Teacher Workflow in the Age of AI: Examining Digital Learning Platforms and AI Utilization among Malaysian Teachers

Mohd Nazri Abdul Rahman (Phd), Aminuddin Awang, Fouzi Singon, Muhammad Ridzuan Idris (PhD), Norazan Matnor

NUTP Malaysia

Abstract

Artificial intelligence (AI) is increasingly being incorporated into educational settings through digital learning platforms that support teachers' instructional and administrative tasks. In Malaysia, the Digital Educational Learning Initiative Malaysia (DELIMa) serves as a national digital learning platform designed to facilitate teaching and learning activities. However, limited studies have explored how teachers utilize DELIMa and its AI-supported features in relation to teacher workflow. Hence, this study aims to examine the relationship between DELIMa use, AI utilization, and teacher workflow among Malaysian teachers, as well as the mediating role of AI utilization in the relationship between DELIMa use and workflow. This study employed a sequential explanatory mixed-methods design consisting of quantitative and qualitative phases. A total of 261 teachers in Malaysia participated in the survey phase. The findings showed that teachers moderately used DELIMa and its AI-supported features, while teacher workflow was perceived at a high level. DELIMa is mainly used for lesson planning, teaching materials, and instructional activities, whereas advanced AI-supported features such as analytics and automated feedback were less frequently used. The study also revealed significant positive relationships between DELIMa use, AI utilization, and teacher workflow. Importantly, AI utilization was found to partially mediate the relationship between DELIMa use and teacher workflow, indicating that active engagement with AI-supported features contributes to improved workflow efficiency. The findings suggest that AI-supported digital learning platforms have considerable potential to support teacher productivity and workflow in Malaysian education. The study contributes to the growing literature on AI in education by highlighting the importance of AI utilization as a mechanism through digital platforms influence teacher workflow.

Keywords: artificial intelligence, DELIMa, digital learning platforms, Malaysia, teacher workflow

Introduction

Artificial intelligence (AI) has emerged as one of the most transformative technological developments in the twenty-first century, significantly reshaping practices across multiple sectors, including education. The increasing advancement of generative AI systems and machine learning-based applications has expanded the role of technology from simple routine task automation to more complex functions such as content generation, adaptive feedback, decision support, and instructional design assistance (Grassini, 2023; Kasneci et al., 2023; Saputra et al., 2023). Recent discussions highlighted that the growing role of AI in educational measurement, assessment systems, and instructional support, emphasized on both its opportunities and ethical challenges in educational contexts (Bulut et al., 2024). Consequently, AI is increasingly embedded into digital ecosystems that assists teachers in managing both pedagogical and administrative responsibilities. This shift reflects a broader global trend in which educational technology is no longer viewed merely just as supplementary tools, but also as integral components of teaching and learning environments (UNESCO, 2023; Yan et al., 2024).

One of the most widely discussed implications of AI integration in education is its potential to enhance teacher productivity and reduce workload. Teachers are typically required to perform a wide range of tasks beyond classroom instruction, including lesson planning, material preparation, student assessment, grading, documentation, and communication with stakeholders. These responsibilities often contribute to high levels of workload and administrative burden, which may affect instructional quality and teacher wellbeing (Adams & editor, 2024; Crompton & Burke, 2023). In response, AI-based tools are increasingly promoted as mechanisms to streamline routine tasks, automate repetitive processes, and support decision-making in teaching practices. For instance, generative AI can assist in drafting lesson plans, generating assessment items, and providing feedback suggestions, thereby potentially reducing time spent on administrative work (Kasneci et al., 2023; Grassini, 2023).

However, despite the optimistic discourse surrounding AI in education, empirical findings regarding its actual impact on teacher workload remain mixed. While some studies suggest that AI and digital tools improve efficiency and reduce time spent on specific tasks, other evidence indicates that the integration of technology may introduce additional cognitive and operational demands, particularly when systems are complex or require continuous adaptation (Chen et al., 2024; Yan et al., 2024). Ethical concerns related to AI usage, including issues of reliability, transparency, and responsible implementation in educational settings, have also been increasingly discussed in recent literature (Panagopoulou et al., 2023). This suggests that the benefits of AI are not automatically realized through availability alone, but depend

significantly on how educators engage with and utilize these technologies in their daily professional practice. Consequently, understanding usage patterns and behavioral engagement with AI tools becomes critical in explaining their actual educational impact. In addition, teachers' awareness, perceptions, and readiness toward AI have been identified as important factors influencing technology adoption and usage behavior in educational environments (Ghimire et al., 2024).

In parallel with AI development, Learning Management Systems (LMS) and digital learning platforms have become essential infrastructures in modern education systems worldwide. Platforms such as Google Classroom, Microsoft Teams, Moodle, and Canvas are widely adopted to support instructional delivery, communication, assessment, and resource management (Garcia et al., 2020; Jackson & Shyamsundar, 2024; Sharip et al., 2023). These systems aim to centralize teaching and learning processes within digital environments, thereby improving organization, accessibility, and coordination of educational activities. LMS platforms are also designed to enhance instructional efficiency by reducing the fragmentation of teaching resources and communication channels. Furthermore, recent studies have shown that LMS digital tools can positively support student engagement and teaching effectiveness when integrated effectively into classroom practices (Simelane-Mnisi, 2023).

Nevertheless, existing literature indicates that LMS adoption does not necessarily guarantee reductions in teacher workload or improvements in workflow efficiency. Several studies report that although LMS platforms facilitate teaching processes, they may simultaneously introduce new forms of digital workload, such as system navigation complexity, increased documentation requirements, and continuous monitoring of student activity (Al-Naabi, 2023; Amankwah et al., 2024). Furthermore, the effectiveness of LMS platforms is highly dependent on user engagement, digital literacy, and institutional support, suggesting that technology outcomes are shaped not only by system design but also by human interaction with the system (Chong & Said, 2023; Ekuase-Anwansedo & Smith, 2019).

From a global perspective, the integration of LMS and AI technologies reflects a broader shift toward digitally mediated education ecosystems. Studies on LMS implementation consistently highlight that platform effectiveness is closely linked to user behavior, particularly the extent and depth of usage among educators (Hussein et al., 2024; Xu et al., 2024). Similarly, research on AI in education emphasizes that the pedagogical value of AI is realized only when educators actively engage with AI-supported features in meaningful ways, rather than using technology superficially (Crompton & Burke, 2023; Lawrence et al., 2024). This highlights the importance of distinguishing between general platform usage and advanced functional utilization when examining technology impact in educational settings.

In Malaysia, the Ministry of Education has introduced the Digital Educational Learning Initiative Malaysia (DELIMa) as a national digital learning ecosystem aimed at integrating multiple educational technologies into a unified platform. DELIMa provides teachers with access to digital learning resources, communication tools, instructional materials, assessment features, and increasingly AI-supported functionalities designed to enhance teaching efficiency and support pedagogical innovation (Chong & Said, 2023; Rusli et al., 2023). By consolidating various digital tools into a single platform, DELIMa is intended to streamline teaching processes, reduce fragmentation in digital resource use, and support teachers in managing both instructional and administrative tasks more efficiently.

Despite its large-scale implementation, empirical research on DELIMa remains relatively constricted and limited, especially in terms of how teachers actually use across the platform in practice. Existing studies on LMS and digital platforms in education have predominantly focused on adoption intention, usability, or general satisfaction, often treating platform usage as a unidimensional construct without differentiating between basic usage and advanced AI-supported functionalities (Hussein et al., 2024; Sharip et al., 2023). As a result, there is still limited understanding of how different dimensions of platform usage contribute to teacher outcomes such as workflow efficiency and perceived workload reduction.

Moreover, while AI integration within educational platforms is becoming increasingly prominent, there is still a lack of empirical evidence examining how AI utilization within such platforms functions as a mechanism that translates platform usage into practical outcomes. Prior research suggests that the relationship between technology use and performance outcomes is often indirect, mediated by behavioural engagement, usage intensity, or capability development (Lawrence et al., 2024; Xie et al., 2023). Recent mediation-based AI studies also emphasize that institutional readiness and teacher capability play important roles in translating AI integration into meaningful educational outcomes (Guan et al., 2026). In this sense, AI utilization within DELIMa may serve as a key mediating mechanism that explains how general platform usage is transformed into improved teacher workflow and productivity

Therefore, this study proposes a mediation framework in how by using DELIMa influences teacher workflow both directly and indirectly through AI utilization. By conceptualizing AI utilization as a mediating construct, this study moves beyond traditional adoption-focused perspectives and instead examines the mechanisms through which digital platforms generate practical benefits in educational practice. Specifically, this study investigates the extent of DELIMa usage among teachers, the level of AI feature utilization within DELIMa, and the relationship between these constructs and teacher workflow efficiency. In doing so, this study contributes to the literature by providing a more nuanced, mechanism-based explanation of

how the national digital learning platforms and AI integration jointly shape teacher professional practice.

Methods

This study employed a sequential explanatory mixed-methods design consisting of quantitative and qualitative phases. The quantitative phase was conducted first using an online survey to examine teachers' AI utilization, teacher agency, and teaching outcomes in AI-supported pedagogy. This was followed by qualitative interviews to triangulate and further explain the quantitative findings. A total of 261 teachers in Malaysia participated in the survey. The questionnaire consisted of demographic information, AI-supported teaching activities, teacher agency, and teaching outcomes. The instrument included both Likert-scale items and multiple-choice questions related to teachers' use of AI tools in instructional practices.

Quantitative data were analyzed using SPSS Version 30 and PROCESS Macro Version 5 to identify the most common AI-supported teaching activities and the levels of teacher agency and teaching outcomes. Pearson correlation analysis was conducted to examine the relationships between variables, while mediation analysis was performed to determine the mediating effect of AI utilization on the relationship between DELIMa use and teacher workflow. Following the quantitative phase, semi-structured interviews were conducted with selected participants to gain deeper insights into teachers' experiences, challenges, and pedagogical decision-making when integrating AI into teaching and learning. The qualitative data were analyzed thematically and used to support and triangulate the quantitative findings.

Result

Respondent Characteristics

Table 1 presents the demographic profile of the respondents. A total of 261 teachers participated in this study. In terms of gender distribution, the majority of respondents were in category 2 (71.6%, *n* = 187), while 28.4% (*n* = 74) were in category 1. Regarding age, most respondents were concentrated in category 3 (51.3%, *n* = 134), followed by category 2 (26.8%, *n* = 70). Smaller proportions were observed in category 4 (16.1%, *n* = 42) and category 1 (5.7%, *n* = 15), indicating that the sample largely represents teachers in their mid-career stage. For school location, more than half of the respondents were from category 1 (56.2%, *n* = 146), followed by category 3 (34.2%, *n* = 89) and category 2 (9.6%, *n* = 25), with one missing response (0.4%). In terms of teaching experience, the majority of respondents were in category 5 (72.4%, *n* = 189), followed by category 4 (19.5%, *n* = 51), suggesting that most participants were highly experienced teachers. With regard to professional position, most respondents were in category 1 (70.9%, *n* = 185), followed by category 3 (14.9%, *n* = 39),

category 2 (10.7%, *n* = 28), and category 4 (3.4%, *n* = 9). Finally, for subject specialization, the majority of respondents were in category 2 (76.2%, *n* = 199), while 23.8% (*n* = 62) were in category 1.

Table 1 Respondent Characteristics

Variable	Category	Frequency (n)	Percentage (%)
Gender	1	74	28.4
	2	187	71.6
Age	1	15	5.7
	2	70	26.8
	3	134	51.3
	4	42	16.1
Location	1	146	56.2
	2	25	9.6
	3	89	34.2
	Missing	1	0.4
Experience	1	1	0.4
	2	7	2.7
	3	13	5.0
	4	51	19.5
	5	189	72.4
Position	1	185	70.9
	2	28	10.7
	3	39	14.9
	4	9	3.4
Subject	1	62	23.8
	2	199	76.2

Descriptive Statistics

Table 2 Descriptive Statistics of Main Variables

Variable	Scale	Min	Max	Mean	SD	Level	Skewness	Kurtosis
DU	0–5	0.50	5.50	3.44	1.36	High	-0.118	-0.987
AID	0–5	0.50	5.50	2.81	1.19	Moderate	0.474	-0.268
WF	1–5	1.00	5.75	3.86	1.20	High	-0.600	0.019

Note: DU = DELIMa Use; AID = AI in DELIMa; WF = Workflow.

Table 2 presents the descriptive statistics for the main variables in this study, including DELIMa use (DU), AI-supported features in DELIMa (AID), and teacher workflow (WF). Overall, teachers reported a moderate level of DELIMa use (M = 3.44, SD = 1.36), indicating that the platform is being utilized to some extent in daily teaching practices, although not yet at an optimal level. Similarly, the use of AI-supported features within DELIMa was also at a moderate level (M = 2.81, SD = 1.19), but closer to the lower bound of the moderate range, suggesting relatively limited engagement with AI functionalities.

In contrast, teacher workflow was reported at a high level (M = 3.86, SD = 1.20), indicating that teachers generally perceive their workflow and productivity positively. In terms of data distribution, skewness values ranged from -0.600 to 0.474, indicating relatively symmetrical distributions across variables. Kurtosis values were also within an acceptable range, suggesting no severe deviation from normality. These results support the suitability of the data for further parametric analyses.

The Use of DELIMa in Teaching and Administrative Tasks

Table 3 presents teachers' use of DELIMa across various teaching and administrative tasks. As multiple responses were allowed, the percentages reflect the proportion of teachers who reported using DELIMa for each specific task. The findings indicate that DELIMa is most frequently used for lesson planning and preparing teaching materials/resources, with 67.4% of teachers selecting each of these tasks. This suggests that the platform is primarily utilized to support instructional preparation activities. Moderate usage was observed for learning activities (59.0%) and administrative tasks/documentation (56.3%), indicating that more than half of the teachers also use DELIMa during classroom implementation and for routine

administrative purposes. In contrast, lower usage was reported for student assessment (43.3%), while student feedback and communication was the least utilized function, with only 26.1% of teachers indicating its use. This suggests that DELIMa is less frequently employed for interactive and evaluative aspects of teaching, particularly those involving direct engagement with students.

Table 3 Teachers' Use of DELIMa Across Teaching and Administrative Tasks

Task	Selected (n)	Percentage (%)	Interpretation
Lesson planning	176	67.4	Frequently used
Teaching materials	176	67.4	Frequently used
Learning activities	154	59.0	Moderately used
Administrative	147	56.3	Moderately used
Student assessment	113	43.3	Less frequently used
Student feedback	68	26.1	Least used

The Use of AI-Supported Features in DELIMa

Table 4 presents teachers' use of AI-supported features within DELIMa. As multiple responses were allowed, the percentages reflect the proportion of teachers who reported using each feature. The findings indicate that the most commonly used AI feature is auto-suggestion for lesson planning and teaching materials, with 66.3% of teachers selecting this option. This aligns with earlier findings showing that DELIMa is primarily used for instructional preparation. Moderate usage was observed for AI-assisted quizzes and assessment grading (52.5%), suggesting that some teachers are beginning to integrate AI into evaluative tasks, although not yet extensively. In contrast, lower usage was reported for more interactive and advanced AI features, such as chatbots or virtual assistants (33.7%) and AI-generated feedback recommendations (33.0%). Even lower adoption was found for dashboard analytics for student progress (19.9%) and automated reminders or notifications (15.7%), indicating that these features are rarely utilized by teachers.

Table 4 Teachers' Use of AI-Supported Features in DELIMa

AI Feature	Selected (n)	Percentage (%)	Interpretation

Auto-suggestion for lesson plans/materials	173	66.3	Frequently used
AI-assisted quizzes/assessment grading	137	52.5	Moderately used
Chatbot/virtual assistant	88	33.7	Less frequently used
AI recommendations for feedback	86	33.0	Less frequently used
Dashboard analytics for student progress	52	19.9	Rarely used
Automated reminders/notifications	41	15.7	Rarely used

DELIMa and Teacher Workflow

Table 5 presents teachers' perceptions of how DELIMa supports their workflow and reduces workload. Overall, the findings indicate a moderate positive impact across all dimensions. In terms of efficiency, teachers reported that DELIMa moderately improves both lesson preparation and classroom tasks (*M* = 4.07, *SD* = 1.37) as well as administrative task management (*M* = 4.13, *SD* = 1.39). Similarly, teachers indicated a moderate level of agreement that DELIMa allows them to focus more on instructional quality and student engagement (*M* = 4.00, *SD* = 1.34). However, when it comes to perceived workload reduction, the mean score was comparatively lower (*M* = 3.25, *SD* = 1.09), although still within the moderate range. This suggests that while DELIMa contributes to efficiency and task management, its impact on actually reducing teachers' workload is less pronounced.

Table 5 Perceived Impact of DELIMa on Teacher Workflow and Workload

Statement	**Scale**	**Mean**	**SD**	**Level**
Improves efficiency in lesson preparation and classroom tasks	1–6	4.07	1.37	Moderate
Helps manage administrative tasks and documentation efficiently	1–6	4.13	1.39	Moderate

Allows greater focus on instructional quality and student engagement	1–6	4.00	1.34	Moderate
Reduces perceived workload	1–5	3.25	1.09	Moderate

Relationship Between DELIMa Use, AI Utilization, and Workflow

The results of Pearson correlation analysis examining the relationships between DELIMa use (DU), AI utilization within DELIMa (AID), and teacher workflow (WF), as shown on Table 6 indicate that all variables are positively and significantly correlated at the 0.01 level. A strong positive correlation was found between DELIMa use and AI utilization (r = .769, p < .001), suggesting that teachers who use DELIMa more frequently are also more likely to utilize its AI-supported features. Similarly, DELIMa use showed a strong positive relationship with teacher workflow (r = .796, p < .001), indicating that increased use of the platform is associated with improved efficiency and productivity in teaching tasks. In addition, AI utilization was strongly correlated with workflow (r = .733, p < .001), suggesting that the use of AI features contributes positively to teachers perceived workflow.

Table 6 Correlation Between DELIMa Use, AI Utilization, and Teacher Workflow

Variable	**DU**	**AID**	**WF**
DU	1	.769**	.796**
AID	.769**	1	.733**
WF	.796**	.733**	1

*Note: DU = DELIMa Use; AID = AI in DELIMa; WF = Workflow. *p < *.01.*

AI Utilization as a Mediator Between DELIMa Use and Teacher Workflow

A mediation analysis was conducted using the PROCESS macro (Model 4) developed by Hayes, with a bootstrapping procedure to examine whether AI utilization (AID) mediates the relationship between DELIMa use (DU) and teacher workflow (WF). A total of 5,000 bootstrap samples were used to estimate the indirect effects and their corresponding confidence intervals. The overall model was statistically significant, explaining approximately 67.0% of the variance in teacher workflow (R^2 = .670, p < .001).

The results indicated that DELIMa use has a significant direct effect on workflow (β = 0.5000, p < .001), suggesting that increased use of the platform is associated with improved teacher

workflow. In addition, AI utilization significantly predicts workflow (β = 0.2979, p < .001). Importantly, the indirect effect of DELIMa use on workflow through AI utilization was also significant (effect = 0.1995, 95% bootstrap CI [0.1305, 0.2660]), as the confidence interval does not include zero. This indicates that AI utilization plays a mediating role in the relationship. Since both the direct and indirect effects remain significant, the findings support a partial mediation model, suggesting that DELIMa enhances teacher workflow both directly and indirectly through AI utilization.

Table 7 Mediation Analysis: The Role of AI Utilization (AID) in the Relationship Between DELIMa Use (DU) and Workflow (WF)

Predictor	**Coefficient (β)**	**SE**	**t**	**p**	**95% CI**
Constant	1.3045	0.12	10.88	<.001	[1.07, 1.54]
DU	0.5000	0.05	10.16	<.001	[0.40, 0.60]
AID	0.2979	0.06	5.27	<.001	[0.19, 0.41]

Model Summary: R = .818, R^2 = .670, $F(2, 258)$ = 261.34, p < .001

Effect Type	**Effect**	**BootSE**	**95% Boot CI**
Direct (DU → WF)	0.5000	0.0492	[0.4031, 0.5970]
Indirect (DU → AID → WF)	0.1995	0.0347	[0.1305, 0.2660]

Discussion

This study examined the role of digital learning platforms and AI utilization in supporting teacher workflow among Malaysian teachers, with particular attention to the mediating role of AI utilization within DELIMa. Overall, the findings indicate that while teachers demonstrate relatively high engagement with digital platforms for instructional and administrative purposes, the integration of AI-supported features remains moderate. Nevertheless, both DELIMa use and AI utilization were found to significantly contribute to teacher workflow, highlighting the growing importance of AI-enabled digital ecosystems in contemporary educational practice.

The findings revealed that teachers reported a moderate level of DELIMa use and AI utilization, while teacher workflow was perceived at a relatively high level. This suggests that although Malaysian teachers have already integrated DELIMa into their professional practices, the use of advanced AI-supported functionalities is still developing. Such findings are consistent with previous studies indicating that educators are generally open to adopting AI

and digital technologies, yet their actual usage of advanced AI tools often remains limited due to factors such as familiarity, confidence, institutional readiness, and perceived usefulness (Ghimire et al., 2024; Xu et al., 2024). This pattern reflects the transitional nature of AI integration in education, where teachers may already be comfortable using digital platforms for routine instructional purposes but are still gradually adapting to AI-enhanced pedagogical practices.

The moderate level of AI utilization found in this study may also reflect broader concerns regarding the complexity and practical implementation of AI technologies in educational contexts. Previous research has shown that although AI tools offer significant opportunities for efficiency and automation, educators may remain cautious about integrating them extensively into teaching due to concerns related to reliability, ethics, digital literacy, and pedagogical appropriateness (Kasneci et al., 2023; Panagopoulou et al., 2023). In the Malaysian context, this may indicate that while DELIMa provides access to AI-supported features, teachers are still in the process of exploring how these tools can be meaningfully incorporated into their daily workflow. The finding therefore suggests that AI integration in schools should not be viewed merely as a technological issue, but also as a pedagogical and professional adaptation process requiring continuous support and training.

The analysis of teachers' use of DELIMa across different tasks further provides important insight into how digital platforms are currently positioned within teachers' professional routines. The findings showed that DELIMa was most frequently used for lesson planning and preparing teaching materials, followed by learning activities and administrative tasks. In contrast, lower usage was reported for student assessment and feedback-related activities. This pattern suggests that teachers primarily perceive DELIMa as a preparatory and organizational tool rather than a fully integrated instructional and interactive ecosystem. Similar trends have been reported in previous studies on LMS usage, where educators tend to prioritize functions that directly reduce preparation time and simplify resource management (Sharip et al., 2023; Jackson & Shyamsundar, 2024).

This finding may also reflect the practical realities of teachers' workload. Lesson preparation and teaching material development are among the most time-consuming aspects of teaching practice, making AI-supported assistance particularly attractive in these areas. Studies by Karpouzis et al. and Grassini (2023) suggest that generative AI tools are especially useful for drafting instructional content, organizing teaching resources, and generating classroom materials efficiently. Consequently, teachers may naturally prioritize AI-supported features that immediately reduce preparation burden. However, the relatively low use of DELIMa for feedback and student interaction indicates that teachers may still prefer human-centered

approaches for evaluative and relational aspects of teaching. This aligns with literature emphasizing that while AI can support instructional efficiency, teachers continue to value human judgment and interpersonal interaction in educational processes (Lawrence et al., 2024).

Similarly, the findings regarding AI-supported features within DELIMa demonstrate that teachers most frequently utilized auto-suggestion tools for lesson planning and teaching materials, whereas more advanced features such as dashboard analytics, automated reminders, and AI-generated feedback were rarely used. This suggests that teachers currently favor AI applications that provide direct and immediate practical benefits while avoiding features perceived as more complex or less relevant to their daily instructional needs. Previous studies have similarly reported that educators are more likely to adopt AI tools when the benefits are visible, accessible, and directly connected to classroom practice (Crompton & Burke, 2023; Xu et al., 2024).

The lower use of analytics and automated monitoring features may also indicate limited familiarity with data-driven instructional decision-making among teachers. Although AI-powered analytics have the potential to support personalized learning and student monitoring, effective use of such features often requires additional digital competencies and interpretive skills (Yan et al., 2024). This finding highlights an important issue for educational policy and professional development in Malaysia. The successful implementation of AI-supported digital ecosystems may depend not only on providing technological infrastructure but also on developing teachers' capability to interpret, evaluate, and apply AI-generated information effectively in pedagogical contexts.

Another important finding of this study concerns teachers' perceptions of workflow and workload reduction. Although teachers generally reported positive perceptions regarding efficiency and task management, the perceived reduction in workload remained comparatively moderate. This suggests that digital platforms and AI tools may improve workflow organization and task efficiency without necessarily eliminating workload pressures entirely. Such findings are consistent with prior studies indicating that technology integration may simultaneously simplify certain tasks while introducing new digital responsibilities and adaptation demands (Al-Naabi, 2023; Amankwah et al., 2024).

This finding is particularly important within the broader discourse surrounding AI in education, which often promotes technology as a solution to teacher workload challenges. While AI-supported systems can automate repetitive processes and support administrative efficiency, teachers may still experience workload associated with monitoring digital systems, verifying AI-generated outputs, adapting teaching materials, and maintaining instructional quality. Chen

et al. (2024) similarly argued that AI integration may produce both supportive and demanding effects on teachers depending on the extent of technological engagement and institutional support available. Therefore, the findings of this study suggest that AI should be viewed as an auxiliary supported augmentation tool rather than a complete replacement for teacher effort and professional judgment.

The correlation analysis further demonstrated strong positive relationships between DELIMa use, AI utilization, and teacher workflow. Teachers who used DELIMa more extensively were also more likely to utilize AI-supported features, and both variables were positively associated with improved workflow. These findings support existing literature emphasizing that meaningful technology integration is strongly associated with perceived usefulness and practical engagement in instructional activities (Hussein et al., 2024; Xie et al., 2025). The strong relationship between DELIMa use and workflow suggests that digital learning platforms can contribute significantly to teacher efficiency when integrated consistently into professional practice.

Most importantly, the mediation analysis revealed that AI utilization significantly mediated the relationship between DELIMa use and teacher workflow. This finding suggests that the impact of digital platform use on workflow is not entirely direct, but partly operates through teachers' engagement with AI-supported features. In other words, simply using a digital platform may not be sufficient to substantially improve workflow unless teachers actively utilize the AI functionalities embedded within the platform. This finding extends previous LMS and AI literature by demonstrating that AI utilization functions as an important mechanism linking platform usage to practical educational outcomes.

The mediation finding is consistent with studies suggesting that technology outcomes are often shaped by behavioral and functional mechanisms rather than direct technological presence alone (Lawrence et al., 2024; Chen et al., 2024). Similarly, Hussein et al. (2024) emphasized that system effectiveness depends heavily on the actual utilization of LMS functionalities rather than mere platform availability. In the context of this study, AI utilization represents an active engagement process through which teachers transform digital infrastructure into practical workflow improvements. This finding therefore contributes to the growing literature on AI-enabled education by highlighting the importance of usage depth and functional engagement in determining the effectiveness of educational technologies.

From a broader policy perspective, the findings of this study have important implications for the future development of AI-supported education in Malaysia. The results suggest that national digital learning initiatives such as DELIMa should move beyond infrastructure provision toward supporting meaningful pedagogical integration of AI technologies. This

includes strengthening professional development programs, improving teachers' AI literacy, and ensuring that AI-supported features are designed in ways that align with teachers' actual workflow needs. As AI continues to evolve within educational environments, the effectiveness of digital learning ecosystems may increasingly depend on how successfully teachers are supported in integrating AI into authentic teaching practices rather than merely accessing digital platforms.

Conclusion

This study examined the relationship between DELIMa use, AI utilization, and teacher workflow among Malaysian teachers. The findings showed that teachers moderately used DELIMa and its AI-supported features, while teacher workflow was perceived at a high level. DELIMa was mainly used for lesson planning, teaching materials, and instructional activities, whereas advanced AI features such as analytics and automated feedback were less frequently utilized.

The study also found significant positive relationships between DELIMa use, AI utilization, and teacher workflow. Importantly, AI utilization partially mediated the relationship between DELIMa use and workflow, indicating that the effectiveness of digital learning platforms depends not only on platform usage itself but also on teachers' active engagement with AI-supported features. Overall, the findings suggest that AI-supported digital platforms can contribute positively to teacher efficiency and workflow in Malaysian education.

Practical Implications

The findings suggest that educational authorities should continue strengthening digital learning ecosystems such as DELIMa while providing more targeted support for AI integration in teaching practice. Professional development programs should focus not only on platform usage but also on practical applications of AI tools for lesson preparation, assessment, and administrative tasks.

In addition, AI-supported features should be designed to be more user-friendly and aligned with teachers' actual workflow needs. Policymakers should also ensure that technological innovation supports teacher wellbeing and does not create additional digital burden.

Recommendations for Future Research

Future studies may examine additional factors influencing AI utilization and teacher workflow, such as digital competence, AI literacy, institutional support, and teacher attitudes toward AI. More complex models involving moderation or multiple mediators may also provide deeper insights into AI integration in education.

In addition, future research may employ qualitative or longitudinal approaches to better understand teachers' experiences and adaptation processes over time. Comparative studies across different countries or educational systems are also recommended to explore how AI-supported digital platforms are implemented in various educational contexts.

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