JIKAP
Jurnal Informasi dan Komunikasi Administrasi Perkantoran
Vol. 10, No. 3, 2026
Hlm. 277

Teachers' perceptions of artificial intelligence (AI) integration in learning at SMKN 3 Surakarta

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Abstrak

Penelitian ini bertujuan untuk mengetahui: (1) sikap guru SMK N 3 Surakarta terhadap penggunaan Artificial Intelligence (AI) dalam pembelajaran, dan (2) persepsi guru terhadap integrasi AI dalam proses belajar mengajar.Penelitian ini dilatarbelakangi oleh masih terbatasnya kajian yang secara spesifik membahas persepsi guru sekolah menengah kejuruan terhadap penggunaan AI dalam konteks pembelajaran. Menggunakan pendekatan mixed methods dengan desain explanatory sequential, data kuantitatif diperoleh melalui angket kepada 73 guru, sedangkan data kualitatif dikumpulkan melalui wawancara terstruktur, observasi langsung, dan dokumentasi untuk memperdalam hasil kuantitatif. Hasil menunjukkan bahwa sebagian besar guru bersikap positif terhadap penggunaan AI karena mendukung efisiensi dan personalisasi pembelajaran. Namun, kekhawatiran juga muncul terkait pemahaman teknologi, keterbatasan pelatihan, dan potensi tergantikannya peran guru. AI dipandang sebagai alat bantu, bukan pengganti guru. Penelitian ini merekomendasikan pelatihan berkelanjutan, penguatan literasi AI, serta kebijakan implementasi yang bertahap dan etis untuk mendukung pemanfaatan AI secara optimal di sekolah kejuruan. Penelitian ini memberikan kontribusi berupa gambaran empiris mengenai kesiapan guru SMK dalam mengadopsi AI sebagai bagian dari transformasi digital pendidikan.

Kata kunci : Artificial Intelligence; persepsi guru; sikap guru; pembelajaran digital

Abstract

This study aimed to investigate: (1) the attitudes of teachers at SMK Negeri 3 Surakarta toward the use of Artificial Intelligence (AI) in learning, and (2) teachers' perceptions regarding the integration of AI in the teaching and learning process. The study was motivated by the limited body of research specifically addressing vocational secondary school teachers' perceptions of AI use in educational contexts. A mixed-methods approach with an explanatory sequential design was employed; quantitative data were collected through questionnaires administered to 73 teachers, while qualitative data were gathered through structured interviews, direct classroom observations, and document

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Citation in APA style: Saputri, D.R., & Susilowati, T. (2026). Teachers' perceptions of artificial intelligence (AI) integration in learning at SMKN 3 Surakarta. *Jurnal Informasi dan Komunikasi Administrasi Perkantoran, 10*(3), 277-287. https://dx.doi.org/10.20961/jikap.v10i3.118109

analysis to extend and deepen the quantitative findings. Results indicated that the majority of teachers held positive attitudes toward AI, perceiving it as a tool that enhances learning efficiency and enables personalized instruction. Nonetheless, concerns were expressed regarding students' potential over-reliance on technology, diminished direct teacher-student interaction, and data privacy risks. Teachers consistently framed AI as a pedagogical aid rather than a substitute for the teaching profession. The study recommends sustained AI literacy training, the establishment of evidence-based and ethically grounded implementation policies, and the development of institutional support structures to facilitate the responsible and optimal integration of AI in vocational school settings. These findings contribute an empirical account of vocational school teachers' readiness to adopt AI as a component of broader digital transformation in education.

Keywords: Artificial Intelligence; teacher perception; teacher attitude; digital learning; vocational school

Received April 28, 2026; Revised May 06, 2026; Accepted May 15, 2026; Published Online Juni 14, 2026

https://dx.doi.org/10.20961/jikap.v10i3.118109

Introduction

The rapid advancement of information and communication technology has catalyzed profound transformations in the educational landscape, particularly in the domain of digital learning approaches. Among the most consequential of these transformations is the integration of Artificial Intelligence (AI) as an innovative technological resource in supporting teaching and learning processes (Annisa, 2024). AI technologies are widely recognized for their capacity to deliver more personalized, adaptive, and efficient learning experiences through features such as intelligent tutoring systems, automated assessment, and individualized content recommendation based on students' learning needs (Afrita, 2023; Sugiarto et al., 2024). As Wiwin (2023) argued, AI possesses the potential to create learning systems that can respond to individual students' needs more effectively than conventional instructional methods.

At the global level, AI adoption in education has been gaining considerable momentum. A UNESCO (2023) report indicated that more than 60% of educational institutions in several developed nations had begun integrating AI into digital learning processes. Similarly, an OECD (2023) survey found that the majority of teachers regard AI as having substantial potential for enhancing learning efficiency, while simultaneously acknowledging persistent challenges related to technological literacy and pedagogical readiness. Within the vocational education context specifically, AI is considered especially relevant given its capacity to support practice-based and simulation-driven learning that aligns with contemporary industry demands.

Despite these promising prospects, the implementation of AI in education is accompanied by significant challenges. Teachers' attitudes and perceptions constitute a critical determinant of successful technology adoption in school settings. Teacher attitudes encompass cognitive, affective, and conative dimensions in relation to technology use (Ajzen, 2020; Scherer, 2023). Teachers who possess positive understanding and confidence regarding AI tend to be more open to integrating it into their instructional practice. Conversely, limited digital literacy and concerns about AI's broader implications may impede technology acceptance.

Existing research has predominantly examined AI adoption in education at a general level, with comparatively few studies specifically investigating the attitudes and perceptions of vocational secondary school (SMK) teachers toward AI use in teaching. This gap is notable given the distinctive character of SMK education, which emphasizes vocationally oriented and practice-based learning requiring pedagogical approaches that are contextually flexible and industry-responsive. Preliminary investigation at SMKN 3 Surakarta revealed that a substantial proportion of teachers expressed ambivalence or uncertainty about AI use, attributable to insufficient training, concerns about potential displacement of the teacher's professional role, and difficulties in integrating AI tools within established curricula. Additional barriers included technical infrastructure limitations and ethical concerns regarding student data privacy and security (Abdul

& Kun, 2024; Hanila & Alghaffaru, 2023).

Two theoretical frameworks inform the conceptual basis of this study. Rogers' Diffusion of Innovations theory posits that technology acceptance is mediated by perceived relative advantage, compatibility, complexity, trialability, and observability. Davis's Technology Acceptance Model (TAM), as discussed by Susanto and Jimad (2020), further explains that technology adoption is primarily shaped by perceived usefulness and perceived ease of use. Both frameworks provide analytical tools for understanding how teachers form decisions to adopt or resist AI in their practice, noting that this decision-making process unfolds through successive stages—from knowledge acquisition to persuasion, decision, implementation, and confirmation (Rachmad et al., 2022).

The novelty of this study lies in its focused analysis of SMK teachers' perceptions of and attitudes toward AI integration in vocational learning, employing a mixed-methods explanatory sequential design. This methodological approach enables the simultaneous generation of statistical descriptions and in-depth interpretive understanding of teachers' lived experiences with AI, yielding a more comprehensive picture than either approach could provide in isolation.

Accordingly, this study pursued three objectives: (1) to determine the attitudes of teachers at SMK Negeri 3 Surakarta toward AI use in learning; (2) to analyze teachers' perceptions of AI integration in the teaching and learning process; and (3) to identify the facilitating and inhibiting factors affecting AI implementation in learning. The findings are expected to contribute to the development of strategic frameworks for educational technology adoption, particularly in vocational school contexts, with the aim of improving instructional quality and effectiveness.

Literature Review

Artificial Intelligence in Education

Artificial Intelligence refers to computer-based systems designed to simulate human cognitive functions such as learning, reasoning, problem-solving, and language understanding. In educational contexts, AI applications encompass a broad spectrum, including intelligent tutoring systems (ITS), automated assessment and feedback tools, adaptive learning platforms, and AI-driven content recommendation systems. Wiwin (2023) noted that AI enables the creation of learning environments capable of tailoring instructional content and pacing to the specific needs of individual students, thereby enhancing personalization in ways that exceed the capacity of traditional teaching methods.

The potential benefits of AI in education are widely documented. Sugiarto et al. (2024) highlighted AI's capacity to support curriculum delivery under the Indonesian Merdeka curriculum framework, while Riyandi et al. (2024) demonstrated AI's effectiveness in reducing teachers' administrative workload and improving adaptive learning outcomes in vocational schools. However, Nisa et al. (2023) cautioned that positive perceptions of AI do not necessarily correlate with deep conceptual understanding, a phenomenon with significant implications for professional development design.

Teacher Attitudes and Perceptions Toward Technology

Teacher attitudes toward technology are typically conceptualized as multidimensional constructs encompassing cognitive (beliefs about usefulness), affective (emotional responses), and conative (behavioral intentions) components (Ajzen, 2020; Scherer, 2023). A favorable attitude across all three dimensions is associated with greater willingness to integrate technology into instructional practice and higher levels of sustained use.

Two theoretical models are particularly relevant to understanding AI acceptance among teachers. The Technology Acceptance Model (TAM), originally formulated by Davis (1989) and elaborated by Susanto and Jimad (2019, 2020), proposes that perceived usefulness (the belief that a technology will enhance performance) and perceived ease of use (the belief that using the technology requires minimal effort) are the primary determinants of behavioral intention to adopt a technology. Rogers' Diffusion of Innovations theory, as applied by Hayati and Zuraini (2023), complements TAM by describing the stages through which individuals move from initial awareness to adoption, and by categorizing adopters into groups—innovators, early adopters, early majority, late majority, and laggards—based on their receptivity to new technologies.

AI Integration in Vocational Secondary Education

Vocational secondary education in Indonesia (Sekolah Menengah Kejuruan/SMK) is characterized by its dual orientation toward academic preparation and practical industry competencies. This context presents both particular opportunities and particular challenges for AI integration. On the opportunity side, AI tools can support simulation-based learning, competency-based assessment, and real-time industry-aligned content updates. On the challenge side, the practical and hands-on nature of SMK pedagogy may create resistance to technological substitution, and concerns about AI's capacity to replicate the mentorship and skill-modeling functions of expert vocational teachers may generate attitudinal ambivalence (Meilinda et al., 2024).

Furthermore, structural factors such as uneven digital infrastructure, limited access to AI-specific professional development, and uncertainty about AI's alignment with national curriculum standards constitute contextual barriers that are particularly salient in Indonesian vocational school settings. Hanila and Alghaffaru (2023) specifically highlighted concerns about student data privacy as an emerging ethical dimension that schools must address in the course of AI adoption.

Method

Research Design and Setting

This study employed a mixed-methods approach with an explanatory sequential design, which involves the sequential collection and integration of quantitative and qualitative data, with qualitative data serving to explain and deepen the patterns identified in the quantitative phase (Creswell & Plano Clark, 2018). This design was deemed appropriate for obtaining a comprehensive portrait of teacher attitudes through statistical description while simultaneously exploring the experiential dimensions of AI adoption through in-depth qualitative inquiry.

The study was conducted at SMK Negeri 3 Surakarta, located at Jalan Brigjen Sudiarto No. 34, Serengan District, Surakarta City, Central Java, Indonesia. This school was purposively selected as the research site due to its relevance to the study's focus. The research period spanned six months, from September 2024 to March 2025, encompassing preparatory, data collection, analysis, and reporting phases.

Participants

The quantitative phase involved the total population of 73 teachers at SMK Negeri 3 Surakarta, all of whom were included as respondents through total (census) sampling. For the qualitative phase, five teachers were purposively selected as interview informants based on their documented experience with and frequency of AI use in teaching and administrative practice. This purposive selection ensured that qualitative data were derived from participants with substantive and diverse AI-related experience.

Instruments and Data Collection

Quantitative data were collected using a closed-ended questionnaire comprising 25 items organized across three dimensions: (1) AI understanding (8 items); (2) AI acceptance (9 items); and (3) AI implementation in learning (8 items). Prior to main data collection, a pilot test was administered to 15 teachers outside the study sample to assess item clarity and estimate completion time. Reliability analysis using Cronbach's Alpha yielded a coefficient of 0.89, indicating high internal consistency. Content validity was established through expert review.

Qualitative data were gathered through three complementary methods: structured interviews with five purposively selected informants, direct classroom observations of teaching activities, and document analysis of teaching modules and school-level AI-related policies. Data validity in the qualitative strand was ensured through source triangulation (cross-referencing multiple informants) and method triangulation (cross-referencing interview, observation, and document data).

Data Analysis

Quantitative data were analyzed descriptively using frequency counts and percentages to characterize patterns of AI attitudes, understanding, acceptance, and use. Qualitative data were analyzed using Miles and Huberman's (1994) interactive model, comprising data reduction, data display, and conclusion drawing/verification.

Integration of the two data strands was accomplished at the interpretation stage using connecting and merging techniques: quantitative results informed the selection of qualitative informants, and the two

data sets were synthesized in the discussion to yield a more comprehensive and nuanced interpretation than either strand could provide independently.

Results

Data were collected through questionnaires administered to all 73 teachers and complemented by in-depth interviews with five purposively selected informants. The quantitative results are presented across six thematic dimensions, each accompanied by relevant qualitative illustration.

Teachers' Acceptance of AI in Learning

Table 1 presents teachers' responses to statements regarding their acceptance of AI as an instructional tool.

Table 1
Teachers' Acceptance of AI Use in the Learning Process

Statement	Frequency	Percentage (%)
AI can improve the effectiveness of learning	32	43.8
AI can accelerate students' learning process	22	30.1
AI can create more personalized learning experiences	12	16.4
AI may reduce the teacher's role in the teaching-learning process	7	9.6
Total	73	100

Note. n = 73 teachers; respondents selected the statement that best reflected their primary perception.

As presented in Table 1, the majority of teachers (43.8%) endorsed the view that AI enhances learning effectiveness, while 30.1% emphasized AI's capacity to accelerate students' learning processes. A further 16.4% highlighted AI's role in enabling personalized learning experiences. Notably, only 9.6% of respondents expressed concern that AI might reduce teachers' professional role in instruction, suggesting that AI is predominantly perceived as an enhancement rather than a threat to the teaching profession.

Qualitative findings corroborated this positive orientation. Informant 2 described the practical utility of AI in instructional preparation: "AI helps me prepare teaching materials and create assessment questions more quickly." This response illustrates how AI acceptance is grounded in concrete, task-related benefits rather than abstract technological enthusiasm.

Teachers' Concerns About AI Use

Despite overall positive attitudes, teachers also articulated significant concerns about AI integration in educational settings. Table 2 summarizes the distribution of teachers' primary concerns.

Table 2
Teachers' Concerns Regarding AI Use in Learning

Concern	Frequency	Percentage (%)
AI may cause students to become overly dependent on technology	40	54.8
AI may reduce direct interaction between teachers and students	23	31.5
AI is difficult to integrate within the existing education system	6	8.2

AI poses risks to the security and privacy of student data	4	5.5
Total	73	100

Note. n = 73 teachers.

Table 2 reveals that the most prevalent concern among teachers was the risk of students becoming excessively dependent on AI-generated answers (54.8%), followed by apprehension about diminished direct teacher-student interaction (31.5%). System integration challenges were identified by 8.2% of respondents, and concerns about student data privacy and security were raised by 5.5%.

Qualitative data provided nuanced elaboration of these concerns. Informant 4 articulated the dependency risk: "Students could become too reliant on AI if its use is not properly supervised." This concern aligns with a broader educational values discourse about critical thinking and intellectual independence.

Teachers' Understanding of AI

Table 3 presents the distribution of teachers' self-reported levels of AI understanding, revealing an important differentiation between practical familiarity and conceptual knowledge.

Table 3

Teachers' Self-Reported Understanding of AI

Statement	Frequency	Percentage (%)
I am aware of several AI applications relevant to education	37	50.7
I understand the basic concepts of AI	26	35.6
I do not yet have a good understanding of AI	7	9.6
I am aware of AI applications in fields other than education	3	4.1
Total	73	100

Note. n = 73 teachers.

As shown in Table 3, the largest group of respondents (50.7%) reported awareness of AI applications used in education without claiming comprehensive conceptual understanding, while 35.6% stated that they understood AI's basic concepts. A minority of 9.6% acknowledged limited understanding of AI, and only 4.1% reported awareness of AI applications in fields beyond education.

Qualitative data indicated that teachers' familiarity with AI was primarily mediated through specific digital learning platforms. Informant 1 noted: "I use ChatGPT and Canva AI to help me create learning materials." This response is representative of a pattern in which AI knowledge is operationally rather than theoretically grounded.

Teachers' Experience Using AI Tools

Table 4 summarizes teachers' reported experience with AI tools in instructional and administrative contexts.

Table 4

Teachers' Experience Using AI Tools in Professional Contexts

Experience	Frequency	Percentage (%)

I have used AI tools or applications in teaching	58	79.5
I regularly use AI to manage administrative tasks	11	15.1
I have not yet used AI in teaching or administration	4	5.5
Total	73	100

Note. n = 73 teachers.

As shown in Table 4, the vast majority of respondents (79.5%) reported prior experience using AI tools in teaching, while 15.1% indicated regular AI use for administrative tasks. Only 5.5% had not yet engaged with AI in either instructional or administrative contexts. These figures indicate a notably high level of practical AI engagement across the teaching staff.

Qualitative accounts described how teachers applied AI across multiple professional functions. Informant 3 reported: "AI helps me create presentations and assessment questions more efficiently." The consistency between quantitative usage data and qualitative illustrations reinforces the finding that AI integration is already an established—if still developing—practice among SMKN 3 Surakarta teachers.

Perceived Benefits of AI in Learning

Table 5 presents the distribution of teachers' perceptions regarding the primary benefits of AI in educational contexts.

Table 5
Teachers' Perceptions of AI Benefits in the Learning Process

Perceived Benefit	Frequency	Percentage (%)
AI supports personalization of student learning	46	63.0
AI provides instructional material recommendations based on students' understanding level	16	21.9
AI automates administrative tasks, allowing teachers to focus on teaching	10	13.7
AI helps analyze students' strengths and weaknesses	1	1.4
Total	73	100

Note. n = 73 teachers.

Table 5 demonstrates that the most widely recognized benefit of AI was its capacity to personalize learning according to students' ability levels (63.0%), followed by AI's role in providing content recommendations tailored to students' understanding (21.9%), and administrative task automation that allows teachers to redirect time and energy toward direct instruction (13.7%). The capacity to analyze individual students' strengths and weaknesses was identified by only 1.4% of respondents, suggesting limited awareness of AI's diagnostic and analytics functions.

Qualitative data reinforced the salience of personalization as the primary perceived benefit. Informant 2 stated: "AI helps me adapt materials to students' abilities, making learning easier to understand." The emphasis on personalization in both quantitative and qualitative data points to a shared professional recognition of differentiated instruction as a core pedagogical priority, with AI perceived as a facilitating mechanism.

Teachers' Views on the Future of AI in Education

Table 6 presents teachers' perspectives on the future role of AI in educational systems, revealing a predominantly cautious yet constructive orientation.

Table 6 Teachers' Views on the Future of AI in Education

View	Frequency	Percentage (%)
AI use must be accompanied by strict policies to protect students	36	49.3
AI will bring positive and innovative changes to teaching methods	15	20.5
AI will become an important part of future education	13	17.8
AI will increase educational inequality if not managed well	9	12.3
Total	73	100

Note. n = 73 teachers.

As shown in Table 6, the plurality of teachers (49.3%) expressed the view that AI adoption must be governed by strict policies to protect students' welfare—a finding that reflects the salience of ethical considerations in teachers' futures-oriented thinking. A further 20.5% anticipated that AI would catalyze positive and innovative changes in teaching practice, while 17.8% regarded AI as destined to become a central feature of future educational systems. Notably, 12.3% expressed concern that poorly managed AI could exacerbate educational inequality.

Qualitative data underscored the theme of regulatory necessity. Informant 5 stated: "The use of AI needs to be regulated to ensure it remains safe and is not misused." The convergence of quantitative and qualitative data on this theme suggests that teachers' enthusiasm for AI's potential is mediated by a strong sense of responsibility for student welfare and educational equity—a disposition entirely consistent with professional teaching ethics.

Discussion

Predominantly Positive Attitudes, Contextualized by TAM and Diffusion of Innovations

The finding that teachers at SMKN 3 Surakarta predominantly hold positive attitudes toward AI is consistent with the expectations of the Technology Acceptance Model (TAM). Teachers' positive orientations toward AI's capacity to enhance learning effectiveness, accelerate instructional processes, and enable personalization directly reflect the TAM dimensions of perceived usefulness and perceived ease of use (Davis, 1989; Susanto & Jimad, 2019). As Wiwin (2023) similarly argued, AI's ability to adapt instructional content to individual learners represents a qualitative improvement over conventional methods that resonates with teachers' professional aspirations.

Situating these findings within Rogers' Diffusion of Innovations framework, as applied by Hayati and Zuraini (2023), the data indicate that most teachers at SMKN 3 Surakarta have moved beyond the initial knowledge stage and are positioned within the persuasion stage—having formed generally favorable attitudes toward AI on the basis of perceived relative advantage. The high adoption rate (79.5% reporting prior AI tool use, as shown in Table 4) further suggests that a substantial proportion of teachers have transitioned into the implementation stage, a development that positions the school community favorably for more systematic AI integration.

The data also reveal that teachers' positive attitudes are instrumentally grounded in concrete pedagogical benefits, particularly learning personalization and administrative efficiency, rather than abstract technological affinity. This finding is consistent with Lazer et al. (2022) and Riyandi et al. (2024), who emphasized AI's effectiveness in reducing teachers' administrative burden and enhancing adaptive instructional quality. The practical orientation of teachers' AI acceptance has important implications for professional development design: training programs that demonstrate tangible, task-relevant AI applications are likely to be more effective in sustaining adoption than programs focused primarily on conceptual or theoretical AI content.

Persistent Concerns and the Paradox of Use Without Understanding

Notwithstanding their predominantly positive orientation, teachers at SMKN 3 Surakarta articulated substantive concerns that warrant institutional attention. The most prevalent concern—students' potential

over-reliance on AI (54.8%, as shown in Table 2)—aligns with Meilinda et al.'s (2024) finding that excessive AI use may undermine students' learning independence by making instant AI-generated responses more attractive than effortful critical thinking. This concern is educationally significant because learning independence and critical reasoning are not merely individual academic virtues but fundamental competencies for vocational graduates entering complex, dynamic workplaces.

The second most prominent concern—reduced direct teacher-student interaction (31.5%)—reflects a deeper professional concern about the irreplaceable relational and mentoring dimensions of teaching. This finding suggests that teachers' resistance to AI as a substitute for human instruction is not simply a defensive reaction to technological threat but a principled articulation of pedagogical values that should inform AI implementation policy. Data privacy concerns (5.5%), though relatively infrequent, are consistent with Hanila and Alghaffaru's (2023) emphasis on the need for rigorous data protection policies in school-based AI deployment.

A particularly noteworthy finding—which may be characterized as a paradox of use without understanding—is the disconnect between teachers' high AI adoption rates and their relatively limited conceptual understanding of AI principles. As shown in Table 3, only 35.6% of teachers claimed to understand AI's basic concepts, while 50.7% described their knowledge as primarily tool-level awareness. This pattern was vividly illustrated by Informant A:

"I often use ChatGPT to create questions or Canva for designing materials, but if asked how the system works or what an AI algorithm is, I honestly do not understand well. What matters to me is that it produces results quickly and helps with my tasks."

This phenomenon mirrors Nisa et al.'s (2023) observation that positive technological perceptions do not necessarily co-occur with deep conceptual understanding. Within the Diffusion of Innovations framework, such teachers may be classified as early adopters or early majority members who adopt technologies primarily on the basis of perceived relative advantage without having fully internalized the underlying principles (Hayati & Zuraini, 2023). While this pattern may be functionally adequate for routine AI tool use, it carries risks for more sophisticated applications that require teachers to critically evaluate AI outputs, adapt AI tools to specific pedagogical contexts, or guide students in responsible AI use.

The efficiency gains associated with AI use were further illustrated by Informant B:

"Previously, it took me many hours to complete classroom administration. Now, with AI assistance, the same work can be completed in minutes. AI has truly reduced our workload."

While this testimony affirms AI's demonstrated value for administrative efficiency—consistent with Lazer et al. (2022) and Riyandi et al. (2024)—it also reinforces the concern that without deeper understanding, AI implementation may remain "shallow"—functional but pedagogically unsophisticated. Teachers who use AI tools primarily as productivity shortcuts risk missing opportunities to leverage AI's more transformative educational capabilities, including formative assessment analytics, adaptive content sequencing, and data-driven pedagogical decision-making.

Future Orientations: Regulatory Consciousness and Equity Concerns

Teachers' views on the future of AI in education (Table 6) reveal a professional disposition that is simultaneously optimistic and vigilant. The plurality position—that AI adoption must be governed by strict protective policies (49.3%)—reflects a sophisticated recognition that technological potential and technological risk are inseparable, particularly in educational settings involving minors whose data, attention, and intellectual development are at stake.

The concern that poorly managed AI may exacerbate educational inequality (12.3%) is an important equity dimension that connects to broader debates about the digital divide in Indonesian education. In the context of vocational secondary education, where students often come from diverse socioeconomic backgrounds, inequitable access to AI tools or AI-enriched learning experiences could entrench rather than reduce existing educational disparities. This finding has direct implications for AI implementation policy at both the school and national levels, suggesting that equity considerations should be built into any systematic AI adoption framework.

Implications for Practice and Policy

The convergence of quantitative and qualitative findings yields several actionable implications for educational institutions and policymakers. First, professional development programs should be restructured to move teachers beyond surface-level tool familiarity toward substantive AI literacy that encompasses conceptual understanding, critical evaluation of AI outputs, and ethical considerations in AI use. Second,

schools should establish clear institutional policies governing AI use in teaching, including guidelines on data privacy, acceptable AI applications, and age-appropriate student AI exposure. Third, AI implementation should be introduced progressively rather than comprehensively, allowing teachers to build confidence and competence through iterative, supported experimentation. Fourth, given the documented concern about student dependency, pedagogical frameworks for AI-integrated instruction should explicitly include strategies for preserving and developing students' critical thinking and independent learning capabilities.

Conclusion

This study investigated the perceptions and attitudes of teachers at SMK Negeri 3 Surakarta toward the integration of Artificial Intelligence in the learning process. The findings indicate that teachers generally hold positive attitudes toward AI, recognizing its capacity to enhance learning effectiveness, facilitate personalization, and reduce administrative workload. The high rate of practical AI tool adoption (79.5%) further confirms that AI is already an established—if developing—feature of many teachers' professional practice.

Simultaneously, the study identified a significant paradox: high practical adoption coexisting with limited conceptual understanding of AI principles. This gap, combined with articulated concerns about student technology dependency, diminished interpersonal interaction, and data privacy risks, underscores the need for a more strategic and supported approach to AI integration than currently exists at the study site.

The study identified two categories of factors affecting AI implementation. Facilitating factors included relative ease of access to AI tools and a generally open institutional culture toward technological innovation. Inhibiting factors included insufficient AI-specific training, gaps in conceptual AI understanding, and ethical-regulatory uncertainties. Addressing these inhibiting factors through targeted professional development, institutional policy development, and support infrastructure is essential to enabling responsible and educationally effective AI use.

This study is subject to several limitations. The single-school sample restricts the generalizability of findings to other vocational schools or educational levels. The cross-sectional design provides a static snapshot of attitudes and may not capture longitudinal changes as teachers gain greater AI experience. The reliance on self-report questionnaires as the primary quantitative instrument introduces potential social desirability bias. Future research should employ multi-school and multi-level sampling designs, longitudinal tracking of AI adoption trajectories, and more direct observation-based measures of AI integration quality to build a more comprehensive empirical base for AI policy in Indonesian vocational education.

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