

The Transformation of Academic Culture in the AI Era: A Case Study of Higher Education Institutions

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Abstract

Students' study habits, academic relationships, and scientific integrity have been significantly impacted by the emergence of AI in higher education. However, in the case of mathematics education in Indonesia, previous studies have largely overlooked the impact of AI on students' academic culture and instead focused on the effectiveness of AI in learning. This study aims to examine how academic culture has changed in the AI era among fourth-semester students of STKIP Kusuma Negara enrolled in the Mathematics Education Study Program. The research was conducted using a case study methodology and qualitative descriptive techniques. Thirteen instructors and 15 students participated in in-depth interviews, while three others observed and documented the process. The results indicate that AI improves learning efficiency and access to academic information, but also creates technological dependency, a decline in critical thinking intensity, and dilemmas about academic integrity. The novelty of this research lies in its analysis of the transformation of mathematics education students' academic culture, encompassing changes in learning culture, intellectual interaction, and scientific integrity due to generative AI. The study recommends strengthening AI literacy, developing digital academic ethics, and designing critical thinking-based learning so that the use of AI in higher education continues to support students' academic quality.

Keywords: Artificial Intelligence; Academic Culture; Mathematics Education; Higher Education; Critical Thinking.

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INTRODUCTION

Digital transformation in higher education has accelerated significantly since the emergence of generative Artificial Intelligence (AI) technologies such as ChatGPT, Gemini, and Copilot. AI is no longer viewed merely as a technological tool but has increasingly influenced how students learn, think, and interact within academic environments. In higher education, academic culture encompasses scientific integrity, critical thinking traditions, academic ethics, and intellectual interactions between lecturers and students (Tajuddin & Zulfikar, 2023). Existing studies generally acknowledge that AI can improve learning efficiency, expand access to information, and support academic productivity (George & Wooden, 2023). However, these developments simultaneously raise concerns regarding the

sustainability of academic values that have traditionally been built through reflective inquiry, independent reasoning, and scholarly dialogue. Consequently, higher education institutions face the challenge of balancing technological innovation with the preservation of academic culture.

Various international studies indicate that AI adoption in higher education has increased substantially in recent years. The Higher Education Policy Institute reports that more than half of students in the United Kingdom have used AI to support academic activities, ranging from searching for references to completing coursework (Zawacki-Richter, Marín, Bond, & Gouverneur, 2019). Students increasingly use AI as an instant learning companion capable of providing rapid responses to academic questions. Nevertheless, previous studies present inconsistent findings. While some scholars argue that AI enhances learning effectiveness and student engagement, others suggest that excessive reliance on AI may reduce cognitive effort and weaken deep learning processes. These contradictory findings indicate that the impact of AI on academic culture remains insufficiently understood, particularly regarding how students negotiate efficiency gains while maintaining critical and reflective learning practices (Liu, Chen, & Yao, 2022). This condition is indirectly starting to shift academic traditions that have emphasized reflective, argumentative, and analytical processes in learning in higher education.

The influence of AI extends beyond learning efficiency and has generated new concerns related to academic integrity. Research conducted at the University of Reading found that AI-generated examination responses could evade lecturer detection and sometimes receive higher scores than authentic student responses (Currie, 2023). In addition, several studies have identified the emergence of AI-assisted academic misconduct, including hidden plagiarism, technological dependency, and declining critical-thinking engagement (Yokubov, 2026). Despite these ongoing concerns, prevailing studies are predominantly confined to macro-level higher education settings and organizational viewpoints. Little consideration has been given to the lived experiences of students facing these challenges within specific academic disciplines. As a result, critical gaps remain concerning how AI redefines scholarly norms, learning routines, and ethical intellectual obligations, particularly for students in fields that heavily prioritize analytical thought and problem-solving.

Changes in academic culture due to AI also impact classroom learning interaction patterns. Students tend to rely more on the instant results provided by AI rather than engaging in in-depth literature exploration and academic discussion (Khatun, Islam, Kumar, Hossain, & Mani, 2024). AI has the potential to shift students' learning orientation from knowledge construction to mere knowledge retrieval (Yu, Zhao, Xu, & Peng, 2025). Same as the previous explanation that the use of AI without clear academic regulations can lead to a weakening of the culture of critical and reflective thinking in higher education (Obaje, 2025). Nevertheless, there is a distinct lack of research on how these shifts unfold specifically among Mathematics Education students, whose scholastic endeavors are deeply rooted in deductive logic, conceptual mastery, and sequential problem-solving. This particular backdrop holds theoretical significance since mathematics instruction is a field where cognitive processing directly dictates learning success, thereby rendering it highly susceptible to both the advantages and drawbacks of integrating

AI. Moreover, empirical data drawn from Indonesian tertiary institutions, such as STKIP Kusuma Negara, is still severely scarce. Consequently, exploring the evolution of scholastic culture among Mathematics Education students within this framework is imperative to expand theoretical insights into AI-driven academic environments and to guide subsequent educational frameworks and instructional practices.

In the context of Indonesian higher education, the issue of transforming academic culture in the AI era is still relatively new and has not been extensively studied through qualitative case study approaches. Most research in Indonesia still focuses on the effectiveness of AI use in learning or student perceptions of AI technology. However, changes in academic culture due to AI are a multidimensional issue related to values, ethics, academic identity, and the sustainability of higher education quality (Khatri & Karki, 2023).

Although previous studies have demonstrated that Artificial Intelligence (AI) enhances learning efficiency and academic productivity, other studies report that excessive AI use may weaken critical thinking and academic integrity, indicating inconsistent evidence regarding its impact on higher education (Lin & Chen, 2024). However, these contradictory findings have rarely been examined within discipline-specific academic cultures, particularly in mathematics education, where logical reasoning and problem-solving constitute the foundation of learning. Moreover, existing studies have predominantly employed survey-based approaches that explain students' perceptions rather than revealing how AI reshapes their academic behaviors and learning culture. Therefore, this study addresses this analytical gap by exploring how AI transforms the academic culture of Mathematics Education students through a qualitative case study approach.

The Mathematics Education Study Program at STKIP Kusuma Negara is an interesting context for research because mathematics students have academic characteristics that emphasize logical, analytical, and problem-solving skills. However, based on initial observations of fourth-semester students, the use of AI has begun to influence patterns of assignment completion, class discussions, reference searches, and math problem-solving. Some students use AI to obtain instant answers without undergoing independent analysis. This situation indicates a shift in learning culture and academic interactions that has the potential to impact the quality of the learning process at the university.

Fourth-semester students were chosen as the focus of this research because they are in a crucial academic transition phase in higher education. In this semester, students begin to face courses based on analysis, research, and problem-solving, which require higher-order thinking skills. Furthermore, the intensity of AI use among middle-semester students tends to increase due to increasingly complex academic demands. This situation makes fourth-semester students a relevant group for understanding how AI is beginning to transform academic culture, learning patterns, and student intellectual interactions in mathematics education environments.

The novelty of this research lies in its focus on analyzing the transformation of the academic culture of fourth-semester students in the Mathematics Education Study Program in the AI era through a qualitative descriptive case study approach. This research not only discusses the use of AI as a learning medium but also explores changes in academic values, scientific integrity, critical thinking patterns,

discussion culture, and students' academic adaptation to AI developments. Furthermore, this research offers a contextual perspective on how academic culture in logic- and analysis-based study programs such as mathematics education is changing amidst the development of generative AI.

Based on the description, this research is important to gain a deep understanding of the transformation of student academic culture in the AI era, especially among fourth-semester students of the Mathematics Education Study Program at STKIP Kusuma Negara. This research is expected to provide theoretical contributions to the development of academic culture studies in higher education as well as serve as a basis for the formulation of academic policies that are adaptive to the development of AI in the higher education environment.

RESEARCH METHOD

This study employed a qualitative case study design to explore the transformation of students' academic culture in the era of Artificial Intelligence (AI). A case study was chosen because the research focused on a bounded case, namely fourth-semester students of the Mathematics Education Study Program at STKIP Kusuma Negara, where AI has become increasingly integrated into academic activities. This design enabled an in-depth examination of how AI shapes students' academic behaviors, interactions, and learning culture within their real-life educational context, providing contextual insights that could not be captured through a generic qualitative approach (Cleland, MacLeod, & Ellaway, 2021).

STKIP Kusuma Negara was intentionally selected as the research site because the institution has experienced increasing integration of AI technologies in learning activities, particularly among Mathematics Education students. This context represents a unique case because mathematics education emphasizes logical reasoning, analytical thinking, and problem-solving processes, which may be directly affected by the growing use of generative AI. The unit of analysis in this study was the transformation of academic culture among fourth-semester Mathematics Education students, including changes in learning habits, academic interactions, critical thinking practices, and academic integrity related to AI utilization. The boundaries of the case were limited to fourth-semester students and lecturers involved in academic activities within the Mathematics Education Study Program at STKIP Kusuma Negara during the period of study.

The research participants consisted of fourth-semester students of the Mathematics Education Study Program selected through purposive sampling. Informants were chosen based on the intensity of AI use in academic activities and their active involvement in technology-supported learning processes. The participants consisted of 15 students and 3 lecturers who were directly engaged in fourth-semester academic activities. Data were collected through in-depth interviews, participatory observation, and document analysis. Interviews were conducted to explore participants' experiences and perceptions regarding the use of AI in learning activities, while observations focused on identifying changes in academic interaction patterns, discussion culture, and learning behaviors in classroom settings. Documentation, including student assignments, learning records, and study program academic policies, was used to complement and triangulate the findings obtained from interviews and observations.

Data analysis was conducted using the interactive model of Miles, Huberman, and Saldaña which includes data reduction, data presentation, and drawing conclusions repeatedly until valid and consistent data are obtained (Salmona & Kaczynski, 2024). Data validity was tested through source triangulation, technique triangulation, and member checking to ensure the credibility of the research results (Moon, 2019). By protecting the anonymity of informants and obtaining participant consent before collecting data, this study also complies with research ethics standards. This approach is expected to produce a deep understanding of the transformation of student academic culture in the AI era in the context of mathematics education in higher education.

RESULTS AND DISCUSSION

This study aims to analyze the transformation of the academic culture of fourth-semester students of the Mathematics Education Study Program at STKIP Kusuma Negara in the era of Artificial Intelligence (AI). Based on the results of interviews, observations, and documentation, it was found that the use of AI has significantly influenced students' learning patterns, academic interactions, and scientific integrity in the learning process at university. AI is not only used as an information search tool, but has become part of the academic culture of students in completing assignments, understanding lecture materials, and building academic arguments.

The research results show that the transformation of academic culture that has occurred is multidimensional. On the one hand, AI provides easy access to knowledge, learning efficiency, and faster academic support for students. However, on the other hand, intensive use of AI also gives rise to changes in learning behavior, a decrease in the intensity of critical thinking, and the emergence of academic integrity dilemmas in the learning process. The findings of this study were analyzed into three main themes, namely: (1) a shift in student learning culture towards AI dependence, (2) a decrease in the intensity of academic interaction and critical thinking of students, and (3) the emergence of academic integrity dilemmas in the use of AI. These three findings illustrate that AI has transformed student academic culture in a complex manner in the context of mathematics education in higher education.

Shifting Student Learning Culture Towards AI Dependence

The research findings indicate that the use of Artificial Intelligence (AI) has transformed the learning culture of fourth-semester students in the Mathematics Education Study Program at STKIP Kusuma Negara. Observations during the learning process revealed that most students used AI to find instant answers to complete assignments, particularly in analysis- and problem-solving-based courses. Of the 15 students interviewed, 12 admitted to using AI almost daily to assist with their academic assignments. Furthermore, observations indicated that students were less likely to independently access reference books and scientific journals compared to before the intensive use of AI.

This shift in learning culture is evident in the decline in students' academic exploration of mathematical concepts in depth. Some students prefer to use AI to quickly find solutions to problems without conducting further analysis of the concepts being studied. One student explained:

"If I have a difficult question, I usually ask AI first because it's faster than looking it up in books or journals. Sometimes I use the answer directly for my assignment." (Interview with Student M-07)

Other students also expressed that AI helped them complete assignments in a shorter time, making the learning process more practical.

"AI is really helpful because its explanations are quick and detailed. But honestly, sometimes I get lazy about looking for references myself." (Interview with M-11 Student)

Research findings indicate that the use of Artificial Intelligence (AI) has transformed student learning culture from exploration-based learning patterns to technology-based instant learning. Fourth-semester students in the Mathematics Education Study Program tend to use AI to obtain quick answers rather than independently searching for academic references. This condition indicates an epistemological change in the learning process, namely a shift from active knowledge construction to passive knowledge consumption. In the context of higher education, this phenomenon is a serious problem because academic culture is essentially built through critical, reflective, and analytical thinking processes. This research finding is in line with the research who stated that the use of generative AI in education has the potential to reduce student cognitive engagement if the technology is used without adequate pedagogical control (Iqbal, Hashmi, Asghar, & Abid, 2025). In addition, research explains that generative AI has created a culture of instant learning that causes students to focus more on the end result than the process of in-depth knowledge construction (Chen, Zhu, & H., 2023).

From a mathematics education perspective, reliance on AI has more complex implications than other disciplines because learning mathematics demands reasoning, logical thinking, and problem-solving skills in a gradual manner. Research findings indicate that some students use AI to obtain steps to solve problems without understanding the underlying fundamental concepts. This situation indicates the emergence of superficial learning that has the potential to weaken students' mathematical thinking skills. Another research confirms that the use of AI without strong academic literacy can reduce students' reflective abilities in building conceptual understanding (Kong, Cheung, & Zhang, 2022). Meanwhile, that the phenomenon of cognitive offloading due to AI causes students to begin to hand over some of their academic thinking processes to technology, resulting in a gradual decline in their analytical abilities (Lodge & AM, 2026).

Based on these findings, the transformation of student learning culture in the AI era indicates that technology is beginning to influence students' thinking processes and academic behavior, in addition to functioning as a learning tool. Mathematical reasoning, systematization, and analysis are important cognitive abilities that AI can never replicate, making this a very pressing issue in mathematics education. Consequently, students should not rely on AI to replace their own critical thinking skills, but rather to complement their academic inquiry.

Decreasing Intensity of Academic Interaction and Critical Thinking of Students

The second finding indicates that the use of AI also influences students' academic interaction patterns during the learning process. Based on classroom observations, academic discussions among fourth-semester students tended to experience a decrease in the intensity of critical argumentation. Some students simply presented AI-generated answers without being able to explain their thought processes or the conceptual basis for those answers. In some situations, students appeared to struggle when instructors requested more in-depth explanations of the solutions they presented in class.

Observations showed that out of 15 students, only five actively developed critical arguments during the learning discussions. Most students were more passive, waiting for the AI to provide answers before engaging in class discussions. One lecturer stated:

"Students now get answers quickly from AI, but when asked to explain their mathematical reasoning or concepts, they often get confused." (Interview with Lecturer D-02)

Students also acknowledged that using AI made them more dependent on the end result than the thought process.

"I usually use AI before class discussions to quickly find out the answers, but sometimes I don't really understand the concept myself." (Interview with Student M-03)

Furthermore, observations show that classroom discussion patterns have shifted to become more confirmatory than exploratory. Students tend to compare AI answers rather than develop academic arguments independently. This situation suggests that AI has changed the dynamics of student intellectual interaction in the mathematics learning process.

The second finding shows that the use of AI also affects the dynamics of student academic interactions during the learning process. Class discussions become less exploratory because students are more inclined to confirm AI answers rather than construct academic arguments independently. This condition indicates a change in intellectual culture in higher education. Academic interactions that were previously dialogic, critical, and argumentative are shifting to confirmative ones regarding technological output. This situation indicates that AI is not only changing the way students acquire knowledge but also influencing patterns of intellectual communication in learning. This finding supports research which states that generative AI can weaken students' critical thinking skills if AI answers are accepted without further academic evaluation (Helal, et al., 2025). Furthermore, that dependence on AI has the potential to reduce the quality of students' intellectual interactions in higher education (Alhur, Khlaif, Hamamra, & Hussein, 2025).

The decline in critical thinking intensity in this study indicates that AI has affected students' knowledge internalization process. Some students had difficulty explaining the conceptual basis of the answers they obtained through AI. This indicates that students tend to understand the output without understanding the underlying reasoning process. In mathematics education, this condition has the potential to weaken students' analytical and problem-solving abilities in the long

term. That AI has the potential to shift the learning orientation from deep learning to dependency learning if not balanced with critical pedagogy (George A. S., 2023). Meanwhile, another research emphasizes that the integration of AI in higher education must be accompanied by strengthening critical pedagogy so that students can continue to develop argumentative and reflective skills independently (Papaneophytou & Nicolaou, 2025).

Thus, the transformation of academic interactions in the AI era demonstrates that technology can facilitate access to knowledge, but at the same time, it has the potential to undermine the culture of academic dialogue if its use is not balanced with critical and reflective learning strategies. In the context of higher education, lecturers play a crucial role in creating a learning environment that continues to encourage students to actively discuss, develop arguments, and develop independent thinking, even as AI technology becomes increasingly dominant in academic activities.

The Emergence of Academic Integrity Dilemmas in the Use of AI

The third finding highlights the emergence of an academic integrity dilemma due to the use of AI in student learning activities. Based on documentation of student assignments, several assignments were found to have very similar answer structures, language patterns, and argumentation systems. These findings indicate the dominant use of AI in the preparation of academic assignments. However, some students consider the use of AI not to constitute academic misconduct as long as it does not involve direct copying and pasting.

One of the students said:

"I think AI is just a tool, so it's still safe to use as long as it doesn't copy everything directly." (Interview with Student M-09)

However, lecturers revealed that the use of AI is starting to complicate the academic evaluation process because it is difficult to distinguish between students' original thinking and the answers generated by AI.

"Now the challenge isn't just simple plagiarism, but how to differentiate between student analysis and AI results." (Interview with Lecturer D-01)

Furthermore, observations indicate that some students are starting to lose confidence in constructing academic answers without AI assistance. Students tend to feel their answers are less valid if they aren't first verified by AI. This situation indicates that AI is not only impacting the learning process but is also beginning to form a new academic dependency within students' learning culture.

Research findings indicate that the use of AI raises new dilemmas regarding the academic integrity of students in higher education. Some students consider AI merely an academic tool that is normally used in preparing assignments. However, observations and documentation show a uniform pattern of answers and a heavy reliance on generative AI output. This condition shows that AI has created a new form of academic dependency that is difficult to detect through conventional academic evaluation approaches. In this context, academic integrity is no longer only related to traditional plagiarism, but also related to the authenticity of students' thought processes (Novianti, 2026). This finding is in line with which states that generative AI has created new challenges to academic integrity because it is able to

produce academic text that resembles human writing. Furthermore, that most AI detectors still have limitations in accurately detecting AI-based writing (Ibrahim, 2023).

Research findings also indicate that some students are beginning to experience a psychological dependence on AI validation in constructing academic answers. Students feel that their answers are not valid enough if they have not been verified by AI. This situation indicates that AI is beginning to influence students' academic identity as independent learners. From an academic culture perspective, this condition has the potential to weaken intellectual values such as originality, critical inquiry, and academic honesty, which have long been the foundation of higher education. The development of AI has driven a redefinition of the relationship between technology, knowledge, and academic identity in higher education (Bearman, Ryan, & Ajjaw, 2023). Meanwhile, another research emphasizes that AI should be positioned as a cognitive partner that supports students' thinking processes, not replaces the intellectual process it self (Jose, et al., 2025).

Based on research findings, the dilemma of academic integrity in the AI era suggests that universities need to redefine their evaluation systems and academic culture within higher education. Strengthening digital academic ethics, fostering literacy in the use of AI, and developing assessment models based on contextual analysis are crucial steps to maintaining student academic quality. Thus, AI should not be viewed as a threat to academic integrity, but as a technology that must be managed critically, ethically, and responsibly within the higher education environment.

Viewed through the lens of Self-Regulated Learning Theory, proficient students are characterized by their capacity to systematically oversee, assess, and direct their own educational experiences. Nonetheless, the empirical data indicates that a segment of the student population is growing excessively dependent on AI tools, utilizing them not merely for retrieving solutions but for endorsing their scholarly choices. This pattern points toward a potential erosion of metacognitive oversight, as students' confidence in their academic output shifts from internal contemplation and self-appraisal toward an external reliance on technological validation.

Furthermore, the data underscores that scholarly honesty within the contemporary AI landscape surpasses conventional anxieties related to intellectual theft. Instead, the core dilemma revolves around the genuineness of cognitive engagement and the degree to which learners are genuinely involved in constructing their own conceptual frameworks. Consequently, the integration of AI presents a novel paradox for tertiary educational institutions: the necessity to preserve students' independent thinking while concurrently fostering technological advancement.

From a theoretical standpoint, this research enriches the ongoing discourse surrounding the reconfiguration of scholarly identity in the age of AI. Learners are evolving past the traditional roles of mere information consumers or creators; they are rapidly transforming into co-agents operating alongside cognitive systems. This shift necessitates a thorough re-evaluation of what constitutes academic honesty, student independence, and moral intellectual duties within modern higher education systems.

CONCLUSION

The findings of this study demonstrate that the integration of Artificial Intelligence (AI) has transformed the academic culture of fourth-semester Mathematics Education students at STKIP Kusuma Negara. The transformation extends beyond changes in learning efficiency and access to information, influencing how students construct knowledge, engage in academic discussions, and evaluate the authenticity of their academic work. AI has become embedded in students' academic practices, shaping learning habits, patterns of intellectual interaction, and perceptions of academic responsibility. While AI provides significant benefits in supporting learning processes, its intensive use also contributes to cognitive dependency, reduced engagement in critical inquiry, and emerging challenges related to academic integrity.

From a theoretical perspective, this study contributes to the development of academic culture studies in the AI era by demonstrating that AI functions not only as a technological tool but also as a cultural mediator that reshapes academic values and practices. The findings extend the concept of academic culture by showing that the traditional foundations of higher education—critical inquiry, intellectual dialogue, and independent knowledge construction—are increasingly influenced by algorithmic assistance. Furthermore, the study supports perspectives from Sociocultural Learning Theory, Cognitive Offloading Theory, and Self-Regulated Learning Theory by illustrating how AI mediates knowledge construction, shifts cognitive responsibilities, and influences students' learning autonomy. These findings suggest that academic culture in higher education is evolving toward a hybrid environment in which human reasoning and AI-supported cognition coexist and interact.

Practically, the findings provide an important basis for higher education institutions in developing policies related to AI literacy, digital academic ethics, and responsible AI integration in teaching and learning. Universities should strengthen students' critical AI literacy and design learning activities that emphasize reflection, argumentation, and problem-solving rather than merely producing correct answers. Lecturers also need to adopt assessment strategies that focus on reasoning processes, conceptual understanding, and authentic intellectual engagement. Such measures are essential to ensure that AI functions as a cognitive support tool rather than a substitute for students' independent thinking and academic responsibility.

This study has several limitations. The investigation was confined to one study program, namely Mathematics Education, within a single higher education institution and involved a limited number of participants. Therefore, the findings should be interpreted within their specific context and may not represent the experiences of students in other disciplines or institutional settings. Future research is recommended to conduct comparative studies across multiple universities and academic disciplines to examine whether similar transformations occur in different contexts. In addition, longitudinal studies are needed to explore how the long-term use of AI influences academic culture, critical thinking development, learning autonomy, and academic identity in higher education.

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