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Exploring artificial intelligence in vocational learning: teachers' perspective from Indonesia

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ABSTRACT

The rapid development of artificial intelligence (AI) in education has expanded its potential applications. However, empirical evidence from vocational education in developing countries remains limited, particularly regarding differences between certified and uncertified vocational high school (VHS) teachers' perspectives. This study investigates VHS teachers' perceptions of AI use in the learning process by explicitly comparing certified and uncertified teachers in Indonesia. Using a quantitative approach combined with data-mining techniques applied to open-ended survey responses, data were collected from 65 VHS teachers in the Special Region of Yogyakarta (DIY). Group differences were examined using a non-parametric Mann-Whitney U test. The findings indicate that both certified and uncertified teachers demonstrate consistently positive perceptions of AI in instructional planning, implementation, and assessment, with no statistically significant differences between the two groups. Importantly, this result suggests that openness toward AI integration is not determined by certification status but reflects broader pedagogical orientations among vocational teachers. Teachers perceive AI primarily as a pedagogical partner rather than a substitute for professional educators. The study underscores the need of structured AI-focused professional development and policy support through adequate infrastructure and targeted training to enhance the effectiveness of AI adoption in improving the quality of vocational education in Indonesia.

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1. INTRODUCTION

Advancements in artificial intelligence (AI) have significantly influenced teaching and learning processes [1]. AI applications such as generative pre-trained transformer (GPT), midjourney, and ChatGPT support teachers in designing content, planning lessons, monitoring progress, assessing performance, and reducing workload [2]–[4]. Thus, AI functions not only as a technological tool but also as a pedagogical partner in comprehensive instructional practices [5].

In Indonesia, vocational teachers face one of the highest workloads in the region, averaging 56.02 hours per week, which leads to burnout, stress, and reduced instructional quality [6], [7]. This issue underscores the pressing need for innovative solutions, such as AI, to alleviate the workload and enhance teaching efficiency [8], [9]. These findings align with studies that recognize AI as both an innovative tool and a growing pedagogical strategy across various educational levels [10].

Although AI's potential to support education is widely acknowledged [11], limited research has examined its effective application in vocational contexts. Most existing studies focus on general education or developed countries, leaving gaps in understanding teachers' readiness and contextual challenges in developing nations [11], [12]. While AI integration has been explored [13]–[15], questions remain on how teachers can apply it effectively without adding pressure [16], [17]. Furthermore, research gaps persist regarding teachers' readiness to adopt AI in instructional practices [18]. This lack of clarity has led some scholars to express skepticism and question the validity of AI as a learning support tool [19], [20]. Effective AI integration, therefore, requires a deep understanding of its capabilities and optimal instructional environments [21]. Most literature highlights AI's impact on student learning outcomes [22], [23], yet few address its role in improving teachers' instructional efficiency in vocational education. Vocational education emphasizes both cognitive and practical skills [24], requiring students to engage in internships and industry simulations [25]–[28]. Therefore, vocational instruction demands distinct strategies to ensure the transfer of operational skills [29].

Although AI benefits in education have been widely documented, existing studies mainly focus on learning outcomes and system development [30]–[33]. While concerns regarding AI's effectiveness and ethical implications persist [34]–[36]. At the same time, relatively few studies have examined teachers' readiness and adoption as key determinants of successful AI integration [37]. Moreover, digital infrastructure gaps and low technological literacy are significant challenges in Indonesia [38]. In fact, successful technology integration heavily depends on teachers' readiness [39]. Most prior studies target developed countries or general education systems, such as those in South Korea, Malaysia, and Brazil [4], [40], [41], or specific disciplines like teaching English as a second language (TESL), science, technology, engineering, arts, and mathematics (STEAM), and higher education [23], [41], [42]. Consequently, research on vocational teachers in developing countries remains scarce.

This study addresses these gaps by examining how teaching experience shapes perceptions of AI. Experienced teachers often hold more favorable views, indicating greater potential for AI adoption in vocational education [43], [44]. In contrast, novice or pre-service teachers—often considered digital natives—offer fresh insights into how younger generations approach the integration of AI [45]. By capturing perspectives from both groups, this study provides a comprehensive understanding of AI integration in vocational education in Indonesia.

2. METHOD

This study employed a quantitative design to explore vocational teachers' perceptions of AI integration in education. In Indonesia, both prospective, inexperienced and experienced teachers are required to complete the nationally standardized teacher professional education program (PPG) to obtain professional certification. This program equips teachers with digital learning competencies and technological familiarity [46], ensuring that participants represent a nationally comparable level of professional preparation and technological exposure. The study focused on vocational high school (VHS) teachers and prospective teachers, as they play a critical role in preparing job-ready graduates. However, they have the lowest certification rates among all educational levels, only 28.49% are certified, compared to 45.77% at the elementary level, 45.07% at the junior high level, and 41.09% at the senior high level. This condition highlights both a pressing need for digital competency development and an opportunity to understand AI readiness within vocational education.

From the 100 invitations sent, 65 valid responses were obtained, yielding a 65% participation rate as shown in Table 1. Selected participants were located in the Special Region of Yogyakarta (DIY), which consistently ranks highest in Indonesia's digital literacy index according to surveys conducted by the Ministry of Communication and Information Technology in 2021 and 2022 [47]. To enrich the data and capture diverse perspectives, quantitative information was collected through an open-ended survey question followed by qualitative enrichment from semi-structured interviews, allowing both in-depth narratives and broader written reflections. The data were then analyzed thematically to identify key patterns and variations in teachers' perceptions of AI in instructional planning, delivery, and assessment.

The survey included demographic questions and 24 statements aimed at evaluating teachers' perceptions of AI integration in education. The demographic section encompassed gender, age, educational attainment, teaching certification, teaching experience, type of school, and geographical location. The perception statements focused on three fundamental elements of the instructional process: planning, implementation, and assessment, as well as teachers' perspectives on the future utilization of AI and its potential to supplant educators. All items were systematically arranged utilizing a five-point Likert scale [45] to classify responses and aggregate perceptions, rather than for inferential analysis.

Almost all of the research was quantitative, and fundamental analysis could describe the characteristics of the respondents and indicate the degree to which they responded to thematic questions. In order to provide a more accurate demographic profile and to summarize the distribution of responses, descriptive data were processed using JSAP and Microsoft Excel. As a result, a non-parametric test known as the Mann-Whitney U test was utilized in order to investigate the differences that existed between certified and uncertified teachers in terms of their perceptions of the use of AI in lesson planning, instructional implementation, and assessment, as well as their perceptions of the potential for AI to replace teachers in instructional practices. A complementary qualitative analysis was carried out in order to identify thematic patterns that were derived from the open-ended responses. This was done in order to delve deeper into the findings. Following the analysis of these patterns, nuanced insights into the ways in which teachers perceive the use of AI in instructional planning, implementation, and assessment were obtained. Taking this complementary approach makes it possible to have a holistic perspective on the findings.

Table 1. Respondent demography

Districts	Schools	Certified		Sex types	
		Certified	Uncertified	Male	Female
Yogyakarta City	DIY 1	4	1	1	4
	DIY 7	1	4	0	5
	BOKPRI 1 DIY	1	1	0	2
Sleman	TMPL 1	5	2	2	5
	GDN 1	3	1	1	3
	DPK 1	2	1	1	2
	MD 2 MYD	1	2	2	1
	ISNCDK	0	4	0	4
Bantul	BNTL 1	3	0	0	3
	MD 2 BNTL	0	2	0	2
Gunungkidul	WNSR 1	2	3	5	0
	MD 1 PYN	2	3	5	0
	MAARIF WNSR	2	2	4	0
Kulon Progo	PGSH 1	5	1	1	5
	MD 1 WTS	1	2	1	2
	MD 2 WTS	1	2	1	2
Total		36	29	10	55

3. RESULTS AND DISCUSSION

3.1. Results

This section presents the findings of the study conducted. These findings focus on addressing how teaching experience can shape teachers' perceptions of AI. The findings are divided into six subsections consisting of respondent demographics, VHS teachers' perceptions of using AI in lesson planning, in the learning process, in learning assessment, an overall perception of VHS teachers on the use of AI in educational processes, and teachers' responses to the issue of AI replacing teachers.

3.1.1. Demographics of research respondents

This study received responses from 65 teachers in the DIY. Table 2 presents the demographic profile of VHS teacher respondents, including sex type, age, education level, teacher certification status, teaching experience, the status of the school where they teach, and geographic region. Table 2 indicates that 84.62% of the respondents are female, while only 15.38% are male. This suggests that female teachers predominate in vocational education, particularly in fields such as office management and business services. Most respondents are young, with 36.92% aged 23-30 years, followed by 32.31% over 45 years old, and 30.77% aged 35-45 years.

Regarding educational background, 82.92% hold a bachelor's degree (n =40), while 23.08% have earned a master's degree (n =15). This study considers the perceptions of both certified and uncertified teachers. Certified teachers make up 46.15% of respondents, while uncertified one's account for 53.85%. In terms of teaching experience, 55.38% have more than six years of experience, while 20% are new teachers with less than two years of experience. Respondents with 2-4 years of experience represent 16.92%, while those with 4-6 years of experience account for 7.69%. Most respondents teach at public schools (52.31%), while the remaining 44.62% teach in private schools. This variation in school type broadens the study's contextual relevance. Demographically, respondents are fairly evenly distributed across regions: 32.31% from Sleman Regency, 21.54% from Gunungkidul, 18.46% from Yogyakarta City and Kulon Progo (each), and 9.23% from Bantul Regency. Figure 1 presents the distribution of respondents across vocational schools.

Researchers also collected data regarding the weekly teaching load of teachers. Table 3 indicates the comparison of teaching loads between certified and uncertified VHS teachers. Table 3 indicates that

uncertified VHS teachers teach an average of 1.296 more hours per week than their certified counterparts. This finding confirms that uncertified teachers—who are generally younger—carry a heavier teaching load. Supporting data reveal that some uncertified teachers work up to 42 hours weekly, while the highest load among certified teachers is 36 hours. The next section summarizes respondents' answers based on certification status.

Table 2. Respondent demographic profile

Variable	Category	Frequency	Percentage (%)
Sex type	Male	10	15.38
	Female	55	84.62
Age	23-30 years	24	36.92
	35-45 years	20	30.77
	>45	21	32.31
Level of education	Bachelor	50	86.92
	Magister	15	23.08
Certified teacher	Uncertified	30	46.15
	Certified	35	53.85
Learning experience	<2 years	13	20.00
	2-4 years	11	16.92
	4-6 years	5	7.69
	>6 years	36	55.38
School status	Public	34	52.31
	Private	29	44.62
District	Yogyakarta City	12	18.46
	Sleman	21	32.31
	Bantul	6	9.23
	Kulon Progo	12	18.46
	Gunungkidul	14	21.54

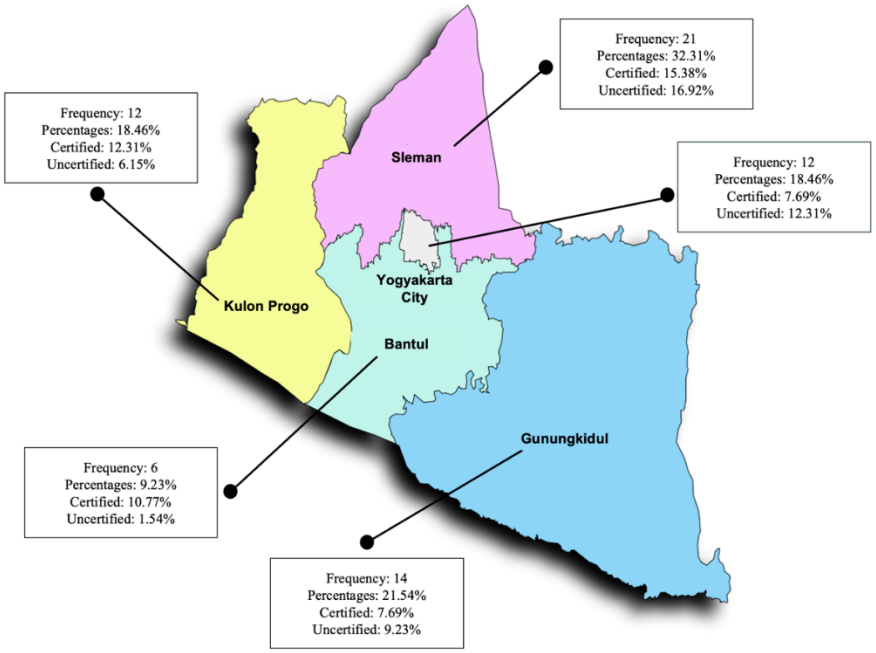

Figure 1. Demographics of VHS based on region

Table 3. Teaching load comparison between certified and uncertified VHS teachers in a week

Statistic	Uncertified teacher	Certified teacher
N	30	35
Mean	26.267	24.971
Median	26.5	26
SD	10.146	6.138
Minimum	2	8
Maximum	42	36

3.1.2. Vocational high school teachers' perceptions of using AI in the lesson plan

This section elucidates the perceptions of VHS educators regarding the utilization of AI, specifically in the context of learning planning. This analysis examines how certification affects vocational education AI acceptance. Table 4 compares teachers' views on AI in the learning plan.

Table 4. Comparison of VHS teachers' perception related to AI-use in lesson plan

Items	Certified teacher		Uncertified teacher	
	Result	(%)	Result	(%)
AI can help teachers create lesson plans faster.	Agree	51.43	Strong agree	53.33
AI can improve teachers' lesson plans.	Agree	51.43	Agree	56.67
AI can improve teachers' lesson planning.	Agree	60.00	Agree	60.00
AI can save teachers time creating teaching materials.	Agree	60.00	Strong agree	53.33
AI can help teachers improve lesson materials.	Agree	54.29	Agree	56.67
AI can help teachers create teaching materials.	Agree	60.00	Agree	60.00
Teachers can save time on presentation materials with AI.	Agree	60.00	Strong agree	60.00
AI can help teachers improve presentation materials.	Agree	60.00	Agree	60.00
AI can help teachers create presentations.	Agree	57.14	Agree	60.00

Table 4 indicates that both certified and uncertified VHS teachers generally hold positive perceptions of AI use in lesson plan development. Both groups expressed similar views on several aspects, including AI's role in enhancing lesson plan quality, improving teachers' performance, and increasing the quality of teaching materials. Respondents also noted improvements in teachers' effectiveness when preparing presentation materials.

> *"I agree because using AI to create lesson plans offers significant potential to increase efficiency and personalize learning. However, AI lacks deep contextual understanding and creativity and can misinterpret data. It's essential to use AI as a tool—not a replacement—and to preserve the teacher's role in planning and instruction." (GR.1: Certified teacher)*

> *"I agree. Creating lesson plans is time-consuming and detailed. With AI, I hope the burden of planning can be reduced." (GR.2: Uncertified teacher)*

Some differences emerged between the two groups. Uncertified teachers expressed stronger agreement regarding AI's role in reducing lesson planning time, with 53.33% strongly agreeing, compared to 51.43% of certified teachers who agreed. However, for AI's role in reducing time spent creating teaching materials, 60% of certified teachers strongly agreed, while only 53.33% of uncertified teachers agreed. Similarly, both groups showed 60% agreement on AI's usefulness in preparing presentation materials, but certified teachers selected "strongly agree," whereas uncertified teachers chose "agree".

> *"Strongly agree. In today's digital era, teachers must leverage technology to improve education quality. AI allows us to plan materials, teaching aids, and PowerPoint presentations quickly and systematically, reducing the burden of administrative work." (GR.2: Certified teacher)*

> *"AI is quite useful in lesson planning and helps save time when preparing materials and presentations. However, teachers must still verify that AI-generated content complies with government regulations." (GR.2: Uncertified teacher)*

Overall, findings suggest a favorable perception of AI, with certified teachers expressing slightly higher agreement, especially regarding time efficiency. To further explore perceptions, the study inquired whether teachers considered the use of AI in learning plans urgent. Figure 2 presents the response summary. Most respondents from both groups perceived AI use in lesson planning as moderately urgent, suggesting that while important, its adoption remains gradual to meet instructional demands.

3.1.3. Vocational high school teachers' perceptions of using AI in the learning process

Researchers disclose survey findings that illustrate VHS educators' perceptions of AI's role in the educational process. Table 5 demonstrates that both certified and uncertified educators typically exhibit favorable attitudes toward the incorporation of AI in classroom instruction. They acknowledge AI's ability to assist teachers, answer students' questions, and improve educational outcomes.

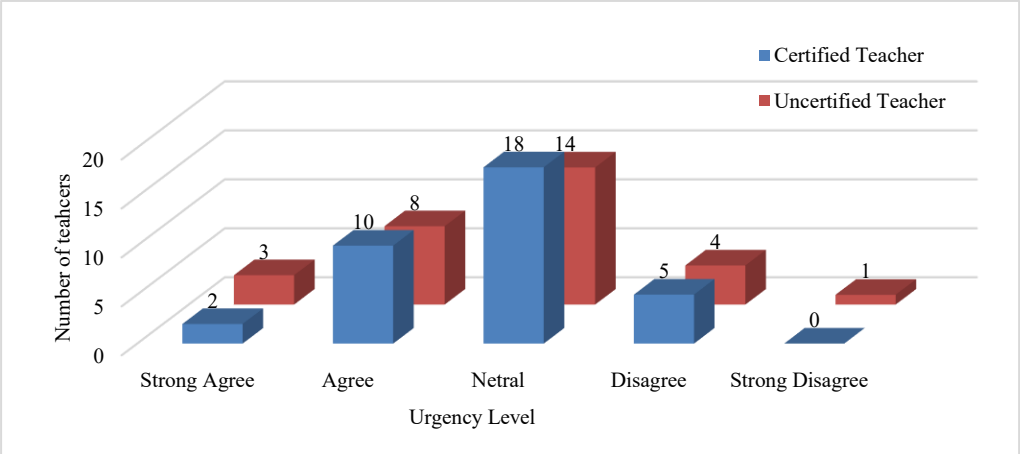

Figure 2. VHS teachers' perceptions regarding the urgency of using AI in the learning plan

Table 5. Comparison of VHS teachers' perception related to AI-use in learning process

Items	Certified teachers		Uncertified teachers	
	Result	(%)	Result	(%)
AI can help teachers assist students.	Agree	60.00	Strong agree	57.43
AI can help teachers answer student questions.	Agree	60.00	Agree	57.43
Teachers' learning performance can improve with AI.	Agree	57.14	Agree	57.43

The results in Table 5 align with responses from the open-ended questionnaire:

"I agree, because with AI, the process of creating teaching materials no longer takes much time, and it helps respond to students' questions." (GR.17: Uncertified teacher)

"Using AI can facilitate learning by acting as an assistant available 24 hours a day." (GR.6: Uncertified teacher)

"AI makes the learning process easier by reducing the teacher's workload. By simply giving commands, AI can carry out instructions, whether to monitor students or assist them in learning." (GR.14: Certified teacher)

These responses suggest that both certified and uncertified teachers believe AI can facilitate the teaching process and enhance classroom learning. To enrich the data on the perceptions, researchers also asked whether teachers consider the use of AI in the learning implementation process to be urgent. Figure 3 summarizes the responses which show that most respondents from both groups rate the urgency of AI use in learning implementation as moderate. This suggests that teachers do not yet view AI as a critical necessity to meet the demands of the learning process.

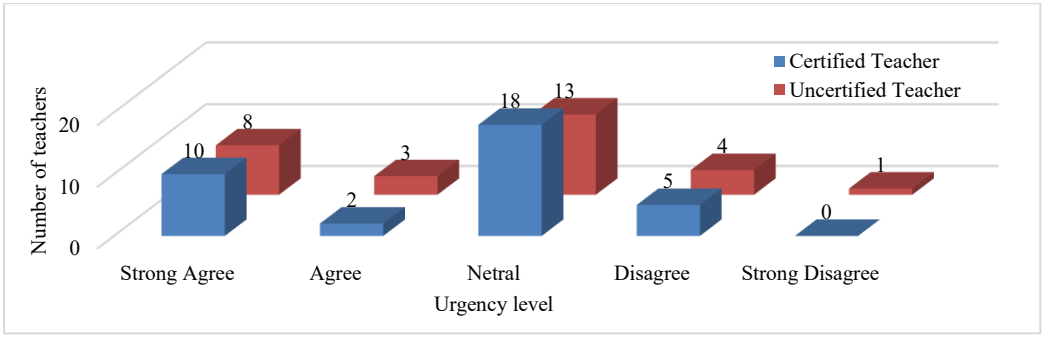

Figure 3. VHS teachers' perceptions regarding the urgency of using AI in the learning process

3.1.4. Perceptions of vocational high school teachers on the use of AI in the learning assessment process

Table 6 indicates the examination results of teachers' perceptions on using AI for various needs in the learning process. Table 6 indicates that both certified and uncertified VHS teachers generally view the use of AI in the learning assessment process positively. Both groups share similar perceptions across most aspects, including using AI to improve question creation, save time on grading, assist with assessments, speed up feedback, enhance feedback quality, and boost performance in giving feedback on student assignments.

"Agree. Overall, AI has strong potential to improve the efficiency and effectiveness of question development and learning assessment. However, it must be used wisely and with proper oversight to maintain educational quality and integrity." (GR.12: Certified teacher)

"AI makes it easier and faster to create questions." (GR.5: Uncertified teacher)

"AI is very advantageous for administrative tasks, especially when creating questions, grading, and giving feedback. Although it saves time, teachers still need to review AI-generated questions and feedback." (GR.7: Uncertified teacher)

Table 6. Perceptions of VHS teachers on the use of AI in the learning assessment process

Items	Certified teachers		Uncertified teachers	
	Result	(%)	Result	(%)
AI can improve the creation of assessment questions for teachers.	Agree	62.86	Agree	73.33
AI can save teachers time correcting student work.	Agree	62.86	Agree	50.00
AI can help teachers grade students work.	Agree	62.86	Agree	60.00
AI can improve teacher learning assessment.	Agree	62.86	Agree	66.67
AI can reduce teacher feedback time on student assignments.	Agree	54.29	Agree	66.67
AI helps teachers improve assignment feedback.	Agree	57.14	Agree	66.67
AI can help teachers provide assignment feedback.	Agree	54.29	Strong agree	70.00

Perceptual differences emerged between the two groups, particularly regarding AI's ability to enhance assessment and feedback. Among certified teachers, 62.86% agreed that AI improves assessment performance, while 54.29% believed it enhances feedback quality. In contrast, a larger proportion of uncertified teachers strongly agreed with these statements, at 66.67% and 70% respectively. These findings suggest that uncertified teachers perceive AI as providing greater support in managing assessments and delivering feedback.

"I strongly agree. AI can significantly enhance the efficiency and consistency of assessments, providing quick and accurate feedback. However, issues like accuracy, bias, and contextual understanding must be addressed. The best approach combines AI tools with human validation to ensure fairness and quality." (GR.22 Certified Teacher)

"AI helps ease the assessment process, especially when reviewing student answers. It's particularly useful for evaluating essays, which usually take more time and benefit from constructive feedback." (GR.10: Uncertified Teacher)

Overall, teachers view AI positively in learning assessments. Certified teachers tend to agree more strongly with the role of AI in enhancing performance, especially in assessment and feedback. To enrich the perception data, researchers also asked about the urgency of using AI in learning assessments. Figure 4 presents a summary of those responses. Figure 4 indicates that most respondents from both groups share a similar level of urgency for using AI in the learning process, at a moderate level, suggesting less urgency for the learning assessment process.

3.1.5. Perceptions of vocational high school teachers on the use of AI in educational processes

This study examined the possibility that VHS teachers will utilize AI in the future for various educational tasks. The potential uses of AI include creating teaching materials, presentations, lesson plans, and assessments, as well as providing feedback to students. Furthermore, a comparison of teachers' responses regarding the future use of AI for educational tasks between certified and non-certified teachers is presented in Table 7.

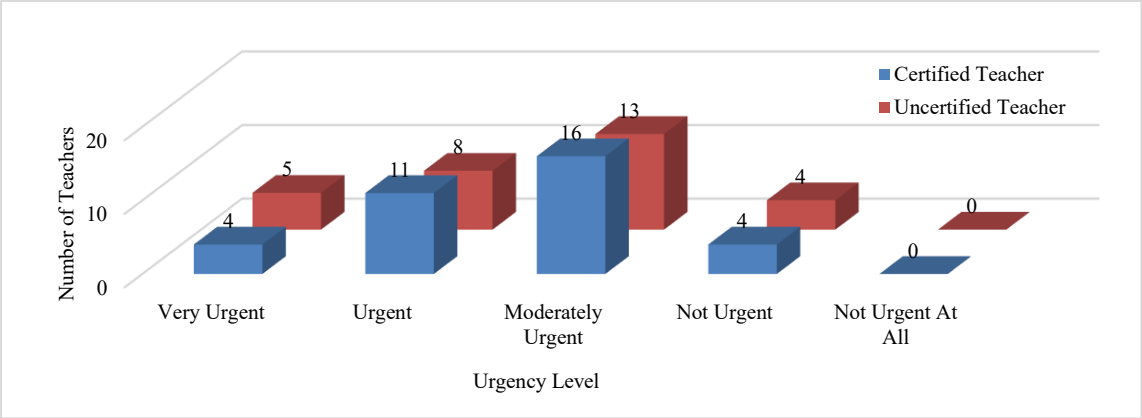

Figure 4. Perceptions of VHS teachers regarding the urgency of using AI in the learning assessment process

Table 7. Teachers' future usage of AI in educational processes: a comparison between certified and uncertified teachers in vocational education

Items	Certified teachers		Uncertified teachers	
	Result	(%)	Result	(%)
AI could potentially be used in the future to create teaching materials.	Often	66.67	Often	63.33
AI presentation creation likelihood.	Often	60.00	Often	66.67
AI could potentially be utilized for the creation of lesson plans.	Often	63.33	Often	70.00
AI could potentially serve as a learning assistant.	Often	66.67	Often	70.00
AI has the potential to generate assessment questions.	Often	56.67	Often	70.00
Future applications of AI could involve correcting student answers.	Often	56.67	Often	43.33
AI could potentially be utilized in the future to assess student responses.	Often	60.00	Often	60.00

Overall, the data in Table 7 indicates consistent results between certified and uncertified teachers regarding the future use of AI. Most respondents in both groups express a preference for frequently using AI across various teaching tasks—from planning and implementation to assessment, though with varying intensity. Both groups predominantly report frequent use of AI, particularly for creating teaching materials, presentations, and lesson plans, as well as acting as teaching assistants and providing feedback to students.

> *"I choose to frequently use this technology because teachers must keep up with developments. AI greatly helps with creating lesson plans, materials, and presentations, producing better results aligned with technological advancements." (GR.19: Certified teacher)*

> *"I will often utilize AI because it simplifies the process of creating lesson plans, so teachers already know what materials to present." (GR.4: Uncertified teacher)*

> *"I will use AI more frequently in the future because it helps provide automatic feedback, saving a lot of time." (GR.1: Uncertified teacher)*

In contrast, perceptions about using AI to create assessment questions vary. While 70% of uncertified teachers prefer frequent AI use in assessment designs, just over half of certified teachers share this preference. This suggests that certified teachers feel less confident about using AI to generate assessment questions than their uncertified counterparts.

> *"AI can assist in assessments for theoretical subjects, but it struggles with practical questions due to their complexity and variation." (GR.30: Certified teacher)*

> *"I plan to use AI more often in the future because it helps when teachers are busy with other tasks. It speeds up question creation, though the output still needs review." (GR.2: Certified teacher)*

> *"Not everything should rely on AI. Students are social beings, and the assessment process shouldn't be rigid." (GR.5: Certified teacher)*

"I'll likely rarely use AI in assessments because effective evaluation considers many aspects—not just numbers." (GR.29: Certified teacher)

"I'll often use AI because it shortens the time needed to create questions. Teachers just input detailed indicators and question types—it's very simple." (GR.2: Uncertified teacher)

3.1.6. Vocational high school teachers' responses to the issue of AI replacing teachers

The most recent survey assessed teachers' perceptions regarding the potential of AI to replace educators. This survey sought to ascertain whether educators perceive AI as an auxiliary resource or as a possible replacement that could jeopardize the teaching profession in the future. Figure 5 illustrates the perceptions of VHS teachers concerning the concept of AI supplanting educators. Figure 5 reveals that the majority of both certified and uncertified teachers agree that AI cannot replace teachers. This reflects the belief that teachers play an essential role in the learning process that technology cannot replace.

"Despite AI's rapid development, the teacher's role remains crucial. While AI may deliver content in less sophisticated ways, teachers are needed to understand students' unique issues." (GR18 Certified Teacher)

"I strongly disagree, because no matter how advanced learning applications become, the teacher's role must remain central in education. Teachers are irreplaceable; they teach and provide character education, which no learning application can offer." (GR2 Certified Teacher)

"I disagree, because the teacher's role is still essential. However, AI can serve as a supportive or supplementary tool in the learning process." (GR1 Uncertified Teacher)

"I disagree, because AI is just a learning technology, and teachers do more than teach academic subjects. They impart social values, morals, and attitudes, which are critical for students' lives." (GR9 Uncertified Teacher)

"I am skeptical. While AI can reduce workloads quickly, it may not enhance competencies immediately. Pedagogical skills are diverse and need to be well-developed." (GR12 Uncertified Teacher)

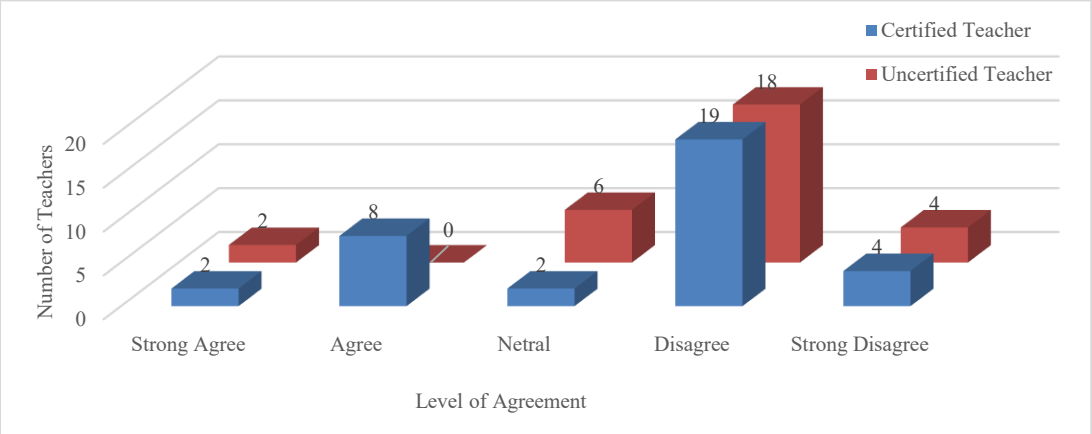

Figure 5. VHS teachers' responses to the issue of AI replacing teachers

Open-ended survey responses strongly reject the idea that AI will replace teachers. Most respondents view AI as a tool rather than a crucial learning tool. The non-parametric Mann-Whitney U test was used to compare certified and uncertified vocational education teachers' AI use perceptions across four composite dimensions to improve reliability (Table 8). These include perceptions of AI in teaching and learning, urgency, future intention to use AI in education, and teacher replacement potential.

Table 8 presents the results of the Mann-Whitney U test across the four analyzed dimensions. Certified and uncertified teachers had similar views on AI use, its urgency in learning, and their future AI

use. Both groups of teachers believe AI will not replace them in learning activities, according to the analysis. Both certified and uncertified vocational teachers in Indonesia see AI as a learning tool rather than a replacement, suggesting they will use it in the future.

Table 8. Comparative analysis of certified and uncertified teachers' perceptions using the Mann-Whitney U test

Dimensions	U	p-value	Sig
Perception of AI in teaching and learning	568.5	0.565	Not significant
Urgency AI for teaching and learning	531.5	0.936	Not significant
Future usage of AI in educational processes	525.0	1.000	Not significant
Perception of AI replacing teacher	463.0	0.369	Not significant

3.2. Discussion

This section divided the discussion into three main themes. First, this section reviews teachers' perceptions of AI use in the teaching and learning process, encompassing lesson planning, implementation, and assessment. Next, we discuss the urgency and interest felt by teachers in utilizing AI in the future. Finally, this section reviews teachers' perceptions of AI's potential to replace human educators.

3.2.1. Teachers' perceptions of AI in teaching and learning

The findings indicate that vocational teachers, both certified and uncertified, generally have positive perceptions of the use of AI in lesson planning, teaching, and assessment. The results of empirical testing using the Mann-White U test (Table 8) also show that there is no difference in perception between the two groups regarding the use of AI in the teaching and learning process. Both groups of teachers believe that AI enhances efficiency in the development of learning plans. This is consistent with prior findings [48], [49] which state that AI can reduce the time required to prepare instructional materials and media while alleviating administrative workloads [50]. Furthermore, the positive perceptions of both groups regarding the use of AI in the implementation stage are grounded in the belief that AI can function as a reliable assistant that can be active 24 hours a day. These findings align with previous research that confirms that AI can be relied upon as a learning assistant capable of providing fast, accurate, and relevant responses [51]. In addition, this research indicates that vocational teachers in Indonesia generally have a positive view of the use of AI in the assessment process, particularly in the preparation of questions and the acceleration of the correction process. Previous studies also revealed that AI has significant potential in reducing correction time while increasing the accuracy of assessment results [52], [53]. This positive perception correlates with the relatively high workload of vocational teachers, with many teachings more than 24 hours per week, positioning AI as an effective means of reducing workload demands.

3.2.2. Perceived urgency and future use of AI

Second, the research results indicate that the level of urgency for AI integration in learning is considered moderate. Further statistical analysis confirms that there is no significant difference in perception regarding the urgency of AI utilization between certified and non-certified teachers (Table 8). This finding indicates that vocational teachers in Indonesia do not yet view AI as an urgent need, possibly influenced by various concerns regarding the implications of its use in the future. Several previous studies also suggest that although teachers show relatively positive attitudes towards AI, issues such as ethics, privacy, skepticism, and limited facilities remain inhibiting factors in the process of AI adoption in educational environments [54], [55].

However, this study actually showed different findings. Both certified and non-certified teachers had a strong tendency to utilize AI intensively in future learning activities, including the planning, implementation, and assessment stages. The results of statistical tests (Table 8) confirmed that there was no significant difference between the two groups regarding their intentions to use AI in the future. These findings indicate that although some vocational teachers in Indonesia still face challenges in adapting to information and communication technology (TIK), the use of AI does not always require a high level of technical skills [56], [57]. Furthermore, the results of this study align with the technology acceptance model (TAM) theoretical framework, which emphasizes that perceived ease of use influences an individual's intention to adopt technology in the future [58]. On the other hand, this finding also provides a different perspective from previous research [59], which stated that AI adoption is highly dependent on the availability of infrastructure, such as internet access, hardware, and AI training. Although most respondents in this study came from private schools, positive perceptions towards the use of AI remain strong, despite limited institutional resources and facility conditions in developing countries [55], [60].

3.2.3. AI as a partner pedagogy, not a replacement

Finally, vocational teachers in Indonesia expressed a strong belief that AI serves as a learning support tool and cannot replace the role of humans as educators, particularly in building social and emotional relationships with students. This view emerged consistently among both certified and uncertified teachers, confirmed through comparative analysis, which showed no significant differences in perceptions between the two groups (Table 8). This finding aligns with a number of previous studies that assert that AI will not replace the role of teachers, although concerns regarding this potential replacement have emerged in recent years [61]–[63]. Furthermore, the results of this study reflect teachers' psychological readiness to coexist with AI ethically and strategically in educational contexts, while also emphasizing that AI adoption is not only related to technical aspects but also encompasses moral and ethical dimensions. Consistent with these findings, previous studies have also reported concerns among teachers that the use of AI has the potential to dehumanize and undermine the formation of students' moral values [34], [61].

3.2.4. Implications for vocational education in developing countries

The findings of this study provide an empirical contribution that the perceptions of vocational teachers in developing countries towards the use of AI in the learning process tend to be positive, both in the planning, implementation, and assessment stages, with no significant differences in perception between certified and uncertified teachers, which are aligned with findings in developed countries [23], [41], [42]. Therefore, the assumption that infrastructure limitations directly drive resistance to technology adoption needs to be reviewed. The implications of these findings suggest that AI adoption strategies in developing countries should not only focus on infrastructure development, but also on strengthening AI competencies for teachers and the formulation of regulations governing ethical AI use, thereby supporting effective and sustainable AI integration [55], [64]. Furthermore, although the perceived urgency of AI use was rated as moderate, teachers showed a strong interest in positioning AI as a supporting tool in the planning, implementation, and assessment of learning. This finding aligns with the view that positions AI as a pedagogical partner rather than a technology that extends beyond teachers' professional authority [5]. Therefore, the widespread adoption of AI, particularly in developing countries, needs to be designed in a manner that protects the authority and rights of teachers within educational contexts [65]. Finally, the consistent views of both groups of teachers that AI will not replace the role of educators contributes significantly to strengthening the argument that skepticism towards teacher replacement by technology is cross-disciplinary. This emphasizes the need for policy support that reinforce teachers' central role in the digital era, as reflected in the Vietnamese government's policy that accommodates the use of AI while still placing teachers as central actors in education [55].

3.2.5. Challenges, limitations and future research

Although the findings of this study indicate that teachers generally hold positive perceptions toward AI use, the comprehensive implementation of AI in vocational education remains likely to encounter various structural and capability challenges. Disparities in educational infrastructure becomes one of the main obstacles to AI adoption, especially in developing countries such as Indonesia [38], [55], [64]. In addition, AI implementation also requires relatively high investment, which can limit its access and widespread use [66], [67]. Adequate competency development is also a crucial prerequisite for ensuring optimal AI utilization. However, vocational teachers in Indonesia continue to face limitations in digital literacy and access to digital resources [68]. This condition stems from inadequate access to technological devices and insufficient information technology proficiency. Failure to address these issues could lead to inequitable learning outcomes, diminish trust in AI, and disadvantage students in the learning process [60], [62], [69].

This study covers a specific Indonesian region. Both experienced and pre-service teachers' perceptions of instructional practices were examined, providing a broader perspective. Despite being statistically significant, the small effect size suggests that differences are subtle. These findings indicate a potential over-specialization in subject matter and a disconnect between vocational educators and evolving digital resources. Consequently, it is imperative to incorporate AI into practical instruction to guarantee relevance and pedagogical efficacy. Future research will gain from a more explicit emphasis on the incorporation of AI in educational practices. Consequently, sustainable AI adoption will generate valuable insights into the conditions under which innovative technologies enrich students' learning experiences and enhance theoretical understanding of education and AI.

4. CONCLUSION

This study revealed that VHS teachers in developing nations, especially Indonesia, hold a favorable perspective on AI and its function in education, encompassing planning, execution, and evaluation. Both certified and non-certified educators concurred that AI is significant and will not supplant teachers in

educational activities. Consequently, AI ought to serve as a supplementary and educational ally, rather than a replacement for the professional responsibilities of educators in the classroom. Although VHS educators exhibit confidence in integrating AI as a pedagogical ally, its widespread implementation encounters several obstacles, including inadequate educational infrastructure and substantial teaching burdens. In the absence of sufficient infrastructure enhancements and continuous training initiatives, the adoption of AI will present greater risks to the national education system than advantages. Future research should further investigate these dynamics in greater depth, especially through longitudinal studies assessing the long-term effects of AI integration on teaching and learning practices. Additional research is required to comprehend the contextual factors affecting AI utilization and to develop professional development programs that more effectively correspond with the changing needs of educators.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
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O : Writing - **O**riginal Draft
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Vi : **Vi**sualization
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CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study are available on request from the corresponding author, [Y]. The data, which contains information that could compromise the privacy of research participants, is not publicly available due to certain restrictions.

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