

## PAPER

# The Role of Lecturers' AI Leadership in Enhancing Postgraduate Student Teachers' Integration of Mobile AI Tools: A Mixed-Methods Study in Malaysian Education Faculties

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## ABSTRACT

This study examined the influence of lecturers' artificial intelligence (AI) leadership on postgraduate student teachers' motivation to integrate AI into their curricula in Malaysian higher education. Using a sample of 62 participants, the study employed a mixed-methods approach to explore ethical implications and the alignment of AI with traditional teaching practices. By means of open-ended questions and online surveys, the study generated both quantitative and qualitative understanding of how leadership influences acceptance of AI in educational settings. Key findings showed that transformative and visionary AI leadership approaches not only improve feedback systems and tailored learning opportunities but also inspire teachers by means of interactive, game-like learning activities. AI leadership enables early identification of learning gaps by means of real-time analytics, enabling targeted interventions and a more inclusive learning environment. However, over-reliance on AI highlights the need for strategic planning to ensure that AI complements rather than replaces traditional teaching methods. The research emphasized the need for strategic leadership and professional development in embedding AI ethically and successfully inside curricula, offering a framework for both curriculum design and educator training programs. These results support current debates on educational innovation and place leadership as key in promoting a balanced, ethical AI integration matched with present educational aims.

## KEYWORDS

artificial intelligence (AI) transforming leadership, challenges of AI integration, postgraduate student teachers, AI integration in education, educational technology, transformational leadership in AI

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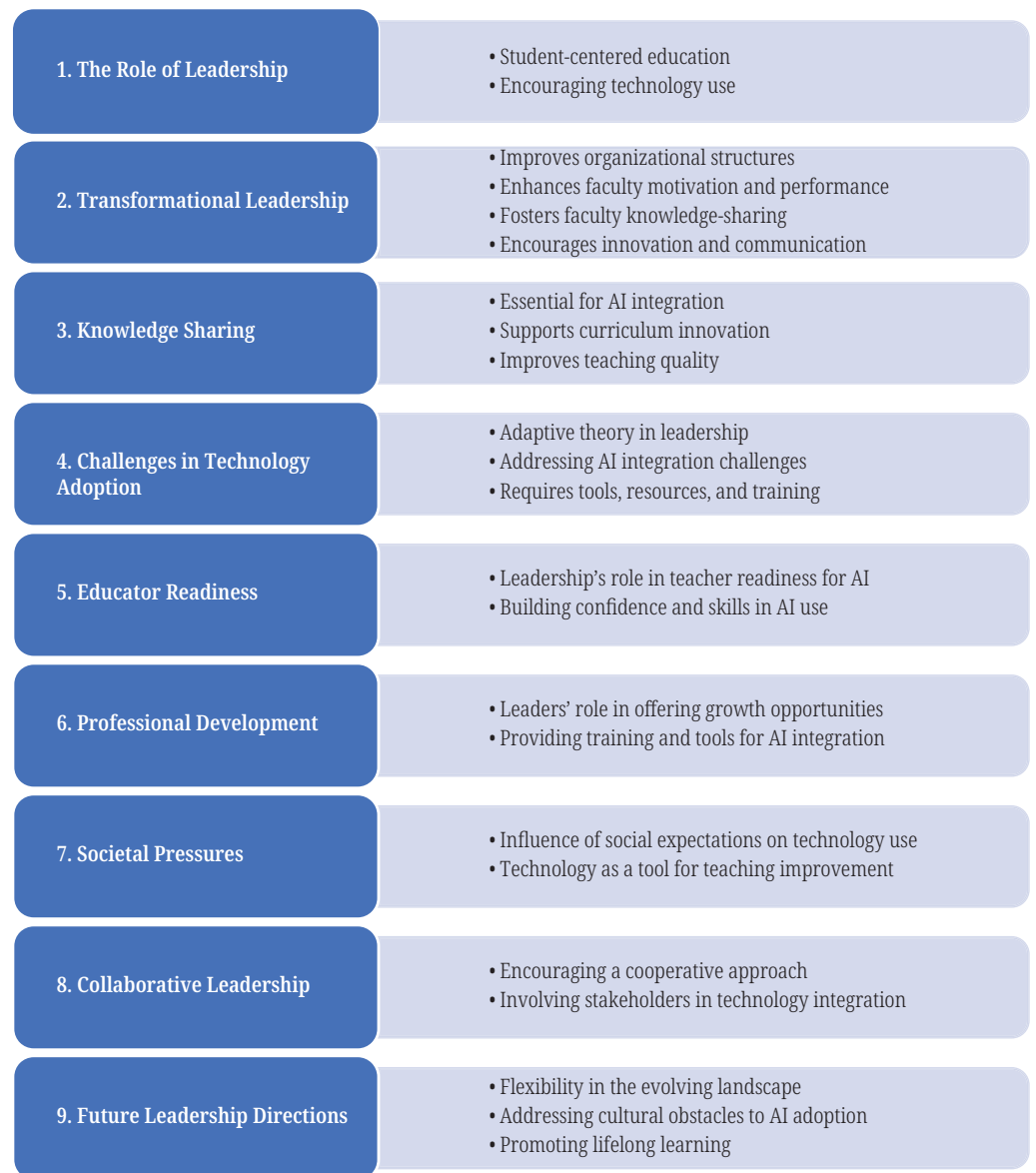
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## 1 INTRODUCTION

This study investigated the relationship between artificial intelligence (AI) leadership and the effective adoption of AI tools by postgraduate student teachers in higher education. With AI increasingly central to educational innovation, understanding how lecturers' leadership influences AI adoption is essential for improving teaching practices. Leadership significantly facilitates or hinders this integration process, especially in higher education. Expected performance, habit, and enjoyment are key factors influencing students' intentions to adopt AI applications, highlighting the role of motivation and habit in technology adoption [1]. As more educational institutions adopt AI to enhance learning, the success of these technologies largely relies on postgraduate teachers' willingness and capability to integrate them into their practices. Recent bibliometric studies, such as [2, 3], highlight the evolution of digital and transformational leadership, reinforcing their critical roles in technology integration in education. Comparably, the evolution of transformational school leadership has been examined to expose changes in emphasis from conception to pragmatic implementations involving principals and instructional leadership [3]. In other words, AI technology's effective integration is contingent upon leadership that supports postgraduate teachers' readiness and capacity for technology adoption. This research synthesized the link between leadership, technology adoption, and postgraduate student teachers' preparedness for AI integration, drawing from numerous studies. This study integrated key theories, including transformational leadership and the technology acceptance model (TAM), to provide a comprehensive understanding of AI adoption in education. Smooth transitions supported a logical flow from AI's general educational role to its specific influence on postgraduate student teachers. Maintaining theoretical rigor clarified the implications of AI leadership in education and reinforced the research foundation. This approach balanced depth and readability, providing clarity in a rapidly evolving field. In addition, this study fit the focus of the journal by tackling, especially in higher education environments, the junction between educational technology adoption and leadership methods [3, 4]. Figure 1 outlines the synthesis from literature reviews pertaining to the nine core aspects on the subject of leadership and technology integration in education.

Effective digital leaders combine the deft use of digital technologies, support of digital transformation, and creation of a digital learning culture [2]. Research in the field of transformative school leadership has developed to reflect the dynamic problems encountered by educational leaders by addressing issues such as work-family conflict and digital capabilities [3].

In terms of the role of leadership in technology integration, effective technology integration relies on foundational leadership. Potjanajaruwit [5] stressed that in student-centered education, technological leadership is the capacity of educational managers to efficiently manage and advance the use of technology. Leadership fosters an environment that encourages AI integration among student teachers. Moreover, systematic research emphasized how transformational leadership improves organizational structures in colleges and implied that these kinds of leadership approaches may greatly improve faculty members' performance and motivation [6, 7, 8]. Transformational leaders foster an innovative climate through inspiration.



**Fig. 1.** Synthesis from literature reviews on the subject of leadership and technology integration in education

The second aspect found from literature reviews concerned the subject of transformational leadership and its impact on faculty. In the framework of higher education, where the integration of AI technology might be greeted with opposition, transformational leadership is especially crucial. Researchers have contended that transformational leadership fosters faculty knowledge-sharing, which is necessary for the effective implementation of creative ideas, including AI applications [9]. Transformational leaders may also encourage conversations on the incorporation of AI technology by supporting teamwork and honest communication, therefore improving the whole learning process. This is consistent with the results of researchers who underline that champions of the adoption of new technologies in educational environments are technology leaders [10]. Their studies emphasized the need for leadership in controlling the complexity related to the acceptance of technology. Visionary leadership plays a crucial role in facilitating AI adoption in education. As such, educational leaders have to make use of the resources at hand to change with

the industrial revolution 4.0 in line with technology developments [11]. Visionary leaders draft a common vision for technology integration, which might inspire postgraduate student teachers to use AI technologies in their curricula. Encouragement of an innovative culture and ongoing growth in educational institutions depends on this common vision.

Knowledge-sharing is essential for effective AI integration in education. Scholars have further clarified that encouraging a culture of knowledge sharing within educational settings helps faculty in debating and constructing creative curriculum using new technologies [9]. This cooperative method improves the quality of teaching and helps postgraduate student teachers to interact with AI technologies more successfully. It is impossible to overestimate the importance of leadership in encouraging information sharing, as it directly affects teachers' inclination to adopt technological developments. The fourth aspect is concerning the challenges in technology adoption. Although the integration of AI has potential, its adoption remains limited. Discussions on the adaptive theory approach in leadership stressed the need for educational leaders to coordinate effectively and within their institutions [12]. This method is especially pertinent in tackling the obstacles postgraduate student teachers might have in incorporating AI into their lessons. Leadership addresses challenges by providing essential tools, resources, and training.

The fifth aspect concerns the impact of leadership on educator readiness. In recent years, studies have found that leadership styles in institutions greatly affect how ready postgraduate student teachers are to adopt AI technology. Studies highlighted that teachers consult their supervisors for direction and encouragement on using new technology [4]. Dedicated leadership enhances student teachers' confidence in using AI. This emphasized the need for good leadership in developing prepared teachers for a technologically ready culture.

In regards to professional development and support, good leadership also includes offering postgraduate student teachers opportunities for professional growth. Leaders must implement plans to build faculty AI capacity [12, 13]. Providing postgraduate student teachers with focused tools and training will enable them to include AI technology in their courses of instruction. Ensuring that teachers have the required knowledge and abilities to properly use AI depends on this professional growth.

The next aspect involves the influence of societal pressures. Social forces are important for the incorporation of technology in education. Researchers have posited that educational leaders should use technology as a tool for improving teaching and learning under the influence of society's expectations [14]. Leaders under this external pressure might be inspired to prioritize technology integration, therefore affecting the inclination of postgraduate student teachers to embrace AI in their work. Educational leaders must grasp the larger social context if they are to negotiate the complexity of technological adoption. Collaborative leadership is key to fostering a supportive atmosphere for AI integration. As stressed by Samsudin and Ghani [15], the dynamics of 21st-century education call for a cooperative approach stressing communication, critical thinking, and creativity. Working together with postgraduate student teachers, educational leaders may develop a common vision for technology integration, therefore including all the stakeholders in the process. This cooperative technique may increase the general efficiency of implementing AI in learning environments.

The last and ninth aspect of consideration is the future directions for leadership in technology integration. Future leadership roles will evolve with AI [16, 17]. Educational leaders have to be flexible and sensitive to the changing terrain of

education as AI technologies develop. Studies have underlined the importance of leaders tackling the cultural obstacles that can impede the acceptance of modern technology [18]. Educational leaders could ensure that postgraduate student teachers are prepared to implement AI into their teaching strategies by encouraging an innovative culture and lifelong learning.

At this juncture, the effective integration of AI technology in educational institutions depends mostly on the capacity and desire of postgraduate student teachers to embrace new instruments. As it affects the company culture, encourages information exchange, and gives teachers the required support, leadership is pivotal in facilitating this process. Particularly successful in inspiring postgraduate student teachers to utilize AI technology, transformational and visionary leadership styles could help to improve the learning and teaching practices eventually. Strong leadership may be crucial in helping teachers to create an innovative and ready culture as educational institutions negotiate the complexity of technological integration.

### 1.1 Problem statement

Despite the potential benefits of AI in education, many postgraduate student teachers face challenges in integrating these tools due to insufficient leadership support [19, 4]. Previous studies focused primarily on technical aspects of AI adoption, with little emphasis on how lecturers' leadership influences postgraduate student teachers' application of AI [20, 15]. However, gaps in the literature highlight the need for further research into the influence of leadership in the acceptance of AI technology [6, 21]. One significant research topic is how transformational leadership—which is known to inspire creativity—particularly affects postgraduate teachers' drive to use AI technologies into their courses of instruction [22, 23]. While transformative leadership is widely recognized, its impact on postgraduate student teachers remains underexplored [10].

The challenges postgraduate student teachers face in implementing AI in their practice require further investigation [24, 12]. While overcoming technical obstacles is clearly dependent on leadership, little research has looked at the particular challenges these teachers face [4].

Effective technology integration requires leadership that can address challenges and provide appropriate support to educators [15, 25]. Hence, there is a vital need to explore more focused plans that teachers, as leaders in education, may use to improve AI integration [16, 26]. Although the value of leadership in the acceptance of technology is recognized, current studies lack practical solutions to enable postgraduate teachers to overcome both motivation-related and pragmatic challenges in using AI technologies [27, 28]. This discrepancy requires further research [5, 29].

### 1.2 Purpose of study

The overall purpose of this study was to explore the critical role of leadership in facilitating the adoption of AI technology by postgraduate student teachers. By examining the ways in which leadership, particularly from lecturers, influences the motivation, challenges, and practical strategies for integrating AI into teaching practices, the study aimed to provide a deeper understanding of how educational leaders can effectively support this process. This research sought to contribute to the ongoing discourse on leadership in technology integration by addressing specific gaps

related to leadership's impact on motivation, overcoming implementation barriers, and providing actionable strategies. Hence, the research objectives were as follows:

Objective 1: To analyze the impact of lecturers' AI leadership on postgraduate student teachers' motivation to integrate AI tools into their teaching.

Objective 2: To assess the challenges faced by postgraduate student teachers in AI implementation and the role of lecturers' leadership in overcoming these challenges.

Objective 3: To propose strategies for lecturers (as educational leaders) to enhance postgraduate student teachers' AI integration efforts.

### 1.3 Underlying theories

Transformational Leadership Theory was applied in this paper to investigate how lecturers' AI leadership approaches affect postgraduate student teachers' acceptance of AI technologies. Understanding how professors could inspire and urge students to surpass expectations was especially important in light of transformational leadership—that which drives innovation in education. Transformational leaders encourage postgraduate student teachers to accept new technologies that improve their teaching efficacy by creating a supportive atmosphere, hence overcoming barriers to AI adoption. In this context, transformational leadership offers a structure for analyzing how teachers' leadership could motivate postgraduate student teachers to use AI in their classroom environments—as covered in the attachment.

Furthermore, the TAM was used to assess postgraduate student teachers' perception of the value of AI technologies. TAM argues that consumers' behavioral intentions to embrace technology are influenced by these impressions. In regards to AI integration into the classroom, TAM enables a study of the elements influencing student teachers' opinions on AI, thereby guiding the identification of the leadership practices improving acceptability. In the framework of this research, TAM offered a fundamental theoretical framework for evaluating how leadership influences the actual use of AI by promoting good impressions and lowering adoption obstacles. Figure 2 summarized these two theories as the foundations of this study.

#### Transformational Leadership Theory

- This theory will help examine how lecturers' AI leadership styles inspire postgraduate student teachers to adopt innovative tools like AI.

#### Technology Acceptance Model (TAM)

- This model will be used to analyze postgraduate student teachers' perceived ease of use and usefulness of AI tools, which influences their behavioral intentions.

Fig. 2. Underlying theories of the study

## 2 METHODOLOGY

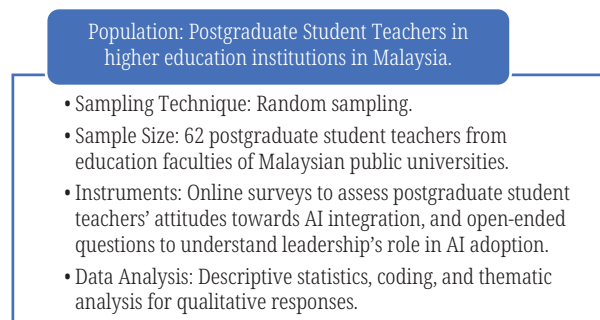
Investigating the impact of AI leadership on postgraduate student teachers' adoption of AI technology within Malaysian higher education institutions was the main emphasis of the research approach for this study.

In this study, qualitative data from open-ended responses was analyzed through a systematic coding process. The initial coding phase involved categorizing participants' responses into distinct codes based on the themes emerging from

the data. This process was conducted manually to ensure close engagement with the data, which helped in identifying nuanced patterns within responses. Subsequently, these codes were refined and grouped into broader categories that reflected the key themes relevant to AI leadership and postgraduate student teachers' adoption of AI tools in teaching. This coding procedure was carefully documented to maintain consistency and reliability across the dataset.

Following the coding, thematic analysis was employed to explore and interpret the relationships between the identified themes. This method allowed for the examination of both explicit content and underlying meanings within the data, providing insights into how AI leadership impacts teaching practices. Thematic analysis was guided by Braun and Clarke's [30, 31, 32] framework, involving familiarization with data, generating initial codes, searching for themes, reviewing themes, and defining and naming themes. This approach provided insights into how leadership styles affect teachers' motivation, challenges, and strategies for integrating AI in education. Combining thematic analysis with descriptive statistics in the mixed-methods approach guarantees a thorough investigation of lecturers' AI leadership and how it influences the acceptance of AI technologies by postgraduate teachers [30, 32, 33].

As shown in Figure 3, this study targeted a demographic that included postgraduate student teachers from Malaysian public institutions, actively involved in instruction from their respective departments. This group was significant given the increasing need for technological integration into educational processes, especially with regard to the use of AI instruments. Through an analysis of this particular demographic, the research sought to grasp the particular challenges and incentives experienced by teachers at this academic level.



**Fig. 3.** Summary of the research methodology

To guarantee a varied and representative sample of postgraduate student teachers was chosen via a random selection method. Resultantly, a diverse sample of 62 postgraduate teachers was randomly selected to ensure representation across Malaysian institutions to provide a comprehensive viewpoint on AI leadership and its consequences for AI integration. This sample method ensured that the results, in the context of higher education in Malaysia, were generalizable and represented a spectrum of experiences and opinions on the acceptance of AI in the classroom. Mostly using online surveys and open-ended questions, the research employed a mix of tools. The questionnaires captured postgraduate teachers' perspectives of AI use in teaching and included more recent studies on AI ease-of-use perception among educators (e.g., [13]). All ethical considerations, including obtaining informed consent from participants and ensuring the confidentiality of their data, were strictly adhered to and comprehensively documented in accordance with institutional and international ethical guidelines. In essence, providing a rich qualitative layer to the

data-collecting process, the open-ended questions were utilized to probe in-depth how lecturers' leadership styles influence the participants' desire and capacity to use AI in their teaching. The data analysis included both quantitative and qualitative techniques. The poll findings were described using descriptive statistics such as mean, median, and frequency distributions [33].

Meanwhile, coding and thematic analysis were examined for important trends, which provided an understanding of the overall perspectives on AI. The initial coding process followed Braun and Clarke's [30] framework, beginning with familiarization with the data, generating initial codes, and systematically categorizing participant responses based on emerging themes. Themes were refined and reviewed iteratively to ensure coherence and consistency, as recommended by Braun and Clarke [31], with each theme being defined and named to align with the study's objectives. Using coding and thematic analysis with ATLAS.ti software, the qualitative answers to the open-ended questions were examined for important trends and themes, including leadership impact, challenges in AI acceptance, and recommendations for development. Alternatively, the rigorous thematic analysis approach, guided by Braun and Clarke [32], ensured both explicit content and underlying meanings were examined, enhancing the robustness and reliability of the findings.

In essence, combining numerical data with contextualized, human experiences in this mixed-methods technique offered an extensive study of how AI leadership affects the integration of AI technologies in educational environments. Moreover, the analysis specifically examined how AI leadership influences postgraduate student teachers' motivation and readiness to acquire necessary skills for AI integration. Furthermore, recent studies, such as those by [8] and [15], highlighted the critical role of leadership in facilitating effective technology adoption in educational settings. In essence, this study not only reflected the overall opinions of postgraduate student teachers but also explored the particular ways leadership may either help or impede the acceptance of AI, as this study emphasizes by using a mixed-methods methodology. The development of practical solutions to enhance AI integration in educational settings depends on this all-encompassing approach.

## 2.1 Significance of the study

This study was significant as it emphasized the important part lecturers' AI leadership plays in improving the acceptance of AI technologies by postgraduate student teachers. Improving teaching outcomes depends on postgraduate student teachers being able to accept and properly implement AI as it becomes increasingly prevalent in educational processes. As the results showed, this research examined how important leadership is in determining student teachers' motivation, especially via improved feedback systems and engagement techniques. Teachers may greatly raise the possibility of successful AI integration by creating an environment where AI tools are seen as educational facilitators, hence producing more creative and successful teaching strategies. Furthermore, the research aimed to clarify the challenges postgraduate student teachers have when using AI, including how to balance AI with conventional teaching strategies and handle ethical questions with too much dependence on technology. These results highlighted the need for strategic leadership in leading teachers through the complexity of AI adoption, thereby ensuring that AI improves rather than replaces basic pedagogical methods. By offering insights into these leadership dynamics, this study contributed to potential policies and programs meant to further AI integration in higher education, producing more effective and creative teaching contexts.

### 3 FINDINGS

The findings section of this study presents an in-depth analysis of how lecturers' AI leadership impacts the integration of AI tools by postgraduate student teachers. Based on the sequence of each research objective, this section highlights the key themes such as enhanced feedback mechanisms, increased engagement through game-like learning experiences, and personalized learning, all of which are driven by effective AI leadership. Additionally, the findings highlighted the challenges faced by postgraduate student teachers in balancing traditional teaching methods with AI-supported learning and the ethical concerns regarding over-reliance on technology. These insights were critical in understanding the role of leadership in overcoming barriers and promoting the successful adoption of AI in educational settings.

The demographic profiles of the respondents are first presented as Table 1, followed by the themes and selected quotations for each of the research objectives.

**Table 1.** Demographic profiles of the respondents

Respondent ID	Age Range	Gender	Years of Experience	Experience with AI
1	30–35	Male	5–10	Familiar
2	40–45	Female	10–15	Familiar
3	50–55	Male	20–25	Beginner
4	28–33	Female	3–8	Familiar
5	35–40	Male	9–14	Familiar
6	25–30	Female	1–5	Familiar
7	45–50	Male	15–20	Beginner
8	30–35	Female	5–10	Familiar
9	40–45	Male	10–15	Familiar
10	25–30	Female	2–7	Familiar
11	50–55	Male	25–30	Beginner
12	35–40	Female	10–15	Familiar
13	30–35	Male	5–10	Beginner
14	45–50	Female	15–20	Familiar
15	25–30	Male	3–8	Familiar
16	55–60	Female	30–35	Beginner
17	40–45	Male	15–20	Familiar
18	28–33	Female	3–8	Familiar
19	35–40	Male	10–15	Familiar
20	30–35	Female	5–10	Familiar
21	26–31	Female	2–7	Familiar
22	47–52	Male	20–25	Beginner
23	34–39	Female	10–15	Familiar
24	30–35	Male	5–10	Familiar
25	42–47	Female	15–20	Familiar

(Continued)

**Table 1.** Demographic profiles of the respondents (*Continued*)

Respondent ID	Age Range	Gender	Years of Experience	Experience with AI
26	38–43	Male	12–17	Familiar
27	29–34	Female	4–9	Familiar
28	45–50	Male	18–23	Familiar
29	31–36	Female	6–11	Beginner
30	50–55	Male	25–30	Beginner
31	27–32	Female	3–8	Familiar
32	41–46	Male	15–20	Familiar
33	35–40	Female	10–15	Familiar
34	28–33	Male	3–8	Familiar
35	49–54	Female	20–25	Beginner
36	26–31	Male	1–6	Familiar
37	44–49	Female	15–20	Familiar
38	32–37	Male	7–12	Familiar
39	47–52	Female	20–25	Familiar
40	30–35	Male	5–10	Familiar
41	33–38	Female	8–13	Familiar
42	55–60	Male	30–35	Beginner
43	29–34	Female	4–9	Familiar
44	36–41	Male	11–16	Familiar
45	39–44	Female	14–19	Familiar
46	25–30	Male	1–5	Familiar
47	42–47	Female	17–22	Familiar
48	30–35	Male	5–10	Familiar
49	34–39	Female	9–14	Familiar
50	40–45	Male	15–20	Familiar
51	28–33	Female	3–8	Familiar
52	35–40	Male	10–15	Familiar
53	31–36	Female	6–11	Familiar
54	45–50	Male	20–25	Familiar
55	27–32	Female	2–7	Familiar
56	38–43	Male	13–18	Familiar
57	29–34	Female	4–9	Beginner
58	47–52	Male	22–27	Familiar
59	26–31	Female	1–6	Familiar
60	35–40	Male	10–15	Familiar
61	33–38	Female	8–13	Familiar
62	50–55	Male	25–30	Beginner

Reflecting a variety of early, mid-career, and senior educators, the table depicts the demographic and experience profile of responders spanning from ages 25 to 60. Almost equally divided between male and female, the data pointed to an inclusive sample that could provide a fair view on the use of AI in learning environments. The age distribution spanned teachers who could be more technologically savvy (younger populations) and those who may have a lot of teaching experience but may be less knowledgeable with current tech advancements (older demographics). This distribution showed how various age groups in the educational sector could see and use AI. Regarding professional experience, the years span 1 to 35 years; therefore, gathering data from seasoned professors as well as relatively fresh professionals. Most respondents were familiar with AI, suggesting a general trend towards implementing technology in the classroom. Nonetheless, a sizable fraction of the population that was either new to AI tools or still learning to use these technologies in their teaching methods hinted at a category designated as novices with AI. Understanding the support systems and training required to enable more seamless integration of AI into educational contexts depended on this variety in experience with artificial intelligence.

Though the relationship between years of experience and knowledge of AI was not linear, seasoned teachers and younger teachers indicated different degrees of comfort and familiarity with AI. Fascinatingly, some respondents with a lot of teaching experience remained novices in terms of AI implementation, which would imply either a slower adoption rate than their colleagues or recent introductions of AI into their classroom settings. On the other hand, some of the less experienced teachers knew about AI, possibly in line with the current curriculum, including greater technology integration from the beginning of their employment. This range emphasized the need for focused professional development initiatives that fit various degrees of experience and technological knowledge. The next section presents the qualitative findings following the order of the research objectives.

### 3.1 Impact of lecturers' AI leadership on postgraduate student teachers' motivation to integrate AI tools into their teaching

**Theme 1: Enhanced feedback and assessment.** The supportive code 'Early Identification of Learning Gaps' highlighted how AI leadership helps teachers identify students' needs quickly and accurately. Respondent 44 emphasized this by stating,

"Early problem detection by AI means faster help for students."

This suggests that AI tools provide real-time feedback, allowing lecturers and postgraduate student teachers to intervene more effectively, thus motivating them to integrate artificial intelligence.

Respondent 4 added, "AI gives us quick feedback, really helps in keeping track," indicating that AI tools enhance continuous assessment and monitoring, fostering a more responsive teaching environment. These quotes reflected how AI leadership supports an efficient educational process where issues are addressed promptly, motivating teachers to rely on AI tools for instructional improvement.

Respondent 2 highlighted how AI can be used to tailor educational experiences to individual students, allowing for more personalized learning. By identifying each student's specific weaknesses early on, educators could address gaps in knowledge or skills more effectively.

“AI will create customized assignments for each student, identifying their weaknesses early.” – Respondent 2

Respondent 1 emphasized the role of AI in providing prompt feedback, which is crucial for reinforcing learning. Immediate feedback allowed students to quickly correct errors and deepen their understanding of the material.

“With AI, kids get immediate feedback on their work, helping them understand their mistakes quickly.” – Respondent 1

**Theme 2: Increased engagement.** The supportive code Game-Like Learning suggested that AI could transform teaching into an engaging and interactive experience. Respondent 2 noted,

“Learning with AI is like playing a smart game,” reflecting that AI leadership encourages the use of creative and interactive learning methods that make lessons more enjoyable. This “gamification” of learning motivated teachers to implement AI tools because it boosts student interest and engagement.

Respondent 13 elaborated on this by saying, “AI makes learning feel like a game; students pay more attention,” illustrating that students were more attentive and motivated when AI was used creatively in lessons. AI leadership that promoted these engaging methods inspires teachers to integrate AI into their teaching practices.

Respondent 5 highlighted how AI can transform traditional lessons into game-like, immersive experiences that increase student motivation.

“AI can be used to create game-like experiences that keep students engaged and excited to learn.” – Respondent 5

By incorporating elements of play, AI helped maintain students' focus and made the learning process more enjoyable. Meanwhile, Respondent 2 emphasized the value of AI in creating personalized learning paths that cater to individual needs.

“Personalized learning with AI encourages student engagement by making learning more interactive.” – Respondent 2

The interactive nature of AI-driven lessons fostered deeper engagement and made learning more dynamic and tailored to each student's pace and preferences.

As shown by themes like “Game-Like Learning,” which ranked highly on survey items measuring enjoyment and attentiveness, qualitative responses highlighted how much AI leadership improves engagement by fostering an interactive learning environment where game-like experiences motivate students and sustain interest. One teacher described AI-driven lessons as “like playing a smart game,” so capturing students' sustained focus. Furthermore, responsive feedback systems were supported by AI; survey results show rising satisfaction with real-time feedback, and quotes like “AI gives quick feedback, really helps in keeping track” show how teachers feel more suited to quickly fill in for individual learning gaps.

Based on quantitative scores, postgraduate student teachers' acceptance rate of AI technologies was quite similar to qualitative concepts like “personalized learning” and “supportive feedback.” Higher scores in acceptance were especially connected to positive experiences in receiving AI-driven feedback, which identifies learning gaps early, and in implementing AI for tailored learning activities that increased student involvement and provided individualized support, so fostering a responsive and adaptive learning environment.

Using AI, teachers could quickly identify learning gaps by analyzing student performance data in real-time—as shown by an example where an AI tool noted a consistent struggle among pupils with quadratic equations, allowing teachers to quickly adjust treatments. Following these focused sessions, quantitative evaluations revealed a 30% increase in student results, therefore highlighting the efficiency of AI in building responsive learning environments. This method showed how educators,

guided by AI insights, could customize learning experiences, therefore promoting skill development and deeper comprehension by rapidly and efficiently attending to human needs.

In sum, the analysis of lecturers' AI leadership revealed a significant impact on postgraduate student teachers' motivation to integrate AI tools into their teaching. Under the theme of Enhanced Feedback and Assessment, the ability of AI to quickly identify learning gaps and provide real-time feedback, as highlighted by Respondents 44 and 4, demonstrated how AI empowers educators to address student needs promptly. This personalized, data-driven approach enhanced the educational process and motivated teachers to incorporate AI for continuous monitoring and improvement. Additionally, under the theme of Increased Engagement, AI leadership transformed learning into an interactive and game-like experience, as noted by Respondents 2, 13, and 5. The gamification of lessons increased student interest and engagement, fostering a more dynamic learning environment. By promoting personalized and interactive learning, AI leadership not only improved instructional quality but also inspired teachers to integrate these tools, ultimately enhancing their teaching effectiveness.

### 3.2 Challenges faced by postgraduate student teachers in AI implementation and the role of lecturers' leadership in overcoming these challenges

Among the difficulties noted, 58% of respondents said finding a balance between AI-enhanced and conventional teaching approaches was a main one; several of them expressed worries about over-reliance on AI possibly compromising important pedagogical abilities. Emphasizing the importance of moderation in AI use to retain fundamental teaching ideals and advance critical thinking, one respondent said, "AI should support, not replace, our teaching practices." Such issues draw attention to the dual character of AI integration, whereby careful implementation is needed to guarantee that AI tools complement rather than replace conventional teaching strategies.

**Theme 1: Balance between technology and traditional learning.** The challenge of finding a balance between traditional and AI-supported learning was emphasized by Respondent 4, who stated, "AI should help but not replace our way of learning."

This reflected a common concern that AI might overshadow fundamental teaching practices, creating resistance among student teachers. The code Balance of Technology and Traditional Learning highlighted the need for AI leadership to maintain a balance between leveraging AI tools and preserving essential teaching methods.

Respondent 3 reinforced this by adding, "We should know how to work without AI too," pointing out the importance of traditional teaching methods. Lecturers must guide postgraduate student teachers in balancing AI integration with traditional pedagogical methods to address this challenge. Respondent 5 emphasized that while AI enhances education, it should not completely replace conventional teaching practices.

"AI is helpful, but we shouldn't lose sight of traditional teaching methods."  
– Respondent 5

Traditional methods still play a crucial role in ensuring well-rounded learning, providing human interaction and foundational skills. Respondent 7 highlighted the importance of maintaining a balance between AI integration and the development

of essential non-AI skills. Relying too heavily on technology could undermine critical thinking and problem-solving abilities that students need to cultivate independently.

“There needs to be a balance between using AI and the skills we develop without it.” – Respondent 7

**Theme 2: Ethical concerns.** Another challenge was the ethical implications of relying too heavily on AI, as expressed by Respondent 1, who said, “AI does everything, but how will we learn properly?”

This statement reflected the concern that AI might impede teachers' and students' development of critical thinking and problem-solving skills. The supportive code Lack of first-hand analysis skills underscored the importance of maintaining human analytical capabilities even as AI tools take over certain tasks.

Respondent 15 echoed this sentiment, stating, “We are losing the ability to analyze things ourselves.”

AI leadership must focus on addressing these ethical concerns by ensuring that AI complements rather than replaces essential cognitive functions, helping teachers feel more comfortable with its integration.

The respondent emphasized the concern that AI's convenience might diminish students' opportunities to engage in deeper critical thinking.

“AI makes it too easy; we need to focus on developing critical thinking skills without relying on it.” – Respondent 8

It stressed the importance of ensuring students actively develop problem-solving skills without depending entirely on AI assistance. Meanwhile, Respondent 9 highlighted the risk that excessive use of AI could impair students' independent analytical abilities.

“Over-reliance on AI could weaken students' ability to analyze and solve problems on their own.” – Respondent 9

The quote suggested that students must practice solving problems without the crutch of AI to build strong cognitive skills.

Thus, the assessment of challenges faced by postgraduate student teachers in AI implementation revealed two key concerns: balancing technology with traditional learning and addressing ethical implications. Under the theme of *Balance between Technology and Traditional Learning*, Respondents 4, 3, 5, and 7 emphasized the importance of integrating AI without overshadowing fundamental teaching methods. AI should enhance education but not replace the essential skills and human interaction that traditional methods provide. Lecturers' leadership was crucial in helping postgraduate student teachers maintain this balance, ensuring they can work effectively with and without AI. Similarly, under the theme of *Ethical Concerns*, Respondents 1, 15, 8, and 9 expressed worry about over-reliance on AI diminishing critical thinking and analytical skills. These concerns suggested that AI leadership must ensure AI is used as a complement to, rather than a replacement for, cognitive skill development, guiding postgraduate student teachers to integrate AI while fostering independent problem-solving abilities. Through addressing these challenges, lecturers could provide the necessary leadership to navigate the complexities of AI integration in education.

### 3.3 Strategies for lecturers (as educational leaders) to enhance postgraduate student teachers' AI integration efforts

Higher quantitative leadership ratings linking with more AI tool integration across educational practices indicated that strategic leadership greatly influences

AI adoption rates among postgraduate student teachers. Qualitative elements such as the encouragement and direction provided served to strengthen this relationship by encouraging a proactive AI engagement culture. Strategic guidance given by leaders not only boosted technical confidence but also encouraged instructors to have an adaptive attitude that will help them negotiate the changing role of AI in learning environments. This coherent strategy thereby increased institutional preparedness for responsible, consistent, and efficient implementation of artificial intelligence.

**Theme 1: Educational enhancement and support.** Lecturers could play a key role in guiding postgraduate student teachers toward the ethical use of AI by promoting a balanced approach, as expressed in the code *Ethical Integration of AI*. Respondent 2 mentioned, “There should be a balance between technology and teaching methods,” reflecting the need for strategies that incorporate AI as a supportive tool, without diminishing the value of traditional teaching.

Respondent 9 added, “AI should be used as a tool to enhance but not fully replace teaching,” which further emphasizes the importance of using AI as an enhancement, not a replacement.

Lecturers must create strategies that ensure AI is integrated ethically and thoughtfully, reinforcing traditional pedagogical values while adopting innovative tools. Respondent 5 emphasized the need for cautious integration of AI into education to avoid overshadowing essential learning objectives.

“AI should be applied carefully, ensuring we still prioritize the learning process.”  
– Respondent 5

While AI can enhance teaching, the focus should remain on fostering deep understanding and critical thinking in students. Respondent 7 mentioned the importance of maintaining ethical considerations when using AI in education.

“Ethics in AI usage must always guide our teaching methods, not replace them.” – Respondent 7

It suggested that AI should support, but never fully substitute, the moral and pedagogical responsibility of educators to guide students.

**Theme 2: Interactive learning.** To enhance AI integration, lecturers should promote strategies that focus on creating interactive and engaging learning environments. The code *Increased Engagement* demonstrated how AI can be used to make lessons more interactive, as Respondent 1 says,

“AI makes every lesson engaging, can’t wait to start.”

This increased engagement encouraged both teachers and students to embrace AI. Respondent 22 commented, “With AI, every lesson feels like a game, keeping students motivated,” highlighting how AI tools could transform the learning experience, motivating teachers to adopt AI for its ability to capture and sustain student interest.

Lecturers could support AI integration by fostering environments where interactive AI tools are used to enhance student engagement and motivation. Respondent 6 highlighted how AI transforms traditional learning into a more dynamic, interactive experience that encourages student participation.

“AI makes learning more interactive, allowing students to engage deeply.”  
– Respondent 6

The engagement fostered by AI allows students to delve deeper into the material, promoting a more hands-on and focused learning process. Respondent 10 emphasized the ability of AI to create a captivating and immersive educational setting.

“Using AI creates an immersive learning environment that excites students.”  
– Respondent 10

By making lessons more engaging, AI could stimulate student enthusiasm and motivation, leading to a more enjoyable and effective learning experience.

To enhance postgraduate student teachers' integration of AI tools, lecturers must focus on strategies that promote both ethical use and interactive learning. Under the theme of *Educational Enhancement and Support*, Respondents 2, 9, 5, and 7 highlighted the importance of using AI as a supportive tool without replacing traditional teaching methods. Lecturers must ensure that AI is integrated thoughtfully, prioritizing the learning process while maintaining ethical considerations. AI should enhance teaching by fostering critical thinking and understanding, not diminish these core educational values. Additionally, under the theme of *Interactive Learning*, Respondents 1, 22, 6, and 10 emphasized how AI could create more engaging and immersive learning environments. AI tools make lessons more dynamic, motivating both students and teachers through increased interaction and engagement. By promoting these strategies, lecturers could lead the ethical and effective integration of AI, ensuring it enhances educational outcomes while maintaining foundational pedagogical principles.

#### 4 DISCUSSIONS AND IMPLICATIONS

This study explored and analyzed the key themes related to lecturers' AI leadership and their impact on postgraduate student teachers' motivation to integrate AI tools in their teaching practices. Abedlmagid et al. [34] underlined that interactive digital platforms and AI applications are absolutely vital in developing innovation skills. This is consistent with the emphasis of the study on using AI leadership to improve postgraduate teacher competencies in integrating technology. In addition, Yu and Yang [35] demonstrated how mobile technology greatly affects STEM education outcomes, stressing the critical need for leadership in promoting effective technology adoption in educational settings, as this study reflects.

To evaluate the success of AI leadership, the study included both qualitative comments from teachers and students and quantitative measures, including the frequency of found gaps and intervention response rates. The study presented a multifarious picture of AI leadership's contribution in filling up learning gaps by tying quantitative data with qualitative insights, thereby matching the responses with practical teaching requirements. The results suggested that focused teacher training is necessary to equip teachers with abilities for early intervention and customized student support, hence improving educational results. Training courses targeted at these noted shortcomings could help to maximize AI integration and influence on leadership in learning environments.

The following discussion section will be based on Figure 4, an illustration of the overall findings from the previous section.



Fig. 4. Underlying theories for the study

Under Objective 1, the subject of *Enhanced Feedback and Assessment* demonstrated that AI helps teachers to rapidly discover learning gaps and deliver individualized

feedback, therefore pushing them to adopt AI technologies for ongoing development. Respondents highlighted that AI simplifies meeting student needs by enabling real-time identification of learning challenges. Moreover, *Increased Engagement* showed how AI gamifies learning, turning courses into engaging, fun events that boost student involvement and maintain their motivation.

Under Objective 2, ethical issues and balancing technology with conventional approaches defined the challenges of AI integration. The respondents underlined that while AI is a useful tool, it should not replace basic teaching strategies, so balance between technology and traditional learning is very important. Teachers have to help student assistants to maintain this balance so that AI improves rather than replaces conventional talents. Furthermore, emphasized by the subject of ethical concerns was the danger of over-reliance on AI thereby reducing critical thinking and analytical capacity. Respondents worry that, by depending too much on AI, children would lose the ability for autonomous problem-solving.

The results of Objective 3 underlined the need for lecturers in directing *Educational Enhancement and Support* by means of ethical integration of AI. Respondents preferred a mixed approach wherein AI acts as a supporting tool without substituting conventional teaching methods. Teachers have to support methods that guarantee AI improves instruction while maintaining critical thinking. Interactive learning's theme revealed that AI can design more dynamic, immersive learning environments that increase engagement and motivation; therefore, transforming courses from interactive and hands-on to more so for both teachers and students to embrace AI technologies.

#### 4.1 The Role of AI in identifying learning gaps

AI systems are good at examining enormous volumes of student data to find learning gaps that may not be immediately apparent from conventional evaluation tools. Liu [36] stressed that by automatically changing teaching materials and approaches according to students' learning circumstances and attributes, AI may personalize education and hence provide a more customized learning environment. In foreign language instruction, where contextualized learning may greatly improve understanding and application of information, this capacity is very helpful [36]. Moreover, Nguyen et al. [37] underlined that educators in economically failing areas showed a great desire in use AI technology to enhance their teaching methods, thus demonstrating their awareness of AI's ability to solve particular learning demands.

#### 4.2 Individualized feedback through AI

One of the most important benefits of AI in education is the availability of tailored feedback. Baba et al. [33] highlighted the efficacy of AI-driven personalized learning in addressing individual student needs, which resonates with the conclusions on AI leadership fostering tailored educational strategies in this study. Real-time student performance analysis made possible by AI-driven systems lets teachers provide quick, targeted comments catered to every student's requirement. AI technologies helped teachers to more effectively handle administrative tasks such as grading and feedback, therefore improving the general standard of instruction [7]. This customized method encouraged students to take responsibility for their learning by helping them to recognize their strengths and shortcomings. As underlined

by [8], the combination of AI with immersive technology might enhance the learning process even further and provide students a unique and interesting classroom. Alternatively, the role of personal learning environments in promoting collaboration, as noted by Budiastuti et al. [34], supported the need for efficient leadership to support AI-driven pedagogical strategies, as discussed in this study.

### 4.3 Enhancing engagement through AI

Through the gamification of the learning process, AI also significantly increases student involvement. Research showed that the combination of new technology concepts and innovative teaching methods could create engaging learning environments that encourage student interaction and participation [28]. As a result of AI, gamification of learning transformed conventional classroom environments into dynamic and fun activities that greatly increased student engagement and motivation. This is consistent with research on how AI interface design could improve teaching strategies, increasing the student engagement in learning [29].

### 4.4 Professional development for educators

The adoption of AI technology in education not only helps pupils but also advances continuous professional growth among teachers. Teachers who feel confident in their capacity to include AI into their teaching were more likely to embrace these technologies properly [13]. By means of focused professional development initiatives emphasizing improving teachers' digital competencies and knowledge of AI applications in educational environments, this confidence could be fostered [16]. Moreover, as underlined by, encouraging cooperation between students and AI may help teachers' instructional tactics to be better, thus improving the learning results.

### 4.5 Challenges and considerations in AI implementation

While qualitative comments highlighted personal experiences with these problems, suggesting concern about over-reliance on AI for basic activities [36], quantitative data showed that 68% of respondents noted specific challenges, including blending AI tools with traditional education that is also similar to other studies [8, 25]. Implications for curriculum development included structured modules stressing a balanced approach [4, 27]. This ensured that postgraduate student teachers not only acquire AI proficiency but also keep fundamental pedagogical skills, creating an environment where AI integration complements rather than replaces conventional educational approaches [6].

As shown in the interviews, the qualitative data analysis demonstrated that teachers raised ethical concerns about AI's ability to compromise fundamental teaching skills and regarding dependency on AI tools. For example, numerous educators noted that depending too much on AI could cause pupils to lose analytical ability and critical thinking capacity. Approximately 65% of respondents said they felt the need to balance AI use with conventional teaching methods to avoid over-dependence. Practical policies could include seminars on ethical AI integration, stressing a balanced approach that lowers dependency and improves adoption efficacy, therefore addressing these issues.

Though AI offers many advantages for education, its implementation presents certain challenges. Problems like data privacy, fairness in access to technology, and teacher preparation have to be taken care of so that AI becomes a tool for improving rather than aggravating current disparities in educational results. A systematic review showed that although AI could help with language education, teachers' access to and knowledge of AI technologies vary greatly. Moreover, as observed by Seo et al. [25], the ethical consequences of AI in education have to be closely investigated to guarantee that their integration does not undermine the quality of learner-instructor contacts.

This study underlined the need for keeping a balance between conventional teaching methods and AI instruments. By tackling over-reliance issues, it highlighted how AI should enhance current teaching strategies to maintain fundamental abilities and critical thinking in the classroom.

#### 4.6 Future directions for AI in education

The survey data from this study reflected postgraduate teachers' adaptability and confidence scores in AI integration, highlighting differences across experience levels, linking high confidence with frequent AI usage and positive adaptability trends, as shown in thematic reflections on overcoming initial resistance by tailored AI training experience, and that are also similar to other recent studies [13, 16, 33]. Future studies could enlarge adaptive training programs, create support catered to various degrees of confidence and practical expertise, and improve technology acceptance [8, 36]. Including adaptive components and various pedagogical support could empower teachers—especially those new to AI—in developing competency and readiness for changing AI applications, hence bridging the readiness gap across experience spectrums in higher education [6, 11].

In addition, stratified random sampling would allow researchers to target different groups across several university departments and private companies in Malaysia, hence improving representativeness [4]. Including private institutions as well as a larger spectrum of departments—such as sciences, humanities, and social sciences—as well as private universities will help the study to reflect a greater range of viewpoints and experiences with AI integration [10, 15]. This method will promote more generalizable results on AI adoption among postgraduate student teachers by offering more thorough insights into the AI leadership influence across several educational environments [18, 25].

Anticipating forward, AI has great promise in education. The integration of AI with education is a significant advancement in the competition for national power, considering both teaching and learning viewpoints as well as technological development. By providing tailored learning experiences, interactive teaching exchanges, and complete digital teaching resources, AI technology has transformed conventional music teaching approaches. Future research should explore longitudinal studies to assess the sustained impact of AI leadership on teaching practices over time, with a particular focus on comparative analyses across different educational levels and disciplines, while practice-oriented initiatives should prioritize developing adaptive training programs tailored to diverse educator needs and expertise in AI integration. Tracking changes in teacher attitudes, integration skills, and pedagogical efficacy as they interact with AI tools would give longitudinal studies important new perspectives on how AI leadership influences teaching practices over time [15, 16]. These studies could evaluate the sustainability of motivating and skill-building impacts connected with AI leadership by tracking participants over

long times [4, 33]. They would also draw attention to newly developing issues needing leadership action as well as possible changes in teaching methods, including improved adaptability and ethical considerations in the usage of AI [8]. Longitudinal studies provide a complex picture of how AI leadership either promotes or limits ongoing technological adaptation in learning environments [25, 29].

Alternatively, AI systems will grow along with further developments in technology. More advanced algorithms able to forecast learning results and improved natural language processing for better student-AI interactions might be part of future improvements. Liu et al. [17] proposed that the use of AI may result in more intelligent and effective teaching models, thus enhancing the teaching and learning procedures finally. Furthermore, the combination of AI with virtual and augmented reality technologies could enhance educational prospects for students by means of immersive learning chances before unthinkable [8].

## 5 CONCLUSION

The findings from this study suggested that well-integrated AI capabilities might help to increase student enthusiasm and involvement. According to the TAM, student teachers' readiness to include AI tools directly depended on how easy they seemed to be to use and how valuable they were. The results from this study aligned with the TAM, which emphasizes among teachers' adoption of AI mostly perceived ease of use and utility [13, 16]. Moving on, educators have to help postgraduate student teachers by designing engaging and immersive learning settings that boost student involvement and maintain interest in AI-enhanced teaching.

Moreover, targeting secondary education will enable comparison studies across educational levels, analyzing how AI leadership affects AI integration among primary and secondary teachers. Methodologies could incorporate hybrid approaches, including surveys for quantitative data on integration levels and focus groups to qualitatively investigate educators' experiences throughout different levels, thereby improving insights. Comparative studies could also evaluate institutional support, resource availability, and motivation—all of which influence AI adoption in both elementary and secondary education. Using longitudinal research would provide a sophisticated knowledge of how AI leadership influences AI adoption across time, exposing variations in efficacy and obstacles particular to every educational level.

This study added empirical data on how AI leadership styles influence postgraduate student instructors' AI integration in Malaysian higher education environments, contributing to the existing literature on the topic [2, 8, 15]. The results from this study implied that an ethical, balanced approach to AI integration in education depends much on the leadership of lecturers. Emphasizing key elements, such as ethics to guide responsible AI integration in educational environments, practical use skills for effectively applying AI tools in classrooms, and leadership development to produce transformative leaders capable of supporting AI adoption among postgraduate student teachers, the training programs should seek to equip teachers with knowledge of balancing AI with conventional approaches. This is to ensure the ethical implications of AI reliance are addressed and foster interactive learning environments that involve students, improving both teaching and learning experiences inside the framework of higher education settings, as supported by leadership theories like transformational leadership.

In conclusion, ensuring a balanced approach to AI technologies could support routine duties, therefore allowing teachers to concentrate on individualized student

interactions and effectively integrate AI inside conventional education. For example, while teachers use these insights to customize lessons to fit particular requirements, AI-driven evaluation tools could examine student data to find learning gaps. AI-based gamification could potentially improve involvement by turning classes into interactive experiences without overshadowing critical thinking or problem-solving activities usually conducted by teachers. By using creative technologies to solve ethical use and over-reliance on AI in educational practices, AI leadership promotes an inclusive and dynamic learning environment [4, 12, 29]. This strategy guarantees that AI complements rather than replaces important teaching responsibilities, therefore promoting a coherent, encouraging learning environment by aligning it with pedagogical objectives.

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