Comparison of Psychological Safety in Learning Environments between AI-Based Classes and Conventional Classes

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Abstrak

Penelitian ini bertujuan membandingkan psychological safety antara kelas berbasis Artificial Intelligence (AI) dan kelas konvensional dengan menelaah dimensi sosial dan kognitif yang memengaruhi kenyamanan belajar. Penelitian dilakukan karena pembelajaran berbasis AI dan pembelajaran tatap muka sama-sama terbukti meningkatkan hasil belajar, tetapi belum dikaji secara komparatif dari aspek keamanan psikologis. Metode yang digunakan adalah kualitatif komparatif melalui wawancara mendalam dan analisis dokumen, serta analisis tematik untuk mengidentifikasi pola pengalaman siswa. Hasil penelitian menunjukkan bahwa kelas berbasis AI meningkatkan psychological safety melalui privasi evaluatif, personalisasi pembelajaran, penurunan kecemasan akademik, dan pengurangan beban kognitif, sedangkan kelas konvensional meningkatkan psychological safety melalui dukungan sosial, kedekatan emosional, dan keterlibatan interpersonal. Namun, keduanya memiliki keterbatasan: AI berpotensi mengurangi keterhubungan sosial, sementara pembelajaran konvensional rawan menimbulkan kecemasan performa. Simpulan penelitian menegaskan bahwa psychological safety paling optimal dicapai melalui integrasi kedua pendekatan, yaitu pembelajaran hibrida yang menggabungkan kekuatan AI dan interaksi sosial manusia.
Kata Kunci: *AI-based classroom, beban kognitif, kelas konvensional, keamanan psikologis, motivasi belajar.*

Abstract

This study compares psychological safety between Artificial-Intelligence-based learning environments and conventional classrooms by examining both social and cognitive dimensions that influence learners' comfort. The study was conducted because although both AI-based and face-to-face instruction have been proven to enhance learning outcomes, they have not been compared specifically in relation to psychological safety. A comparative qualitative method was used, involving in-depth interviews and document analysis, followed by thematic analysis to capture recurring experience patterns. Findings reveal that AI-based classrooms enhance psychological safety through evaluative privacy, personalized learning, reduced academic anxiety, and lower cognitive load, whereas conventional classrooms strengthen psychological safety through social support, emotional closeness, and interpersonal engagement. However, both have limitations: AI-based learning may reduce social connectedness, while conventional learning is vulnerable to performance anxiety. The study concludes that optimal psychological safety is achieved through an integrated hybrid learning model that combines the strengths of AI and human interaction.
Keywords: *academic motivation, AI-based classroom, cognitive load, conventional learning, psychological safety.*

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Introduction

The development of artificial intelligence (AI) technology has brought about a major transformation in the world of education, including changes in the model of interaction between students and the learning environment. Initially, conventional face-to-face learning systems were considered the standard because they facilitated social relationships, direct communication, and emotional support from teachers and peers. However, the emergence of AI-based classrooms has created a new learning ecosystem that enables personalization, automatic adaptation of material, and data-driven self-evaluation, thereby modifying the learning experience both cognitively and socially. This transformation raises fundamental questions about how AI-based environments affect psychological safety, a key factor that determines students' comfort in actively participating, expressing opinions, and making mistakes without fear or psychological threats (Mustafa, 2024).

AI-based classrooms essentially offer technological advantages in the form of adaptive learning, real-time feedback, and the ability to adjust the learning process based on the unique characteristics of each student. This is believed to create a more personalized learning experience and reduce anxiety related to academic performance, as the system provides automatic support without social judgment from teachers or classmates. Several studies show that AI-based personalization has a positive impact on self-efficacy, academic motivation, and higher learning engagement thanks to exploration opportunities that are not limited by social pressure (Lee et al., 2022). However, the increase in the sophistication of adaptive learning does not necessarily guarantee psychological security in a social context, because human emotional interaction (which is still an important element in learning) can be reduced in AI-based classrooms (Baig et al., 2025).

On the other hand, conventional classrooms maintain the advantage of face-to-face interaction, which allows for direct social expression and emotional support. Physical engagement can increase a sense of togetherness, emotional closeness, and social connectedness between students and teachers, thereby helping to provide a sense of security to express oneself, ask questions, and reveal learning difficulties. The presence of peers also plays a role in building psychological safety through informal social support that only occurs through direct interpersonal communication. Previous research has proven that face-to-face social interaction helps reduce academic anxiety due to the presence of collective support when facing learning pressures (Sardila, 2025). However, the conventional approach also has limitations because it still leaves social pressure in the form of fear of making mistakes in front of teachers or peers, especially for students who are introverted or have high levels of academic anxiety.

The dynamics of this comparison show that psychological safety in AI-based learning and conventional classrooms is not absolutely superior or inferior, but is influenced by the emotional and cognitive needs of each student. AI-based classrooms have the potential to reduce social pressure because interactions take place without direct assessment, but they can also cause feelings of isolation due to the lack of emotional contact between people. Conversely, conventional classrooms have the potential to create a sense of social security through peer support and the direct presence of teachers, but they can also increase performance anxiety due to the risk of social comparison and academic pressure in public (Mazaimi & Sary, 2023). These differences indicate that different learning approaches have the potential to cause different psychological effects on learning comfort.

Research on AI-based learning has shown various relevant findings, but has not explicitly highlighted the aspect of psychological safety in a comparative context. For example, research by Khan et al. (2025) found that AI-based learning affects students' motivation, anxiety, and cognitive load, but the study did not directly compare it with conventional learning, so it did not describe the differences in psychological safety between learning methods. In addition, research by Wah & Daud (2025) shows the effectiveness of AI in improving student learning outcomes compared to traditional learning, but this study does not include the variable of psychological safety as an evaluation indicator, so the emotional dimension of learning is still neglected. Another study by Zakariyah et al. (2025)

confirmed that AI-based adaptive learning is effective in improving achievement, but it also did not comprehensively integrate the aspect of psychological comfort, so there is still no clear understanding of the comparison of psychological safety between AI-based and conventional learning. Psychological safety refers to an individual's perception of being able to engage, express ideas, and make mistakes without fear of negative psychological consequences (Edmondson, 1999). In educational contexts, psychological safety is closely linked to students' willingness to participate actively and take intellectual risks. Cognitive Load Theory explains that excessive mental demands during learning can increase anxiety and reduce engagement, thereby weakening psychological safety. Meanwhile, academic motivation is influenced by students' perceptions of support, autonomy, and evaluative pressure within the learning environment.

In this study, psychological safety is conceptualized as an outcome shaped by both cognitive factors (such as reduced evaluation anxiety and cognitive load in AI-based learning) and social factors (such as interpersonal support and emotional connectedness in conventional classrooms). This framework guides the thematic analysis by linking learning environments to students' affective and motivational experiences.

Thus, there is a clear research gap: many studies have proven the effectiveness of AI in improving learning outcomes, but very few directly compare how two different learning environments, AI and conventional, shape psychological safety in both social (comfort of interaction) and cognitive (anxiety, motivation, and mental load) perspectives. This gap indicates the need for research that considers both sides of psychological safety, not just through the lens of learning outcomes. The novelty of this research is that it compares psychological safety in two different learning settings by analyzing the dimensions of social comfort and cognitive pressure simultaneously, rather than partially as in previous studies. Therefore, the purpose of this study is to analyze and compare psychological safety between AI-based classes and conventional classes to understand which learning model is more conducive to a sense of security to actively participate, express opinions, and make mistakes without psychological fear, taking into account both social interaction and motivational-cognitive aspects (Khatter & Dolphin, 2025).

This study offers a novel contribution by positioning *psychological safety* as the primary analytical lens in comparing AI-based and conventional learning environments. Unlike previous studies that predominantly focus on learning outcomes, efficiency, or technological effectiveness, this research explicitly examines psychological safety through both social and cognitive dimensions. By directly comparing two contrasting learning environments, this study provides a deeper understanding of how different pedagogical contexts shape students' emotional comfort, academic anxiety, and willingness to participate. This comparative and multidimensional focus distinguishes the present study from prior research and enriches the discourse on affective dimensions of AI integration in education.

Methodology

This study uses a comparative qualitative method because it aims to deeply understand the differences in psychological safety in two different learning environments, not to measure variables numerically. This method allows researchers to explore students' emotional experiences and perceptions of feeling safe to ask questions, take intellectual risks, and interact with teachers and technology in two different learning contexts, namely AI-based classes and conventional classes. Data collection was conducted through in-depth interviews with students who had experienced both learning models and analyzed using a thematic approach to identify relevant patterns of experience (Amandangi & Parahyanti, 2025).

The use of comparative qualitative analysis is also relevant because psychological safety is a multidimensional phenomenon that cannot be explained solely through quantitative data. Learning documents, student reflection notes, and learning process recordings were analyzed to obtain a comprehensive picture of the social and cognitive elements that contribute to a sense of security or psychological pressure in both learning options.

Data were collected through semi-structured in-depth interviews and supported by document analysis, including learning reflections and course interaction records. To enhance the credibility of the findings, data triangulation was applied by comparing interview data with documentary evidence. In addition, member checking was conducted by returning thematic summaries to selected participants

to confirm the accuracy of interpretations. These procedures were employed to minimize misinterpretation and strengthen the trustworthiness of the qualitative findings.The participants consisted of 18 undergraduate students who had experienced both AI-based learning environments and conventional face-to-face classrooms. The participants were enrolled in teacher education and language education programs at a private university in Indonesia. All participants had completed at least one semester in each learning mode, ensuring sufficient exposure to both instructional settings. This criterion was applied to enable meaningful comparison based on lived learning experiences. The researchers acknowledge their role as interpreters of participants' experiences. To reduce potential interpretive bias, reflexive notes were maintained throughout the data analysis process, and coding decisions were discussed collaboratively among researchers. This reflexive approach aimed to ensure that the analysis remained grounded in participants' narratives rather than researchers' preconceived assumptions.

Result And Discussion

Analysis of Psychological Safety between AI-Based Classes and Conventional Classes from the Perspective of Students' Social and Affective Dynamics

Differences in psychological safety in the context of AI-based classes and conventional classes can be understood through the social and affective dynamics that shape students' comfort when participating and expressing their thoughts. In conventional classrooms, face-to-face interactions between individuals allow students to build emotional and social relationships that can support a sense of security in asking questions, discussing, and making mistakes. However, these face-to-face interactions do not always lead to psychological security because some students experience performance pressure, fear of negative judgment, and anxiety about appearing in public. This phenomenon is reinforced by research showing that traditional learning provides space for emotional support among peers, but is also prone to social pressures that affect students' psychology (Sardila, 2025).

Meanwhile, AI-based classrooms offer a more private and socially judgment-free space for interaction, allowing students to explore learning without fear of making mistakes in front of others. AI-based adaptive learning provides automatic support based on individual abilities rather than social comparison, thereby reducing anxiety about evaluation and increasing academic confidence. For example, AI systems can automatically assess and correct errors without social expressions that can be perceived as psychological punishment. This is in line with the findings of Khan et al. (2025) that AI has a significant influence on student motivation, anxiety, and cognitive load through the personalization of learning and evaluation mechanisms without social pressure (Khan et al., 2025). Thus, AI tends to moderately reduce affective barriers to the learning process.

Although AI-based classes tend to provide psychological security in the affective domain, the question arises as to whether this compensates for the loss of the social aspect. Learners who study with digital systems predominantly interact with automated modules, rather than with peers or teachers, thereby reducing opportunities to build emotional connections. This shortcoming is a critical aspect because psychological safety is not only related to the absence of cognitive anxiety, but also to the level of comfort in social interaction, sharing experiences, and feeling accepted in a learning group. Research by Baig et al. (2025) shows that AI-based learning successfully increases the personalization of learning, but has the potential to reduce human-to-human engagement, which previously served as a source of emotional support (Baig et al., 2025). In other words, AI offers intrapersonal psychological safety, while conventional classrooms offer interpersonal safety.

Conventional learning also provides *direct social feedback*, which has great benefits for perceptions of support and increased psychological safety, especially when teachers create a safe and nonjudgmental atmosphere. Learners who feel understood tend to be more courageous in expressing their opinions and experimenting intellectually. However, not all conventional classes are able to meet these ideal conditions due to differences in teachers' abilities to create a safe and inclusive teaching environment. Research by Amandangi & Parahyanti (2025) shows that psychological safety increases when the learning environment facilitates mutual trust and openness, but this is highly dependent on interpersonal competence in social interactions (Amandangi & Parahyanti, 2025). Thus, the effectiveness of conventional classes in building psychological safety is greatly influenced by the quality of their social dynamics.

In addition to interpersonal relationships, psychological safety is also closely related to the sense of security in taking intellectual risks. AI-based classes encourage this risk-taking through the automation of evaluation without fear of social impressions, so that students can test their understanding repeatedly without fear of damaging their self-esteem. Research on the use of AI in learning shows that digital systems can strengthen self-efficacy, interest in learning, and courage to explore because they reduce exposure to direct social assessment environments (Lee et al., 2022). Conversely, conventional classrooms can inhibit intellectual risk-taking in students with high social anxiety, due to fear of being judged by peers or teachers. This difference emphasizes that conventional classrooms can create psychological safety for students with high social tendencies, while AI classrooms can create safety for students with high social assessment sensitivity.

However, ideal psychological safety requires a balance between social safety and cognitive safety. Social isolation in AI-based classrooms can create a sense of disconnection that undermines academic courage and long-term motivation. A study by Barkhowa & Primadani (2025) shows that interpersonal interactions in a supportive work context have been proven to strengthen psychological safety and innovation due to the presence of emotional relationships (Barkhowa & Primadani, 2025). When contextualized in education, AI-based learning needs to integrate forms of social interaction so that psychological safety does not only operate at the individual level, but also within the learning community. Thus, analytically, AI-based classes excel in reducing anxiety but have the potential to weaken the dimension of emotional connection; conversely, conventional classes excel in facilitating social relationships but have the potential to cause affective pressure in public assessment.

Social, Cognitive, and Technological Integration in the Formation of Psychological Safety: A Comparative Analysis of AI Classrooms vs. Conventional Classrooms

The comparison of psychological safety between AI-based classrooms and conventional classrooms must be analyzed from the integration of three main dimensions: (1) social interaction, (2) emotional-cognitive experience, and (3) learning technology structure. In AI-based learning environments, technological structures dominate the learning process, thereby changing the nature of student participation. When learning systems automatically assess academic performance, the evaluation process shifts from social relations to human-system relations, thereby reducing psychological barriers such as embarrassment or fear of being assessed directly. Research by Khatter & Dolphin (2025) shows that AI-based learning can enhance collaborative learning experiences when the system is designed to complement, rather than replace, the social role of teachers, as the integration of social and technological elements actually strengthens students' trust in the learning process (Khatter & Dolphin, 2025). Therefore, psychological safety in AI-based classrooms is complex, it supports autonomy but has the potential to weaken emotional connections if social interaction is limited.

In conventional classrooms, psychological safety is greatly influenced by interpersonal communication dynamics and the teacher's classroom management style. When social interactions are harmonious and emotional support is available, students feel safe to engage in intellectual exploration without fear of negative evaluation. However, if the classroom culture is competitive or authoritarian, social interactions become a source of psychological pressure. Research by Shahid et al. (2024) shows that psychological readiness determines an individual's attitude toward any learning system, whether technology-based or conventional, so that psychological safety is not only determined by technology but also by psychological acceptance of the learning environment (Shahid et al., 2024). Thus, the comparison of the two models depends on the presence of "interaction safety" and "evaluative safety," which can serve as drivers or inhibitors of academic exploration.

A comparative analysis of the literature can be represented in the following table to illustrate the distinguishing structure of psychological safety in both learning approaches:

Learning Model	Social Interaction	Evaluation Environment	Anxiety Level	Cognitive Load	Psychological Safety Implication
AI-Based Classroom	Low to Moderate	Private, automated, non-evaluative	Low	Low to Moderate	High individual psychological safety, but lower group belonging

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Conventional Classroom	High	Public, socially evaluated	Moderate to High	Moderate	High collective psychological safety if culture is supportive, but vulnerable to performance anxiety

The table shows that psychological safety in AI-based classes stems from *evaluative privacy* and reduced performance pressure, rather than social support. Meanwhile, psychological safety in conventional classes stems from *social support and a sense of community*, but is fragile in the face of performance anxiety. This is consistent with the findings of Nagata & Uetake (2025) that AI-based learning can increase psychological safety only if it continues to integrate emotional experiences through digital learning communities to compensate for the lack of face-to-face interaction (Nagata & Uetake, 2025). In other words, AI can create stable personal comfort but requires social intervention for emotional sustainability.

Another factor determining psychological safety is access to feedback. AI-based classes provide constant data-driven feedback so that students can know their abilities without embarrassment, while conventional classes provide interpersonal feedback that has the potential to strengthen emotional bonds but can trigger anxiety for some individuals. Conventional learning becomes effective when teachers are able to create a culture of reflection and learning without fear. Conversely, AI learning is effective when the system includes digital social support and emotional adaptation features. Research by Wah & Daud (2025) confirms that AI is most effective when used to increase a sense of security and not to replace human dynamics, because AI alone is not enough to support the long-term sustainability of student motivation (Wah & Daud, 2025). Therefore, AI is not an absolute solution, but a component of a larger learning ecosystem.

When contextualized within the needs of today's education, the best psychological safety does not come from AI alone or from a completely conventional approach, but from a learning design that combines the strengths of both. AI can address evaluative pressure, while conventional learning offers emotional support and social connectedness. This integrative approach reflects the idea that ideal psychological safety requires emotional protection and cognitive autonomy simultaneously. This is reinforced by the findings of Judijanto et al. (2025), which explain that 21st-century education requires a learning model that develops social-emotional capacity and technological adaptation simultaneously (Judijanto et al., 2025). Thus, the critical conclusion of this analysis is that both learning models can create psychological safety, but only in different dimensions; AI in the cognitive dimension, conventional in the social dimension.

Pedagogical Implications and Strategies for Optimizing Psychological Safety in AI-Based and Conventional Classes

Discussing psychological safety comparatively is not enough to understand the advantages of each learning environment, because the most important aspect of modern education is not only knowing the differences, but how to optimize both so that learning is truly psychologically and academically conducive. In the AI-based classroom model, the main pedagogical implication is the importance of maintaining elements of personalized learning while minimizing the risk of social isolation. AI can offer strong evaluative safety, but the long-term effect on motivation will depend on whether learners feel they are part of a learning community, not just users of a digital system. Research by Nagata & Uetake (2025) shows that psychological safety in AI-based learning increases when the system explicitly designs social features such as AI-based forums, virtual group work, or *AI-based cooperative task scaffolding* that foster a sense of connectedness (Nagata & Uetake, 2025). This means that AI is not a substitute for social elements, but a container that needs to be optimized to support the perception of togetherness.

In conventional classrooms, the pedagogical implications emphasize the importance of building a socially safe culture so that the power of direct interaction does not turn into performative pressure. Psychological safety will not arise simply because learning takes place face-to-face; a teaching approach that is sensitive to students' emotions is needed. Teachers must encourage inquisitive and nonjudgmental communication patterns to foster students' courage in taking academic

risks. Research by Amandangi & Parahyanti (2025) confirms that psychological safety in the learning space increases significantly when social relationships are built on trust, positive reinforcement, and the opportunity to express ideas without stigma (Amandangi & Parahyanti, 2025). Thus, conventional classrooms require classroom management strategies that can neutralize potential performance anxiety so that social dynamics become a driver, not a barrier, to the learning process.

The next strategy relates to how developmental psychology and educational technology can be integrated to reduce anxiety and cognitive load without eliminating the social value of learning. In AI-based classrooms, academic anxiety is reduced because assessments are private; however, AI has the potential to create new cognitive loads if students do not feel they have social support when they encounter learning difficulties. Khan et al. (2025) emphasize that AI increases motivation and reduces anxiety only when its adaptive features provide supportive feedback, not merely informative evaluation (Khan et al., 2025). AI-based learning needs to be designed with emotional support modules, such as automatic verbal reinforcement, self-reflection guides, and emotion-responsive learning pathways so that psychological safety is not only present due to minimal evaluation, but also through feelings of support and not being alone during the learning process.

Conversely, in conventional classrooms, psychological safety is achieved when the assessment system does not cause fear of public evaluation. Teachers can implement low-stakes learning strategies, personal reflection, and formative evaluation to reduce the performance pressure that often arises in face-to-face environments. This is in line with the principle of social-emotional learning that students need to experience positive interpersonal interactions in order to increase their self-confidence and academic courage. Findings by Sardila (2025) show that traditional learning produces the highest psychological safety when teachers act as facilitators rather than the center of evaluative attention, and when students feel they can support each other in learning (Sardila, 2025). Therefore, conventional learning is not less modern; it requires a humanistic classroom management design.

From a 21st-century learning design perspective, the optimal strategy is not the dominance of one approach, but rather the pedagogical integration of AI and face-to-face learning. Essentially, psychological safety requires synergy between social acceptance and evaluative safety. AI can provide evaluative safety by minimizing performance anxiety; on the other hand, conventional classrooms provide emotional interactions that strengthen a sense of togetherness and meaningful learning. This view is reinforced by Judijanto et al. (2025), who emphasize that education in the Society 5.0 era must integrate social-emotional competencies and the use of technology so that learning is relevant to both human and digital development (Judijanto et al., 2025). Thus, ideally, the learning environment should not choose between AI and conventional methods, but combine the advantages of both.

Furthermore, the implications of learning become even more complex when considering the dynamics of student identity and diversity. Academic anxiety is not only related to ability but also to personality traits. Introverted students or those who are sensitive to social judgment are likely to gain greater psychological security through AI systems than through face-to-face learning. Conversely, extroverted students tend to thrive in conventional environments rich in interpersonal communication. Research by Shahid et al. (2024) confirms that student acceptance of technology is greatly influenced by psychological readiness and individual learning styles (Shahid et al., 2024). This shows that there is no single approach that is ideal for all students; future learning must be flexible and adaptive to psychological diversity.

Further implications are also apparent in curriculum design and school policy. If psychological safety is an indicator of learning success, then evaluation tools should no longer only measure academic performance, but also students' perceptions of psychological safety. AI-based curricula need to integrate socio-emotional components, and face-to-face curricula need to adopt automation components to reduce evaluative anxiety. The study by Barkhowa & Primadani (2025) provides evidence that personal interaction and AI technology can reinforce each other when combined to develop creativity and innovative behavior as a derivative of psychological safety (Barkhowa & Primadani, 2025). Therefore, the combination of AI and conventional methods can create the most comprehensive learning ecosystem to support both academic and psychological development.

From the overall analysis, it can be concluded that remediation of the shortcomings of each learning model is not done by eliminating one of them, but by utilizing their strengths complementarily. AI overcomes evaluative anxiety, while conventional learning overcomes emotional isolation. Both act as two pillars that build psychological safety as a whole through two parallel paths:

intrapersonal (feelings of cognitive safety) and interpersonal (feelings of social safety). Thus, the future of psychological safety does not lie in the dichotomy of AI vs. conventional, but in hybrid learning designs based on human AI collaboration.

Conclusion

The results of the analysis show that psychological safety is formed through a combination of social safety and evaluative safety, and both learning environments (AI and conventional) are capable of creating it but through different paths. AI-based classes reduce academic anxiety and cognitive load through personalized learning and private evaluation free from social pressure, while conventional learning strengthens psychological safety through social support and emotional presence from teachers and peers. This comparison proves that psychological safety is not determined by technology or physical presence, but rather by the extent to which the learning environment allows students to participate without fear, experiment freely, and feel socially and cognitively accepted.

Thus, the most conducive learning is not determined by the dominance of AI-based or conventional approaches, but by pedagogical designs that integrate the strengths of both. Hybrid learning strategies that combine AI-based evaluative privacy with conventional emotion-based interaction offer an ideal model for fostering psychological safety as a whole. Therefore, educational institutions need to view technology not as a substitute for the human role, but as a pedagogical partner that strengthens the emotional and cognitive well-being of learners in the learning process.

This study is limited by its qualitative scope and the relatively small number of participants drawn from a single institutional context, which may restrict the generalizability of the findings. Future research is therefore recommended to employ mixed-method or large-scale comparative designs across diverse educational settings to further validate and expand the understanding of psychological safety in AI-integrated learning environments.

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