KOMPUTASI: JURNAL ILMIAH ILMU KOMPUTER DAN MATEMATIKA
VOL. 23 (1) (2026), XX-XXp-ISSN: 693-7554, e-ISSN:2654-3990

Assessing Students' Ethical Concerns in AI-Integrated Online Learning Systems: A Study in Batam City

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Abstract

The adoption of Artificial Intelligence (AI) in online education introduces ethical concerns related to accuracy, fairness, and accountability. This study examines students' ethical concerns of AI-integrated learning systems, focusing on AI-generated materials, attendance monitoring, and chatbot interactions. A mixed-method approach combining qualitative and quantitative techniques was used, involving interviews with 48 students from three different educational levels in Batam City. Thematic analysis identified five dominant themes. These included AI as a useful yet unreliable learning assistant, concerns about fairness in AI-based monitoring, uncertainty regarding responsibility and accountability, the need for transparent institutional policies, and limited AI literacy leading to overreliance. The study reports its findings using percentage-based distributions to illustrate the prevalence of these concerns across educational levels. The results indicate that students' acceptance of AI in online learning is closely tied to the presence of human oversight, transparent institutional policies, and clearly defined accountability mechanisms. The novelty of this study lies in its focus on a pre-adoption educational environment, where AI is not yet fully institutionalized. Unlike prior studies examining post-implementation contexts, this research captures students' anticipatory ethical expectations, highlighting concerns often overlooked in retrospective evaluations. The study contributes by providing empirical evidence across educational levels, offering localized insights from a developing Indonesian city, and extending AI ethics research beyond technology-advanced settings. The findings emphasize the importance of human oversight, accountability mechanisms, and transparent institutional policies for ethically grounded AI governance in education.

Keywords: *Artificial Intelligence, Online Learning, Ethical Concerns, Student Perception, Educational Technology Ethics*

1. Introduction

Artificial Intelligence (AI) has become a central driver of digital transformation in education, changing how learning content is delivered, personalized, and evaluated [1], [2]. The integration of AI into online learning environments has enabled adaptive learning pathways, automated assessment, and real-time feedback. These features have been shown to improve learning efficiency and student engagement [3] - [5]. Technologies such as intelligent tutoring systems, automated grading tools, and conversational agents, including large language models like ChatGPT and Gemini, offer students rapid access to information, structured revision support, and continuous academic assistance beyond traditional classroom boundaries [6], [7]. Alongside these opportunities, ethical concerns related to accuracy, fairness, transparency, and accountability have become increasingly prominent as AI systems play a greater role in educational decision-making [8] - [10].

While there is broad optimism that AI can enhance educational quality, a growing body of literature emphasizes its potential risks. Wayne Holmes said that AI can productively complement teachers by improving efficiency and personalization, yet they caution that insufficient human oversight may lead to algorithmic bias, misinformation, and ethical lapses [11]. Xuemei Ma and Cuisian Jiang highlight the importance of clearly defined institutional responsibility in addressing AI-generated errors to avoid ambiguity in accountability structures [12]. Similarly, Selin Akgun and Christine Greenhow, as well as

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Received: xx xxxxx 20xx, Accepted: xx xxxxx 20xx and available online XX January 2026
DOI: https://doi.org/10.33751/komputasi.v19i2.5260

Okan Bulut, stress the ethical concerns associated with student data protection, informed consent, and unequal access to technological resources [13], [14]. These debates suggest that ethical governance, rather than technical capability alone, is essential for maintaining trust in AI-supported education systems [15].

Despite the expanding literature on AI ethics in education, research has largely focused on technologically advanced contexts. Batam City, Indonesia, represents an underexplored setting where digital learning is growing but institutional AI adoption remains limited, providing an opportunity to examine students' ethical concerns prior to widespread implementation and their influence on technology acceptance and learning behavior [16] - [18].

This research examines students' ethical concerns of AI integration in online learning systems across different educational levels in Batam City, focusing on the accuracy and trustworthiness of AI-generated learning materials, the fairness and reliability of AI-based monitoring systems, and the role of AI-powered chatbots in supporting learning activities. Using a descriptive and analytical approach based on responses to structured scenarios and survey instruments, the study captures anticipatory ethical awareness in a context where direct experience with educational AI remains limited [19]. The novelty of this study lies in its focus on a pre-adoption educational environment, where AI is not yet fully embedded in institutional practice. While most prior studies on AI ethics in education examine post-implementation issues in technologically mature environments, this study differs by focusing on a pre-adoption context, capturing students' ethical concerns before AI becomes institutionally embedded. This focus enables the identification of anticipatory ethical concerns that are often overlooked in retrospective evaluations [9], [11].

This study makes three key contributions to literature by providing empirical evidence on students' ethical concerns within a pre-adoption context, where AI has not yet been fully institutionalized in educational practice. It extends existing research by examining ethical concerns across multiple educational levels, an aspect that remains insufficiently explored in prior studies. In addition, the study offers localized insights from a developing Indonesian city, thereby enriching the predominantly technology-centered and developed-country perspectives in current discussions on ethical AI governance in education. By providing localized empirical insights from Batam City, the findings extend existing research beyond technology-advanced settings and contribute to global discussions on responsible AI governance in education, offering implications for the development of AI-enabled learning environments that are ethically grounded, transparent, and responsive to students' rights and expectations [20], [21].

2. Methods

This study employed a mixed-methods approach combining qualitative and quantitative elements to examine students' concerns of ethical issues related to the potential integration of Artificial Intelligence (AI) in online learning systems. This design was selected because qualitative inquiry enables in-depth exploration of ethical concerns, while quantitative structuring strengthens the rigor and transparency of pattern identification [22], [23]. The research focused on hypothetical AI-use scenarios, as AI adoption in Batam remains at an early stage, allowing the study to capture anticipatory ethical awareness rather than post-implementation evaluations.

The research was guided by a conceptual framework derived from Nthoesane's ethical principles, specifically Foundational Principles from Virtue Ethics and Transparency & Accountability from Social Contract Theory like shown by Table 1 [24].

Table 1. Conceptual Framework

Foundational Principles Derived from Virtue Ethics	
Integrity	Can you share your thoughts on how the application of AI in online learning systems should maintain the integrity of providing accurate and reliable learning materials?
Honesty	What challenges do you think may arise in ensuring that AI provides unbiased answers?
Transparency	How important do you think it is for students to understand how AI processes learning materials or evaluates student work?
Responsibility	Who do you think should be held responsible if an AI system provides inaccurate or unfair results, and why?
Transparency and Accountability Drawing from Principles of Social Contract Theory	

Clear Policies	What kind of policies do you think should be in place to regulate the use of AI for monitoring attendance in online classes?
Procedures	Can you describe any concerns you might have about the way AI monitors attendance or evaluates students' performance?
Mechanisms for Accountability	What do you think is needed to ensure authorities are held accountable when there are errors or unfair decisions in AI systems?

2.1. Research Procedure

The research was conducted through a chronological and structured procedure consisting of seven stages. This procedure ensured systematic execution and scientific rigor, as illustrated in Figure 1.

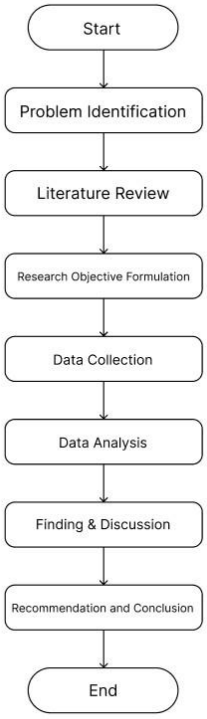

Figure 1. Research procedural stage

a. Problem Identification

The study began by identifying the core problem: potential ethical concerns faced by students if AI is integrated into online learning systems. This stage involved contextual analysis of existing online learning practices and potential AI applications in education.

b. Literature Review

A structured review of prior studies on AI in education, ethics, and student perceptions was conducted to establish a theoretical foundation and identify research gaps.

c. Research Objectives

Research objectives were formulated to focus on identifying ethical concerns, exploring students' perceptions, and assessing potential challenges and implications of AI integration for educational development in Batam City.

d. Data Collection

Data were collected through semi-structured interviews consisting of open-ended questions designed to explore students' ethical concerns regarding the potential use of AI in online learning systems. The interview questions focused on key ethical aspects such as trust in AI-generated learning materials, fairness in AI-based assessment and monitoring, and the perceived reliability of AI-powered learning tools. This approach

allowed participants to freely express their views while ensuring that the collected data remained aligned with the study's research objectives. The interviews involved students from various schools and universities across Batam City to ensure diversity in educational background and learning experience. To accommodate participants' availability and accessibility, the interviews were conducted in two formats: face-to-face interviews and online interviews via video conferencing platforms.

e. Data Analysis

The collected data were analyzed using thematic analysis, a qualitative method aimed at identifying and interpreting recurring patterns within the interview responses. The analysis began with an in-depth reading of all interview transcripts to gain familiarity with the data. Relevant segments of the responses were then coded based on recurring ideas related to ethical concerns, including trust, fairness, reliability, transparency, and accountability in AI-supported learning environments.

These codes were subsequently grouped into broader themes that represented the main ethical concerns expressed by the participants. The themes were reviewed and refined to ensure internal consistency and clear alignment with the research objectives. This analytical process enabled the study to systematically capture and interpret students' ethical concerns across the three educational levels, providing a comprehensive understanding of the anticipated challenges associated with AI integration in online learning systems.

f. Finding and Discussion

The analyzed themes were aligned with existing literature to ensure theoretical consistency and contextual relevance.

g. Recommendation and conclusion

The final stage synthesized results into recommendations for responsible AI implementation in education in Batam.

2.2. Participants

Participants were drawn from a wide educational ecosystem in Batam City. According to BPS-Statistics Indonesia Batam Municipality, Batam has 206 junior high schools with 61,789 students, 79 high schools with 27,211 students, and 28 higher education institutions with 35,091 students [25]. Six institutions were selected: Ananda Batam School [26], Yos Sudarso Batam School [27], Maitreyawira School [28], Universitas Internasional Batam [29], Universitas Putera Batam [30], and Institut Teknologi Batam [31].

A total of 48 respondents participated in the interview process, consisting of 16 participants from each educational level: junior high school, senior high school, and university students. This equal distribution was intentionally designed to enable systematic comparison of ethical concerns across educational levels, rather than reflecting population proportions. Participants were drawn from six educational institutions in Batam City to ensure diversity in learning environments and student backgrounds.

Data saturation was closely monitored throughout the qualitative interview process. During analysis, responses from participants beyond the sixteenth respondent in each educational cluster demonstrated substantial repetition of previously identified themes, with no emergence of new concepts or ethical concerns. In accordance with the principle of data saturation, only responses up to the sixteenth participant per educational level were included for in-depth thematic analysis, as subsequent interviews did not contribute additional analytical value.

This approach aligns with qualitative research principles that prioritize depth of insight over sample size, where purposive sampling and data saturation guide analytical sufficiency, and typical qualitative studies involve sample sizes ranging from four to forty participants. The saturation-based decision confirms that the analyzed data were sufficient to capture the breadth and depth of students' ethical concerns, thereby ensuring methodological rigor and credibility of the findings [22], [23].

2.3. Validity & Reliability

The trustworthiness of the qualitative data in this study was established through a systematic and reflective research process that emphasized analytical rigor, transparency, and consistency throughout data collection and analysis. Rather than relying on statistical validation, the study adopted qualitative validation strategies to ensure that the findings accurately represent participants' ethical concerns regarding AI-integrated online learning systems.

The credibility of the findings was strengthened through iterative engagement with the interview data and continuous comparison between participants and educational levels. Interview transcripts were repeatedly reviewed to ensure close alignment between participants' statements and the emerging codes and themes. The thematic structure was not predetermined but developed inductively from the data, allowing participants' perspectives to guide interpretation. Data saturation further reinforced credibility, as responses from participants beyond the sixteenth interview in each educational cluster did not introduce new ethical concerns, indicating that the identified themes sufficiently captured the range of perspectives within the sample.

Reliability in terms of analytical consistency was addressed through a structured and well-documented research procedure. The interview protocol remained consistent across participants, and the same coding framework was applied systematically to all transcripts. Decisions regarding code refinement, theme consolidation, and interpretation followed a clear analytical sequence derived from the study's conceptual framework. This procedural coherence ensures that the analytical process is dependable and that similar data, if analyzed using the same approach, would lead to comparable thematic outcomes.

To support confirmability, the analysis was grounded directly in participants' verbal accounts rather than researcher expectations or theoretical assumptions. Interpretive claims were continuously checked against the original interview data, and themes were retained only when supported by recurring evidence across multiple participants. The use of participants' statements as the primary basis for interpretation reduced subjective bias and strengthened the objectivity of the analytical conclusions.

The transferability of the findings was enhanced through purposive sampling across multiple educational levels and institutions, enabling the exploration of ethical concerns within diverse learning contexts. Detailed descriptions of the research setting, participant characteristics, and analytical procedures were provided to allow readers to assess the applicability of the findings to similar educational environments.

3. Results and Discussion

The results indicate that students perceive Artificial Intelligence in online learning as beneficial for supporting learning activities. At the same time, they raise ethical concerns related to trust, fairness, privacy, and responsibility. As summarized in Table 2, three major themes emerged from the data, reflecting students' experiences and expectations regarding AI-generated learning assistance, AI-based attendance monitoring, and institutional accountability. These themes illustrate that students' acceptance of AI is closely linked to ethical safeguards and human oversight rather than technological capability alone.

To ensure that the identified themes genuinely reflect participants' perceptions rather than the researcher's subjective interpretation, several analytical validation strategies were applied during the thematic analysis. The themes presented in this section emerged from recurring patterns consistently expressed across participants from different educational levels, rather than isolated or singular responses. Each theme was constructed through the systematic comparison of coded segments derived directly from participants' verbal accounts, and themes were retained only when supported by convergent evidence across multiple interviews. The distribution of responses, as reflected in the percentage-based summaries, further reinforces the analytical consistency of the findings by demonstrating that the identified concerns were shared by a substantial proportion of participants rather than driven by individual cases. In addition, thematic interpretations were continuously reviewed against the original interview data to ensure close alignment between participants expressed views and the resulting analytical claims. This process strengthens the credibility and dependability of the findings, confirming that the reported themes represent participants' collective ethical concerns regarding AI-integrated online learning systems

Table 2. Result of Thematic Analysis

Major Themes	Minor Themes	Concepts
AI as a helpful but unreliable learning assistant	Usefulness for quick explanations	AI helps students learn faster, provides additional examples and summaries

	Doubts about accuracy	Students are unsure whether AI answers are correct, need to cross-check information
	Cultural mismatch	How important do you think it is for AI to use foreign examples or language that differs from local curriculum
	Need for teacher verification	Teachers expected to validate or correct AI-generated materials
Discomfort and fairness concerns in AI-based attendance monitoring	Privacy worries about facial monitoring	Students feel watched or uncomfortable being recorded by camera-based systems
	Fear of system errors	Concerns about being marked absent due to detection or connection errors
	Unequal access and device limitations	Students with poor internet or low-quality cameras fear being unfairly penalized
Unclear responsibility and the need for institutional accountability	Uncertainty about who is responsible	Students are unsure whether teachers, schools, or AI providers should handle mistakes
	Need of complaint and correction mechanisms	Students want clear ways to report AI errors and request corrections
	Expectation of fairness and teacher oversight	Teachers should remain final decision-makers in grading and evaluation
Need for clearer policies and ethical governance	Need of explicit consent rules	Students want to be informed when AI is used to monitor or assess them
	Concerns about data storage and use	Questions about how long data is kept and who can access it
	Desire for transparent institutional policies	Requests for written regulations and clear communication before AI deployment
Limited AI literacy and overreliance among students	Limited understanding of how AI works	Students admit not knowing how AI processes or produces results
	Dependence on AI for assignments	Students use AI tools frequently, sometimes without critical thinking
	Desire for AI literacy support	Students request simple explanations or training on how to use AI ethically

Students' perceptions indicate that AI is primarily valued for its functional benefits in supporting online learning, particularly in providing quick explanations and supplementary materials. Approximately 37.5% of students reported that AI-assisted tools helped them understand learning content more efficiently during online study. Nevertheless, this perceived usefulness was accompanied by concerns related to reliability and contextual relevance. Around 29.2% of participants expressed doubts about the accuracy of AI-generated responses, while 25% noted that AI often presents examples or explanations that are culturally or contextually misaligned with local curricula. These findings suggest that AI enhances learning efficiency. However, students remain cautious and expect teachers to validate and contextualize AI-generated content.

Ethical concerns were also evident in relation to AI-based attendance and monitoring systems. Approximately 33.3% of students reported discomfort with camera-based attendance mechanisms, citing

privacy concerns and feelings of continuous surveillance. In addition, 29.2% raised concerns about potential technical errors, such as facial recognition inaccuracies or unstable internet connections, which could lead to unfair attendance records. Students with limited access to reliable devices or internet connectivity expressed particular concern about being disadvantaged. This indicates that fairness and equity remain central considerations in the use of AI-driven monitoring technologies in education.

Concerns related to responsibility, accountability, and students' understanding of AI systems further shaped ethical concerns of AI in online learning environments. Approximately 35.4% of participants indicated uncertainty regarding who should be held responsible when AI systems produce incorrect or unfair outcomes, whether teachers, educational institutions, or technology providers. In addition, 31.3% emphasized the importance of having clear institutional mechanisms to report AI-related errors and request corrections. Alongside these concerns, 27.1% of students demonstrated limited understanding of how AI generates answers or evaluates performance, which contributed to an excessive reliance on AI tools without adequate critical judgment. This limited AI literacy raises ethical concerns, as students may accept AI outputs uncritically or depend on AI as a primary source of knowledge, underscoring the need for institutional guidance and teacher oversight to support responsible and informed AI use.

Taken together, these findings indicate that the ethical integration of AI in education must balance technological innovation with human-centered values [32], [33]. Students' perceptions point toward the importance of embedding fairness, transparency, and accountability within AI systems and ensuring that AI serves as a complement, not a replacement to human educators. This discussion also confirms that ethical concerns in Batam's educational context are shaped more by anticipation and perception than by direct experience, consistent with the study's stated limitations.

This research aligns closely with previous scholarship that emphasizes the importance of ethical awareness and human oversight in AI-assisted education. Scholars such as Wayne Holmes, Kenneth Holstein & Shayan Doroudi have highlighted transparency, fairness, and accountability as essential foundations for sustaining trust in educational AI perspectives that strongly resonate with the attitudes expressed by students [8], [11]. The analysis of Juan Cruz-Benito on the risks of overreliance and the erosion of critical thinking also parallel the concerns raised by participants in this study [20]. In contrast, research by Jihyun Kim reported higher levels of confidence and acceptance toward AI-based learning systems, suggesting that contextual readiness and prior exposure play a decisive role in shaping users' trust in such technologies [17]. These similarities and differences highlight the contribution of this research by positioning Batam's educational context within the broader global discussion on ethical AI use in learning.

The findings of this study highlight the ethical concerns that must be considered in the governance of AI in education. Students' anticipatory concerns regarding fairness, accountability, and transparency underscore the need for national-level policies that provide clear frameworks for ethical AI integration. Such frameworks could include guidelines on human oversight, data protection, and equitable access, ensuring that AI adoption aligns with broader educational goals and societal values. By situating AI implementation within coherent policy structures, national authorities can foster a responsible approach that mitigates potential ethical concerns while supporting innovation in online learning systems.

At the institutional level, the study suggests that schools and universities should develop explicit policies regulating AI use, including mechanisms for reporting errors, providing oversight of AI-generated content, and promoting AI literacy among students and educators. These measures would enable learners to engage critically with AI tools and reduce the risk of overreliance or misuse. For policymakers, the findings offer practical guidance for designing educational strategies that integrate ethical considerations into AI deployment, ensuring that technological advancement does not compromise fairness, trust, or accountability. Collectively, these insights bridge the gap between empirical findings and actionable interventions, enhancing the relevance and impact of AI adoption in Indonesian education.

4. Conclusion

This study examined students' ethical concerns of Artificial Intelligence in online learning environments, with particular attention to issues of reliability, fairness, privacy, and accountability. The results indicate that students recognize AI as a supportive educational tool that enhances learning efficiency. However, they do not perceive it as a reliable or autonomous authority. A substantial proportion of students emphasized the necessity of teacher involvement in verifying AI-generated content, indicating that trust in AI remains conditional on human oversight rather than technological capability

alone.

Ethical concerns were especially evident in the context of AI-based monitoring and attendance systems. Students expressed discomfort with continuous surveillance and raised concerns about the potential for technical errors to produce unfair academic consequences. These findings suggest that resistance to AI in education is not rooted in rejection of innovation, but in apprehension toward implementation practices that may compromise fairness and students' rights. The results also reveal uncertainty regarding responsibility when AI systems fail, highlighting the expectation that educational institutions, rather than individual teachers or technology providers, should bear primary accountability for AI-related outcomes.

From a methodological perspective, the findings do not indicate errors in data interpretation or analytical validity, as the themes consistently reflect participants' ethical concerns across educational levels. However, the results should be understood as anticipatory rather than evaluative, given that AI has not yet been fully institutionalized in the studied online learning contexts. This limitation does not undermine the validity of the findings. Instead, it positions the study as an early ethical inquiry into students' expectations prior to widespread AI adoption.

This study highlights the importance of embedding ethical considerations into AI integration in Indonesian education. At the national level, policymakers are encouraged to establish guidelines that ensure fairness, transparency, and human oversight in AI deployment, while at the institutional level, schools and universities should implement clear policies, error-reporting mechanisms, and AI literacy programs for students and educators. By translating these findings into practical governance and educational strategies, AI adoption can enhance learning outcomes while safeguarding students' rights, fostering trust, and mitigating risks associated with overreliance or misuse.

The ethical concerns highlighted in this study stem not from the technology itself but from issues of governance, responsibility, and human-centered implementation. Effectively addressing these dimensions is essential to ensure that AI enhances educational quality while maintaining fairness, trust, and institutional accountability.

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