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HOW CAN GEN-AI INTEGRATION TRANSFORM CRITICAL READING STRATEGIES? A CASE STUDIES IN INDONESIAN HIGHER EDUCATION

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Abstract-This study explores lecturers' experiences in reorganizing critical reading learning strategies as well as students' experiences in utilizing generative artificial intelligence as a tool. A qualitative approach with an intrinsic case study design was utilized, involving lecturers and 10 students selected through a purposive sampling technique. Participatory observation and semi-structured interviews constituted the primary instruments of data collection, thereby facilitating an in-depth analysis of lecturers' and students' experiences in utilizing AI as a critical reading tool. The findings indicated that lecturers reorganized critical reading learning strategies with selective integration of technology at the exploration, information clarification, and idea organization stages. The evaluation, presentation, and self-regulation stages are still conducted manually to promote independent thinking. Students experience a transformation from passive users to reflective learners who utilize technology strategically, accompanied by verification of academic sources and critical discussions. The implications highlight that the integration of generative artificial intelligence in a structured pedagogical framework can strengthen students' self-regulation and digital literacy skills, rather than inhibit critical thinking if accompanied by a repositioning of the lecturer's role as a critical thinking facilitator. The limitations of this study include a small sample size limited to one institutional context and variations in students' initial digital literacy levels. Further research needs to expand the sample across various institutional contexts to assess the consistency of the results and their potential for wider adaptation.

Keywords- Gen-AI, critical reading strategies, AI literacy, digital literacy, Indonesian higher education

I. INTRODUCTION

In the digital age, critical reading skills are becoming increasingly essential for college students around the world to analyze, evaluate, and respond to information. Critical reading is closely related to critical thinking skills which is a core 21st century skill as it enables students to analyze factual truths, compare multiple sources, evaluate and respond to information critically [1, 2]. Without these skills, students are susceptible to the pernicious influence of misinformation propagated through digital means and encounter challenges in assessing the reliability of information [3, 4].

However, a considerable number of students encounter challenges in critical reading including difficulties in comprehending the author's concealed intentions, differentiating between facts and opinions, identifying credible sources, and synthesizing information [5]. In Indonesia, this problem is exemplified by the substandard reading literacy of students who ranked 69th out of 80 OECD countries in the Program for International Student Assessment (PISA) survey in 2022 with 30% of students having only rudimentary reading skills [6, 7].

The advent of Generative AI (Gen-AI) adds both complexity and opportunity. On the one hand, Gen-has the capacity to generate new content based on data, with the potential to support critical reading skills [8]. Gen-AI can also facilitate students access to information, promote deep text analysis, encourage exploration of various perspectives, and organize concepts systematically [9, 10]. Conversely, the quality of Gen-AI information depends on user's prompts [11]. Furthermore, the utilization of Gen-AI without critical understanding can lead to dependency and weaken students' ability to evaluate the validity and bias of information. In Indonesia, students still have difficulty in composing critical prompts, tend to use Gen-AI instantly, and have difficulty evaluating information in depth [12].

Consequently, a significant gap in the field demands attention: the necessity to reorganize critical reading learning strategies through the integration of Gen-AI in an effective manner. The extant literature has largely focused on the general role of Gen-AI in improving critical thinking skills and creating a positive learning environment [13, 14, 15, 16]. Nevertheless, research exploring the potential of Gen-AI specifically on critical reading skills remains

quite limited.
This study addresses the aforementioned gap by emphasizing the significance of the selective integration of Gen-AI in critical reading instruction and focusing on students' critical thinking independence, developing students' digital literacy, and the ethics of utilizing Gen-AI in higher education. Therefore, this study aims to explore lecturers' experiences in reorganizing Gen-AI-based critical reading learning strategies and students' experiences in utilizing it as a learning tool. Specifically, this research answers the following questions.
1) How do lecturers experience in reorganizing critical reading learning strategies with Gen-AI?
2) How are students' experiences with Gen-AI have influenced their approach to critical reading?

II. LITERATURE REVIEW

This literature review provides a comprehensive overview of the role, strategies, and integration of Gen-AI in critical reading learning in higher education, focusing on the urgency of improving students' reflective thinking skills, reorganizing learning strategies in the digital era, and selectively utilizing Gen-AI to strengthen analysis, information verification, and self-regulation.

A. The Role of Critical Reading in Higher Education in Indonesia

Critical reading is important in the development of 21st century skills, such as critical thinking, collaboration, and digital literacy [17]. In higher education, critical reading trains students to reflectively analyze, evaluate, and synthesize information, assess evidence-based texts, and self-regulate [18, 19]. To that end, the characteristics of critical reading include (1) active engagement with text through analysis and reflection, (2) the ability to compare multiple perspectives, (3) evaluate the validity of information, and (4) formulate evidence-based responses [20, 21, 22]. Studies have found that learning methods that lack critical analysis are the main cause [23, 24]. The School Literacy Movement has not significantly improved critical literacy. Critical reading requires logical reasoning to test the accuracy of information [25].
Research shows the effectiveness of critical reading in higher education. Students with critical reading skills have a better understanding of course materials [26]. With critical reading, students can strengthen arguments in academic discussions [27]. Therefore, the integration of critical reading into the higher education curriculum is essential to improve academic performance and prepare students for global challenges [28].

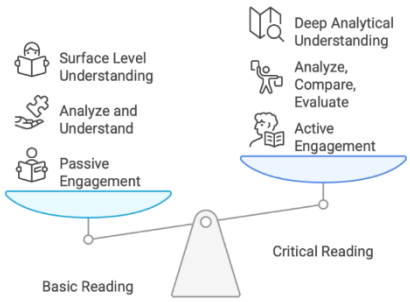

Fig. 1. Comparison of basic reading and critical reading strategies [19, 29, 18].

Figure 1 shows that critical reading demands reflective engagement through evaluation, synthesis, and reasoning across multiple perspectives and sources of information. This is different from basic reading which emphasizes literal comprehension. In the information-laden digital age, critical reading skills are crucial to evaluate and filter information responsibly. Therefore, the integration of critical reading in the higher education curriculum is crucial, especially in the midst of the development of Gen-AI technology that demands reflective evaluation of information.

B. Critical Reading Learning Strategies in the Gen-AI Era

In the Gen-AI era, critical reading learning strategies need to be adjusted so that students can adapt to changing patterns of access, analysis, and verification of information. Gen-AI has changed the experience of students accessing and evaluating information [30]. However, in Indonesia, students tend to still use Gen-AI passively without in-depth analysis and choose to believe in textual meaning [12, 31]. Therefore, lecturers need to design critical reading learning strategies that integrate Gen-AI selectively at three main stages, namely pre-reading, reading process, and post-reading.

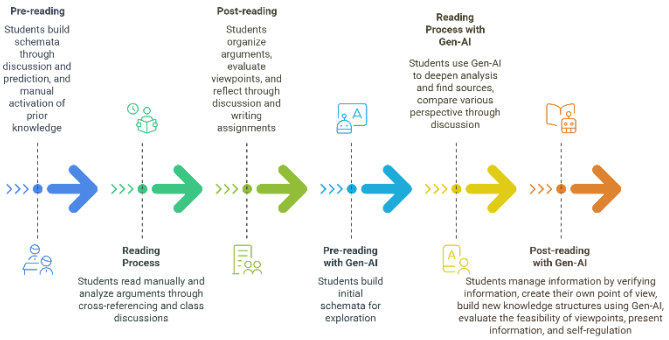

Fig. 2. Comparison of critical reading strategies before and after the Gen-AI era [32, 33].

Figure 2 shows a comparison of critical reading strategies before and after the Gen-AI era based on these three stages.

1) Pre-reading Stage

At this stage, the lecturer guides students to build initial schemata and assumptions manually as a basis for information exploration. After that, Gen-AI is used to find additional information that enriches these schemata and assumptions. Schemata help students make predictions and anticipate the content of the text. The discussion is then directed to prepare students to read the text analytically [34].

2) Reading Process Stage

In the reading process stage, students read the text manually. The goal is for students to understand the structure, context, and potential bias of the information. Then Gen-AI is used to explore further information. Research results show Gen-AI can help explore additional information that may be missed [9, 10]. However, because students in Indonesia tend to rely on instant information, lecturers need to guide them to develop critical question prompts so that interactions with Gen-AI still hone critical thinking [35]. In addition, students are also encouraged to verify and enrich perspectives by comparing information from various sources. Verification of information credibility can be tested by cross-referencing [36]. Gen-AI is used as a tool to find references that are credible and have different points of view. Then to encourage critical thinking, students also compare information from various perspectives with discussions .

3) Post-reading Stage

In the post-reading stage, students verify information, organize viewpoints, and build new knowledge structures. Gen-AI is only used to help organize relationships between concepts in the new knowledge structure. The next stage involves evaluation, presentation of information, and self-regulation, namely through integration of analysis results with schemata, development of logic between ideas, and self-regulation [37]. However, research found that students in Indonesia still have difficulty connecting sources of information and trusting their own arguments [31, 38]. The reason is the lack of practice in perspective evaluation and information synthesis. Therefore, learning should emphasize reflective discussion and perspective comparison [39].

Through the rearrangement of critical reading learning strategies at all three stages of reading, lecturers can help students maintain their critical thinking independence and provide a strong foundation of reflective thinking, despite using Gen-AI assistance. This can be achieved if the integration of Gen-AI is done in a structured manner with consistent lecturer guidance.

C. Gen-AI Integration in Critical Reading Learning Strategy

The role of Gen-AI in critical reading learning is as an active partner in students' critical thinking process. The integration of Gen-AI does not only focus on the utilization of technology, but also changes the interaction pattern between lecturers, students, and Gen-AI itself. Gen-AI functions as a collaborative partner in building initial assumptions, deepening text analysis, enriching information from various perspectives, and organizing new knowledge structures [40, 41].

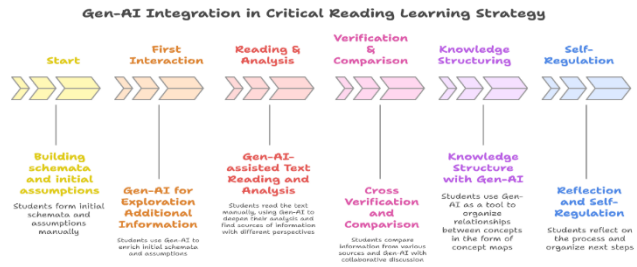

Fig. 3. Gen-AI integration in critical reading learning strategy.

Figure 3 shows the integration of Gen-AI in critical reading learning. In the pre-reading stage, students manually build initial schemata and assumptions. Then they use ChatGPT, Perplexity, and Scite AI to enrich the information. However, lecturer guidance is needed to help students develop critical questions as prompts. ChatGPT can help students build initial understanding, but its effectiveness requires lecturer guidance to formulate analytical questions as prompts [42]. The results show that lecturer guidance is needed because students in Indonesia often have difficulty in formulating analytical questions that can lead to deeper exploration of information [43, 44].

In the reading process stage, students read the text manually. Then Humata AI helps students to clarify information that is missed when reading the text manually. Students must still assess the credibility and accuracy of the information obtained from Gen-AI by comparing information from different perspectives [45]. Scite AI can help students find more credible references [46]. Through this process, students do not only rely on one source, but build a critical assessment of information from various perspectives. Further verification with collaborative discussions so that students can exchange perspectives.

In the post-reading stage, students verify the results of information analysis, build a point of view, construct new knowledge structures, evaluate, present information, and self-regulate. NoteGPT is only used in the stage of building new knowledge structures. Conceptual mapping can help students integrate information from various sources systematically [47]. With the help of NoteGPT, students can organize relationships between concepts logically and systematically so that they can strengthen the development of arguments at the stage of presenting information.

Throughout this process, self-regulation is a key aspect. Students need to reflect on the steps of information exploration that have been carried out, assess the strengths and weaknesses of the arguments built, and develop the next action [48]. The role of the lecturer is to ensure that the use of Gen-AI strengthens student self-regulation, not creating dependence.

Thus, the integration of Gen-AI in critical reading learning helps enrich schemata, support critical analysis, facilitate information verification, and strengthen self-regulation. The students are still placed as the main actors who play an active and reflective role in the critical reading process.

III. MATERIALS AND METHODS

A. Research Design

This research employs a qualitative approach, utilizing an intrinsic case study design. This approach is very suitable for this study because it allows exploring in depth (1) lecturers' experiences in reorganizing critical reading learning strategies with Gen-AI and (2) students' experiences utilizing Gen-AI within the same instructional setting. The focus of the research is the dynamics of learning in one class in a specific context according to the perspectives of those involved, without aiming to make broader generalizations [49].

B. Research Participants

This study aims to gain an in-depth understanding of lecturers' experiences in reorganizing critical reading learning strategies by integrating Gen-AI and the experiences of second-year students (semester 3) in utilizing it as a learning tool. The study was conducted in the Indonesian Language and Literature Education Study Program at a public university in East Java, Indonesia. The class comprised 38 students who actively participated in the learning process.

To explore students' experiences more deeply and diversely, 10 students were selected using a *purposive sampling* method based on variations in their academic achievements. The composition includes 4 students with high grades, 3 students with medium grades, and 3 students with low grades. This selection aims to encapsulate a comprehensive array of experiences and perceptions regarding the utilization of Gen-AI in critical reading instruction.

In addition to the students, one lecturer who teaches the course was also participated in this research. The presence of the lecturer as a participant enabled the researcher to gain direct insight into the process of rearranging learning strategies in the face of Gen-AI technology integration.

All participants received written and verbal explanations of the study's objectives and procedures. The participants voluntarily consented to participate in the study, and the confidentiality of their data was maintained by using initials in the data reporting. Throughout the research process, ethical procedures for withdrawing at any time and assurance of data confidentiality were upheld. This recruitment strategy was designed to ensure a diversity of participant perspectives while adhering to the ethical principles of research to support the validity and credibility of the findings. Table 1 below summarizes the demographic characteristics of the participants.

Table 1. Demographics of participants

Participant Code	Role	Year of Birth	Frequently used AI types	Experience with AI (Years)	Description
D-1	Lecturer	1988	ChatGPT, Perplexity, Humata AI, Scite AI	>2	14 years of teaching experience in critical literacy
AA	Student	2005	ChatGPT, Perplexity	>1	High value
PA	Student	2005	ChatGPT, Gemini AI, Humata AI	>2	High value
BO	Student	2004	ChatGPT, Humata AI	>1	High value
AN	Student	2005	ChatGPT, ChatPDF	>1	High value
AP	Student	2005	ChatGPT, Gemini AI	>1	Medium value
SH	Student	2005	ChatGPT, Gemini AI, Humata AI	>2	Medium value
NZ	Student	2006	ChatGPT, Humata AI	>1	Medium value
NN	Student	2005	ChatGPT	>1	Low value
NE	Student	2004	ChatGPT, Perplexity	>1	Low value
DV	Student	2003	ChatGPT	>1	Low value

C. Data Collection Technique

To answer both research questions, data was collected by observation and semi-structured interviews. These two approaches allowed for an in-depth exploration of ongoing learning processes and participants' personal experiences.

1) Participatory Observation

Participatory observation was conducted over the course of 16 meetings. The aspects observed in the instrument were based on the concepts identified during the literature review with the focus tailored to the RQs. The focus of observation for RQ 1 was on the lecturer's action in reorganizing the learning strategy to integrate Gen-AI gradually and contextually. Meanwhile, for RQ 2, the focus was on student interactions in the critical reading process assisted by Gen-AI. The investigation focused on aspects of information exploration, cross-validation, and reflection on the students' critical thinking process.

Observation instruments were developed to elucidate by which lecturers facilitated AI literacy, exemplified critical thinking, and assisted students through the stages of critical reading, employing both manual and with Gen-AI techniques. The students' activities were observed in a multifaceted and incremental context, commencing with the construction of schemata, followed by the analysis of case studies. They then proceeded to formulate initial assumptions, both with and without the assistance of generative artificial intelligence (Gen-AI) tools such as ChatGPT, Perplexity, and Scite AI. The students then engaged in the manual reading of text, and subsequently explored and clarified information with the aid of Gen-AI tools like Humata AI and Scite AI. They then compared information from diverse perspectives, engaged in collaborative discussions, and constructed new knowledge structures with the support of NoteGPT. The students then evaluated, presented information, and engaged in self-regulation without the aid of Gen-AI.

2) Semi-structured Interview

Semi-structured interviews were conducted with 1 lecturer and 10 students who were actively involved in Gen-AI-assisted critical reading learning. The semi-structured format was selected because it offers the potential to thoroughly examine participants' responses and to adapt the direction of questions in real time, based on the emergent themes that emerge from the participants' responses during the interview. This approach also ensures that the thematic framework remains aligned with the overarching research objectives. This approach permitted an exhaustive examination of the dynamics of attitude change, understanding, and the challenges confronted in the integration of generative artificial intelligence (Gen-AI) into critical reading instruction.

a) Key topics and interview design

The interview questions were developed based on key concepts obtained from a literature review. The interviews with lecturers focused on the process of redesigning learning strategies, the stages that underwent substantial modifications, methods to encourage students thinking critically, and the evaluation of the impact of Gen-AI on the development of student self-reflection. The questions also explored lecturers' strategies in promoting prompting, verifying information, and establishing a learning framework that utilizes Gen-AI a cognitive collaborator. In detail, table 2 outlines the interview topics and questions used to explore lecturers' experiences.

Table 2. Key topics in the lecturer interviews

Main Topic	**Sample Question**
Early experience of Gen-AI integration	Can you tell us about your experience when you first integrated Gen-AI into critical reading learning? What is the main reason you decided to use Gen-AI in the critical reading learning strategy?
Redesign learning strategies	What is your process in redesigning the stages of critical reading when using Gen-AI? In practice, which stages have undergone the most changes? Why?
Critical thinking assistance and prompting	How do you guide students to not only be passive users of Gen-AI, but still think critically? How do you facilitate students to develop critical questions before using Gen-AI?
Information verification and validity management	Does Gen-AI help in the information verification process? How do you emphasize the importance of source validity? How do you facilitate students to manage information, build arguments, and conduct critical evaluations with the help of Gen-AI?

Main Topic	Sample Question
Reflections on the impact of Gen-AI	What are the biggest challenges you face in the process of integrating Gen-AI into critical reading learning? How do students respond to the use of Gen-AI? Are they more engaged, confused, or dependent? Do you see progress in students' self-reflection skills after using Gen-AI in critical reading? What do you think are the advantages and disadvantages of using Gen-AI in the context of critical reading in higher education? What advice do you have for other lecturers who want to integrate Gen-AI in critical reading learning?

Meanwhile, for the student interviews, the main topics encompassed cognitive engagement with Gen-AI, AI literacy (comprehension, prompt design, and assessment of information validity), and challenges and reflections while utilizing Gen-AI. The questions were designed to delve into students' strategic information exploration, their responses to Gen-AI outputs, their construction of critical questions, and their discernment of limitations and risks inherent in Gen-AI utilization. In detail, table 3 outlines the interview topics and questions designed to explore students' experiences.

Table 3. Key topics in student interviews

Main Topic	Sample Question
Engagement with Gen-AI in critical reading	Can you tell us how you usually use Gen-AI when doing critical reading tasks? Do you feel that using Gen-AI makes you more involved in the process of reading and analyzing texts? Why? In terms of frequency, how often do you use Gen-AI during critical reading? Have you ever discussed with lecturers or friends about the results of Gen-AI? How was the interaction?
Understanding of Gen-AI and ability to design prompts	How familiar do you think you are with how Gen-AI (e.g. ChatGPT) works? How do you usually structure questions or prompts for Gen-AI in critical reading tasks?
Ability to compare and verify information	Have you ever compared answers from Gen-AI with other academic sources? What did you find? How do you assess whether the answers from Gen-AI are valid

Main Topic	Sample Question
	or not? What do you do if you doubt the answer?
Challenges of using Gen-AI	What are the main difficulties you face when using Gen-AI in critical reading? Has the use of Gen-AI ever made you confused or lost your way in critical reading? Can you tell us an example? How do you deal with errors or misinformation from Gen-AI? Do you feel too dependent on Gen-AI? Why or why not?
Suggestions and reflections on the use of Gen-AI	If you were asked to give advice to a friend or lecturer on using Gen-AI for critical reading, what would you say?

Overall, this interview design aims to achieve a comprehensive understanding of the influence of Gen-AI on critical thinking processes, learning interactions, and the development of technological literacy within the context of higher education. The findings of the aforementioned interviews are consistent with the observational data and serve as a foundation for interpreting the participants' real-life experiences using Gen-AI to support the academic process.

b) Validity and reliability of interview questions

To ensure the validity of the interview questions in this study, the questions were developed based on the results of a review of current literature relevant to the integration of Gen-AI in critical reading learning. The literature encompasses studies on AI literacy, critical reading strategies, cognitive engagement, self-regulation, and the role of lecturers in developing prompting and validating information [32, 33, 36, 39, 42, 47, 48]. This review offers a robust theoretical framework for formulating questions that elicit the subjective experiences of participants, both students and lecturers, within the context of Gen-AI-based learning.

Content validity was developed through consultation with experts who have competence in the fields of reading learning, Gen-AI technology, and language learning evaluation for higher education. Experts reviewed the comprehensive list of interview questions to ensure that the constructs to be explored including interaction with Gen-AI, information exploration strategies, verification ability, and reflection process were adequately reflected. Feedback from the experts was also used to refine the formulation of the questions to make them more contextual, relevant, and non-interpretive.

To ensure the reliability of the interviews, questions were piloted with 2 students and 1 lecturer who were similar to the main research participants. The researcher obtained feedback on the clarity of the wording, the depth of the questions, and the understandability of the context from this pilot test. The results of the pilot test were used to refine the structure and sequence of the questions to ensure that the interviews proceeded in an organized manner, were focused, and elicited reflective and informative responses from the participants.

c) Interview schedule and protocol

All interviews were conducted individually and had an average duration of approximately 30 minutes. These interviews were recorded with the permission of the participants. During the interviews, the researcher documented salient points and conversational dynamics to corroborate the audio recordings and guarantee the veracity and thoroughness of the data.

Interviews were conducted in a tranquil and accommodating setting on campus to foster a conducive atmosphere and make participants felt secure, unencumbered, and at ease during the interview process. Before starting the interview, the researcher provided a concise explanation outlining the study's purpose, the voluntary nature of participation, the participants' right to withdraw at any time, and the assurance of anonymity and confidentiality. Following the provision of written consent, participants commenced the interview session, guided by a list of semi-structured questions. Interviews were conducted in Bahasa Indonesia to allow participants to express their experiences, views and reflections in the most natural and barrier-free manner possible.

After the interviews were completed, the recordings were manually transcribed by the researcher to maintain proximity to the nuances of the data contained in the participants' utterances. All transcribed data and notes were

stored in an encrypted system and coded anonymously (e.g. D1, AA, PA, BO, AN, AP, SH, NZ, NN, NE, DV) to protect participants' identities and maintain research ethics.

D. Data Analysis

Data analysis in this study was carried out using a thematic analysis approach by paying attention to mapping the findings to the two main research focuses [50]. The stages of analysis are as follows.

1) Reread all data including observation notes, interview transcripts, and documentation to understand the context.
2) Initial coding included (a) codes for lecturer experiences and (b) codes for student experiences.
3) Group the codes into themes based on their respective RQs.
4) Review themes to be coherent with each other and with the focus of the RQ.
5) Compose a narrative of findings to answer the RQ.

Furthermore, to ensure the validity of the research data, three strategies were employed: data source triangulation, member checking, and audit trail. Triangulation of data sources was carried out by comparing data from observations, interviews, and documentation to ensure the consistency of findings. Member checking was employed by confirming the findings with participants to avoid misinterpretation. Audit trail was conducted by documenting the entire process of data collection and analysis in detail to ensure transparency and traceability of the analysis process.

In the final stage, the confirmed themes were synthesized into main categories that answered the research questions. These themes were then linked back to theoretical frameworks and relevant literature to strengthen the depth of analysis. This approach allows for a thorough and reflective understanding of the transformation of critical reading strategies through the integration of Gen-AI in higher education and ensures analysis that is systematic, credible and rooted in the real experiences of participants.

IV. RESULT AND DISCUSSION

A. Findings

This study aims to explore lecturers' experiences in reorganizing critical reading learning strategies by integrating Gen-AI and students' experiences of utilizing it as a learning tool. From the lecturers' side, based on our findings, four main themes were identified from the observations and lecturers' responses during the interviews, namely lecturers repositioning Gen-AI as an explorative tool for strengthening students' critical thinking, reorganizing critical reading strategies with selective integration of Gen-AI to encourage student autonomy and reflection, repositioning their strategic role as facilitators of critical thinking and reflection-based AI literacy, and critically reflecting on the challenges of AI literacy and the strategic repositioning of Gen-AI in learning. In detail, each of these themes is discussed below.

1) Repositioning Gen-AI as an explorative tool to strengthen students' critical thinking

Lecturer has integrated Gen-AI into critical reading learning as a response to the tendency of students who employ it instantaneously without conducting thorough analysis and to be unaccustomed to formulating their own point of view. This encourages lecturer to reorganize pedagogical strategies, thereby ensuring that Gen-AI serves as a catalyst for critical thinking rather than a primary source of information.

"But, they **lack training in critically assessing information, comparing varied perspectives, and formulating their own point of view**. Consequently, I thought that as a lecturer, I have to adapt these technological advancements and modify my pedagogical approaches to align mode closely with the times and the evolving demands of students". (D1-A1.2)

Observations in meetings 1-3 reinforced these interview results. Students were seen directly relying on ChatGPT to answer questions such as *"In paragraph 2, it is stated "Discussions and also debates about the existence of AI have increasingly gained ground in the past month, especially because of the emergence of an AI called ChatGPT". Do you think this statement is fact or opinion? Why?",* without reading the text beforehand. This demonstrates the consumptive tendency of Gen-AI information.

To overcome this, in meeting 1, the lecturer instructed students to manually construct initial schemata and assumptions, then utilize ChatGPT, Perplexity, and Scite AI to expand their understanding. In meetings 2-3, students read the text manually before using Humata AI to enrich information. Furtermode, students verify the results of their exploration by manually reading other texts such as news, essays, and legislation, and searching for academic references using Scite AI. This process is then continued with group discussions, which are used to compare perspectives and strengthen arguments. In meeting 3, students were tasked with verifying, synthesizing, and reflecting on the results of the analysis without the assistance of Gen-AI. Subsequently, students employed the NoteGPT to organize ideas in the form of concept maps. This practice demonstrates a selective utilization of Generative AI, employed exclusively during the exploratory phase. The evaluation and reflection stages continue to be conducted manually.

"The cognition of students and Gen-AI complement each other. **With the knowledge after reading the text manually, students can verify information from Gen-AI.** With Gen-AI, students can deepen their analysis of the text". (D1-B2.4)
This quote confirms that the integration of Gen-AI is predicated on pedagogical considerations. Lecturers employ Gen-AI as an exploratory instrument and a catalyst for discourse, thereby enhancing students' capacity to critically evaluate information and compare viewpoints.

2) Reorganizing critical reading strategies with Gen-AI selective integration to encourage student autonomy and reflection
Lecturer has been known reorganize critical reading strategies, ranging from pre-reading (preparation of schemata and initial assumptions), reading process (information analysis), to post-reading (verification of information analysis results, making points of view, compiling new knowledge structures, evaluating, presenting information, and self-regulation) with selective integration of Gen-AI. For other stages such as verifying the results of information analysis, creating a point of view, evaluating, presenting information, and self-regulation, the utilization of Gen-AI is not applicable.
In the pre-reading stage, before using Gen-AI, students read the case study manually to develop initial schemata and assumptions, then expand the information with the assistance of ChatGPT, Perplexity, and Scite AI.
"Students **read the case study, build initial schemata and assumptions manually**, and then add information with the help of ChatGPT, Perplexity, and Scite AI". (D1-B1.1)
This finding is reinforced by the results of observations at meetings 1 and 9, where the lecturer asked students to make initial assumptions based on the results of reading case studies without the help of Gen-AI. Then asked to utilize Gen-AI with the RACE (Role, Action, Context, Expectation) prompt to broaden the initial assumptions.
In the reading process stage, students manually read and analyze the text, subsequently leveraging Humata AI to further explore the subject matter. To verify the information obtained, students are instructed to search for other perspectives from news, essays, legislation, and scientific articles through Scite AI. Additionally, students engage in discourse on the subject in both group and class settings. This finding is corroborated by observations of meetings 2-3 and 10-11.
"Students read and analyze the text manually. Then use **Humata AI to deepen text analysis**... Then **look for reference sources from Scite AI-assisted scientific articles**". (D1-B1.3)
In the post-reading stage, after verifying and forming a personal point of view, students employ NoteGPT to visualize the concept map of the self-constructed knowledge structure.
"Students manage information by verifying the results of information analysis, creating different points of view, and **building new knowledge structures with the help of NoteGPT**". (D1-B1.5)
This finding was confirmed through observations of meetings 4 and 12, which revealed that students initially developed arguments before employing AI as a visualization tool.
The stages of evaluating, presenting, and self-regulation are conducted without Gen-AI to train critical expression and self-reflection. Observations at meetings 5-8 and 13-16 reveals that this strategy allocates Gen-AI proportionally only at the exploration stage. Then students build thinking autonomy as well as evaluative and reflective acumen in subsequent syntaxes. This approach has been demonstrated to enhance digital literacy while cultivating students' thinking autonomy and their reflective capacity as 21st century critical readers.

3) Repositioning the strategic role of lecturers as facilitators of critical thinking and reflection-based AI literacy
Lecturer fulfill a strategic role as critical thinking models, social reflection facilitators, and AI literacy mediators. Lecturers guide students to develop critical prompts using the RACE technique, as implemented in meetings 1-4 and 9-12. Students compare information from Gen-AI before and after being given an example prompt by the lecturer.
"I model a **prompt that I call RACE**. It stands for Role, Action, Context, and Expectation". *(*D1-C1.1)
Lecturers also emphasized the significance of validating information through manual reading and reflective discussion to prevent passive use of Gen-AI. Gen-AI is only used for exploration after students have developed their understanding and point of view independently.
" [...] I emphasize **validation of the source** by reading manuals from various credible references before and after using Gen-AI and **collaborative discussions**". (D1-C2.4)
The facilitative role of the lecturer is evident in meetings 4 and 12 where students are guided to explore relationships between concepts and compile concept maps and in meetings 5 and 13 where students are guided to evaluate the feasibility of ideas. In meetings 6-8 and 14-16, the lecturer's role shifts as a reflective guide who assist students construct data-based narratives and perform self-regulation. Overall, the lecturer's role is not only as a task director, but as a critical thinking facilitator, social reflection scaffolder, AI literacy mediator with a focus on enhancing thinking autonomy, validate information, and promote academic reflection.

4) Critically reflecting on AI literacy challenges and strategic repositioning of Gen-AI in learning

Lecturers' reflections indicated that the restructuring of learning strategies improved students' self-reflection, critical thinking, and active participation. Students are more engaged in discussions, constructing arguments, and formulating critical positions on information.

"Yes, I saw that **students' self-reflection ability developed** significantly after I reorganized the strategy and made Gen-AI a thinking partner". (D1-D1.1)

"[...] **students develop more actively, discussions are more -lively, and realize** that their intelligence is complementary to the intelligence possessed by Gen-AI". (D1-D1.8)

Observations of meetings 5 and 13 revealed that students possessed the capacity to evaluate arguments independently, compare authors' points of view, and assess the validity of sources and logical structures without Gen-AI. This process is reinforced through group discussions and evaluative modeling facilitated by the lecturer. In meetings 6-7 and 14-15, students articulate personal positions on issues in a logical, data-driven manner. Student narratives reflect the successful integration of critical thinking stages. Lecturer guide by providing feedback on content, argument structure, and communication effectiveness.

As evidenced by the students' personal reflections during meetings 8 and 16, they demonstrated an aptitude for introspection, examining their cognitive processes and formulating adaptive strategies. These reflections reinforced the position of AI as a supportive tool. Confidence in one's own thinking was facilitated by the practice of manual exploration and reflective discussion.

However, challenges remain: information from Gen-AI can be vary even when the same prompt is the used accross different platforms. Students initially depend on AI without conducting thorough analysis, and their prompting and verification literacy remains inadequate.

"...**with the same prompt**, but different **Gen-AI** platforms **produce different information [**...]". (D1-D2.1)

"In the beginning, **students were not trained to criticize information from Gen-AI** and think reflectively [...]". (D1-D2.2)

"Without developing a critical question prompt, Gen-AI can provide very general information and **students [...] only type in general questions, not critical questions**". (D1-D2.7)

As a strategic implication, the lecturer emphasized the importance of strategically integrating Gen-AI as a critical thinking partner during specific stages of the learning process. Then accompanied by familiarization with reading and verification of manuals, reflective discussions, and guidance in preparing prompts. The lecturer further highlighted the significance of repositioning the role as an active critical thinking facilitator and adaptive to technology.

"[...] **the role of the lecturer is as a model of critical thinking, a scaffolder of social reflection, a mediator of AI literacy,** not just a task director". (D1-D3.7)

"[...] I call this Gen-AI a critical thinking partner, not the only main source of information". (D1-D2.5)

Meanwhile, from the vantage point of students, three main themes surfaced from the observations and student responses during the interviews. These themes pertained to the strategic utilization of Gen-AI, which engaged students cognitively and socially. Additionally, the study noted an evolution in students' AI literacy, progressing from a technical understanding to a more reflective one through the cultivation of critical literacy practices. Finally, the initial challenges of utilizing Gen-AI were met with the adoption of adaptive strategies and critical reflection, signifying a shift in their approach to the technology. In detail, each of these themes is provided below.

1) Students are cognitively and socially engaged through the strategic use of Gen-AI

It was demonstrated that students exhibited heightened levels of cognitive and social engagement, as evidenced by their strategic utilization of Gen-AI. Students employed ChatGPT, Scite AI, Perplexity, Humata, and NoteGPT to interpret, analyze, and manage information. The evaluation, presenting of information, and self-regulation stages were conducted without the assistance of Gen-AI.

"... in syntax 1, in interpreting information, I used ChatGPT, Scite AI, and the last one is Perplexity... in analyzing information, I used Humata AI and Scite AI... in making concept maps, I used NoteGPT... the **rest of the syntax [...] did not use AI**". (DV-A1.10)

The findings from observations in meetings 1-4 and 9-12 substantiate the hypothesis that students employ Gen-AI after reading the manual to expand their perspectives, rather than to substitute for their cognitive process. The verification process entails the consultation of additional sources and the facilitation of group discussions.

Social engagement was also evident when students explored Gen-AI in groups and with lecturer, thereby transforming AI from a mere provider of definitive answers to a catalyst for discussion.

"[...] After the practice, the **results given by AI were discussed with the group [**...]". (SH-A1.6)

Observations of meetings 2-3 and 10-11 reveals that students compare information, assess contextual appropriateness, and filter Gen-AI results through discussion. Thus, Gen-AI serves as a trigger for discussion.
The frequency of Gen-AI utilization is contingent upon the requirements of the learning stages, as opposed to being a passive habit.
"[...] So whether it is frequent or not **depends on the syntax needs**". (NE-A2.9)
In meetings 5-8 and 13-16, students demonstrated in-depth evaluation and articulated critical positions without Gen-AI. This reflects the transition from a consumerist mindset to one of introspection and contemplation.
Metacognitively, students began to discern the function of Gen-AI as a complement, thereby broadening their perspective.
"[...] This **AI gene** actually makes the process of reading and analyzing text more complex because this AI is **to complement**, not to be a benchmark". (AA-A3.1)

"[...] **AI is just [...] an assistant**". (AP-C3.5)
Social interactions have also developed to become more reflective. As stated by NZ:
"[...] So the discussion not only serves to verify information, but at the same time **adds perspectives to each other** because of critical reading activities". (NZ-A4.7)
It was observed in meetings 1-6 and 9-13 that group discussions played an important role in verifying and forming a collective understanding of information from Gen-AI. Thus, student engagement evolved from technical use to users who emphasized reflective and collaborative interaction. Gen-AI was used in a purposeful way to support the thinking process with students remaining as the primary rationalists.

2) Students' AI literacy develops from technical to reflective through prompting and critical interpretation practices
Students demonstrated advancement in their AI literacy, which encompassed the ability to comprehend, generate prompts, and interpret the results. It has been demonstrated that Gen-AI functions through the utilization of algorithms and directed prompts. The significance of contextual and structured input has also been acknowledged.
"[...] we entered the text[...] **and then added the RACE prompt so that the answer is directed** and structured according to what we want". (PA-B1.2)

"[...] we are introduced to a **prompt called RACE** [...] We give the role first to the AI [...] Well, the action is the context [...] Then, what we are looking for goes into that expectation". (BO-B2.3)
A close examination of these statements reveals that students have developed prompting literacy based on the RACE model. This model assists students in formulating critical and context-appropriate questions. The RACE prompting model, as introduced and modeled by the lecturer in meetings 1-3 and 9-11, has been shown to facilitate students's exploration of complex issues in a more focused and analytical manner.
Furthermore, students exhibited the capacity to select Gen-AI platform that was appropriate with the critical thinking stage.
"[...] I have ChatGPT, Perplexity, SciteAI, and Humata. **Humata is for analyzing text. Then NoteGPT is for making mindmaps. For ChatGPT, Perplexity was [...] used to find stimulus**". (AP-A.15)
Observations in meetings 1-4 and 9-12 revealed that students consistently employed ChatGPT, Perplexity, Scite AI to expand initial assumptions, Humata and Scite AI for the clarification of text content analysis, and NoteGPT to visualize the arguments that have been compiled. This demonstrates the students' adaptive ability in selecting the platform that aligns with their learning syntax requirements.
Concurrently, students exhibited marked enhancements in their aptitude for critical interpretation. Students have come to understand that information derived from generative artificial intelligence (Gen-AI) must undergo a process of verification with academic sources and be deliberated upon collectively.
"[...] **we don't fully have to trust the answer from AI** [...] we have to reinforce it with other academic sources [...]". (NZ-B3.7)

"[...] if it is still lacking [...] **we discuss with group friends, large group discussions, and with the lecturer [**...]". (SH-B4.6)
Observations in meetings 5-8 and 13-16 revealed that students participated actively in group discussions to assess the accuracy of information. This skeptical-constructive attitude forms the foundation of reflective AI literacy. Consequently, students' AI literacy evolved from the development of technical skills to the cultivation of reflective skills, in conjunction with the capacity to engage in critical reading through systematic exploration, verification, and discussion.

3) Initial challenges of using Gen-AI transform into adaptive strategies and critical reflection

Preliminary findings indicate that students encountered several obstacles when utilizing Generative AI for critical reading purposes. These challenges include subpar prompting literacy and inadequate verification abilities. "[...] if you have not read the manual text [...] the **difficulty is to verify the truth of the information from the AI [**...] Confused, we just use it...". (PA-C1.2)

The difference in information between Gen-AI platforms also caused confusion during the discussion.

"[...] **Why is the answer in my AI like this? Why is yours like this? [**...]." (AN-C1.4)

Observations in meetings 1-2 demonstrated that the utilization of Gen-AI without a comprehensive understanding or the provision of prompts, yielded generic and less pertinent results. Students generally receive information without cross-source comparison.

Another obstacle is the absence of cross-perspective discussion or verification at the initiation of the learning cycle. It has been observed that students often accept the AI results without comparing with other sources or discussing across perspectives. As SH said:

"[...] **don't be lazy to read [**...] if for example from one text is not enough [...] look for other data sources, scientific articles, popular articles, essays, and other things [...] we have more new perspectives [...]". (SH-C2.6*)*

To overcome these challenges, students developed adaptive strategies. The initial strategy entails the thorough perusal of the manual prior to the utilization of Gen-AI, as articulated by NN.:

"To overcome the misinformation, of course we have to [...] **read the manual first**". (NN-C2.8)

The second strategy entailed the utilization of the RACE prompt to ensure the AI remained within the established context. As in AP's statement:

"[...] Then for the use of AI, we still have to **consider the prompt [**...] for example RACE earlier [...]." (AP-C2.5)

The third strategy involves the utilization of Gen-AI as an exploratory tool, not as a primary source of information. Students also cultivate the habit of comparing Gen-AI outputs with other academic sources, including scholarly articles, news, essays, and legislation. This approach fosters the development of a more comprehensive and substantiated perspective.

The final strategy entails the consultation of peers and instructors to corroborate and elucidate the outcomes of Generative AI. As expressed by NZ:

"[...] I usually **discuss** with my group of friends [...] then later will discuss with the whole class...". (NZ-C2.7)

The findings from meetings 1-5 and 9-14 corroborated these strategies, which were employed gradually to establish students' critical thinking frameworks.

An analysis of the students' reflections indicated a shift in their attitudes. They began to see Gen-AI as an assistant, not an information authority.

"[...] we also have to train ourselves to read the manual first and **AI is just [...] an assistant**". (AP-C3.5)

"[...] **the answer from AI needs to be verified** [...] On the other hand, AI also adds to my knowledge that I might have missed". (NN-C3.8)

Consequently, the initial challenges encountered by students became the basis for the development of their critical literacy and self-regulation skills. Structured learning strategies, encompassing manual exploration, prompting, multi-perspective analysis, collective discussion, and self-evaluation, has been demonstrated to effectively cultivate the capacity to navigate with Generative AI in a reflexive and responsible manner.

B. Discussion

This research answers the fundamental question of how Gen-AI integration can transform critical reading strategies through contextual, collaborative, and reflective instructional approaches. The findings indicate that the integration of Gen-possesses the potential to transform critical reading strategies within the context of Indonesian higher education, encompassing both the pedagogical approaches of lecturers and the cognitive processes of students. Lecturer reorganize learning strategies into three main stages, namely pre-reading, reading process, and post-reading stages by employing Gen-AI as a tool for information exploration. Meanwhile, the evaluation, information presentation, and self-regulation stages persist in their non-AI-dependent methodologies. This change signifies a shift in the nature of the lecturer's role, marking its transition from a position primarily focused on task direction to one that emphasizes the facilitation of reflection, the promotion of critical thinking, the provision of a model for Gen-AI literacy, and the facilitation of the integration of Gen-AI literacy into academic pursuits.

This strategy rearrangement has a substantial influence on the transformation of students' cognitive frameworks. In the early stages, students tended to use Gen-AI instantly and consumptively. For example, directly utilizing ChatGPT to answer questions without reading the text first. This suggests that students initially depend on Gen-AI as the primary source of information without engaging in substantial cognitive processing. After the instructional intervention, shift in student behavior was observed, characterized by a transition from a consumptive Gen-AI to a reflective and adaptive stance as critical readers. In the pre-reading stage, students manually construct initial schemata and assumptions before utilizing ChatGPT, Perplexity, or Scite AI to expand their information.

Lecturer guide students in developing critical prompts with the RACE model (Role, Action, Context, Expectation). In the reading process stage, students manually analyze the text, enrich the analysis with Humata AI and Scite AI, and verify the information through reading various academic references and discussions. Lecturer are tasked with the responsibility of verifying the accuracy of information through manual reading and facilitating reflective discussion spaces on a consistent basis. In the post-reading stage, students verify the results of information analysis and censoring without Gen-AI. Then students compile a new knowledge structure with the assintance of NoteGPT. Furthermore, at the evaluation, information presentation, and self-regulation stages are executed in the absence of Gen-AI. With this strategy, students not only learn to organize the utilization of Gen-AI according to the stages of thinking, but also utilize Gen-AI as an exploratory partner by developing prompting literacy, manual analysis, cross-verification, discussion, and building critical positions independently.

Furthermore, students have come to recognize the significance of prompting literacy, a crucial factor that significantly impacts the quality of Gen-AI information. Because with the same prompt, the information output can be different between platforms. Consequently, students devise adaptive strategies including reading the manual before utilizing Gen-AI and employing the RACE prompt in a directed manner. This strategy fosters students' skeptical-constructive attitude towards Gen-AI outputs. The validation of information derived from Gen-AI is achieved through a multifaceted approach that incorporates the analysis of manual texts from diverse vantage points, including news, essays, legislation, and scientific research papers. This validation process is further enriched by discourse among groups or with lecturers, fostering a comprehensive and nuanced understanding of the subject matter. In the final reflection, students characterize Gen-AI as an "*assistant",* not a reliable source of information. This finding suggests a profound comprehension that is seldom observed among students in the nascent stages of technology integration within the higher education context.

This finding suggests that the transformation of critical reading learning strategies is not only technical, but also involves the cognitive and metacognitive aspects of students. The reflective and structured pedagogical design has been shown to shape students into critical readers who are not only technologically literate, but also sensitive to the quality of information and able to take conscious critical positions. This represents a shift from the consumption of technology to its intelligent integration, a transition that aligns with the objectives of 21st-century education.

A comparison of the results of this study with those of previous studies reveals both similarities and differences. The similarity is emphasizing the importance of critical reading as a foundation for reflective and evaluative thinking [18, 19]. In line with the findings of research that demonstrates the efficacy of Gen-AI in serving as an effective thinking partner when utilized selectively and contextually for exploration [40, 41]. The findings of this study further substantiate the integration of Gen-AI, aiding in the exploration, clarification of information, and organization of ideas [9, 10, 32]. It was further determined that, within this framework, lecturer’s function as social reflection facilitators, facilitating group discussions to establish connections between concepts and students' critical positions. This finding aligns with research on the significance of discussion as a medium for integrating manual exploration, Gen-AI, and reflective practice [39].

However, the distinguishing aspect of this study is that its findings build upon and refine previous research. In the context of prior research, which highlighted the propensity of Indonesian students to employ Gen-AI without deliberation [12, 31, 35], this study offers a counterargument. It demonstrates the efficacy of a reflective pedagogical approach in addressing these concerns. The findings of this study serve to rectify previous research on the risk of Gen-AI in weakening students' evaluation skills [11]. This study actually demonstrates that, hen utilized in conjunction with an effective instructional strategy, Gen-AI enhances students' evaluative abilities through the RACE prompting strategy, manual exploration, reflective discussion, and multi-perspective verification. Indeed, students have the capacity to select Gen-AI platforms commensurate with their cognitive functions such as ChatGPT, Perplexity, and Scite AI for initial exploration; Humata AI for content analysis; and NoteGPT for concept organization. This also shows a shift in student attitudes, indicating a transition from a passive stance towards Gen-AI to an active role as users.

Moreover, the findings of this study contribute to the existing body of knowledge on the significance of critically evaluating and responding to information, as well as the importance of verifying credibility through cross-verification [1, 2, 36]. In this study, students actively compared information from Gen-AI with other texts and discussed to ensure the validity of the information. This skeptical-constructive attitude serves as the foundation for the cultivation of thinking autonomy. Indeed, students' metacognitive reflection refutes concerns that Gen-AI can diminish thinking independence [11]. Instead, students demonstrate full responsibility in filtering information and forming their own critical positions.

Consequently, context-aware and reflective instructional design is proven to be able to transform Gen-AI challenges into opportunities that strengthen students' critical literacy and intellectual independence. This transition does not occur automatically, but it is influenced by systematic pedagogical strategies within the framework of post-Gen-AI critical reading strategies [30, 32]. An approach that incorporate manual reading, critical prompting, multi-perspective exploration, and reflective discussion has been shown to equips students

with digital literacy, evaluative, and regulative skills that are at the core of 21st-century critical reading [19, 21, 39, 42].

The findings contradict the hypothesis that Gen-AI becomes the center of information, a replacement for lecturers, and weakens students' thinking autonomy, as previously postulated by studies [12, 31, 35]. Conversely, the role of the instructor as a facilitator of reflective thinking and as a scaffold for AI literacy is paramount in cultivating students with skeptical-constructive attitudes and the capacity to regulate their thinking processes independently [20, 40, 48]. This suggests that the context-aware and structured integration of Gen-AI is able to strengthen critical reading practices that are not only text-based, but also based on reflective, evaluative, and collaborative thinking processes [18, 28]. These findings can be generalized in a limited way to the Indonesian higher education context, especially in environments that have Gen-AI access, but have not implemented reflection-based instructional strategies.

Thus, this study contributes to the formulation of a Gen-AI-based critical reading learning model that not only responds to the challenges of passive use of AI, but also offers a reflective pedagogical approach, which can be replicated in similar contexts. Theoretically, this study expands the discourse of Gen-AI literacy in the context of critical thinking by demonstrating that Gen-AI integration should be directed within a reflective and context-aware pedagogical framework. Practically, the findings provide a basis for curriculum development and learning strategies that can shape technologically proficient, reflective and responsible critical readers in the digital era.

V. CONCLUSION

This study concludes that the strategic and selective integration of Gen-AI is able to transform critical reading learning strategies in higher education. Lecturers function as reflection facilitators, critical thinking models, and AI literacy mediators by assigning Gen-AI only at the exploratory stage. This strategy effectively transitioned students from consumptive Gen-AI users to reflective and adaptive critical readers. Students were capable of constructing contextualized prompts and developing critical positions independently, while still relying on manual analysis, cross-verification, and discussion. This finding confirms that technology integration, when designed in a context-aware and reflective manner, does not diminish thinking autonomy, but instead strengthens 21st-century critical literacy.

The limitation of this study lies in the scope that is limited to one institutional context and certain courses. Consequently, the findings cannot be widely generalized. Additionally, the dynamics of Gen-AI utilization by students can be influenced by varying levels of initial digital literacy. Therefore, it is recommended that subsequent research assess the effectiveness of this learning model in diverse institutional contexts and study programs. This assessment should examine the consistency of the results and the potential for wider adaptation.

The implication of this study shows that selective and reflection-based Gen-AI integration can enhance students' critical literacy if supported by structured pedagogical strategies and the active role of lecturers as thinking facilitators. This signifies the importance of repositioning the lecture's role in the digital era to ensure the use of AI critically and responsibly.

CONFLICT OF INTEREST: THE AUTHORS DECLARE NO CONFLICT OF INTEREST.

AUTHOR CONTRIBUTIONS

P.K.D. drafted the concept, research design, research questions, conducted the research process, analyzed the data, and wrote the first draft of the manuscript, especially the introduction, results, discussion, and conclusion sections. A.R. designed the research method, developed the research instruments, analyzed the research data, and provided feedback on the draft and revised the draft content. I.A.B. contributed to preparing the research instruments, analyzing the data, interpreting the research data, and writing the initial draft of the manuscript, especially the research methods section. All authors reviewed and approved the final version of the manuscript before publication and were responsible for the division of labor.

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