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ADOPTING AI TOOLS AND MOBILE TECHNOLOGY TO ASSIST COLLEGE STUDENTS IN ENGLISH LEARNING

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Abstract

This study investigates the pedagogical impact of integrating Artificial Intelligence (AI) tools and Mobile-Assisted Language Learning (MALL) technologies into English-Medium Instruction (EMI) courses that focus on English for Academic Purposes (EAP) at the tertiary level. Despite sustained national and institutional efforts to improve academic English proficiency, many university students continue to struggle with essential competencies such as vocabulary development, academic reading, grammatical precision, and active classroom participation. These challenges are magnified in EMI contexts, where learners must concurrently process complex academic content and discipline-specific linguistic conventions in a non-native language. Traditional EMI instruction—often characterized by static curricula, teacher-centered delivery, and insufficient scaffolding—frequently fails to address the diverse linguistic needs, cognitive profiles, and motivational dispositions of today's students. In contrast, AI-enhanced and mobile-supported platforms offer adaptive learning environments, real-time feedback, gamified activities, and multimodal input, aligning with principles of learner-centered pedagogy and differentiated instruction. These affordances hold promise for promoting learner autonomy, enhancing engagement, and fostering metacognitive growth in EMI classrooms. While the theoretical benefits of these technologies are well documented, there remains a paucity of rigorous empirical research assessing their actual impact on students' language learning outcomes and classroom experiences. To address this gap, this mixed-methods study will compare the linguistic performance, in-class academic behaviors, and learner perceptions of students in AI- and mobile-supported EMI courses with those in traditional non-EMI instruction. The findings aim to inform evidence-based EMI curriculum design, digital pedagogical innovation, and language policy development in higher education.

Keywords: AI, EMI, MALL, EAP, higher education

Introduction

English language learners at the tertiary level face multifaceted challenges in navigating academic discourse communities, with difficulties rooted in diverse educational backgrounds, varying levels of proficiency, and unequal access to instructional resources. These challenges manifest in lexical deficiencies, persistent grammatical inaccuracies, limited pronunciation accuracy, and reading comprehension difficulties. In English for Academic Purposes (EAP) settings, where learners are expected to interpret and produce discipline-specific texts, such limitations are further magnified. Traditional, lecture-based instruction often fails to address the individualized needs of learners or cultivate the metacognitive strategies essential for academic literacy. In light of these limitations, there has been a discernible pedagogical shift toward integrating artificial intelligence (AI) tools and mobile technologies to enhance language instruction in higher education contexts.

In Taiwan and beyond, AI-supported platforms are increasingly recognized for their pedagogical value. These systems offer adaptive learning pathways, personalized vocabulary practice, and instant feedback mechanisms aligned with learner-centered principles and differentiated instruction. AI's potential to personalize content according to each student's proficiency level, pace, and learning style aligns well with modern EAP instruction, which emphasizes autonomy and self-regulation. As Chen (2020) highlights, the integration of multimedia and digital technologies not only supports vocabulary acquisition and retention but also increases learners' motivation and participation.

Empirical evidence supports the affective advantages of digital integration. Learners frequently report heightened curiosity, enjoyment, and willingness to take risks in AI- and mobile-assisted environments (Zhang, Wang, & Rice, 2025). Moreover, multimodal features—such as visual prompts, audio recordings, and interactive simulations—help clarify abstract concepts and support learners' comprehension of discipline-specific content (Hussain, 2016; Hickman, 2020; Sofia, 2022). Mobile-Assisted Language Learning (MALL) extends these benefits beyond the classroom, offering ubiquitous, asynchronous access to contextualized input and real-time practice, making it an ideal modality for tertiary-level language learners with varied schedules and needs.

Despite these benefits, researchers have raised valid concerns regarding AI's pedagogical limitations. As Zou et al. (2020) and Wu (2024) caution, many AI-driven applications lack meaningful feedback and model quality, while fostering a risk of overdependence on automation. AI systems simulate human cognitive functions such as pattern recognition, memory, and decision-making (Xu et al., 2021), but without intentional pedagogical scaffolding, they may disincentivize learners from developing critical thinking, creativity, and autonomy. Thus, AI integration should be grounded in principled pedagogical frameworks that ensure a dynamic balance between human facilitation and machine-generated support.

Generative AI (GAI) is increasingly regarded as a transformative force in higher education. Studies by Kasneci et al. (2023) and Yan et al. (2024) illustrate how GAI can support academic writing, discipline-specific modeling, and assessment innovation. In EAP instruction, its capacity to generate academic prompts, offer stylistic models, and scaffold genre-specific writing enhances learners' exposure to high-quality language input. Tools such as AI chatbots, grammar correctors, and pronunciation analyzers foster individualized, iterative practice, thereby promoting metalinguistic awareness and fluency. These affordances support not only surface-level correction but also deeper linguistic processing.

Moreover, the role of AI and mobile technologies in promoting socio-cognitive development cannot be overstated. Collaborative tools—shared document platforms, discussion forums, and real-time chat—support peer interaction, social negotiation of meaning, and co-construction of knowledge. These features align with sociocultural theories of learning, particularly Vygotsky's Zone of Proximal Development (ZPD), which emphasizes the role of mediating tools in guiding learners through tasks just beyond their current competencies. Appropriately designed AI systems can function as digital mediators that provide timely scaffolding while encouraging learners to stretch their linguistic and cognitive capacities.

AI also operationalizes constructivist learning principles through interactive simulations, gamified modules, and real-world problem-solving activities. Digital graphic organizers, mind maps, and self-paced quizzes allow learners to structure and internalize complex linguistic information (Kaur, Yoong, & Keat, 2019). Furthermore, by automating routine cognitive tasks—such as spelling checks, formatting, and grammar corrections, AI tools reduce extraneous cognitive load, thereby enabling learners to concentrate on higher-order skills like synthesis, critical evaluation, and argumentation (Humble & Mozelius, 2024). This realignment of cognitive resources is especially valuable in tertiary EAP contexts where learners are expected to engage with abstract ideas and disciplinary conventions.

Studies by Klimova (2019), Alali (2024), and Al-Mamary et al. (2024) reinforce these findings, indicating that learners generally perceive AI and mobile technologies as accessible, flexible, and conducive to personalized learning. The interactivity and immediacy offered by such tools empower students to take ownership of their learning trajectories. Instructors, meanwhile, benefit from access to real-time analytics and individualized learning profiles, allowing for more responsive instructional decision-making.

Nevertheless, these technologies must be integrated with care. Effective implementation requires not only the availability of tools but also pedagogically informed instructional design and sustained faculty development. Educators must be trained to curate high-quality AI-assisted content, facilitate reflective use of technology, and support students in critically interpreting AI-generated outputs. Ethical considerations—particularly concerning data

privacy, algorithmic bias, and intellectual property—must also be addressed within institutional frameworks.

In conclusion, the integration of AI tools and mobile technologies into EAP instruction at the tertiary level offers considerable promise for addressing the multifaceted challenges faced by English language learners. These tools promote personalized learning, facilitate deeper cognitive engagement, and enhance learner autonomy and motivation. However, their impact is contingent upon intentional, theory-informed implementation grounded in principles of sociocultural and constructivist learning. As digital innovations continue to evolve, so must our pedagogical paradigms—ensuring that technology acts not as a substitute for sound instruction, but as a powerful complement to it. Future research should investigate long-term impacts on learner autonomy, instructional effectiveness across disciplines, and the nuanced interplay between human and machine-driven language learning in global higher education contexts.

Problem Statement

English language learners at the tertiary level frequently encounter persistent challenges in vocabulary acquisition, academic reading comprehension, grammatical accuracy, and oral proficiency. These difficulties are particularly acute in English-Medium Instruction (EMI) contexts, where students are required to engage with complex academic discourse in a non-native language. Traditional English instruction, often characterized by teacher-centered delivery, limited feedback, and uniform pacing, may fall short in addressing the diverse needs and proficiency levels of students. In contrast, emerging instructional approaches that leverage Artificial Intelligence (AI) tools and mobile technologies offer the potential to individualize instruction, enhance learner engagement, and improve academic outcomes through adaptive feedback and ubiquitous access to learning materials.

Although a growing body of research suggests that AI- and mobile-supported instruction fosters positive learner perceptions and supports the development of English language skills, empirical studies comparing such technology-enhanced approaches with traditional instruction—particularly within and outside EMI contexts—remain limited. Furthermore, while anecdotal evidence and small-scale studies point to enhanced learner motivation and academic performance, there is insufficient statistical validation of these claims across different instructional modalities. There is also a need to understand how students perceive and respond to AI-mediated learning environments compared to conventional classroom experiences.

This study aims to address these gaps by systematically comparing traditional instruction and AI/mobile-supported EMI instruction in terms of student achievement, in-class performance, and learner perceptions. The findings will inform pedagogical design and contribute to the growing discourse on digitally enhanced EMI in higher education.

Research Questions

(1) Is there a statistically significant difference in academic

success rates between students enrolled in EMI courses utilizing AI tools and mobile technologies and those in non-EMI courses relying on traditional instruction?

(2) To what extent does students' in-class academic performance vary depending on whether instructors implement AI- and mobile-assisted EMI instruction versus traditional approaches in non-EMI settings?

(3) What differences can be observed in students' perceptions and feedback regarding their classroom experiences when taught through AI- and mobile-supported EMI courses compared to traditional instruction in non-EMI courses?

Literature Review

Evolving Pedagogical Paradigms in Language Education

The integration of Artificial Intelligence (AI) and Mobile-Assisted Language Learning (MALL) technologies has gained momentum in tertiary English language instruction, particularly within English for Academic Purposes (EAP) and English-Medium Instruction (EMI) contexts. Traditional English language teaching methods—centered on monologic instruction and static curricula—often fail to meet the dynamic and individualized needs of contemporary learners, especially when navigating cognitively demanding academic content in a second language. In response, AI-enhanced and mobile-supported learning platforms are increasingly utilized to provide flexible, adaptive, and interactive learning experiences.

Empirical studies have consistently highlighted the pedagogical benefits of such technologies. Abeer et al. (2024) demonstrated that the adoption of AI and mobile tools significantly enhances learners' academic performance, leading to increased institutional interest in their implementation. Similarly, research by Klimova (2019), Alali (2024), and Al-Mamary et al. (2024) indicates that learners generally hold favorable perceptions toward mobile-supported learning, particularly valuing its flexibility, accessibility, and ability to deliver varied resources tailored to individual learning trajectories.

The Promise of Generative AI in Higher Education

Generative AI (GAI) tools have emerged as a transformative force in reshaping instructional methods, assessment practices, and student engagement across higher education (Kasneci et al., 2023; Yan, Sha et al., 2024). In the EAP classroom, AI applications provide personalized learning pathways through automated feedback, customized prompts, and context-sensitive language models. These platforms support essential academic skills, including vocabulary acquisition, grammar instruction, and writing development (Huang et al., 2023).

AI-driven mobile applications are particularly effective in improving

learners' listening and speaking competencies. Studies such as Sadoune, Azebchikh, and Boussaid (2024) demonstrate that such applications deliver real-time, adaptive feedback, fostering oral fluency and pronunciation accuracy through repeated, low-anxiety practice. These features resonate with student preferences for on-demand and self-paced learning, further reinforcing the value of AI in language development.

Concerns over Over-Automation and Shallow Engagement

While the pedagogical affordances of AI and mobile tools are substantial, several scholars raise concerns about the unintended consequences of their widespread adoption. Selwyn (2023) and Davis & Marcus (2024) argue that excessive reliance on AI-generated feedback and automation may lead to "automation complacency," where students become passive recipients rather than active constructors of knowledge. This can diminish critical thinking, reduce learner agency, and inhibit the development of metacognitive and problem-solving skills.

Moreover, there is a growing critique that AI-based platforms often prioritize surface-level competencies—such as vocabulary recall or grammar correction—at the expense of deeper linguistic and pragmatic development. As Lee (2024) contends, neglecting cultural and contextual dimensions of language use may result in shallow communicative competence that fails to transfer to real-world academic and intercultural interactions.

AI and MALL as Catalysts for Collaborative and Autonomous Learning

Despite these concerns, AI and mobile technologies play a vital role in supporting collaborative, autonomous, and learner-centered pedagogies. Kuddus (2022) emphasizes that AI tools can be seamlessly embedded in the English Language Teaching (ELT) classroom to personalize instruction and support differentiated learning needs. Moorhouse (2024) further highlights the role of AI-based text generators in supporting academic writing by offering diverse prompts and ideation support—essential for students developing critical writing skills in EAP contexts.

Mobile learning platforms also promote peer collaboration through features such as discussion forums, shared documents, and virtual whiteboards. These affordances enable collective knowledge construction and are particularly beneficial in EMI classrooms, where the dual demands of language and content mastery often necessitate greater scaffolding and peer support.

AI-enabled platforms engage learners through gamification, real-time quizzes, and interactive assessments, which sustain motivation and attention. These engagement mechanisms align with the findings of Yu et al. (2018) and Bączkowska (2021), who assert that such tools positively influence learners' language beliefs and promote greater self-direction in language learning.

Equity Concerns and the Digital Divide

While AI and MALL tools offer significant advantages, their integration is not without equity-related challenges. Johnson et al. (2024) caution that students from socioeconomically disadvantaged backgrounds may lack access to stable internet connections, up-to-date mobile devices, or the digital literacy necessary to navigate AI-enhanced platforms effectively. Such disparities risk exacerbating existing educational inequalities and limiting the potential benefits of technological innovation in language education.

Addressing these challenges requires not only technological infrastructure but also institutional policies and targeted support that ensure equitable access and inclusive digital pedagogies. Without deliberate intervention, the digital divide may become a structural barrier to achieving the full potential of AI and mobile technologies in EMI and EAP settings.

Theoretical Foundations: Constructivism and Sociocultural Scaffolding

From a theoretical standpoint, AI and mobile technologies align with constructivist learning principles by enabling students to construct knowledge through authentic tasks, collaboration, and reflective engagement. For instance, Kaur, Yoong, and Keat (2019) illustrate how AI-supported digital graphic organizers help learners structure and internalize vocabulary and complex textual information, thus promoting deeper comprehension and long-term retention.

These technologies also resonate with Vygotsky's Zone of Proximal Development (ZPD), as they provide dynamic scaffolding for tasks just beyond the learner's current capability. Adaptive feedback, context-sensitive prompts, and real-time performance analytics act as mediating tools that support learner progression while preserving cognitive challenges. Such alignment with sociocultural learning theories reinforces the pedagogical value of these digital tools in fostering higher-order thinking and self-regulated learning.

The integration of AI and mobile technologies into EMI and EAP instruction offers a compelling opportunity to enhance academic language learning through personalized, collaborative, and multimodal pedagogical approaches. These tools address traditional instructional limitations by offering real-time feedback, differentiated learning paths, and engaging content delivery formats. However, concerns about over-reliance, digital equity, and surface-level learning outcomes warrant careful consideration. As such, effective implementation must be grounded in evidence-based practice and guided by sound pedagogical frameworks. Future research should continue to evaluate the long-term impact of these tools on learner autonomy, intercultural competence, and academic success across diverse EMI contexts.

Research Design

Methods

The purpose of this study was to investigate the impact of English-Medium Instruction (EMI) supported by Artificial Intelligence (AI) tools and mobile technologies on students' English language development within English for Academic Purposes (EAP)

courses. Adopting an experimental research design, the study involved two groups: an experimental group receiving instruction enhanced by AI tools and mobile-assisted language learning (MALL) technologies, and a control group receiving traditional instruction without the integration of such tools. To assess the effectiveness of the intervention, quantitative data were collected through pre- and post-tests measuring students' linguistic performance. In addition, to explore learners' attitudes and perceptions toward technology-enhanced EMI instruction, a structured questionnaire comprising 13 items was administered to the experimental group. This mixed-methods approach enabled a comprehensive examination of both the cognitive (learning outcomes) and affective (learner perceptions) dimensions of AI- and mobile-supported EAP instruction at the tertiary level.

Participants

The study recruited a total of 70 college students from a university in southern Taiwan. All participants had comparable English learning experiences, with a minimum of four months of prior instruction in an English for Academic Purposes (EAP) context. Based on diagnostic assessments and classroom performance, their overall English proficiency was classified at the beginner level. The participants were evenly distributed across two instructional settings: a traditional classroom and a technology-enhanced classroom. Both groups received instruction from the same instructor to ensure pedagogical consistency, with classes held twice per week, each lasting 50 minutes. This controlled design allowed for a reliable comparison of the instructional modalities while minimizing teacher-related variability.

Procedures

This study employed a quasi-experimental research design with a pretest-posttest control group structure to investigate the pedagogical impact of integrating AI tools and mobile technologies into English-Medium Instruction (EMI) within English for Academic Purposes (EAP) courses. Two intact classes, taught by the same English instructor to control for instructional variability, were randomly assigned to either the experimental group (AI- and mobile-supported instruction) or the control group (traditional instruction without technological integration).

The intervention spanned four months, during which the experimental group received instruction in a technology-enhanced learning environment utilizing AI-based applications and mobile-assisted platforms to support vocabulary and sentence pattern acquisition. The control group followed the same curriculum objectives and instructional pacing but without the use of digital tools.

To evaluate learning outcomes, both groups completed a posttest at the end of the intervention period. This assessment, administered four months after the initial instruction, measured English proficiency across listening, reading, and writing domains. Both pretest and posttest scores were collected to analyze changes in linguistic performance over time and between groups.

In addition to achievement data, the study incorporated a learner perception component. A structured questionnaire comprising 13 closed-ended items was administered anonymously to all participants during class time in the latter part of the semester. The survey was designed to capture students' attitudes toward learning English with or without technological support. Descriptive statistics, including frequencies and means, were calculated to interpret learners' perceptions of the instructional approaches.

The instructional sequence was organized into seven phases:

Pretest 1
Treatment Instruction Phase 1
Posttest 1
Pretest 2
Treatment Instruction Phase 2
Posttest 2
Perception Survey Administration

This phased design allowed for longitudinal tracking of student progress and triangulation of performance data with self-reported perceptions, thereby strengthening the internal validity of the study.

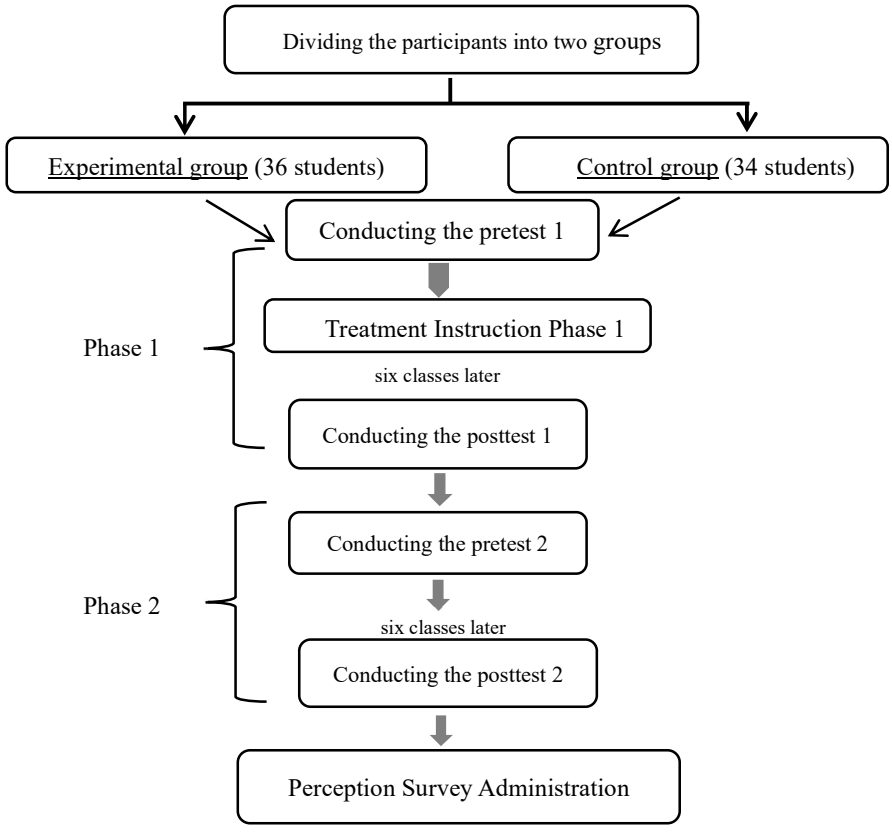

Figure 1 The procedure of the research design

Results

Data were analyzed using SPSS. Descriptive statistics (mean, standard deviation) were used to summarize test scores and questionnaire responses. To compare students' performance before and after the intervention, paired sample t-tests were conducted within each group. Furthermore, independent sample t-tests were used to determine whether there were significant differences in learning outcomes and perceptions between the experimental and control groups.

The analysis revealed that the experimental group showed statistically significant improvements from pretest to posttest, particularly in writing and vocabulary acquisition. Questionnaire results also indicated that students in the experimental group expressed more favorable attitudes toward using AI tools and mobile technology in English language learning.

Table 1. Both Groups' Pretests & Posttests (Stage1) (n = 70)

Groups	N	Test	Mean	SD	t	df	Sig.
Control Group	34	Pretest	38.86	10.46	-.616	34	.542
		Posttest	41.14	10.80			
Experimental Group	36	Pretest	39.31	10.29	-1.11	34	.273
		Posttest	39.69	10.17			

* $p < .05$.

Table 2 Both Groups' Pretests & Posttests (Stage 2) (n = 70)

Groups	N	Test	Mean	SD	t	df	Sig.
Control Group	34	Pretest	48.26	20.90	-1.68	34	.102
		Posttest	49.69	19.48			
Experimental Group	36	Pretest	47.09	13.35	-7.45	34	.000
		Posttest	80.34	17.93			

*** $p < .001$

Statistics and Data Analysis

Research Question One

Is there a statistically significant difference in academic success rates between students enrolled in EMI courses utilizing AI tools and mobile technologies and those in non-EMI courses relying on traditional instruction?

According to the data of both groups' scores related to pretests and posttests in phase 1, the mean of posttest scores (M = 41.44, SD = 10.80) in the control group, was nearly the same as the pretest scores in the same group (M = 38.86, SD = 10.46). There was no significant difference between the two tests (t (34) = -.616, p = .542 > .05). On the other hand, the mean of posttest scores in the experimental group (M = 39.69, SD = 10.17) was nearly the same as the pretest scores in the same group (M = 39.31, SD = 10.29). There was also no significant difference between two tests (t (36) = -.1.11, p = .273 > .05). The results were represented in Table 1.

Moreover, according to the data of both groups' scores related to pretests and posttests in phase 2, pair t test was computed for two groups, too. The results were represented in Table 2. In the control group, the mean of posttest scores (M = 49.69, SD = 19.48) was nearly the same as the pretest scores in the same graders (M = 48.26, SD = 20.90). There was no significant difference between two tests (t (34) = -1.68, p = .102 > .05).

However, in the experimental group, the mean of posttest scores (M = 80.34, SD = 17.93) was higher than that of pretest scores in the same group (M = 47.09, SD = 13.35). There was a significant difference between the two tests (t (36) = -7.45, p = .000 < .001).

Research Question Two

To what extent does students' in-class academic performance vary depending on whether instructors implement AI- and mobile-assisted EMI instruction versus traditional approaches in non-EMI settings?

From table 3, the item 4 shows that participants most strongly agreed that the instructor actively encouraged classroom engagement, especially through English-based discussions. This reflects an appreciation for open and interactive class dynamics. Besides, all means are above 4.0, indicating that students generally agreed or strongly agreed with all statements. According to item 4, **i**nstructor engagement is the strongest factor, potentially the most impactful on students' learning experiences. In addition, standard deviations (SD) range from 0.62 to 0.80**,** showing moderate variation in student responses. Item 4 had the lowest SD (0.62), meaning responses were most consistent here. However, the result of item 3 shows that participants might need more attention, despite being positively rated.

Moreover, according to the result of table 4, item 4 (Mean = 4.71, SD = 0.49) stood out strongly, indicating very high student satisfaction with how the instructor encouraged questions and promoted interaction. Besides, **i**tems 1, 3, and 5 were closely grouped around 4.33–4.35, suggesting

Table 3. Participants' Feedback in Performance toward All Groups (n = 70)

Item		Mean	Rank	SD
1	I believe the oral lectures, textbooks, handouts, and references used in this class should be all delivered in English with AI tools and mobile technology supporting	4.24	4	0.80
2	I think the instructor delivered the lecture in a clear and engaging manner, making complex concepts with AI tools and mobile technology supporting easy to understand in English	4.34	2	0.71
3	I think the communication between the instructor and students was effective, fostering a collaborative and interactive learning environment with AI tools and mobile technology supporting	4.16	5	0.75
4	I think the instructor actively promoted student discussions and encouraged questions in English, creating an open and engaging classroom atmosphere	4.39	1	0.62
5	Overall, I believe the instructor demonstrates sufficient professional expertise to effectively teach EAP courses	4.30	3	0.80

Table 4. Participants' Feedback in Performance toward Experimental Groups (n = 34)

	Item	Mean	Rank	SD
1	I believe the oral lectures, textbooks, handouts, and references used in this class should be all delivered in English with AI tools and mobile technology supporting	4.33	4	0.79
2	I think the instructor delivered the lecture in a clear and engaging manner, making complex concepts with AI tools and mobile technology supporting easy to understand in English	4.36	2	0.66
3	I think the communication between the instructor and students was effective, fostering a collaborative and interactive learning environment with AI tools and mobile technology supporting	4.33	4	0.72
4	I think the instructor actively promoted student discussions and encouraged questions in English, creating an open and engaging classroom atmosphere	4.71	1	0.49
5	Overall, I believe the instructor demonstrates sufficient professional expertise to effectively teach EAP courses	4.35	3	0.66

consistently positive perceptions of instruction and communication. From the result, the experimental group rated the teaching experience more positively across all items. The experimental teaching strategy, involving AI tools and English immersion, likely contributed to more engaged, effective learning environments**.** According to Table 5, the Control group showed positive but consistently lower satisfaction, especially on clarity (Item 2) and interactivity (Item 3). Comparing with the Experimental group and All group, the Experimental group scored the highest on all items, consistently outperforming both the Control and All groups. However, Control group scored the

Table 5. Participants' Feedback in Performance toward Control Groups (n = 36)

Item		Mean	Rank	SD
1	I believe the oral lectures, textbooks, handouts, and references used in this class should be all delivered in English with AI tools and mobile technology supporting	3.99	3	0.82
2	I think the instructor delivered the lecture in a clear and engaging manner, making complex concepts with AI tools and mobile technology supporting easy to understand in English	3.79	5	0.77
3	I think the communication between the instructor and students was effective, fostering a collaborative and interactive learning environment with AI tools and mobile technology supporting	3.87	4	0.77
4	I think the instructor actively promoted student discussions and encouraged questions in English, creating an open and engaging classroom atmosphere	4.14	2	0.66
5	Overall, I believe the instructor demonstrates sufficient professional expertise to effectively teach EAP courses	4.24	1	0.92

lowest on 4 of 5 items, especially for lecture clarity and collaborative communication.

Research Question Three

What differences can be observed in students' perceptions and feedback regarding their classroom experiences when taught through AI- and mobile-supported EMI courses compared to traditional instruction in non-EMI courses?

From the results, the experimental group consistently outperformed the control group in mean scores for each

Table 6. Participants' Feedback Regarding Their Classroom Experiences toward All Group (n = 70)

	Item	Mean	Rank	SD
6	I think this EAP course will help improve my English capacity for future EMI studies with AI tools and mobile technology supporting	4.25	2	0.65
7	I think the learning outcomes of the EAP course will have an impact on the teaching of EMI with AI tools and mobile technology supporting	3.95	7	0.89
8	I think the improved English capacity learned through the EAP course is sufficient for studying EMI courses with AI tools and mobile technology supporting	4.18	4	0.80
9	I think I prefer to have more EAP courses to enhance my English proficiency training before studying EMI courses with AI tools and mobile technology supporting	3.30	8	1.37
10	I think I need teaching assistants in the EAP courses with AI tools and mobile technology supporting	4.14	6	0.96
11	I think I need teaching assistants in the EMI courses with AI tools and mobile technology supporting	4.23	3	0.80
12	The upgraded English proficiency learned through the EAP course motivates me to studies EMI courses with AI tools and mobile technology supporting	4.34	1	0.71
13	I would recommend the EAP course with AI tools and mobile technology supporting to my classmates to study	4.16	5	0.75

Table 7. Participants' Feedback Regarding Their Classroom Experiences toward Experimental Group (n = 34)

	Item	Mean	Rank	SD
6	I think this EAP course will help improve my English capacity for future EMI studies with AI tools and mobile technology supporting	4.65	1	0.52
7	I think the learning outcomes of the EAP course will have an impact on the teaching of EMI with AI tools and mobile technology supporting	4.00	8	0.83
8	I think the improved English capacity learned through the EAP course is sufficient for studying EMI courses with AI tools and mobile technology supporting	4.43	3	0.60
9	I think I prefer to have more EAP courses to enhance my English proficiency training before studying EMI courses with AI tools and mobile technology supporting	4.12	7	0.26
10	I think I need teaching assistants in the EAP courses with AI tools and mobile technology supporting	4.30	6	0.72
11	I think I need teaching assistants in the EMI courses with AI tools and mobile technology supporting	4.33	5	0.77
12	The upgraded English proficiency learned through the EAP course motivates me to studies EMI courses with AI tools and mobile technology supporting	4.39	4	0.66

13	I would recommend the EAP course with AI tools and mobile technology supporting to my classmates to study	4.56	2	0.77

Table 8. Participants' Feedback Regarding Their Classroom Experiences toward Control Group (n = 36)

	Item	Mean	Rank	SD
6	I think this EAP course will help improve my English capacity for future EMI studies with AI tools and mobile technology supporting	4.21	1	0.79
7	I think the learning outcomes of the EAP course will have an impact on the teaching of EMI with AI tools and mobile technology supporting	3.91	5	0.96
8	I think the improved English capacity learned through the EAP course is sufficient for studying EMI courses with AI tools and mobile technology supporting	3.96	4	0.88
9	I think I prefer to have more EAP courses to enhance my English proficiency training before studying EMI courses with AI tools and mobile technology supporting	3.19	8	1.45
10	I think I need teaching assistants in the EAP courses with AI tools and mobile technology supporting	4.18	2	1.15
11	I think I need teaching assistants in the EMI courses with AI tools and mobile technology supporting	4.13	3	0.81

12	The upgraded English proficiency learned through the EAP course motivates me to studies EMI courses with AI tools and mobile technology supporting	3.51	7	0.70
13	I would recommend the EAP course with AI tools and mobile technology supporting to my classmates to study	3.88	6	0.79

item presented in Tables 6.7.8. However, item 6, 10 and 11 showed the mean scores above 4 for both groups. More specifically, the mean scores for all items in the experimental group exceeded 4.00.

According to item 6, students in the experimental group (AI/mobile support) felt more confident that the EAP course improved their English for EMI (English as a Medium of Instruction) success. This reflects a clear impact of tech-supported instruction**.**

The item 10 shows slightly higher agreement from the experimental group, possibly suggesting a desire for more support even when AI tools are used. Moreover, consistent with item 10, students appreciate human support alongside tech-based systems.

The findings demonstrate that students in the experimental group**,** who received EAP instruction supported by AI tools and mobile technologies**,** consistently reported higher levels of satisfaction, confidence, and motivation compared to those in the control group.

Overall, the data indicate that technology-enhanced EAP instruction not only improves learning outcomes but also increases learner engagement, satisfaction, and preparedness for EMI contexts. These results support the integration of adaptive technologies into bilingual education programs, provided they are implemented alongside adequate instructional and human support.

Discussion

This section aimed to analyze the results and relate the findings to previous research. The findings were discussed in alignment with the three research questions.

Research Question 1

Is there a statistically significant difference in academic success rates between students enrolled in EMI courses utilizing AI tools and mobile technologies and those in non-EMI courses relying on traditional instruction?

This research question investigated the impact of differing instructional modalities on students' English language performance. The findings revealed a statistically significant difference between the two groups, with students in the AI- and mobile-supported EMI courses outperforming those in the traditional non-EMI control group on the immediate posttest ($t(34) = -7.45$, $p = .000 < .05$). This outcome suggests that the integration of AI tools

and mobile technologies can enhance language acquisition by fostering a more engaging, responsive, and personalized learning environment.

Students in the experimental group reported higher levels of motivation, increased participation, and improved interaction with instructors—factors that have been linked to better learning outcomes (Elliot, 2021). The findings are consistent with those of Zou (2020), who observed that learners turn to AI tools for speaking practice due to insufficient classroom feedback. Applications such as ELSA and Speechnotes offer real-time speech analysis, helping students refine pronunciation, fluency, and academic oral communication.

Moreover, AI-powered platforms provide immediate, detailed feedback on grammar, vocabulary, and writing structure, enabling learners to engage in autonomous, iterative revision. Sertel Djelal (2023) highlighted that embedding AI technologies into English for Academic Purposes (EAP) curricula represents a significant innovation in language education, supporting differentiated instruction and learner-centered pedagogy. These findings collectively suggest that AI-enhanced EMI instruction not only improves academic performance but also aligns with contemporary pedagogical goals of personalization, interactivity, and learner autonomy.

Research Question 2

To what extent does students' in-class academic performance vary depending on whether instructors implement AI- and mobile-assisted EMI instruction versus traditional approaches in non-EMI settings?

This research question explored how students perceived the effectiveness of AI- and mobile-supported EMI instruction in shaping their academic engagement and classroom performance. Based on the analysis of questionnaire data, students in the experimental group—those exposed to AI tools and mobile technologies—reported consistently high levels of satisfaction, with all item means exceeding 4 on a 5-point Likert scale. The highest-rated item ($M = 4.71$) corresponded to the statement: "I think the instructor actively promoted student discussions and encouraged questions in English, creating an open and engaging classroom atmosphere." This suggests that learners were not only receptive to the AI-enhanced pedagogical environment but also experienced increased interaction and motivation during instruction.

Learners reported that the integration of technology supported both independent exploration and collaborative participation. The use of mobile devices and AI platforms allowed students to access learning materials at any time, promoting flexibility, personalized pacing, and self-directed learning. These findings align with Allen and Mizumoto (2024), who noted that students perceive generative AI tools as more thorough and reliable compared to traditional resources. Additionally, real-time feedback on grammar, vocabulary, and pronunciation—afforded by platforms such as Grammarly, ELSA, and ChatGPT—was highlighted as particularly beneficial in enhancing self-monitoring and writing

development (Almusharraf & Alotaibi, 2023).

The role of AI tools in fostering self-regulated learning (SRL) is also underscored by recent research (Chiu, 2024; Zimmerman, 2000), emphasizing that immediate and personalized feedback enables learners to assess their own performance, set goals, and refine their strategies. Moreover, AI-generated examples and contextualized corrections help demystify complex linguistic features, thereby supporting deeper language comprehension (Kohnke et al., 2023b).

Nevertheless, while the technological affordances enhanced learners' engagement and confidence, participants emphasized that sustained progress required continued effort beyond classroom instruction. Effective language acquisition depends not only on teacher input but also on learners' autonomous practice. Thus, while AI tools serve as valuable scaffolds, their impact is maximized when embedded within culturally relevant curricula that encourage independent learning, critical reflection, and consistent application in diverse contexts.

Research Question 3

What differences can be observed in students' perceptions and feedback regarding their classroom experiences when taught through AI- and mobile-supported EMI courses compared to traditional instruction in non-EMI courses?

The analysis of student perceptions revealed notable differences in classroom experiences between the experimental group, which engaged with AI- and mobile-supported EMI instruction, and the control group, which received traditional non-EMI instruction. As indicated in Table 2, students in the experimental group demonstrated higher performance levels and reported more favorable attitudes toward the learning environment. These outcomes can be attributed to the interactive and adaptive nature of the AI tools employed, which fostered a more engaging and exploratory learning experience.

Participants noted that real-time feedback from AI systems made error correction less intimidating and more actionable, thereby promoting learner autonomy and confidence. As Allen and Mizumoto (2024) suggest, such feedback mechanisms support a dynamic learning process that encourages experimentation, self-monitoring, and continuous improvement. Moreover, students emphasized the importance of the intuitive and user-friendly design of these tools, which contributed to their widespread adoption and positive reception—a finding consistent with Kohnke et al. (2023a), who underscore the role of accessibility in successful technology integration.

Overall, students responded positively to the integration of AI and mobile technologies, citing enhanced engagement, comprehension, and enjoyment during lessons. This aligns with Biró's (2011) observation that learners value technology-enhanced instruction for making classroom experiences more stimulating and comprehensible. These findings suggest that AI-supported EMI instruction not only improves academic outcomes but also transforms the affective dimensions of learning, fostering greater motivation,

interest, and learner-centered engagement.

Conclusion

The integration of AI tools into language learning offers transformative possibilities, yet it also poses pedagogical challenges that demand thoughtful instructional design. While AI-assisted platforms provide learners with instant access to vocabulary enhancement, grammar correction, and stylistic suggestions, this study underscores the risk of students becoming overly dependent on these tools, potentially undermining the development of independent linguistic and cognitive skills. To counteract this tendency, it is imperative that English instructors incorporate reflective learning tasks into their pedagogy. Such tasks should guide students to critically evaluate AI-generated content, identify both strengths and limitations, and justify any modifications they make. This metacognitive engagement fosters deeper language awareness, strengthens critical thinking, and sharpens editorial judgment—skills essential for both academic literacy and professional communication.

However, it is equally important to interpret the findings within the methodological constraints of the study. Consistent with earlier research (e.g., Li & Zou, 2022; Jeon, 2024), the limited sample size and the context-specific nature of participant feedback (e.g., Xiao & Park, 2021; Tai & Chen, 2023) restrict the generalizability of the results. These limitations call for future research that spans diverse institutional, cultural, and disciplinary contexts to validate and expand upon the present findings.

Given these complexities, educators must receive sustained and specialized professional development to effectively integrate AI tools into their teaching. Such training should extend beyond technical fluency to encompass pedagogical strategies, digital ethics, and the promotion of academic integrity. Instructors must be empowered to guide students in navigating AI-generated content critically and ethically—teaching not only how to use such tools, but when and why to question them. At the institutional level, this necessitates the development of comprehensive policies that clearly define ethical boundaries, appropriate attribution practices, and pedagogical safeguards against overreliance.

In conclusion, the responsible integration of AI into language education requires a multi-pronged approach: robust instructor training, institutional support, ethical frameworks, and ongoing research. When these elements are aligned, AI can serve not as a shortcut to fluency but as a scaffold that enhances learner autonomy, deepens language competence, and cultivates the critical literacies required in a rapidly evolving digital world.

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