was shown that university students' understanding of artificial intelligence (AI) is neither equal nor in-depth. This was evident when respondents were asked what artificial intelligence (AI) is; most appeared hesitant and even needed time to respond, requiring guidance to articulate their thoughts as answers. Regarding how artificial intelligence (AI) works, most respondents knew that AI is trained using big data models, which they learned from various sources; however, two respondents answered that AI does not require data as input for learning.

Quantitative data from the survey showed that the understanding of artificial intelligence (AI) indicator scored 66.3%, which falls into the moderate category. This result indicates that, in general, university students have a theoretical understanding of artificial intelligence (AI). Interview findings further confirmed the survey results and illustrated that this understanding remains superficial and has not yet developed in depth.The lack of in-depth conceptual understanding and its practical application may be caused by the absence of comprehensive learning materials and limited opportunities for direct exploration within the existing formal curriculum of the study program. The insufficient integration of learning materials directly into the curriculum results in university students relying more on independent exploration to understand artificial intelligence (AI) from various sources, such as social media or peer environments.

This aligns with the study by[24], which revealed a significant gap between conceptual understanding and practical application, caused by the lack of comprehensive learning as well as socioeconomic disparities that result in unequal opportunities for learning and exposure to artificial intelligence (AI) technology.

b. Using Artificial Intelligence

The AI usage indicator in this study was used to measure university students' ability to use and apply artificial intelligence (AI) in their academic activities. Findings from the interviews showed that nearly all respondents stated that they often modify prompts or question models to obtain more appropriate answers. This indicates their basic ability to use AI technologies such as ChatGPT, Gemini, and Meta AI. However, this usage is limited to basic skills only. This is evidenced by the fact that the majority of respondents do not understand how to optimize the use of AI prompts in more complex academic contexts.

The limitation in the ability to use artificial intelligence (AI) is strongly suspected to be due to the lack of technical training and official guidance within the study program regarding the effective use of AI. This causes university students to rely on independent exploration, resulting in highly variable and insufficient outcomes to support optimal learning.

This result aligns with the findings of[25], which states that technical readiness and formal training are the main factors in improving the ability to use artificial intelligence (AI).

c. Detecting Artificial Intelligence Outputs

The indicator for detecting artificial intelligence (AI) outputs in this study was used to measure university students' ability to recognize and distinguish between outputs generated by AI and those that are not. Interview findings showed that only one respondent out of seven was able, in practice, to differentiate between AI-generated and human-written texts. The low detection ability of university students regarding AI-generated

outputs indicates that they do not yet possess adequate skills to recognize characteristic features of AI-produced text, such as text that is overly formal and rigid or contextually misaligned.

The findings from the interviews contrast significantly with the 65.43% moderate category score obtained from the survey, as in practice, university students experience considerable difficulty in detecting AI-generated text. The primary cause of this difficulty likely stems from the fact that artificial intelligence (AI) technology can now produce text and visual content that closely resembles human work, making it challenging for university students to clearly identify. This low detection ability may result in academic integrity issues, such as plagiarism or a lack of a critical attitude toward available information sources. This finding aligns with the results of [26], which states that as AI technology outputs become increasingly realistic, many people find it difficult to distinguish between human-made content and engineered or AI-generated outputs, whether in the form of text or other types of outputs.

d. Evaluating Artificial Intelligence

The artificial intelligence (AI) evaluation indicator in this study was designed to measure university students' ability to independently assess the credibility and reliability of AI-generated answers or outputs, as well as to maintain personal responsibility for the content and academic integrity of assignments assisted by AI. Based on the conducted interviews, most respondents initially claimed to evaluate or recheck AI-generated answers and compare them with answers from other sources; however, deeper interview results revealed that in practice, their evaluation was superficial, limited to assessing the appropriateness of language and sentence structure produced by AI technology. Respondents generally answered that a more in-depth evaluation concerning the accuracy or credibility of answers provided by artificial intelligence (AI) is rarely applied automatically but is situational, especially when time is limited. However, this aspect's indicator received the highest survey score of 71.3%, which falls into the moderate category.

This finding indicates a discrepancy between what university students reported in the survey and their practical implementation in the academic context. The mismatch between survey results and practical application suggests a difference between what university students express or perceive through the survey regarding their ability to evaluate answers from artificial intelligence (AI) and how they apply it. In practice, they face challenges such as a lack of direct experience and time pressure in completing assignments.

The possible cause is the low level of critical attitude toward artificial intelligence (AI) answers, or university students' lack of awareness and complete trust in AI-generated answers. This finding aligns with the results of the study[27]which states that a low critical attitude and full trust in AI outputs result in university students not performing automatic and consistent evaluations of AI-generated answers. Thus, the survey results reflecting a relatively high level of evaluation toward AI answers do not fully represent the actual practices carried out by university students.

e. Ethics of Artificial Intelligence Use

The ethics indicator in the use of artificial intelligence (AI) in this study aimed to measure university students' ability to be aware of and consider social impacts such as plagiarism, bias risks, and potential inaccuracies in responsibly using AI technology. Interview findings revealed that most respondents admitted feeling responsible for assignments completed using AI-generated answers. However, in practice, all respondents acknowledged that they often disregard these ethical considerations when facing academic pressures such as numerous assignments and perceived insufficient time to complete all tasks. In such situations, most respondents revealed that they directly copied answers from artificial intelligence (AI) without editing or checking for potential plagiarism.

Findings in this indicator aspect illustrate that ethical awareness regarding AI use among university students remains situational and has not yet become a consistent practice. This finding reconfirms the survey score (67.61%), which indicates that ethical use of AI is not consistently applied in practice. This finding also aligns with research by[28]which states that although university students recognize the importance of ethics in AI use, the implementation of such awareness remains inconsistent and non-automatic, often depending on specific situations.

CONCLUSION

Based on the research findings, it can be concluded that university students' artificial intelligence (AI) literacy is at a moderate level, with uneven mastery and tends to be limited to basic understanding. The evaluation and ethics aspects are relatively stronger components, while the ability to use and detect artificial intelligence (AI) remains weak. In practice, AI literacy has not been implemented consistently and in-depth; thus, strengthening is needed both conceptually and practically within the academic environment. These findings emphasize the need for comprehensive and

equitable reinforcement of AI literacy in accordance with current technological developments.

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