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Integrating Artificial Intelligence in Vocational Higher Education: A Case Study at Politeknik Penerbangan Makassar

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ABSTRACT

This study seeks to gauge the implementation, effectiveness, and lecturers' perceptions of artificial intelligence (AI) integration in teaching at Politeknik Penerbangan Makassar, Indonesia. A mixed-methods approach was employed, utilizing Likert-scale questionnaires to measure implementation and effectiveness, and open-ended questionnaires to assess lecturers' perceptions. The quantitative findings indicate that AI implementation is generally effective (mean = 4.00), with institutional policies and opportunities for student innovation being key factors, while infrastructure presents an obstacle. Qualitative results indicate that lecturers view AI as a transformative tool for enhancing teaching efficiency, providing instant and consistent feedback, and fostering creativity and collaboration. However, despite its benefits, lecturers emphasize the essential nature of human guidance, such as contextual feedback, emotional support, or ethical oversight. The novelty of the study's approach lies in its focus on vocational higher education, a subject that has relatively little empirical evidence, and demonstrates how the introduction of AI can supplement rather than replace pedagogues' work in learning. The implications of the findings provide practical guidance for policymakers and educators seeking more comprehensive institutional policies, targeted faculty development, and investment in technological infrastructure to leverage AI in teaching and learning effectively.

INTRODUCTION

Technology revolutionization in the 21st Century has fundamentally changed all aspects of human life including education. To be pertinent and effective, education systems need to keep pace with technological advancement in real time and respond to a changing industrial and broader society. For academia, particularly for higher education, such a shift is necessary to ensure that development and technological advancement are in harmony with the educational and human resources development. The task of vocational colleges is to generate graduates with theory as well as skills in a pragmatic way, and in a future filled with digital labour markets. In this regard, the incorporation of Artificial Intelligence (AI) into teaching and learning has become a strategic requirement for supporting vocational institutions in adapting to Industry 4.0 and Society 5.0. While AI tools offer significant potential such as adaptive learning platforms, automated assessments, intelligent tutoring systems, and predictive analytics their practical adoption varies greatly across different vocational fields. In aviation-related education, the relevance of AI is even more pronounced because the sector operates within strict international standards for safety, precision, and operational accuracy. These characteristics distinguish aviation vocational programs from other technical areas. However, despite this strategic importance, AI adoption in Indonesia's higher education system remains uneven. Limited bandwidth capacity, outdated

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hardware, insufficient digital literacy, and the absence of structured institutional policies create systemic barriers for effective implementation.

These challenges are amplified in aviation vocational education, where a higher degree of technological readiness and operational reliability is required. As a result, institutions such as Politeknik Penerbangan Makassar face a dual burden: overcoming national-level infrastructure constraints while simultaneously meeting aviation-specific competency and regulatory demands. This contextual complexity strengthens the rationale for studying AI integration within the aviation education environment rather than treating it as part of a general vocational education discourse.. International scholarship has extensively discussed the importance of integrating AI within education. For instance, Zawacki-Richter et al. (2019) mapped worldwide AI applications in higher education and found that most of the use cases were centered around administrative support and learning analytics rather than practical, skill-oriented contexts. Recent research like Holmes et al. (2021), highlighted the considerable potential of AI for adaptive learning, though significant ethical, pedagogical, and infrastructural limitations restrict its uptake. In the Asian context, Chen et al. (2020) found that AI tools-based analytics could improve learning efficiency in Chinese technical colleges, although institutional preparedness was uneven.

Likewise, Ahmad et al. (2022) in Malaysia, found that students reported having a positive perspective on AI but identified lecturers' readiness and organizational policy as most important predictors of success. These findings highlight that AI is an increasing worldwide trend but there are still systemic barriers to its application in vocational and technical education. Work on AI interventions in vocational education for example, such as vocational education, is still limited in Indonesia. Rahmatika et al. (2022) mentioned some of the advantages of AI in vocational mechanical engineering education however limited numbers of devices and absence of structured training were also barriers. Their results highlighted the discrepancy between theoretical enthusiasm and practical application in classrooms. (Chen et al., 2025) emphasized that effective integration between vocational education and industry practices significantly enhances graduate employability. However, their findings also highlight the need for stronger collaboration frameworks to ensure that AI-based vocational learning aligns with industry standards and practical applications.. (Rosyadi et al., 2023) identified that while AI applications in vocational education continue to expand, digital literacy gaps among lecturers remain a major challenge, resulting in uneven implementation of technology-enhanced learning across institutions.

These studies signal increasing acknowledgment of the potential of AI but also suggest a paucity of deep inquiry into areas with specific operations needs, such as aviation. There are unique problems and benefits in aviation education in regard to other vocational fields. Unlike machine or general scientific programs, aviation follows international accuracy, safety, and technical competencies. AI adoption in vocational and technical education has become increasingly relevant in supporting automation, safety, and adaptive learning processes. Recent studies also emphasize that AI-based learning media enhance effectiveness and engagement in vocational settings (Muttaqin et al., 2024). Hence, aviation vocational institutions should not find themselves lagging behind the AI educational approaches. However, there has been little academic research that investigates how AI tools are integrated into educational aviation programs in Indonesia, as well as what lecturers and students' attitudes toward its use are like, or reasons behind

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systemic barriers to adoption. The small scope of existing literature suggests a clear research gap. Most current researches only look at either large educational settings or fields unrelated to aviation. Studies that only consider vocational AI integration mainly tend to focus on such as a conceptual framework without any empirical bases or tend to cover technical dimensions in technology and other areas, or concentrate on other technical fields – areas where technology and the industries themselves differ a lot from aviation practices very much. Very few studies have been conducted in a common research design as to institutional readiness, lecturer/student perceptions, and regulatory support for students. As a consequence, there is a dearth of evidence regarding how AI can be effectively deployed, sustained and scaled up in aviation vocational education, at scale.

This study seeks to fill that gap by determining the role of AI at Politeknik Penerbangan Makassar, one of Indonesia's top aviation vocational institutions. The study proposes to offer empirical examination of the current use of AI in teaching and learning along with the lecturer and student views of using AI, challenges and limitations in AI adoption, and the role of regulatory and institutional framework. The unique orientation of this study toward the aviation vocation background contrasts with prior work that has predominantly been conceptual or applied in non-aviation fields. The novelty of the study is the context in which it's being set and how it's applied, providing a theoretical complement to AI and education discourse while also suggesting policy and institutional choices. Therefore, the aims of this study are; 1) study the application of AI in the learning process in Politeknik Penerbangan Makassar, 2) compare and contrast lecturers' and students' perception of AI in the academic institution, 3) discuss the challenges and impediments to AI implementation in aviation vocational education and 4) discuss the potential support or restriction of institutional and regulatory contexts for AI integration. By taking on these goals, the project would be expected to make a contribution both to the academic literature and to the practical development of vocational education in Indonesia, and world-wide.

RESEARCH METHOD

The study applied a mixed-methods explanatory sequential design (Creswell, 2022). This was firstly executed as a quantification to assess the general perceptions and experiences of learners, faculty and educational administrators on AI in vocational education, and subsequently as a qualitative phase to explore more about the patterns to emerge from the feedback given by the questionnaires. This design has been accepted since it makes sense and provides a context for quantitative findings by using qualitative findings, which has proven to be effective for AI education studies (e.g., Towards a Holistic Integration of AI in EFL Education, 2025; Investigating Student Engagement with AI-Driven Feedback, 2025).

Participants

The study participants were drawn from three classes of internal stakeholders of Politeknik Penerbangan Makassar: lecturers or teachers; management or policy-makers (program heads and coordinators); students. This multi-stakeholder design guaranteed that perspectives from implementers, decision-makers, and end-users were collected to provide a cross-section view on the integration of AI in teaching and learning. Stratified sampling strategy was implemented to have a representative sample of each group as

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suggested for mixed-methods studies in higher education (Effective Technology Integration in Higher Education, 2025). A total of 15 lecturers and 89 students were solicited for responses in the quantitative phase. A purposive sample within these groups was then collected to improve interviews and observations during the qualitative phase, in order to include people with different background and experience in interviews and observations made in the qualitative phase.

Instruments and Procedures

The quantitative instrument consisted of Likert-scale items developed to measure participants' perceptions of AI-assisted learning. The selection and justification of the Likert scale followed recent methodological recommendations. Studies from 2020–2025 emphasize the importance of selecting appropriate response categories to ensure measurement accuracy, validity, and reduced respondent bias (Huh & Gim, 2025; Kusmaryono et al., 2022; Santoso et al., 2023). These updated guidelines informed the construction and refinement of the questionnaire items. The instrument also included several open-ended questions to capture deeper insights into the implementation of AI-based learning within vocational settings. All items were reviewed by three subject-matter experts to ensure clarity, relevance, and content validity.

Instrument reliability was tested using Cronbach's Alpha. Recent literature indicates that Alpha values ≥0.70 are considered acceptable for educational and social science research (Kusmaryono et al., 2022). The decision to apply Cronbach's Alpha aligns with contemporary findings suggesting its robustness for scales with 4–7 response categories, particularly in technology-enhanced learning environments.

Construct validity was assessed through expert judgment and pilot testing. Updated analyses on Likert measurement properties emphasize the importance of evaluating potential biases arising from category number selection and respondent interpretation (Mohd Rokeman, 2024; Santoso et al., 2023).

Data Analysis

Quantitative data were analyzed using descriptive statistics (mean, standard deviation, and percentage). The interpretation of Likert-scale results followed the most recent guidelines in measurement research, which support treating Likert responses as continuous data under parametric assumptions when distributional requirements are met (Huh & Gim, 2025). This approach ensures more accurate estimation of central tendencies and variability.

Qualitative data from interviews and open-ended responses were analyzed using thematic analysis. The coding and theme development processes were conducted following modern qualitative research guidelines, ensuring analytic rigor and transparency (Mohd Rokeman, 2024). Themes were refined through constant comparison, memo writing, and inter-coder agreement procedures.

RESULTS AND DISCUSSION

Results

Implementation

Table 1 depicts the descriptive analysis showing that the average score of the Implementation variable is 4.00, which falls into the Effective category. This result indicates that respondents generally perceive the implementation of Artificial

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Intelligence (AI) within campus learning as functioning optimally. The interpretation of this score aligns with contemporary educational measurement practices, where values ranging from 3.40 to 4.19 are categorized as effective levels of implementation. This categorization approach is consistent with recent studies such as (Atoulloh et al., 2024), who used descriptive score intervals to determine the effectiveness of learning interventions within the educational environment.. This result is in line with systematic reviews that found that AI implementation in higher education offers promising developments in learning personalization and overall teaching efficiency when it is enabled by appropriate policies and facilities. Such positive effects of AI in higher education should instill a sense of optimism and hope in the audience (Garzón et al., 2025).

Table 1. Descriptive Statistics of Implementation.

Statements (Items)	Cronbach's α	Mean	Std. Deviation	Category
K1.1	0.913	3.98	0.73	effective
K1.2	0.913	4.22	0.68	Effective
K1.3	0.913	4.01	0.70	Effective
K1.4	0.913	4.12	0.64	Effective
K1.5	0.913	4.20	0.62	Effective
K1.6	0.913	3.89	0.80	Effective
K1.7	0.913	3.56	1.01	Fairly effective
K1.8	0.913	4.08	0.73	Effective
Overall Mean	**0.913**	**4.00**	**–**	**Effective**

A more in-depth investigation of each item shows that item K1.2 had the highest score, with an average of 4.22, and emphasizes the critical role of campus policies for the effective adoption of AI. This shows how an infrastructure of regulations and policies has an impact on attitudes toward new technologies. Research in the area of AI education policy confirms that a well-designed policy framework, such as usage guidelines, ethics, and automated evaluation arrangements, is a priority for responsible and effective introduction of AI in educational environments. Thus, the conclusion that campus policies are considered necessary is in alignment with the AI policy framework suggested for higher education (Chan, 2023)

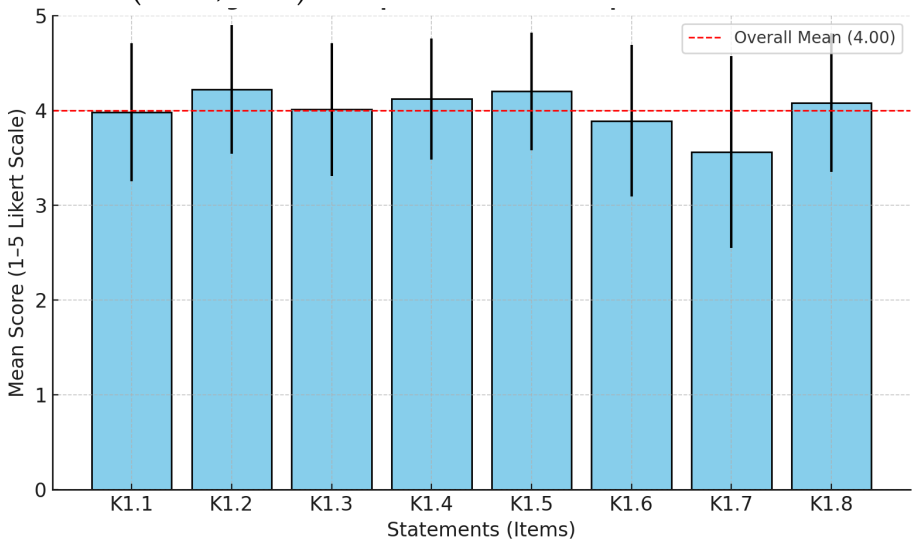

Figure 1. Descriptive Statistics of Implementation.

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Furthermore, a high score was also achieved for K1.5 (mean = 4.20), which emphasizes the importance of allowing students an avenue to innovate using AI. This implies that respondents agree that AI can help promote creativity and collective learning. AI also proves the ability of customized and intelligent tutoring applications in the student journey when it becomes an approach to learning that fosters a pedagogical tool for inquiry and discovery and to develop a project towards experimental research (Létourneau et al., 2025). For item K1.7, the lowest score, on the other hand, was recorded (mean = 3.56). This is a result of the problems caused by insufficient campus facilities. Our results suggest that despite a broad tendency to use AI, there is a pressing need to strengthen technology infrastructure in order to provide us with optimal benefits. That said, technology-related barriers such as network availability, hardware and using cloud services or AI models remain outstanding hurdles. Most recent papers have also echoed this result with findings that highlight the challenges of AI adoption, from infrastructure gaps to the digital divide.

Therefore, technological capacity strengthening needs to be made a priority for large scale deployment (Novianti, 2025). The reliability test confirmed that as a result of Cronbach's Alpha tests, this was 0.913, which is a very high value. This means that all the items of the Implementation variable had a high level of internal consistency, which means the instrument is valid for measuring aspects of AI implementation. This enhances the validity of the findings and proves that the instrument is applicable in capturing the respondents' thoughts about the application of technology to learning. Overall, with a valid instrument, such findings give a good empirical basis on which to recommend future policy and technical measures. Implications The findings of the present study lend support to a comprehensive approach that encompasses the following: (1) clear institutional policy regarding AI use (policy & governance), (2) the continued training of faculty and other staff to ensure effective pedagogical embedding of AI and (3) resources directed at IT infrastructures (networks, devices, and cloud services). Comparable strategies such as a multifaceted effort involving policy, training, and infrastructure intervention have been suggested over the past decade to guarantee equal access and sustainability in the adoption of the capabilities that AI offers to education (Chan, 2023).

According to the responses of lecturers, there is a variety of advantages of incorporating AI in Engineering and any other courses, especially as part of the teaching and learning. From a pedagogical perspective, AI is able to customize material to students' abilities. It allows them to monitor learning progress at any given moment, and also to provide relevant simulations for engineering practice on learning outcomes. The lecturer has efficiency in task grade procedure, administration automation – attendance, reporting. Furthermore, AI is able to open access to international references and increase students' learning motivation as a consequence of the interactive interface of AI, which enables them, especially those who are learning to be themselves. There are also a number of difficulties which lecturers also identified. At a pedagogical stage, over-dependence on AI could lead to less face-to-face interaction between instructors and learners, create dependency that stifles creativity and encourage cheating via instant response copying. Technically speaking, the accuracy of AI replies still needs confirmation — most of these systems are designed for English, meaning a language barrier and the discrepancy in campus infrastructure and student infrastructure adds to the difficulty. Taken in the round, lecturers tend to see AI as a powerful learning support tool to prepare students for the technology-driven business environment. Still, lecturers have an active need for

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efficient AI implementation. They play an essential role in helping to provide direction, filtering information, and enhance academic integrity, something that is in addition to being, well they do, helpful and critical to AI's successful adoption in the education community.

Looking at problems of using AI in learning, it has become clear that these issues can be divided into three major categories: technical, pedagogical, and institutional. These perspectives offer an overall picture of the difficulties AI will face when integrated into educational environments. The difficulty of introducing AI into education comes from a technical perspective: its challenges are huge. The biggest challenge we face daily is AI inaccurate answers. As one teacher said: 'I do believe that AI answers the questions quickly, but sometimes it makes mistakes and I tend to make them myself, that is why if I don't fix this students will sometimes misinterpret my answers.' This discrepancy can cause confusion and slow down the learning process. Inadequate user technology and infrastructure (e.g., unreliable, and often unstable internet connections) may also hamper AI implementation. There are language barriers, too, with most AI systems now operating optimized more in English than they are in other languages.

Lecturer's Perception

The responses presented by the lecturers also reveal that most of them feel that AI integration will affect the future role of lecturers, however not in its entirety. Rather than just a replacement for teachers, AI is considered more as a force for change. A certain number of lecturers commented that the traditional status of the information provider will decrease, because, "AI helps automate feedback and speaking practice, but lecturers remain important for guiding students' cultural, emotional, and motivation." The majority of lecturers said they had shifted their main responsibilities to being facilitator, mentor, and director. This seems clear in the dictum, "Lecturers will become facilitators, mentors, and directors more and more." Indeed, AI integration for some lecturers can offer the chance to increase their own knowledge based on the existing literature, as AI-produced information is from a world literature. However, challenges remain. They worry that students will become more dependent on AI or might prefer AI to human interaction (face-to-face lectures). Instructed people also know they have to continue learning to stay relevant in the tech developments. This awareness of the continual need to learn can inspire us to remain dedicated to our work as lecturers: "AI integration will force lecturers to continue learning.

Otherwise, we could be left behind by technology." But many lecturers stress that AI can never replace education. While technology can assist with instruction, education--integrated with values, ethics, and contextual social practices--still relies on human interaction. "The teaching process can be replaced or intervened by AI, but education never can," said one lecturer. In general, lecturers' attitudes are mixed about AI integration. There is still hope that transformation and more of a role would follow. A strong caution also holds towards the potential impact on the learning process and lecturer-student relationships. This understanding will prepare us for what lies ahead. On the lecturer side, chatbots (ChatGPT, Copilot, Gemini, Elsa Speak or similar platform) are believed to have huge potential.

A lot of lecturers accept that chatbots can have a tangible impact on things, whether that be a time-saving or an effort-reducing benefit for the individual doing the class exercises. E.g., "In certain instances chatbots may lessen the dependence on lecturers to

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assist them by answering routine or administrative questions." Using chatbots students study with no time delay; they are even better for reviewing material. As one speaker has said: "Chatbots are quite helpful for students because they can ask questions anytime, even outside of class hours... this saves me time too." But most of the speakers stressed the criticality of using chatbots correctly. They believe digital literacy is crucial to keep students from hearing every answer at face value: 'The use of chatbots must be accompanied by digital literacy. Otherwise, students might accept every answer at face value.' This emphasises the need for educators to show students how to critically evaluate the information that chatbots generate for students to evaluate the information given in chatbots critically.

Moreover, it is said that clear rules will be needed not to allow chatbots to be abused in the area of plagiarism. They said, while chatbots may be useful, educators still stressed chatbots were not without their drawbacks. Chatbots, one lecturer likened them to calculators: "A tool to make things easier, but it should not take the place of how you think." Moreover, the deepest weakness of a chatbot is that it cannot understand students' moods, relationships, social context. There was a general sense of cynicism in the comments. "I remain skeptical, because chatbots can't understand students' emotions and cultural contexts."

Overall, lecturers' views on chatbots were somewhat ambivalent, with many recognising the advantages of chatbots in terms of efficiency, access, and enriching content, and acknowledging the need for lecturer mediation and supervision of their use within a formal teaching relationship. This guidance is important for keeping students critical, not passive, and for preventing them from making errors or misusing information. Teachers must ensure that chatbots supplement learning rather than replace it. The pedagogical issues regarding AI in teaching and learning are no less crucial. There are also concerns that AI may compromise the quality of education, with some lecturers noting that students are becoming overly dependent on it. This dependence could result in less critical thinking, as students start to do nothing but wait for the answer without being able to think critically.' A significant challenge is determining whether or not originality of work is being demonstrated — 'with the help of AI, almost all answers sound neat, but they do not reflect their true understanding.' Moreover, to make matters worse, AI has even been misused to impersonate exam answers, which has generated huge ethical concerns." Also, lecturers fear the decreasing amount of human interaction in the classroom because 'students tend to spend more time in dialogue with AI than in discussions with their peers or me.'

From the lecturers' and institutions' perspective, many of the challenges arose from time pressures in learning about AI, syllabus restrictions, and concerns about students' data privacy. As well, some of my colleagues were resistant to using AI in the classroom. The cost of premium access for better AI capabilities also prevented many from using them. All in all, lecturers realized that while adopting AI offers vast possibilities, it also introduces an existential crisis, summarized with a single quote: "The hardest thing is balancing. On one hand, I want my students to be in touch with the latest technology, but I have concerns that they are going to miss authentic learning." As such, this balance is vital for the adequate deployment of AI in education.

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The effectiveness

Based on the descriptive analysis of the Likert-scale questionnaire (Table 1), the average score for the Effectiveness variable was 4.00, falling within the "Effective" category as commonly interpreted in recent IJORER studies on learning outcomes and technology-enhanced learning (Atoulloh et al., 2024). This indicates that respondents perceive the integration of Artificial Intelligence (AI) in learning at Politeknik Penerbangan Makassar as functioning well and supporting the learning process. The quantitative results show that AI is particularly effective in providing timely feedback, supporting personalized learning, and enhancing students' practice and engagement.

A more detailed examination of individual items reveals that lecturers rated aspects such as feedback speed, consistency, and objectivity highly. Many noted that AI enables students to identify their weaknesses immediately, without waiting for manual correction, thereby enabling real-time improvement. Lecturers also reported a motivational effect, as students feel attended to even when the feedback is machine-generated: "AI can be consistent in providing feedback, not biased like humans. But sometimes it feels rigid and inflexible."

However, the lowest-scoring items indicated areas for improvement. Lecturers highlighted that AI feedback can sometimes be too brief, too general, or misaligned with local standards. For analytical or essay-based tasks, AI often fails to provide sufficient contextual guidance: "Its effectiveness varies. For technical materials, AI can provide detailed feedback, but for analytical essays, the feedback is often too general."

The qualitative responses underscore that AI's effectiveness depends on integration with lecturer involvement. While AI excels at providing rapid evaluation and basic feedback, the lecturer's role remains essential for interpretation, local context, and more detailed guidance. Lecturers consistently emphasized that AI is a complement rather than a replacement: "In general, I find AI quite effective, but it's not the sole solution. The best integration is to complement traditional teaching."

Overall, these findings suggest that AI effectively enhances learning by improving feedback speed, consistency, and engagement. However, its maximum effectiveness is achieved only when combined with human guidance and pedagogical support. This aligns with recent research indicating that AI can improve learning outcomes while enabling lecturers to focus on higher-order instructional tasks. (Garzón et al., 2025; W. B. M. F. C. Holmes, 2019)

Discussion

Implementation

Responses from the lecturers of Politeknik Penerbangan Makassar reveal a clear, ambivalent picture: AI is regarded as a powerful enabler for vocational and engineering teaching – particularly for personalization, effective feedback loops, simulation-based practice, and administrative efficiency – but it also raises pedagogical, technical, and institutional risks that need to be carefully addressed.

Pedagogically, educators appreciated AI's ability to personalize learning paths, facilitate prompt formative feedback, and facilitate realistic simulations for engineering practices. This aligns with recent surveys that found intelligent tutoring systems (ITS) and chatbots increase engagement, customize support, and improve learning outcomes, particularly in higher education (Labadze et al., 2023; Okonkwo & Ade-Ibijola, 2021). In vocational settings, AI-enabled simulation-based learning demonstrated a highly

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positive effect, with educational technology using simulation-like solutions to replace costly or unsafe laboratory work for students, as in engineering education (Simulation in Engineering Education Review, 2024). Automation of grading and administration was identified as a potential value-addition in terms of the speed of instruction, with research evidence that AI can alleviate lecturers' workload and spare time for mentoring and higher-level teaching tasks (Garzón et al., 2025). However, the answers also exposed pedagogical binders. Over-reliance on AI could weaken students' critical reasoning and creativity, and cause them to learn material at a shallow level or commit plagiarism, they said. Research strongly supports these concerns, indicating that although AI can provide instant answers, it may, in fact, promote academic dishonesty in the absence of adaptive assessment approaches (Cotton et al., 2024; Okonkwo & Ade-Ibijola, 2021). Moreover, the AI's feedback appeared quick but superficial, particularly for open-ended or analytical problems. Such results are consistent with previous meta-analytic research on ITS. Although ITS are very effective for procedural and objective tasks, their impact may be less pronounced in contexts requiring higher-order reasoning and complex writing, especially when the tasks and assessments are not tightly aligned with the ITS design (Kulik & Fletcher, 2016; Lin et al., 2023a). They call for blended approaches where AI enables drill and practice but with context on commentary to support academic performance, ethical reflection, and socioemotional coaching from lecturers (Crompton et al., 2024)

From a tech perspective, the challenges are just as critical. Lecturers described inconsistent value of AI responses, English-heavy outputs, and inequitable access based on infrastructure divides. This resonates with broader discourse on the digital divide and language bias in AI systems that can widen educational disparities in non-English-speaking and low-resource settings (Digital Divide in AI Education, 2025; Crompton et al., 2024). The challenge of securing equitable access is therefore to invest in infrastructure, adapt to language, and develop contextual solutions tailored to Indonesian vocational education. Institutions faced challenges: the added responsibility placed on lecturers to learn new tools, the mismatch between AI applications and traditional curricula, and the issue of student data privacy.

Findings are supported by recent literature that makes clear that integrating AI into education goes beyond technological readiness and requires teacher professional development, ethical considerations, and curricular redesign. (Garzón et al., 2025; Toledo Tan et al., 2024). This suggests, indeed, that this is a systemic as well as a technical system, with resistance from colleagues alongside worries around subscription fees for advanced AI tools underscoring it further. More generally, we argue that AI can be both an opportunity and a menace for vocational higher education. On the one hand, it is improving personalized learning, improving performance, and better preparing students for jobs in tech-based fields. On the other hand, reliance on technology risks moral transgressions and the degradation of the human-centered education system. Successful integration of AI will inevitably require a balance between innovation and tradition. Lecturers' roles will not be reduced but will be transformed into facilitators, mentors, and moral advisors for AI-based education, helping faculty shift from transmitters of knowledge to interpreters, guides, enablers, and ethical guides in an AI-facilitated learning environment. (Labadze et al., 2023; Toledo Tan et al., 2024). For Politeknik Penerbangan Makassar, this equilibrium is even more significant as the goal is not just to

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produce technically competent graduates, but also professional, disciplined, judicious, and ethically-grounded graduates are anticipated.

Lecturers Perception

Findings of this study suggest that lecturers view the incorporation of artificial intelligence (AI) as an inevitable and powerful element of their professional role. Though there is widespread agreement that AI will not completely replace lecturers, there is also consensus that their roles and duties will change. Lecturers expect to transition from providing information to becoming facilitators, mentors, and guides rather than content providers. This aligns with previous studies that suggest AI can promote pedagogical roles that shift learning processes away from traditional knowledge transmission toward facilitative, learner-centred approaches. (Daher, 2025; Garzón et al., 2025). One lecturer wrote: "AI supports feedback and speaking, but lecturers are important in shaping students' cultural context, emotions, and motivations."

To many lecturers, their perspective on this transformation is rosy: AI promises to make new knowledge accessible to the world and to simplify the tedious little chores commonly handled by teachers (and lecturers). Such optimism echoes results from studies that have found efficiency-enhancing properties of AI in grading, feedback, and class administration. This frees lecturers to devote themselves to higher-order teaching tasks (Crompton et al., 2024; Okonkwo & Ade-Ibijola, 2021). Instructors at Politeknik Penerbangan Makassar also noted that AI's global knowledge base can broaden their perspectives, as described in the literature examining AI as an agent of knowledge expansion and an evidence-based approach to teaching (An et al., 2025; Kandlhofer et al., 2016).

However, even now, there is a small quantity of ambivalence about this success. The concern students developed about the reliance on AI or their lack of participation in traditional classroom interactions, as raised by lecturers. These findings resonate with those of (Cotton et al., 2024), the possibility not of critical oversight but of dependence on AI tools, leading to a reduction in authentic learning. Likewise, for example, (Lee et al., 2021), highlighted that although AI contributes to the establishment of personal learning paths, overuse can limit students' capacity to solve problems independently.

Chatbots like ChatGPT, Microsoft Copilot, and Elsa Speak were recognized as powerful tools, especially for taking learning outside the classroom. They were reported to be efficient at handling repetitive and administrative queries, making it easier for students to reach out for help at any time. This is in agreement with (Lin et al., 2023b), who claimed that chatbots promote learner autonomy and reduce educators' burden in higher education. Amid these developments in the learning environment, the university also emphasized the need for digital literacy to help students analyze AI-generated outputs critically: "The deployment of chatbots needs to be supported by digital literacy. Otherwise, students may take every answer at face value." This is representative of a wider worry about disinformation, and the specific context limitations of AI outputs (Labadze et al., 2023).

Even when lecturers acknowledged practical benefits, they expressed skepticism about chatbots. Concerns included errors in the responses, a lack of sensitivity to cultural and contextual dimensions, and failing to address students' emotional needs. An instructor likened chatbots to calculators: "A tool that streamlines things, it is not supposed to substitute the thought process." It reflects (Kulik & Fletcher, 2016) The point

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of view stresses that teachers provide emotional, cultural, and social dimensions in education, which are irreplaceable elements, and it shows this caution. Overall, lecturers' views are both optimistic and cautious. On the one hand, AI and chatbots are viewed as agents of innovation, enabling efficient work, personalized opportunities, and greater reach into the learning process.(Garzón et al., 2025; W. Holmes et al., 2022). Concerns about over-reliance, quality assurance, and ethics (e.g., plagiarism), however, remain. This indicates that while AI integration is often achieved through technical adoption, instructors made significant contributions to formulating, filtering, and contextualizing the content. In its absence, the vulnerabilities of passivity, misinformation, and the erosion of lecturer-student relationships may overshadow possible gains.

The effectiveness

The quantitative Likert-scale survey indicates that the use of AI in learning at Politeknik Penerbangan Makassar is considered adequate, with an overall mean score of 4.00 (“Effective”) (Atoulloh et al., 2024). The highest score on K in the scale was found for item K1.2 (M = 4.22), highlighting the significance of institutional policies that facilitate the adoption of AI, and K1.5 (M = 4.20) emphasized the benefits of allowing students to explore creatively with AI. Conversely, K1.7 ranked lowest (mean = 3.56), indicating that the lack of infrastructure remains a significant obstacle to realizing AI's potential. This is evidenced by a Cronbach’s Alpha value of 0.913, indicating high reliability in capturing respondents' views on AI implementation. Overall, these findings indicate that AI integration is occurring appropriately within the existing institutional context, especially when policies, pedagogical support, and innovation pathways are in place (Chan, 2023; Garzón et al., 2025; Létourneau et al., 2025; Novianti, 2025).

These findings are further explained by qualitative feedback from lecturers on the utility of AI and its contributions to learning effectiveness. When examining AI as a pedagogical tool, its advantages include the ability to provide timely, consistent, and objective feedback, helping students recognize weaknesses and take corrective action. As one lecturer stated, “AI can deliver feedback, not in a biased way like humans, consistently. Nevertheless, occasionally it seems constricting and set in its ways.” This view is consistent with research showing that AI-powered feedback speeds up evaluation, enhances procedural learning, and may have a positive effect on the motivation of the student (Qassrawi, 2025; Shi & Aryadoust, 2024). AI also enhanced productivity in administrative activities, including basic practice tasks, freeing up time for lecturers to focus on more advanced pedagogical tasks. (Crompton et al., 2024; W. Holmes et al., 2022)

Even with its benefits, lecturers also noted that AI is not very good at offering contextual and nuanced feedback. Short, abstract answers and generalization to local standards also became typical features of the input, especially in analytical or open-ended assignments. “AI is effective in general (and) I find AI quite effective in general, but it is not the sole solution,” said a couple of lecturers. “Integrating new technologies is best when integrating them with the existing teaching.” supports this view, arguing that AI-powered assessments are less potent in enhancing education than their use, observing that the educational value of AI relies on the capacity of the instigators to moderate and contextualize automated feedback.

Lecturers also emphasized the motivational aspect of AI, especially when real-time, timely, and objective feedback is provided. Students say they are “monitored and

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supported," leading to greater engagement and prompt remedial actions. These elements have been empirically proven to enhance students' attainment and mastery in technical and vocational contexts, even when physical lab access is restricted. (Alsaiari et al., 2024).

Still, obstacles to effectiveness persist. Barriers were repeatedly cited, including infrastructure problems, students' over-reliance, potential ethical dilemmas such as plagiarism, and a loss of interaction with fellow students. In turn, these limitations reflect the quantitative evidence, where infrastructure had the lowest score, indicating a visible barrier to the effective implementation. AI cannot supplant the human element of education, especially when it comes to emotional, cultural, and social facets. (Kulik & Fletcher, 2016). Finally, combining both quantitative and qualitative findings indicates that AI integration works when it complements human instruction rather than replacing it. Effective AI use requires:

1. Clear institutional policies and governance to guide responsible adoption (Chan, 2023);
2. Opportunities for students to engage in innovative and collaborative tasks (Létourneau et al., 2025).
3. Adequate infrastructure to support smooth implementation (Novianti, 2025); and
4. Active lecturer involvement to provide interpretation, contextual alignment, and emotional support.

Final Words: AI can significantly improve learning effectiveness in vocational education by automating routine tasks, providing timely feedback, and offering extensive learning opportunities. Nevertheless, the most effective results come through active lecturers who facilitate the integration of AI while ensuring that learning happens to enable the best practice (innovative tech) without detriment to pedagogy or student growth.

CONCLUSION

This study examined the implementation, effectiveness, and lecturers' perceptions of Artificial Intelligence (AI) integration in teaching and learning at Politeknik Penerbangan Makassar. The results indicate that AI integration is generally effective, as reflected in the mean score of 4.00, and are supported by qualitative evidence showing that lecturers view AI as a tool that enhances feedback quality, supports instructional tasks, and stimulates student creativity. While AI strengthens efficiency and access to knowledge, the findings also affirm that it cannot replace the human elements of teaching—such as emotional understanding, contextual judgment, and professional expertise.

The practical implications of these findings are particularly relevant to the vocational training goals of aviation education. Since aviation requires high-precision competencies, hands-on simulation accuracy, adherence to safety protocols, and procedural standardization, the study highlights that weaknesses in infrastructure (e.g., low bandwidth, outdated hardware) directly hinder the effective use of AI-based simulation tools and learning analytics that are essential for competency-based aviation training. Likewise, lecturers' limited digital literacy impacts their ability to guide students in AI-supported tasks such as troubleshooting, risk-scenario analysis, and virtual laboratory practice key components in aviation skill formation. Therefore, AI should be positioned

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as a supportive pedagogical partner that enhances, rather than replaces, human instructors in technical and safety-critical learning environments.

Successful AI implementation requires institutional readiness, clear regulatory guidance, reliable technological infrastructure, and continuous professional development for educators. Ethical considerations including privacy, accountability, and inclusivity must also be prioritized to ensure that AI use strengthens rather than diminishes the human-centered nature of vocational aviation education.

This study is limited by its single-institution scope and reliance on self-reported data, which may influence the perceived effectiveness. Despite these limitations, the findings provide important insights into AI readiness and adoption within aviation-focused vocational higher education settings.

Future research should expand into multi-institutional aviation and engineering contexts and adopt longitudinal methods to examine long-term impacts of AI on instructional performance and student skill development. Further investigations into ethical, regulatory, and socio-technical aspects of AI are needed to support the development of sustainable, responsible, and human-centered AI integration in aviation education.

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REFERENCES

Alamri, W. A. (2019). Communicative language teaching: Possible alternative approaches to CLT and teaching contexts. *English Language Teaching, 12*(8), 73–93. https://doi.org/10.5539/elt.v11n10p132

Alrawashdeh, A. H., & Al-Zayed, N. N. (2019). The effect of a computer program based on virtual reality on students' achievement in physics. *Journal of Education and Learning, 8*(1), 23–35. https://doi.org/10.5539/jel.v8n1p23

Alsaiari, O., Baghaei, N., Lahza, H., Lodge, J., Boden, M., & Khosravi, H. (2024). Emotionally Enriched Feedback via Generative AI. http://arxiv.org/abs/2410.15077

Al-Samarraie, H., & Saeed, N. (2018). A systematic review of cloud computing tools for collaborative learning: Opportunities and challenges to the blended-learning environment. *Computers & Education, 124*, 77–91. https://doi.org/10.1016/j.compedu.2018.05.016

Authors. (2025). *Effects of an AI-supported approach to peer feedback in EFL contexts*. [Details incomplete].

Authors. (2025). *Emotionally enriched feedback study*. [Details incomplete].

Atoulloh, A., Fitriani, A., & Daryono, R. W. (2024). *Exploring the Influence of Game-Based Learning and School Environment on Learning Achievement: Does the Mediation of Self-*

IJORER : International Journal of Recent Educational Research
Homepage : https://journal.ia-education.com/index.php/ijorer
Email : ijorer@ia-education.com

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IJORER, Vol. 6, No. 6, November 2025
Page 1981-1997

Intention Matter, International Journal of Recent Educational Research (IJORER), 5**(3).**

Aydin, S. (2019). Technology and foreign language teaching: A literature review. *Journal of Language and Linguistic Studies, 15*(1), 1–12.

Bahari, A. (2021). Artificial intelligence in education: Opportunities and challenges. *Journal of Artificial Intelligence in Education, 31*(2), 215–232. https://doi.org/10.1007/s40593-021-00258-0

Boholano, H. B. (2017). Smart social networking: 21st century teaching and learning skills. *Research in Pedagogy, 7*(1), 21–29. https://doi.org/10.17810/2015.45

Buckingham Shum, S., Ferguson, R., & Martinez-Maldonado, R. (2019). Human-centred learning analytics. *Journal of Learning Analytics, 10*(3), 1–15. http://dx.doi.org/10.18608/jla.2019.62.1

Cabot, J., & Ciurana, E. (2019). *Web 2.0 design patterns*. Springer. https://doi.org/10.1007/978-1-4842-4191-8

Chan, C. K. Y. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education, 20*(1), 38. https://doi.org/10.1186/s41239-023-00408-3

Creswell, J. W., & Creswell, J. D. (2022). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

Crompton, H., Edmett, A., Ichaporia, N., & Burke, D. (2024). AI and English language teaching: Affordances and challenges. British Journal of Educational Technology, 55(6), 2503–2529. https://doi.org/10.1111/bjet.13460

Çukurova, M., Luckin, R., & Clark-Wilson, A. (2019). Creating the golden triangle of evidence-informed education technology with EDUCATE. *British Journal of Educational Technology, 50*(2), 490–504. https://doi.org/10.1111/bjet.12727

Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2024). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, *61*(2), 228–239. https://doi.org/10.1080/14703297.2023.2190148

Dignum, V. (2018). Ethics in artificial intelligence: Introduction to the special issue. *Ethics and Information Technology, 20*(1), 1–3. https://doi.org/10.1007/s10676-018-9450-z

Fitria, T. N. (2021). Artificial intelligence in education: A study of ChatGPT in academic writing. *Indonesian Journal of English Language Teaching and Applied Linguistics, 6*(2), 245–260. https://doi.org/10.21093/ijeltal.v6i2.1112

Fryer, L. K., & Bovee, H. N. (2018). Staying motivated to learn: Personality, academic orientation and teachers' competence. *Educational Psychology, 38*(6), 743–760. https://doi.org/10.1080/01443410.2018.1457775

Garzón, J., Patiño, E., & Marulanda, C. (2025). Systematic review of artificial intelligence in education: Trends, benefits, and challenges. *Multimodal Technologies and Interaction, 9*(8), 84. https://doi.org/10.3390/mti9080084

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., Shum, S. B., Santos, O. C., Rodrigo, M. M. T., Cukurova, M., & Bittencourt, I. (2021). Ethics of AI in education: Towards a community-wide framework. *International Journal of Artificial Intelligence in Education, 31*(4), 1–23. https://doi.org/10.1007/s40593-021-00239-1

IJORER : International Journal of Recent Educational Research
Homepage : https://journal.ia-education.com/index.php/ijorer
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p-ISSN : 2721-852X ; e-ISSN : 2721-7965
IJORER, Vol. 6, No. 6, November 2025
Page 1981-1997

Indonesian Ministry of Education and Culture. (2003). *Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional*.

Indonesian Ministry of Education and Culture. (2013). *Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 70 Tahun 2013 tentang Kerangka Dasar dan Struktur Kurikulum Sekolah Menengah Kejuruan/Madrasah Aliyah Kejuruan*.

Indonesian Ministry of Education, Culture, Research, and Technology. (2022). *Kurikulum Merdeka: Buku saku*.

M. Kandlhofer, G. Steinbauer, S. Hirschmugl-Gaisch and P. Huber, "Artificial intelligence and computer science in education: From kindergarten to university," 2016 IEEE Frontiers in Education Conference (FIE), Erie, PA, USA, 2016, pp. 1-9, doi: 10.1109/FIE.2016.7757570.

Kukulska-Hulme, A. (2020). Mobile-assisted language learning [MALL]: A selected annotated bibliography (2005–2019). *Language Learning & Technology, 24*(2), 1–23. https://doi.org/10125/44782

Kulik, J. A., & Fletcher, J. D. (2016). Effectiveness of Intelligent Tutoring Systems: A Meta-Analytic Review. Review of Educational Research, 86(1), 42–78. https://doi.org/10.3102/0034654315581420

Lin, C. C., Huang, A. Y. Q., & Lu, O. H. T. (2023). Artificial intelligence in intelligent tutoring systems toward sustainable education: a systematic review. In Smart Learning Environments (Vol. 10, Issue 1). Springer. https://doi.org/10.1186/s40561-023-00260-y

Li, Y., Zhang, X., & Chen, Z. (2025). *Impact of Industry and Education Integration on Employment Quality in Higher Vocational Colleges: Moderating Role of Faculty Qualifications and Curriculum Development Capacity. Education Sciences, 15*(10), 1316. https://www.mdpi.com/2227-7102/15/10/1316

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson.

Létourneau, A., Deslandes Martineau, M., Charland, P., Karran, J. A., Boasen, J., & Léger, P. M. (2025). A systematic review of AI-driven intelligent tutoring systems (ITS) in K-12 education. NPJ Science of Learning, 10(1), 29. https://doi.org/10.1038/s41539-025-00320-7

Mayer, R. E. (2021). *Multimedia learning* (3rd ed.). Cambridge University Press. https://doi.org/10.1017/9781108894333

Nguyen, A., & Bui, T. (2022). Artificial intelligence in education: Opportunities, challenges, and policy implications. *Journal of Educational Technology & Society, 25*(1), 1–14.

Novianti, I. (2025). An exploratory study on the challenges of AI technology in education and its practical recommendations. *International Journal of Social Science Research and Review, 8*(1), 26–37. https://doi.org/10.47814/ijssrr.v8i3.2481

OECD. (2021). *AI and the future of skills: Policy implications*. OECD Publishing. https://doi.org/10.1787/5ee7f09b-en

Okonkwo, C. W., & Ade-Ibijola, A. (2021). Chatbots applications in education: A systematic review. Computers and Education: Artificial Intelligence, 2, 100033.

Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning, 12*(1), 22. https://doi.org/10.1186/s41039-017-0062-8

IJORER : International Journal of Recent Educational Research
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p-ISSN : 2721-852X ; e-ISSN : 2721-7965
IJORER, Vol. 6, No. 6, November 2025
Page 1981-1997

Qassrawi, R. (2025). A meta-analysis of AI-based feedback systems in education. *Journal of Educational Computing Research*. Advance online publication. https://doi.org/10.1007/978-981-96-2532-1_20

Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.

Rosyadi, M. I., Kustiawan, I., Tetehfio, E. O., & Joshua, Q. (2023). *The Role of AI in Vocational Education: A Systematic Literature Review. Journal of Vocational Education Studies (JOVES)*, 6(2), 122–136. https://doi.org/10.12928/joves.v6i2.9032

Shi, L., & Aryadoust, V. (2024). Automated written feedback and its impact on procedural writing skills. *Language Learning & Technology, 28*(1), 45–64. https://doi.org/10125/73901

UNESCO. (2021). *AI and education: Guidance for policymakers*. UNESCO Publishing.

Yang, X., Gao, Y., & Shen, J. (2024). Student interaction with AI-generated feedback: Opportunities and challenges. *Computers & Education, 200*, 104790. https://doi.org/10.1016/j.compedu.2023.104790

Zheng, Y., Li, X., & Wang, H. (2024). Simulation platform for intelligent manufacturing education: Reinforcing technical competencies through robotics experimentation. *International Journal of Engineering Education, 40*(2), 120–134.

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