The Impact of Mobile-Assisted Language Learning: Push and Pull Mechanisms on Enhancing English Language Proficiency of Undergraduate Students

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Abstract

This study aimed to assess the impact of push and pull mechanisms in mobile-assisted language learning (MALL) on students' English language proficiency and their satisfaction with MALL usage. The study involved comparing pretest and posttest scores between a control group and an experimental group, both initially exhibiting similar proficiency levels. Sixty students enrolled in an English Communication for Teachers course in the second semester of the 2023 academic year participated in the study, purposefully divided into control and experimental groups of 30 students each. The control group utilised the pull mechanism of MALL, while the experimental group used the push mechanism. Research instruments included a MALL application, an English proficiency test, a questionnaire, and an interview. Quantitative data underwent t-tests, means, standard deviations, and percentages analysis, while qualitative data from interviews were content-analysed. Results showed the experimental group's posttest mean significantly higher than the control group's, indicating the push mechanism positively impacted English proficiency. Additionally, the study explored students' satisfaction with MALL, revealing varied contentment levels with the platform's effectiveness, accessibility, engagement, and user interface. While overall satisfaction was high, areas such as material relevance, customisation options, and technical support had room for improvement. These findings contributed to discussions on innovative language education approaches, emphasising technology's potential to enhance language acquisition and create dynamic learning environments.

Keywords: Mobile-Assisted Language Learning, Push and Pull Mechanisms, English Language Learning, English Proficiency, Undergraduate Student

1. INTRODUCTION

The rise of mobile-assisted language learning (MALL) has transformed language education, offering adaptable and inventive methods to augment traditional pedagogical practices (Jalili et al., 2020; Stockwell, 2018). MALL's positive impact on language learning has garnered substantial academic attention, with numerous empirical studies illustrating its capacity to enhance learners' motivation, engagement, and proficiency across various linguistic skills such as vocabulary acquisition, grammar comprehension, speaking fluency, and listening comprehension (Li, 2023; Lei et al., 2022; Sun et al., 2017; Eubanks et al., 2018; Jia & Hew, 2019; Chu et al., 2019; Wongsuriya, 2020). Despite this, research on the efficacy of push and pull mechanisms in MALL remained limited. This study aimed to address this gap by investigating the impact of these mechanisms on students' English language proficiency and their satisfaction with MALL usage, hypothesising that the push mechanism would correlate with an improvement in English language proficiency.

MALL has been developed around a variety of instructional approaches that are intended to improve learning outcomes and increase student engagement. Among these mechanisms, push and pull have garnered significant attention for their potential to facilitate language learning (Stockwell & Hubbard, 2013). The push and pull mechanisms are distinct strategies in mobile-assisted language learning (MALL) that enhance language proficiency by leveraging mobile technology. The push mechanism delivers learning content at predetermined times, ensuring regular engagement and a structured learning path, which is beneficial for maintaining consistent practice and reducing procrastination. Conversely, the pull mechanism encourages self-directed learning, allowing students to access materials at their own pace, fostering autonomy, and personalizing their learning experience. By combining these approaches, teachers can cater to various learning styles and preferences, providing a balanced and adaptable learning environment that effectively supports language acquisition and proficiency (Stockwell, 2013; Puebla et al., 2022).

In today's classroom, undergraduate students are more likely to posses mobile or other devices more than one device making it difficult for teachers to monitor or control their uses. Recognising that the majority of Thai students use mobile devices to help their language learning in a variety of ways, including translation, correction, and artificial intelligence (AI) support platforms. These tools can be effectively employed for educational purposes, particularly within EFL teaching and learning (Hockly & Dudeney, 2018). Therefore, this study explored the effectiveness of diverse instructional

strategies, such as push and pull mechanisms, within Mobile-Assisted Language Learning (MALL) to optimize learning outcomes and cater to varied preferences. It assessed the students' language proficiency and satisfaction with MALL, highlighting its effectiveness and user experience. The research examined accessibility, engagement, and user interface, offering insights into enhancing language learning experiences and creating dynamic educational environments.

2. OBJECTIVES

1) To compare students' English language proficiency before and after implementing push and pull mechanisms in mobile-assisted language learning (MALL).

2) To assess students' satisfaction with mobile-assisted language learning (MALL) usage.

3. CONCEPTUAL FRAMEWORK

The conceptual framework for this study encompassed several key aspects. English language teaching and learning served as the underlying foundation. In the experimental group, MALL's push mechanism was integrated with traditional pedagogy to assess its impact on English language proficiency outcomes. Conversely, the control group employed the pull mechanism of MALL alongside traditional pedagogy, evaluating the effectiveness of self-directed learning behaviours facilitated by MALL. Additionally, students' satisfaction was measured to gauge the acceptability and usability of the MALL approach. Qualitative interviews provided insights into students' experiences, challenges, and preferences regarding both MALL and conventional pedagogy, while English language proficiency tests offered quantitative data on the effectiveness of both methods in improving language skills. This comprehensive framework enabled a thorough examination of MALL's efficacy in English language teaching and learning.

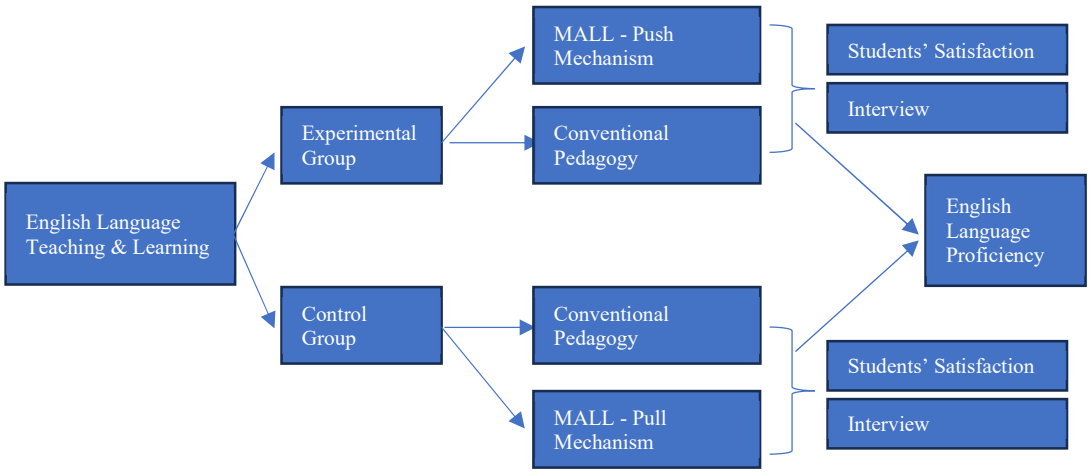

Fig 1. Conceptual Framework

4. LITERATURE REVIEW

4.1 Mobile-Assisted Language Learning (MALL)

Trifonova and Ronchetti (2003) defined mobile learning as the use of information technology via mobile devices to enhance teaching and learning experiences, whereas mobile-assisted language learning (MALL) specifically employed various mobile technologies to accelerate language acquisition. Naismith et al. (2004) categorised mobile technologies into personal and shared, and portable and static dimensions. Studies indicated that mobile technologies in education support six theories: constructivism, behaviourism, cooperation, contextual learning, informal learning, and lifelong learning (Naismith et al., 2004; Rahamat et al., 2017; Cakmak, 2019). Traxler and Kukulska-Hulme (2015) reported significant support for MALL among educators, while Hashim et al. (2017) validated its emergence as a unique discipline over the last decade, with numerous studies exploring its application in both formal and informal language learning contexts. These attributes enabled learning to transcend physical and temporal boundaries, fostering learner autonomy. MALL has emerged as a dynamic method in language education, utilising the widespread availability of mobile devices to facilitate language acquisition anytime and anywhere (Clark & Mayer, 2023).

Drawing from diverse frameworks in education, psychology, and technology, the theoretical foundations of MALL informed its conceptual framework and guide its implementation. Constructivist theories, exemplified

by Vygotsky's sociocultural theory and Piaget's cognitive constructivism, asserted that learners actively construct knowledge through interactions with their surroundings. In MALL, constructivism emphasised learner autonomy and engagement, with mobile devices serving as tools for exploring authentic language materials, fostering collaboration, and constructing meaning through real-world interactions (Stockwell, 2010; Zare & Derakhshan, 2022).

Sociocultural theory, rooted in Vygotsky's work, underscored the importance of social interaction and cultural context in shaping learning experiences. The MALL theory emphasised collaborative learning and social interaction for language acquisition, facilitated by mobile devices that enabled connections with peers and promote cultural exchange (Kukulska-Hulme & Shield, 2008). Situated learning theory posited that learning occurred within authentic contexts and social communities. MALL leveraged mobile devices to create situated learning environments, enabling engagement with language in real-world contexts (Chinnery, 2006).

Finally, the technology acceptance model (TAM) offered insights into users' acceptance and adoption of technology. In MALL, TAM explored factors shaping learners' attitudes towards mobile language learning applications, with perceived usefulness, ease of use, and enjoyment influencing their acceptance and utilisation of these technologies (Ally, 2009). By embracing these theoretical frameworks, teachers could design MALL interventions that fostered learner autonomy, facilitated social interaction, created authentic learning environments, and enhanced technology acceptance, ultimately supporting and empowering learners in their language acquisition journey.

4.2 Push and Pull Mechanisms

As mentioned above, MALL has revolutionised language education by providing learners with anytime, anywhere access to language learning materials through mobile devices. Central to the effectiveness of MALL were the push and pull mechanisms, which governed the delivery and retrieval of learning content. This section examined the role of push and pull mechanisms in facilitating language learning outcomes and explored recent developments in this field. Push mechanisms involved the proactive delivery of learning materials to learners' devices, often through notifications, reminders, or automated updates. These mechanisms ensured timely access to relevant content, thereby enhancing learners' engagement and motivation (Viberg & Grönlund, 2012).

For instance, Viberg & Grönlund (2012) emphasised the importance of push mechanisms in delivering bite-sized language learning activities that could be seamlessly integrated into learners' daily routines. By receiving regular prompts and notifications, learners were encouraged to engage with language learning materials consistently, leading to improved language proficiency over time. In contrast, pull mechanisms empowered learners to retrieve learning materials based on their preferences and needs, thereby promoting autonomy and personalised learning experiences. Pull mechanisms allowed learners to access a wide range of language learning resources, such as vocabulary lists, grammar explanations, and interactive exercises, at their convenience (Wu, 2015). This flexibility fostered a sense of ownership over the learning process, as learners could tailor their study sessions to suit their individual learning goals and preferences.

Recent research has sought to explore the interplay between push and pull mechanisms in MALL and their impact on language learning outcomes. Wu (2015) investigated how the combination of push notifications and pull access to vocabulary resources influences learners' vocabulary acquisition. Their findings suggested that push mechanisms prompt learners to engage with vocabulary learning materials, while pull mechanisms empowered learners to explore additional resources and practice at their own pace. This combination of push and pull mechanisms facilitated a balanced approach to language learning, promoting both engagement and autonomy.

Moreover, meta-analytical studies, such as that conducted by Smith (2018), have provided insights into the effectiveness of push mechanisms in MALL. Smith's meta-analysis synthesised findings from multiple studies and concluded that push mechanisms significantly enhance learners' engagement with learning materials and contribute to improved language proficiency. By delivering timely notifications and updates, push mechanisms fostered regular practice and sustained motivation in language learning.

In conclusion, push and pull mechanisms played complementary roles in mobile-assisted language learning, facilitating engagement, autonomy, and language learning outcomes. Push mechanisms ensured the proactive delivery of learning content, while pull mechanisms empowered learners to retrieve resources according to their preferences and needs. Future research should continue to explore the synergistic effects of push and pull mechanisms in MALL, considering factors such as learner preferences, technological advancements, and pedagogical contexts (Apoko et al., 2023; Nuraeni et al., 2020). By leveraging the strengths of both push and pull

mechanisms, educators can create dynamic and effective language learning environments in MALL.

4.3 Pedagogies in MALL

Pedagogically, MALL encompassed a diverse range of approaches. One prevalent pedagogical approach in MALL was task-based learning, which emphasised the completion of language learning tasks designed to achieve specific learning objectives (García Laborda, 2009). Task-based learning in MALL capitalised on the interactive and multimedia capabilities of mobile devices to engage learners in authentic language use and meaningful communication (Stockwell & Hubbard, 2013). Research indicated that task-based MALL activities promoted language acquisition by providing opportunities for contextualised language practice and feedback (Kukulska-Hulme & Shield, 2008).

Another prominent pedagogical approach in MALL was content-based instruction, which integrated language learning with subject-matter content to enhance learners' language proficiency while addressing academic content knowledge (Warschauer & Meskill, 2000). Content-based MALL programs often featured multimedia resources, such as videos, podcasts, and interactive simulations, to scaffold language learning and content comprehension (Kukulska-Hulme, 2009).

Studies have shown that content-based MALL approaches promoted language development while fostering subject-area knowledge and critical thinking skills (Kukulska-Hulme & Shield, 2008). Additionally, the flipped classroom model has gained traction in MALL, whereby traditional classroom activities were moved online, and interactive tasks were completed outside of class, allowing for more personalised and interactive in-class activities (Doung-in, 2017). Flipped classroom approaches in MALL leveraged mobile technologies to deliver instructional content, facilitate collaborative learning, and provide immediate feedback to learners (Soleymani et al., 2021). The research conducted by Jalili et al. (2020) suggested that flipped classroom models in MALL enhanced learner engagement, autonomy, and language proficiency. Furthermore, learner-centred approaches, such as inquiry-based learning and project-based learning, have been adapted for MALL environments to promote learner autonomy, creativity, and critical thinking skills (Kukulska-Hulme, 2013). In inquiry-based MALL, learners explored authentic language materials and resources to address research questions or solve real-world problems, fostering inquiry skills and language proficiency (Facer et al., 2014).

In conclusion, pedagogical approaches in MALL encompassed a diverse range of methodologies aimed at optimising language learning outcomes in mobile learning environments. Task-based learning, content-based instruction, the flipped classroom model, and learner-centred approaches offered valuable frameworks for designing effective MALL programmes that engaged learners, promote language acquisition, and fostered 21st-century skills. Future research should continue to explore the effectiveness of different pedagogical approaches in MALL, considering factors such as learner characteristics, technological affordances, and pedagogical contexts, to inform best practices in mobile language education (Lei, 2022; Rajendran & Yunus, 2021)

The empirical evidence surrounding MALL underlined its potential as a transformative tool in language education. Studies have consistently revealed MALL's positive impact on language learning outcomes, enhancing learners' motivation, engagement, and proficiency across various linguistic skills, including vocabulary acquisition, grammar comprehension, speaking fluency, and listening comprehension (Kukulska-Hulme & Traxler, 2013). A study conducted by Li (2023) on the effects of MALL on listening skills suggested that MALL was more effective than traditional methods in developing listening skills.

4.4 Related research to MALL

Furthermore, research has highlighted MALL's effectiveness in promoting learner autonomy, facilitating authentic language use, and catering to diverse learner needs (Herrington et al., 2009). However, challenges such as digital inequality, technical constraints, and pedagogical integration issues persisted within the MALL landscape (Viberg et al., 2020). Addressing these challenges necessitated ongoing investigation and refinement of MALL practices to ensure its continued efficacy and accessibility. Beyond MALL, empirical research has extensively explored the effectiveness of technology-enhanced learning environments in diverse educational contexts. Meta-analyses, such as the one conducted by Means et al. (2009), have consistently shown that technology, including MALL, could enhance student engagement, motivation, and learning outcomes. Also, studies examining the effectiveness of MALL have demonstrated its potential to facilitate language acquisition, improve proficiency, and foster autonomous learning (Burston, 2014; Jeong, 2022). In addition to technology-enhanced learning, empirical evidence has shed light on the effectiveness of various instructional strategies and approaches across educational domains. Meta-analyses examining interventions such as cooperative learning (Esai & Mahbib, 2015) and

formative assessment (Hattie & Timperley, 2007) have consistently shown positive effects on academic achievement and student motivation.

On this basis, empirical evidence highlighted the effectiveness of a wide range of educational interventions and approaches in enhancing student learning outcomes. By synthesising findings from diverse studies, teachers and policymakers could identify evidence-based practices to inform instructional design, curriculum development, and educational policy decisions. Nonetheless, it was crucial to acknowledge the contextual nuances and individual differences that may influence the effectiveness of educational interventions, emphasising the need for ongoing research and evaluation in the field of education

5. METHODOLOGY

5.1 Research Design

This study employed experimental research methodology to explore potential cause-and-effect relationships between independent and dependent variables. According to Creswell (2012), the independent variable either "causes" or is believed to have caused changes in the dependent variable, indicating that the independent variable influences the outcome. In this study, the independent variable was the MALL application, while the dependent variables were students' English language proficiency and satisfaction. Experimental research aims to establish whether a specific intervention affects an outcome (Creswell, 2014). Various types of experimental designs include true experiments, field experiments, and natural experiments (Cohen et al., 2007). This study utilized a two-group quasi-experimental design to evaluate the effectiveness of push and pull mechanisms within mobile-assisted language learning (MALL) for enhancing English language proficiency.

Table 1. Pretest and posttest design

Group	Pretest	Treatment	Posttest
Experiment	O1	X	O2
Control	O2	Y	O2

Annotation: O1: Pretest
O2: Posttest
X: Utilising the push mechanism of MALL
Y: Utilising the pull mechanism of MALL

The dashed line between the parallel rows in the diagram of the non-equivalent control group indicates that randomisation was not used to equate the experimental and control groups, hence the term non-equivalent (Cohen et al., 2007). Both groups underwent pretest and posttest assessments but received different treatments. The experimental group utilised the push mechanism of MALL, whereas the control group employed the pull mechanism of MALL.

5.2 Participants

The population for this study consisted of undergraduate students from the Faculty of Education at Chiang Mai Rajabhat University. The sample group for the experiment was selected through purposive sampling, with the criteria being the same major students who were enrolled in the English Communication for Teachers' course during the second semester of the 2023 academic year. The sample was divided into two groups: a control group and an experimental group, each comprising 30 students.

5.3 Variables

5.3.1 Independent variable was the MALL application.

5.3.2 Dependent variables were students' English language proficiency and satisfaction towards the MALL application.

5.4 Research Instruments

The research instruments were as follows:

5.4.1 The MALL application was the pre-intermediate headway online practice from Oxford online practice, aligned with the pre-intermediate headway student book, and consisted of six units. The application incorporated practice activities covering all four language skills, along with video-based tasks.

5.4.2 The English proficiency test was adapted from the 5th edition headway placement test and consisted of 60 multiple-choice questions.

5.4.3 The student satisfaction questionnaire comprised 12 questions rated on a 5-point scale.

5.4.4 The semi-structured interviews entailed posing a series of open-ended questions to the participants, supplemented by probe questions to delve deeper into their responses and the relevant topic.

5.4.5 The research instruments were verified using the Index of Objective Congruence (IOC) by three English language teaching (ELT) experts, resulting in 0.64 for the content validity index. Based on the feedback from these experts, the instruments were then revised and further developed.

5.5 Data Collection and Analysis

The study was conducted with two groups of students, control and experimental groups, in the second semester of the 2023 academic year. The data collection procedures were divided into three phrases as follows:

1) Before the experiment commenced, the students participated in an orientation session during the first week of the course, which focused on the use of the MALL application. The orientation focused on the application's push and pull mechanisms. Additionally, students were required to register for an account on Oxford online practice. Following the orientation, the pretest was administered prior to the start of instruction.

2) During the experimental phase spanning 12 weeks, the students in the control group were assigned to complete the six units of the MALL application though the pull mechanism. In this approach, the students took an active role in seeking out learning content, fostering self-directed learning behaviours. Conversely, the experimental group was assigned to complete the same six units using the push mechanism. In this approach, tasks on the MALL application were delivered directly to students according to a predetermined schedule set by the lecturer, thereby encouraging consistent engagement with the materials at the specified times.

3) After the experiment, the parallel posttest was administered to all students. Additionally, the questionnaire was distributed to both groups to assess their satisfaction with the use of mobile-assisted language learning (MALL). The results from the questionnaire were analysed for means and standard deviations. Additionally, the E1/E2 formula was utilised to calculate the scores obtained from exercises in the MALL application and the posttest of the two groups, aiming to ascertain the effectiveness of the MALL application. The scores from the pretest and posttest of both groups were calculated to compare the differences using T-Tests, means, and standard deviations. Additionally, some students from each group underwent semi-structured interviews, randomly selected, to delve into their experiences with

the MALL application as an integral part of their learning process aimed at enhancing their English proficiency. The qualitative data gathered from these interviews underwent analysis and categorisation, delineating positive and negative experiences, with the findings presented descriptively.

5.6 Ethical Consideration

The ethical issues in this study were guided by Caruana's (2015) recommendations for conducting research within one's academic institution. The study used pretest-posttest assessments, questionnaires, and interviews to emphasise the importance of preserving participants' well-being and rights. Informed permission was essential for ensuring that participants knew the study's objectives, procedures, and potential dangers, as well as their right to withdraw at any time without penalty. Participants were briefed during an orientation session and completed consent forms before to their participation. Confidentiality was tightly maintained throughout data collection, processing, and dissemination to protect participants' names and responses. The researcher minimised risks such as discomfort from sensitive inquiries while prioritizing participant safety and mental well-being. Participation was voluntary, tension-free, and culturally sensitive, with benefits to participants and the boarder community outweighing any hazards. Throughout the research process, important ethical principles were followed, including secure data management and storage, as well as post-study debriefing for participants.

6. RESULTS

6.1 The effectiveness of students' English language proficiency before and after implementing push and pull mechanisms of mobile-assisted language learning (MALL)

To examine the effectiveness of push and pull mechanisms of MALL on improving students' English language proficiency, the study divided participants into two groups. The control group was instructed to complete six units of the MALL application using the pull mechanism, which required them to actively search for learning materials independently. In contrast, the experimental group completed the same units using the push mechanism, where materials were sent directly to them at set times. The effectiveness of push and pull mechanisms of MALL was based on 70/70 effectiveness criteria summarised in Table 2 and 3.

Table 2. The effectiveness of the push mechanism of MALL on improving students' English language proficiency

Effectiveness	Total score	$\bar{x}$	S.D.	%
Learning process (E1)	30	21.77	4.53	72.56
Learning product (E2)	30	23.10	3.40	77.00

Table 2 demonstrates the effectiveness result of the push mechanism of MALL on improving students' English language proficiency. The effectiveness of the push mechanism of MALL during the learning process (E1) was at 72.56 and the learning product (E2) was at 77.00. It indicated that both exercise and posttest scores met the 70/70 effectiveness criteria. As a result, it could be summarised that the push mechanisms of MALL could be implemented or applied in teaching and learning.

Table 3. The effectiveness of the pull mechanism of MALL on improving students' English language proficiency

Effectiveness	Total score	$\bar{x}$	S.D.	%
Learning process (E1)	30	21.03	3.31	70.11
Learning product (E2)	30	21.37	2.91	71.22

Table 3 demonstrates the effectiveness result of the pull mechanism of MALL on improving students' English language proficiency. The effectiveness of the pull mechanism of MALL during the learning process (E1) was at 70.11, and the learning product (E2) was at 71.22. It indicated that both exercise and posttest scores met the 70/70 effectiveness criteria. As a result, it could be summarised that the push mechanisms of MALL could be implemented or applied in teaching and learning.

Table 4. The comparison of data from the pretest between the control and experimental groups

Group	N	Total Score	$\bar{x}$	S.D.	t	Sig.
Control group	30	60	28.10	5.38	1.72	0.096
Experimental group	30	60	28.93	4.19		

According to Table 4, the results revealed that pretest scores of the control group ($\bar{x}$ = 28.10, S.D. = 5.38) and the experimental group ($\bar{x}$ = 28.93, S.D. = 4.19) did not differ significantly ($t = 1.72$, $p > 0.05$). This implied that both groups had similar levels of English proficiency at the start of the course, indicating that the population sample selected for the study was appropriate.

Table 5. The comparison of data from the posttest between the control and experimental groups

Group	N	Total Score	$\bar{x}$	S.D.	t	Sig.
Control group	30	60	28.90	4.92	4.04	0.0004
Experimental group	30	60	31.97	4.23		

Table 5 presents the comparison of posttest scores between the control and experimental groups. The experimental group scored significantly higher on the posttest ($\bar{x}$ = 31.97, S.D. = 4.23) than the control group ($\bar{x}$ = 28.90, S.D. = 4.92), with a t-value of 4.04 and a p-value greater than 0.05. These results indicated that the push mechanism of MALL effectively enhanced students' English language proficiency.

6.2 Students' satisfaction with mobile-assisted language learning (MALL) usage

To assess students' satisfaction with mobile-assisted language learning (MALL) usage, all students were required to complete a questionnaire by rating each question on a five-point scale: very dissatisfied, dissatisfied, neutral, satisfied, and very satisfied. The self-rating scores from the questionnaire were analysed for mean and standard deviation and interpreted into five levels of satisfaction, as illustrated in Table 3.

Table 6. The students' satisfaction with mobile-assisted language learning (MALL) usage

No.	Questions	Experimental group			Control group			Overall		
		$\bar{x}$	S.D.	Level of Satis-faction	$\bar{x}$	S.D.	Level of Satis-faction	$\bar{x}$	S.D.	Level of Satis-faction
1	How satisfied are you with the overall effectiveness of MALL in improving your language skills?	4.41	0.34	High	4.28	0.52	High	4.35	0.43	High
2	How easy is it to access MALL resources on your mobile device?	4.23	0.67	High	4.03	0.35	High	4.13	0.51	High
3	How engaging do you find the MALL activities and exercises?	4.42	0.45	High	4.36	0.78	High	4.39	0.62	High

No.	Questions	Experimental group			Control group			Overall		
		$\bar{x}$	S.D.	Level of Satis-faction	$\bar{x}$	S.D.	Level of Satis-faction	$\bar{x}$	S.D.	Level of Satis-faction
4	How satisfied are you with the variety of learning materials provided through MALL?	4.67	0.53	Highest	4.46	0.32	High	4.57	0.43	Highest
5	How well do MALL activities fit into your daily schedule?	4.49	0.45	High	4.12	0.67	High	4.31	0.56	High
6	How helpful are the feedback and corrections provided by MALL?	4.81	0.34	Highest	4.68	0.31	Highest	4.75	0.33	Highest
7	How satisfied are you with the user interface and design of the MALL application?	4.61	0.54	Highest	4.55	0.40	Highest	4.58	0.47	Highest
8	How effective do you find the MALL platform in enhancing your vocabulary?	4.52	0.31	Highest	4.34	0.27	High	4.43	0.29	High
9	How well does MALL help you achieve your personal language learning goals?	4.87	0.27	Highest	4.51	0.29	Highest	4.69	0.28	Highest
10	How satisfied are you with the level of interaction (e.g., quizzes, interactive lessons) offered by MALL?	4.67	0.39	Highest	4.30	0.32	High	4.48	0.36	High
11	How satisfied are you with the technical support provided for MALL?	4.21	0.58	High	4.25	0.40	High	4.23	0.49	High

No.	Questions	Experimental group			Control group			Overall		
		$\bar{x}$	S.D.	Level of Satis-faction	$\bar{x}$	S.D.	Level of Satis-faction	$\bar{x}$	S.D.	Level of Satis-faction
12	How likely are you to continue using MALL for language learning in the future?	4.63	0.29	Highest	4.44	0.38	High	4.54	0.34	Highest
Total		4.55	0.43	Highest	4.36	0.42	High	4.45	0.43	High

Table 6 provided a detailed analysis of students' satisfaction with mobile-assisted language learning (MALL). The overall satisfaction level of the two groups was high, with an average score of 4.45 (S.D. = 0.43). The overall satisfaction level of the experimental group (4.55) was higher than the control group (4.36). Each question in the questionnaire garnered a high or highest level of satisfaction, although there were some differences in the mean scores. Question 6, which asked about the helpfulness of feedback and corrections provided by MALL, received the highest satisfaction score with an average of 4.75 (S.D. = 0.33). This suggested that students found the feedback feature of MALL particularly beneficial. Other questions that scored at the highest satisfaction level included question 4, regarding the variety of learning materials ($\bar{x}$ = 4.57, S.D. = 0.43), question 7, about the user interface and design of the MALL application ($\bar{x}$ = 4.58, S.D. = 0.47), question 9, on achieving personal language learning goals ($\bar{x}$ = 4.69, S.D. = 0.28), and question 12, concerning the likelihood of continuing to use MALL in the future ($\bar{x}$ = 4.54, S.D. = 0.34). Even questions that did not reach the highest satisfaction level still scored well. For example, question 1, which inquired about the overall effectiveness of MALL in improving language skills, had a mean score of 4.35 (S.D. = 0.43), indicating a high level of satisfaction. Similarly, question 3, regarding the engagement of MALL activities, scored 4.39 (S.D. = 0.62). In conclusion, the table showed that students were generally very satisfied with the various aspects of MALL, particularly appreciating the helpful feedback, the variety of learning materials, and the user-friendly design.

The qualitative data from the interviews with students yielded both positive and negative experiences regarding the mobile-assisted language learning (MALL) application used during the course. A predominant sentiment among students was their enjoyment of using the MALL application, citing its support in course content learning.

S1:"... Personallly, I don't quite like learning and practicing grammar, but the game mechanisms in the application make me want to win more and more. I enjoyed playing the games without noticing the language learning" (Translated from S1 response in Thai)

S2: "... I love the video-based tasks, where I can learn the contents about the world that I never know before. That is my first time staying in English practice for a long time without boring." (Translated from S2 responses in Thai)

Several key themes emerged from the interviews. Firstly, students expressed a higher level of engagement with the pull mechanism compared to the push mechanism. They perceived the pull mechanism as more interactive and tailored to their individual learning needs, thereby fostering greater motivation and enthusiasm for language learning activities. Some quotations from the students were as follow:

S2: "... I think in the pull mechanism I can choose the contents and tasks whenever I need. And I can also find the information outside the designated application. I feel comfortable that I can do the tasks anytime I want." (Translated from S2 responses in Thai)

S3: "... I can choose any contents and tasks I want to do even we haven't reached that unit in the class. This is because I saw this content on Facebook, and I noticed, it is also one of our units." (Translated from S3 responses in Thai)

Conversely, the push mechanism was recognised for its effectiveness in aiding course content mastery.

S1: ".... Although I don't like spending time studying grammar, the designated contents and times are useful for me to follow what we're learning in the class. If I have to use the application myself with any guideline, I think I may not know what to do on the application." (Translated from S1 responses in Thai)

S4: "... I can review and practise the contents we have done in the class so I know what to practise.

"It makes me get high scores in quizzes." (Translated from S4 responses in Thai)

Secondly, both mechanisms were lauded for their flexibility and convenience, enabling students to access language learning materials at their convenience and from any location. However, the pull mechanism was perceived as offering superior flexibility, allowing students to select content based on their preferences and learning pace as stated by S2. Thirdly, students acknowledged the relevance of content delivered through both mechanisms. However, some noted that the push mechanism occasionally delivered material less aligned with their interests or immediate learning goals.

S4: "... Sometimes I don't feel like doing the assigned tasks because some tasks are slightly boring that I have done many times. (Translated from S4 responses in Thai)

Furthermore, the pull mechanism was seen as providing more personalised feedback and support compared to the push mechanism. Students valued the opportunity to receive timely feedback on their performance and progress, which they found motivating and beneficial to their learning process. Ultimately, while some students encountered technical challenges such as connectivity issues or difficulties navigating the MALL platforms, these obstacles were generally considered minor and did not significantly impact overall satisfaction with the learning experience.

7. CONCLUSION

The research findings indicated that both push and pull mechanisms positively impact students' English language proficiency, with notable distinctions between the two. The experimental group, which utilised the push mechanism of MALL, scored significantly higher on the posttest ($\overline{x}$ = 31.97, S.D. = 4.23) compared to the control group that used the pull mechanism ($\overline{x}$ = 28.90, S.D. = 4.92), with a t-value of 4.04 and a p-value greater than 0.05. This suggested that both the push and pull mechanisms effectively enhanced English language proficiency. Furthermore, a detailed analysis of student satisfaction revealed that the experimental group reported a higher overall satisfaction level (4.55) than the control group (4.36).

In terms of engagement, students expressed a higher level of engagement with the pull mechanism than with the push mechanism. Both mechanisms were praised for their flexibility and convenience, allowing students to access learning materials from any location. The pull mechanism, however, was perceived as offering superior flexibility, enabling students to select content based on their preferences and learning pace. While content delivered through both mechanisms was considered relevant, some students noted that the push mechanism occasionally provided materials that were less

aligned with their interests or immediate learning goals. Additionally, the pull mechanism was seen as providing more personalised feedback and support compared to the push mechanism. These findings highlighted the complementary strengths of both mechanisms in supporting language learning and suggest that integrating elements of both could optimise learning outcomes.

8. DISCUSSION

The research findings underscored the positive impact of both push and pull mechanisms on students' English language proficiency, aligning with Puebla et al.'s (2022) study, which showed significant language improvements regardless of whether learners chose content independently or were assigned specific materials. The push mechanism's structured content delivery and regular engagement prompts resulted in higher posttest scores, highlighting its effectiveness in enhancing proficiency through consistent exposure. This method facilitated behavioural engagement by promoting regular interaction with learning materials, which was crucial for habit formation and skill acquisition. The Pull mechanism, which allowed students to select materials based on their preferences and pace, demonstrated substantial benefits, particularly in terms of increased emotional engagement and motivation. The autonomy and personalised learning pathways associated with the pull mechanism fostered a sense of ownership and intrinsic motivation, which were key components of emotional engagement. Both mechanisms were praised for their convenience, enabling learning from any location, with the pull mechanism offering more personalised feedback and support, thereby enhancing cognitive engagement (Li, 2023). This personalised approach likely facilitated deeper processing and understanding of language materials. While the push mechanism sometimes provided less relevant material, its overall structure facilitated effective learning by maintaining consistent engagement. These findings suggested that integrating both mechanisms could optimize learning outcomes by combining structured engagement with personalised flexibility, catering to diverse learner needs and improving behavioural, emotional, and cognitive engagement, ultimately enhancing language proficiency.

The comparison of posttest scores between the control and experimental groups highlighted the effectiveness of the push mechanism in mobile-assisted language learning (MALL). The experimental group, which used the push mechanism, achieved significantly higher posttest scores ($\overline{x}$ = 31.97, S.D. = 4.23) than the control group with the pull mechanism ($\overline{x}$ = 28.90, S.D. = 4.92), with a t-value of 4.04 and a p-value greater than 0.05. These

results suggested that the structured and proactive delivery of content in the push mechanism promoted consistent engagement, leading to improved language proficiency. The regular prompts and notifications likely fostered disciplined study habits, resulting in more substantial progress. While the pull mechanism offered flexibility and supports self-directed learning, it may not provide the same level of reinforcement as the push mechanism. These findings indicated that the push mechanism was highly effective in enhancing language proficiency through regular interaction with learning materials, suggesting its potential as a valuable tool in structured language education (Wu, 2015). Moreover, the results highlighted the importance of incorporating diverse instructional strategies, including push and pull mechanisms, to cater to varied learning preferences and optimise learning outcomes in language education settings (Viberg & Grönlund, 2012). Future research could delve deeper into the specific features of push mechanisms within MALL and explore their differential effects on language learning outcomes across diverse learner populations. In conclusion, the findings underscored the effectiveness of the push mechanism in MALL as a means of enhancing students' English language proficiency. These insights contributed to the ongoing discourse on innovative pedagogical approaches in language education and underscore the potential of technology-enhanced learning environments to facilitate language acquisition.

The analysis of students' satisfaction with mobile-assisted language learning (MALL) revealed a generally positive reception across both the experimental and control groups. The experimental group, utilising the push mechanism, reported a higher overall satisfaction level (4.55) compared to the control group, which used the pull mechanism (4.36). This suggested that the structured and proactive delivery of learning content through the push mechanism may have contributed to a higher degree of satisfaction, possibly due to the regular engagement and consistent learning opportunities it provided (Li, 2023; Lei, 2022; Rajendran & Yunus, 2021). However, deeper insights into student engagement indicate a preference for the pull mechanism. Students expressed a higher level of engagement with the pull mechanism compared to the push mechanism. This finding underscored the importance of learner autonomy and the ability to control the pace and content of their learning experience. The pull mechanism's flexibility allowed students to access learning materials based on their individual needs and preferences, making it particularly effective for personalised learning.

Both mechanisms were praised for their flexibility and convenience, enabling students to access language learning materials anytime and from any location. This aligned with the inherent advantages of mobile learning, which

facilitates learning beyond the traditional classroom setting. However, the pull mechanism was perceived as offering superior flexibility. By allowing students to select content according to their personal learning goals and schedules, the pull mechanism supports a more tailored learning experience. Students also acknowledged the relevance of content delivered through both mechanisms, recognising their contribution to language learning as supported by Stockwelll (2013). Nonetheless, there were some criticisms of the push mechanism, as it occasionally delivered materials that were less aligned with students' immediate interests or learning goals. This suggested that while the push mechanism ensures regular content delivery, it may lack the adaptability needed to fully meet individual learning preferences at all times (Sun et al., 2017; Eubanks et al., 2018; Jia& Hew, 2019; Chu et al., 2019). Furthermore, the pull mechanism was seen as providing more personalised feedback and support compared to the push mechanism. This was likely due to the self-directed nature of the pull approach, where students actively seek out resources and receive feedback based on their specific interactions with the material. Personalised feedback is a critical component of effective language learning, as it helps address individual learner needs and promotes a deeper understanding of the language.

In summary, the findings indicated that while both push and pull mechanisms have distinct advantages in mobile-assisted language learning (MALL), the pull mechanism's flexibility and capacity for personalised learning are particularly valued by students. These findings suggested that an optimal MALL strategy might integrate the regular engagement benefits of the push mechanism with the flexibility and personalisation offered by the pull mechanism, thus providing a more balanced and effective learning experience.

8.1 Suggestions

Based on the findings of the comparison between students' English language proficiency before and after implementing push and pull mechanisms in mobile-assisted language learning (MALL), several suggestions emerged to optimise language learning outcomes:

1) The significant enhancement in English language proficiency observed in the experimental group, attributed to the implementation of push mechanisms, demonstrates the effectiveness of this instructional approach. Therefore, it is advisable for teachers to incorporate push mechanisms more prominently within MALL platforms to optimise language learning outcomes.

2) The observed differences in posttest scores between the control and experimental groups highlight the benefits of incorporating diverse

instructional strategies, including both push and pull mechanisms. Teachers should therefore adopt a blended approach, leveraging a combination of these methods to address varied learning preferences and enhance language learning outcomes.

3) The positive influence/impact of push mechanisms on language acquisition emphasises the importance of interactive and personalised learning experiences. Hence, educators should prioritise the development of MALL resources that provide tailored feedback and support to foster student engagement and motivation.

4) Further study into the specific features and functionalities of push mechanisms within MALL platforms is recommended to gain deeper insights into their differential effects on language learning outcomes across diverse learner populations. This research endeavour will enable teachers to refine instructional strategies and harness the full potential of MALL for language education.

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