

A Systematic Review of Mobile-Assisted Language Learning Research Trends and Practices in Malaysia

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Nursufyana Ulfa Che Mustaffa^(✉), Siti Nazuar Sailin
Universiti Utara Malaysia, Sintok, Malaysia
n.sufyanulfa@gmail.com

Abstract—Mobile technology integration in Malaysia's English language education has a bright future, owing to the many advantages offered by mobile devices. However, there are inadequate studies that systematically review existing work in Malaysia to uncover gaps in the use of mobile technologies for English teaching and learning. Thus, a systematic review was conducted to offer an up-to-date synthesis of Mobile-Assisted Language Learning (MALL) integration in Malaysia from January 2019 to January 2021. The review followed the PRISMA Statement's guidelines which resulted in the identification of eleven articles that met all the inclusion criteria. Following that, the eleven articles were analysed and synthesised quantitatively and qualitatively using seven codes derived from two earlier systematic reviews of the literature. The codes were: (1) research objectives, (2) research methodologies, (3) educational level, (4) learning context, (5) device types, (6) theories, and (7) research outcomes. The systematic review discovered several significant findings, including the fact that the majority of the studies examined the effect of MALL integration on students' English acquisition and performance, and that MALL was more prevalent in Malaysian higher education institutions than other levels of education, with the lowest prevalence in primary schools. In light of this information, recommendations for future research were proposed. Malaysian academics are encouraged to broaden the scope of their future research and engage students from all levels of education in future MALL practices in order to better understand MALL's usability in English language instruction in Malaysia.

Keywords—systematic literature review, research trends, mobile-assisted language learning, MALL, english as second language (ESL), mobile technologies, Malaysia

1 Introduction

The advancement of the latest technologies has paved the way for multi-functional mobile devices such as smartphones, tablet PCs, pocket computers and e-readers, that make working and communicating facile and learning a second language simpler,

quicker, easier, and more enjoyable. The integration of the newest technologies into the framework of teaching and learning a language has benefitted both teachers and students because it has enabled them to develop and experience previously unimaginable methods of teaching and learning a second language.

Even though the spread of new technology, especially mobile phones, has evolved rapidly in both developed and developing countries, the differences in practices are staggering. Like all other technical advances, the affordability and availability of mobile learning are generally more successfully integrated into practices in developed countries, which have a different state of technology and social system than developing countries [1], [2]. Looking at the integration of mobile technology in teaching and learning a second language, it is evident that Malaysia is trailing a decade behind the advancements made in developed countries such as Australia, America, and China. Evidence indicates that Malaysia only started adopting mobile-assisted language learning (MALL) in 2003 [3], even though developed countries had begun exploiting mobile technology in language learning since 1994 [4].

Although Malaysia started relatively later, the ubiquity of mobile technology in today's society and the proliferation of mobile devices in the Malaysian community have significantly impacted the implementation of mobile technology in the education system, particularly in English language learning. [5] from Statista, who surveyed in 2019, noted that the number of smartphone users in Malaysia will reach more than 33 million by 2021. It was also recorded that the millennial generation is more likely to own smartphones than the older generation and that around 86.3% of respondents below the age of 20 own a smartphone [5]. The widespread ownership of smartphones among the millennial generation in Malaysia has influenced the pervasive integration of MALL in English language classes in Malaysia. However, as indicated by [6], there are still relatively few systematic literature reviews on this popular subject. In addition, there have been no comprehensive reviews on studies that have been published from January 2019 until January 2021, as the systematic literature review conducted by [6] only reviewed studies that were published from 2009 until 2019.

Consequently, the present systematic review is prompted by one fundamental research question: What research has been undertaken on the integration of MALL in language classrooms in Malaysia between January 2019 and January 2021? The main objective of the review is to provide an up-to-date summary of research trends and MALL practices in Malaysia between January 2019 to January 2021, based on seven codes obtained from previous systematic literature reviews: (1) research objectives, (2) research methodologies, (3) educational level, (4) learning context, (5) device types, (6) theories, and (7) research outcomes. The present paper is subdivided into six sections. The first section begins with an introduction. Section 2 provides a review of the literature on MALL in Malaysia and throughout the world. Section 3 explains the research methodology employed in this study. Following that, Section 4 discusses and integrates the findings and discussion with relevant literature. Section 5 highlights the gaps and gives recommendations for future studies. Finally, Section 6 summarises the entire review.

2 Literature review

Mobile device usage, particularly interactive touchscreen devices, has become ingrained and indispensable in the lives of today's younger generation, many of whom may have had their first experience with touchscreen devices prior to the age of two [7]. In an ideal situation, mobile devices, particularly touchscreen devices, would deliver interactive experiences that capitalise on a human's inherent constructivist learning capacities, thereby promoting the development of 21st-century skills deemed necessary for learning and future employment in an age of technology [8], [9]. Thus, according to [6], it is inevitable that the use of mobile technology, particularly touchscreen devices, as an effective tool for learning has become a global phenomenon, attracting significant attention from researchers, practitioners, and stakeholders across a range of educational contexts in an effort to advance towards Education 4.0.

The idea of mobile learning is not novel; thus, the definition of mobile learning has always been extended time and again. There are two major perspectives of mobile learning which explain the term from a technology-centred perspective and learner-centred perspective [10]. The earlier well-known definition of mobile learning originated from the technology-centred perspective proposed by [11, p. 262], who defined mobile learning as "any educational provision where the sole or dominant technologies are handheld or palmtop devices". [11, p. 263] characterised mobility of mobile learning as the use of mobile devices such as "phones, smartphones, personal digital assistants (PDAs) and their peripherals, perhaps tablet PCs and perhaps laptop PCs, but not desktops in carts and other similar solutions".

In addition, [12, p. 159] offered a different definition derived from the learner-centred perspective, by defining mobile learning as the portability of devices and the mobility of learners who "create ever-changing learning environments" that transcend time and places. In recent years, [13] presented a broader definition that best encapsulates the essence of mobile learning, by stating that mobile learning is the process of acquiring knowledge via intra- and inter-personal interactions among users as well as their learning materials in a range of scenarios through the use of personal mobile devices capable of swiftly collecting and delivering information to users.

2.1 Mobile-assisted language learning (MALL)

The constant evolution of mobile technology and associated technologies has resulted in the increased usage of mobile devices for language learning. MALL is a prominent subset of mobile learning that allows language educators to exploit the various features of mobile devices to assist in language acquisition [14]. The results from two research reviews, which were published five years apart, indicated that the typical sub-disciplines for the implementation of mobile learning in the field of education are still in the language and linguistic disciplines over 15 years, from 2000 to 2015 [15], [16]. The findings of these two research reviews suggested that mobile technology has been pervasively used by language educators and students to facilitate effective teaching and learning of the target language in the past and present and is most likely to have the same effect in the future. [17] and [18] noted that technological advances often impact education systems,

wherein the future of learning appears to be increasingly mobile due to the evolution and functionalities of mobile technology. The integration of mobile technology into education has expanded the opportunities for students at all levels of the educational system to access innovative English language education [17], [18].

Furthermore, teaching and learning the English language through the use of mobile devices is becoming a common practice in many countries across various educational settings. MALL has been widely adopted in recent years in a number of countries, most particularly Indonesia [19], [20], Iran [21], [22], Japan [23], [24], Korea [25], [26], Malaysia [27], [28], Saudi Arabia [29], [30], Taiwan [31], [32], Thailand [33], [34], Turkey [35], [36], United States of America [37], [38], and Vietnam [39], [40]. The growing adoption trends of MALL indicate that students in both developed and developing countries utilise a range of mobile technologies for learning due to mobile technologies becoming more accessible and inexpensive globally.

Additionally, previous studies investigating students' and teachers' perceptions of the implementation of mobile technology in English language learning revealed that both groups have favourable perceptions and attitudes towards the use of MALL in teaching and learning English [29], [41], [42], [43], [44], [45]. Several studies concurred that the incorporation of MALL promotes constructive English language learning experiences in several areas of language skills relative to the conventional teaching and learning practices, such as vocabulary learning [46], reading skills [30], [47], writing skills [28], [43], speaking skills [48], [49], and listening skills [50], [51]. In addition, several studies also reported the positive effects of mobile technology on students' autonomy [24], [52] and motivation in learning English [53], [54]. MALL has rapidly grown over the past decade, and numerous studies conducted globally have proved that MALL has become ubiquitous in English language teaching and learning.

Nevertheless, amid the growing number of studies emphasising the positive effect on improving students' English language skills and profound acceptance and attitudes towards the use of MALL in English language learning, several studies also exposed the unfavourable aspects of the use of MALL in classrooms. These studies revealed several shortcomings, such as lack of students readiness and willingness to assume charge of their learning and manage flexibility in their schedules [22], difficulties in achieving learning targets due to the unavailability of knowledgeable and skilled individuals who can provide individualised attention and feedback [55], the limiting condition in learning owing to the limited features of mobile devices like small screen size and keys [56], and the detrimental effects of smartphones that cause learning distractions among students who use mobile technology in their learning [57], [58].

The emergence of the inconclusive findings demonstrates that the usefulness of MALL integration in the global language classroom requires further investigations and synthesis. Therefore, recent studies in this field must be reviewed systematically. This is to develop a comprehensive understanding and knowledge of recent findings, which will serve as valuable references for academics and practitioners, particularly in the Malaysian context. Furthermore, since new technology is continuously developing and

evolving, varying dramatically from two decades ago, researchers and practitioners must pay keen attention to the latest development in mobile technology as mobile devices can be prospective educational tools that can deliver and support learning content.

3 Methodology

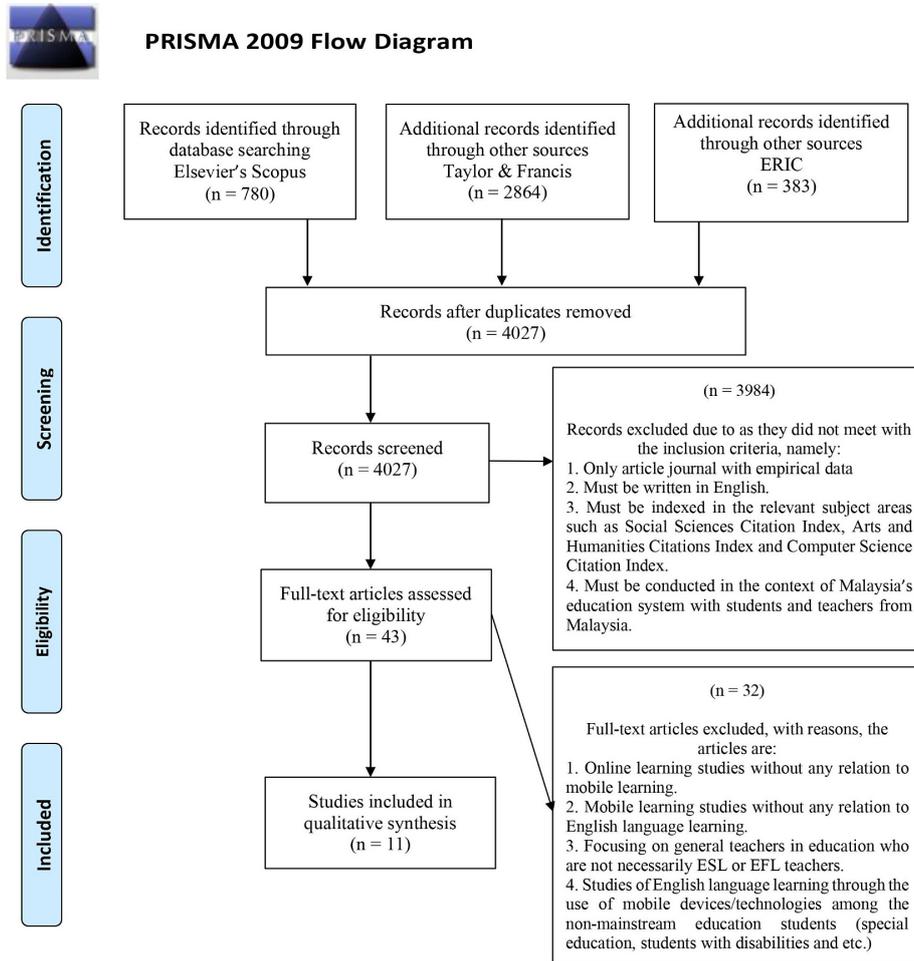
The research method chosen for the investigation of the research question was the systematic literature review. A systematic literature review (SLR) is a systematic procedure that follows a specified process that allows researchers to explore the breadth and depth of existing literature that leads to the testing of new hypotheses, development of new theories, or identification of potential gaps that need to be explored [59]. The study's research method was chosen because it contributes to the consistent and concise synthesis of existing academic literature by confirming or refuting the literature's reliability, establishing the literature's quality, and addressing any uncertainties or variations in practice that may arise [60], [61]. This SLR was conducted to identify, summarise and evaluate the existing relevant articles on MALL implementation in the context of the education system in Malaysia that were published between January 2019 and January 2021.

3.1 Search strategy using PRISMA

The present SLR adhered to the guidelines provided by the PRISMA 2009 Statement. The PRISMA 2009 Statement is established to support systematic reviewers in reporting publicly why the review was undertaken, what the authors performed, and what they discovered [62]. The authors followed four major phases in PRISMA 2009 Statement, namely identification, screening, eligibility, and inclusion [63], to address a specific research question on MALL implementation in the Malaysian education system (see Figure 1).

3.2 Databases

Journal articles for this review were compiled from three extensively referenced and citation-enhanced electronic database indexing sites, including Elsevier's Scopus, Taylor & Francis, and ERIC. The Elsevier's Scopus and Taylor & Francis databases were selected because the scholarly community widely views the databases as authoritative sources of bibliometric data containing a large number of journal articles, research reports, conference papers, dissertations, and books published by respected journal publishers in a rigorous review process [64]. On the other hand, the ERIC database was selected because it is reliable and the most accessible educational database globally that is commonly used to search scholarly literature [65].



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Fig. 1. The PRISMA flow diagram of the literature search and review process

3.3 Inclusion and exclusion criteria

In general, all the titles and abstracts of the eligible articles were read carefully before being selected based on the inclusion and exclusion criteria. Each article must fulfil all of the inclusion criteria and must not match any of the exclusion criteria. First, only journal papers with empirical data were chosen as sources of literature. The review omitted all book series, book chapters, conference proceedings and review articles. Second, the articles must be published in English, and all languages other than English were excluded. Thirdly, regarding the publication year, the period between January 2019 and January 2021 appeared to be a reasonable timeframe for the most current

research trends on the use of MALL in English teaching and learning. As the review concentrated on figuring out the recent studies conducted on the implementation of MALL in Malaysia, related articles indexed in Social Sciences, Arts and Humanities and Computer Science were selected while other articles indexed in other subject areas were excluded. Moreover, since the review aimed to highlight the current trends and practices of MALL in Malaysia, only studies involving Malaysian students or teachers in the Malaysian education system were selected. The criteria implied that studies conducted on students and teachers from other nationalities in different contexts than Malaysia were also excluded from the review (see Table 1).

Table 1. Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Document type	Article journal (empirical data)	All book series, book chapters, conference proceedings and review articles
Language	English	Non-English
Timeline	January 2019–January 2021	<January 2019 and> January 2021
Indexes	Social Sciences, Arts and Humanities and Computer Science	Not indexed in Social Sciences, Arts and Humanities, and Computer Science
Context	Malaysia	Other than Malaysia

Additionally, the review included additional criteria to narrow the search and provide more relevant results that addressed the study’s research question. The additional criteria outlined for the review were that the eligible studies: (1) must be related to mobile-assisted language learning, (2) must be related to English language learning through the use of mobile devices/mobile technology, (3) must be related to ESL or EFL teachers, and (4) must be related to English language learning through the use of mobile devices/technology by mainstream education students.

3.4 Systematic review process

The systematic review process entailed the identification of keywords, screening of records, determining the eligibility of records, and finally, the inclusion of studies. Figure 1 illustrates the process of identifying and selecting articles for this systematic review of the literature.

Identification. Identification is the first stage of the systematic review process. The authors began the identification process by generating a range of keywords derived from the research question, thesaurus and prior relevant studies relative to MALL. The three databases were combed with these exact keywords: “mobile-assisted language learning”, “mobile-assisted language learning”, “m-learning”, “mobile learning”, “mobile technology”, “mobile device*”, “smartphone*”, “mobile phone*”, “English”, “English language learning”, “ELT”, “ESL”, and “second language learning” (see Table 2).

The search yielded 4027 articles from three databases: 780 from Elsevier’s Scopus, 2864 from Taylor & Francis, and 383 from ERIC. Despite the authors’ decision to utilise a 2-year timeline to determine the trends in the usage of MALL activities in Malaysia

and using this inclusion criterion (publication year) at the start of the searching procedure, the search generated far too many articles from the three databases. The timeline period was established following an assertion made by [66], who mentioned that it is almost unrealistic for researchers to examine all published papers; hence, researchers should define the timeline period to analyse and report the review findings effectively.

Additionally, the large number of records was ascribed to the extensive use of keywords while searching for MALL publications published between January 2019 and January 2021 in Elsevier’s Scopus, Taylor & Francis, and ERIC databases. Furthermore, the massive number of articles was compounded by a timeline sorting feature limitation in the ERIC database since the database only provides the “last five years” (since 2017) option. Resultantly, the articles retrieved from the ERIC database were manually screened using Microsoft Excel to remove those that were not published between January 2019 and January 2021.

Table 2. The search string used in the systematic review process

Databases	Keywords Used
Elsevier by Scopus	TITLE-ABS-KEY (“mobile-assisted language learning” OR “mobile assisted language learning” OR “m-learning” OR “mobile learning” OR “mobile technology” OR “mobile device*” OR “smartphone*” OR “mobile phone*”) AND (“English” OR “English language learning” OR “ELT” OR “ESL” OR “second language learning”))
Taylor & Francis	[[All: “mobile-assisted language learning”] OR [All: “mobile assisted language learning”] OR [All: “m-learning”] OR [All: “mobile learning”] OR [All: “mobile technology”] OR [All: “mobile device*”] OR [All: “smartphone*”] OR [All: “mobile phone*”]] AND [[All: “english”] OR [All: “english language learning”] OR [All: “elt”] OR [All: “esl”] OR [All: “second language learning”]] AND [Publication Date: (01/01/2019 TO 12/31/2021)]
ERIC	(“mobile-assisted language learning” OR “mobile assisted language learning” OR “m-learning” OR “mobile learning” OR “mobile technology” OR “mobile device*” OR “smartphone*” OR “mobile phone*”) AND (“English” OR “English language learning” OR “ELT” OR “ESL” OR “second language learning”))

Screening. The second stage was the screening procedure, in which the authors automated the screening of all 4027 articles by utilising the sorting features available in the three databases. Besides, the authors also applied the inclusion and exclusion parameters determined at the beginning of the review process to determine the articles that best addressed the research question (see Table 1). At this stage, 3,984 of 4,027 articles were eliminated from the screening process because (1) they were not articles with empirical data, (2) they were not written in English, (3) they were indexed in other subject areas other than the indexes mentioned in the inclusion criteria, such as Business, Management and Accounting Index, Economics, Econometrics and Finance Index, and Engineering Index, and (4) they were not conducted within the context of Malaysia’s educational system and included non-Malaysian participants (teachers and students). The remaining 43 articles were subsequently included in the third phase of the systematic review process, the eligibility phase.

Eligibility. During the eligibility phase, the authors carefully analysed and filtered the remaining 43 articles to verify that each article met all of the additional criteria

established by the authors at the outset of the study in order to answer the research question (see Table 1). This was achieved by reading the 43 full-text publications systematically rather than just skimming the titles and abstracts. This procedure eliminated 32 articles that did not meet the authors' additional criteria, since they were: (1) online learning studies with no connection to mobile learning, (2) mobile learning studies with no relation to English language learning, (3) focused on general teachers who were not necessarily ESL or EFL teachers, and (4) studies of English language learning with the use of mobile devices/technologies by non-mainstream education students (special education and students with disabilities). After this procedure concluded, only eleven eligible articles remained.

Inclusion. The remaining eleven articles were appraised for quality at the culmination of the systematic review process, the Inclusion phase. This was achieved by submitting the articles for quality assessment to two experts. Following that, the articles were appraised using a checklist established to ascertain the trustworthiness of the studies. The checklist included the following:

- Are the studies' objectives well-defined?
- Is the methodology for the study well-articulated?
- Are the findings of the study plausible and backed by evidence?

Experts and authors must concur that the articles adhered to the checklist's guidelines to be eligible for inclusion in the review. Additionally, any points of contention were discussed prior to including or excluding articles from the review. Following this, all eleven remaining articles were determined to be eligible for the review and were analysed using both quantitative and qualitative techniques.

3.5 Data abstraction and analysis

To address the study's research question of providing an up-to-date synthesis of MALL research trends in the Malaysian context, the eleven articles that fulfilled the inclusion criteria were analysed and synthesised using qualitative and quantitative techniques. Both qualitative and quantitative techniques to data synthesis enable researchers to "generate a robust, empirically derived answer to a focused research question" [67, p. 446]. Based on the research question, seven codes were used for the qualitative analysis: (1) research objectives, (2) research methodologies, (3) educational level, (4) learning context, (5) device types, (6) theories, and (7) research outcomes. The codes were obtained from systematic reviews of the literature conducted by [68] and [69] with the primary objective of gaining insight into research trends and practices concerning the use of mobile technologies in education. The two experts that helped with article assessment during the Inclusion phase assisted with the code verification process as well. The experts were engaged in both phases since they were not only competent in qualitative analysis, but also because their reading of the articles during the Inclusion phase enriched their perspectives and judgement about code selection. Accordingly, both experts concurred that the codes used for this review were pertinent to the study's single overarching research question.

The writers analysed the eleven papers in a five-step approach. First, the authors combed through all articles to formulate an answer to the study's research question. Next, the authors highlighted and tagged the information from each of the eleven studies and mapped the information to the appropriate codes derived from the study's primary research question. The authors then abstracted the data and entered it into a Microsoft Excel spreadsheet for subsequent quantitative and qualitative analysis. Following that, the authors synthesised the qualitative data before conducting quantitative data analysis, using frequency data analysis to determine the number of occurrences for each code. Finally, a comprehensive frequency table was created. The frequency table was developed according to a suggestion made by [70], who stated that a frequency table enables readers to instantly detect trends in a corresponding data set by providing a snapshot of the data in a concise manner. All of the aforementioned procedures were cross-checked by the two authors to ensure the review's accountability and robustness.

4 Findings and discussion

This section presents the findings and discussion in reference to seven codes pertinent to the research question of the present systematic literature review. The codes are (1) research objectives, (2) research methodologies, (3) educational level, (4) learning context, (5) device types, (6) theories, and (7) research outcomes.

4.1 Background of the selected articles

The review identified eleven papers that offered critical information concerning research trends and MALL practices in Malaysia. Seven codes adopted from two previous and established systematic reviews of the literature were analysed and synthesised. The codes were research purposes, methodologies, educational level, learning setting, device types, theories, and research outcomes. Out of eleven articles, seven were published in 2019, and four were published in 2020. In addition, four of the eleven studies were conducted in Selangor and one in each of the other states, namely Negeri Sembilan, Sarawak, Terengganu, and Kelantan. Three studies omitted information on the study's location.

4.2 Research purposes

As indicated in Table 3, the most often documented research purpose was to determine the effects of MALL activities on students' English performance, as five out of eleven studies focused only on this topic. The performance of students was evaluated in several aspects related to language skills. For instance, [71] investigated the use of social media in helping students improve their spelling skills. [28] investigated the use of WhatsApp to help students develop their narrative writing skills. Meanwhile, [72] examined the use of mobile self-access learning through Quizziz to assist students in acquiring idioms and improving their writing. [73] investigated the effects of using mobile-assisted vocabulary learning on students' vocabulary development. [74]

assessed students' performance in English class following the introduction of guided mobile learning intervention.

The studies on the effects of MALL were the prime focus of current research trends and practices in Malaysia since mobile learning is a growing phenomenon in the country, and the usage of mobile devices in the educational system is intended to expand and enhance students' learning [18], [75]. Additionally, the high level of interest in conducting studies on the effects of MALL implementation in the Malaysian context indicates that mobile technologies are rapidly attracting researchers and educators in Malaysia to address the increasing demand for a robust understanding as to how mobile devices may be used to enhance English teaching and learning [76], [77].

The second most-often occurring research purpose, accounting for three out of eleven studies, was to assess students' perceptions and experiences with MALL activities in the context of English learning. Students' perceptions and experiences with MALL activities were evaluated in a multitude of aspects, including their perceptions about the usage of mobile learning to enhance MUET students' writing proficiency [43], their perceptions toward the use of MP3 in non-formal listening activities [78], and their perceptions regarding the use of technology in secondary school English instructions in Malaysia during the Covid-19 pandemic [79].

Studying students' perceptions and experiences was the second major trend in MALL research and practice in Malaysia, as an in-depth understanding of how each student experiences learning as they come from diverse backgrounds is critical in ensuring the successful implementation of mobile learning [45]. Additionally, [68] emphasised the need to research students' perceptions and experiences since students' perceptions of the usefulness of MALL activities may influence their propensity to adopt the learning practice. Understanding students' perceptions and experiences are critical because input from students who are also technology users will assist researchers and educators in developing successful MALL practices that will ultimately become a powerful tool in teaching and learning English.

From January 2019 to January 2021, a study undertaken by [80] was the only study that ascertained students' acceptance of the usage of MALL in learning English vocabulary and the expected app features. It is alarming that no more research is being undertaken in this domain. This situation must change since advocating for the use of technology in education will be challenging without students' acceptance and comprehension of the technology's usefulness [81]. Furthermore, it is essential to comprehend the variables that contribute to students' acceptance of mobile learning in the context of English learning, as students' acceptance of mobile technologies has a significant impact on their future intention to use MALL [80] as well as on their academic achievement [82].

Furthermore, [83] performed the only research that examined the effect of gender as a moderator in the relationships between variables in the Unified Theory of Acceptance and the Use of Technology (UTAUT) Model and students' attitudes regarding the use of m-learning in English learning. Similar to the acceptance study, this was the only study that examined the moderating impact of gender and students' attitudes towards MALL usage. Additional studies should be conducted to add to the existing body of knowledge regarding the variables that affect students' attitudes toward MALL practices and the moderating effect of gender on the relationships between the specified

variables in UTAUT. Assessing the variables affecting students' attitudes is necessary because "mobile learning does not happen in a vacuum" [68, p. 58], and effective implementation of MALL demands a comprehensive knowledge of the key variables influencing students' attitudes concerning MALL [84], [85]. Furthermore, it is critical to assess students' attitudes since positive student attitudes encourage mobile learning, while negative student attitudes may result in a lack of usage [86].

Besides, further study into the moderating effect of gender is needed to provide robust empirical evidence on the role of gender in affecting students' attitudes towards MALL. According to [87], while several previous studies have demonstrated that gender has no effect on students' intentions to adopt new technology in specific settings, there are instances where gender has been demonstrated to be a deciding factor in students' willingness to accept technologies in learning. Furthermore, prior research also indicated that the effects of gender on the use of technology for learning vary according to the study's subject matter and cultural background [88]. Thus, acknowledging the gender dimension in MALL in Malaysia is critical for informing researchers and educators about the factors to consider when designing MALL activities that appeal to both male and female students.

Finally, only one of eleven studies examined students' smartphone usage behaviours. [89] investigated how distance education students utilise their smartphones for academic purposes, namely to complete their English coursework. The research of students' behaviour while using smartphones for educational purposes in Malaysia is critical, yet limited. According to [90] and [91], empirical data on smartphone usage behaviours is critical because it may provide answers to the ongoing debate over the benefits and drawbacks of incorporating mobile phones into educational activities. It is helpful to understand students' smartphone behaviour for smartphones to evolve into more than merely a communication tool and instead into a valuable educational tool that supports sustainable learning [89], [92]. By gaining an understanding of how students use mobile phones for learning, researchers and educators may develop mobile-friendly MALL strategies which are reflective of students' behavioural usage of smartphones; thereby accommodating students' diverse learning styles [89], [93].

4.3 Research methodologies

The systematic review of the literature indicated that eleven studies published between January 2019 and January 2021 used three different types of research methodologies. The quantitative research method was the most often used method to investigate contemporary MALL trends and practices in Malaysia, accounting for six studies, followed by four studies that employed a mixed-method approach. The qualitative method was the least often used, with just one study (see Table 3).

From six of the quantitative studies, three studies used a survey method with questionnaires, two used a quasi-experimental design with pretest-posttest control groups, and only one study used quantitative action research of three levels to elicit empirical data about Malaysian students' experiences, perceptions, and effects of MALL implementation and intervention.

The review findings support the assertions made by [94] and [95] that researchers in the field of education are more inclined to conduct quantitative research. This scenario

may be attributable to the Malaysian researchers' preference for quantitative study over qualitative study to understand the burgeoning phenomena of MALL application in supporting English language learning. As emphasised by [96] and [97], quantitative studies enable researchers to describe trends and relationships between study variables using statistical analysis, which is more reliable, objective, and accurate using established computational techniques that support research generalisations.

Mixed-method approach was the second most often employed research methodology, accounting for four of the eleven studies. Two studies integrated questionnaires and semi-structured interviews; one study incorporated questionnaires and participant's self-report, and one study combined questionnaires and open-ended questions. The use of a mixed-method approach highlights the vital importance of investigating and interpreting MALL activities in Malaysia from a variety of perspectives. The findings of the SLR correspond to several academics' statements on the increasing relevance of the mixed-method approach in social sciences research over the last several decades [98], [99].

The increased relevance of mixed-method research in the education field stems from the research design's central objective and principle, which is to integrate quantitative and qualitative approaches in order to obtain a more comprehensive understanding of research issues and complicated phenomena than each approach alone could offer [100], [101]. Furthermore, the mixed-method approach is praiseworthy because it allows researchers to acquire both the depth and breadth [100] of information regarding MALL practices in Malaysia by triangulating one set of findings with another, thus improving the validity and completeness of the evidence [102].

Between January 2019 and January 2021, the qualitative method was the least often employed method in conducting research in Malaysia, accounting for just one of eleven studies conducted during that time period. The study performed by [28] used a case study research design to explore the effects of MALL implementation among students in Malaysia. As shown by the dearth of qualitative research in Malaysia, it appears that researchers are more interested in objectively comprehending the MALL phenomenon than they are in researching it in profundity.

This scenario is certainly a result of common criticisms levelled against qualitative research, including its small sample size, anecdotal character, lack of rigour, reliability and validity concerns, inability to be extrapolated, uncontrolled bias, and subjectivities [103], [104], [105]. While qualitative data provide well-founded, thorough, and extensive descriptions and explanations of participants' personal views on the phenomena under investigation, analysing qualitative data is often an unexpectedly tricky, iterative, complicated, ambiguous, and time-consuming process [106], [107], [108]. Even with established qualitative data analysis software, researchers generally struggle to elucidate the implicit meanings that people associate with their actions and responses to a phenomenon without losing sight of their assumptions, opinions, and personal beliefs that may influence the analysis [106], [107], [109]. As a result of the external criticism and analytical difficulty associated with qualitative research, many researchers continue to avoid it even though more qualitative research is needed in the MALL field in Malaysia because of its diversity, quality, and authority that can aid in the development of a more nuanced understanding of educational problems.

Table 3. The findings

Studies	Year	Locality	Purposes				Methodology						Educational Level						Education Context				Types of Devices			Theories		Research Outcomes				
			EI	PE	SA	GA	UB	Q	QE	QAR	Q+SSI	Q+SR	Q+Q	QL	PS	SS	HE	F	IF	NF	NS	SP	ST	IN	A	NA	SL	PER	TA	NEG	NR	
John and Md. Yunus	2019	Sarawak	/								/					/					/						/					
Ahmad Tajuddin et al.	2019	Terengganu	/							/						/											/					
Ders and Shukor	2019	Not specified		/							/					/					/						/					
Lee et al.	2019	Selangor					/									/										/						
Suhaimi et al.	2019	Negeri Sembilan	/									/				/					/					/						
Abdullah et al.	2019	Selangor	/							/						/					/					/						
Govindasamy et al.	2019	Selangor	/								/					/					/					/						
Annamalai and Kumar	2020	Not specified				/										/					/					/						
Siew et al.	2020	Kelantan	/													/					/					/						
Azar and Iskandar Tan	2020	Selangor	/				/									/					/					/						/
Hashim et al.	2020	Not specified				/										/					/					/						/

Purposes	Methodology	Educational Level	Educational Context	Types of Devices	Theories	Research Outcomes
EI= Effects of integration PE= Perceptions and experiences SA= Students' acceptance GA= Moderating role of gender and students' attitudes UB= Students' smartphone usage behaviour	QN= Quantitative CS= Case study MM = Mixed method QL= Qualitative Q= Questionnaire QE= Quasi experiment QAR= Quantitative action research Q+SSI= Questionnaire and Semi-structured interview Q+SR= Questionnaire and Participants' self-reports Q+OQ= Questionnaire and Open-ended questions	PS= Primary school SS= Secondary school HE= Higher education	F= Formal IF= Informal NF= Non-formal NS= Not specified	SP= Smartphones ST= Smartphones and tablets NI= Not indicated	A= Available NA= Not available TAM= Technology Acceptance Model ZPD= Zone of Proximal Development DCE= Dale's Cone of Experience UTAUT= Unified Theory of Acceptance and Technology Use	POS= Positive NEG= Negative NR= Not related SL= Students' learning PER = Perceptions and experiences TA = Technology acceptance

4.4 Educational level

Table 3 summarises the educational level reported in the eleven research articles included in the systematic review. Higher education institutions (HEIs) level was the most researched educational level, accounting for six of eleven studies and secondary school was the second most researched educational level, accounting for three studies. On the other side, primary school was the least studied educational level, accounting for just two of the eleven studies. The data indicates that the researchers were nearly twice as likely to investigate students in HEIs than they were in elementary and secondary schools. Previous systematic reviews of the literature reported similar findings, namely that the majority of researchers were more inclined to study MALL practices among students enrolled at HEIs than at other educational levels [10], [110], [111].

The findings of the current SLR demonstrate that more studies were undertaken at institutions of higher education than at the lower educational levels. This trend is explained by the widespread use of m-learning in HEIs, since older students and HEIs are perceived to be better equipped for and adaptable to the transition to Education 4.0 [112], [113]. The findings echo those of [111], who found that primary school is the least studied educational level in MALL research. The scarcity of studies examining MALL integration in the context of primary school students in Malaysia is because mobile learning has not been incorporated formally within the framework of primary school instruction due to the policy prohibiting primary school students from using mobile devices in school [80], [114], [115].

4.5 Learning context

The learning context is the environment in which something is learned or comprehended. [116] identified three distinct dimensions of the learning context: (1) formal context, which refers to learning meant to occur in a formal classroom environment; (2) informal context, which refers to learning intended to occur outside the classroom; and (3) non-formal context, which refers to learning that is not intended to occur in a formal or informal classroom setting.

Since the majority of the eleven studies included in the systematic review did not specify the learning contexts in which the research was conducted, the learning contexts for the majority of the studies were inferred through reading the articles using classification description by [116]. However, when [78] investigated the usage of non-formal MP3 listening activities, they understood non-formal context differently than [116]. [78] defined non-formal contexts using the Luxembourg Ministry of Family and Integration's (2013) definition, which identifies "non-formal education as organised educational activity outside of the classroom that is intended to serve identifiable learning groups with identifiable learning objectives" [78, p. 86]. However, as described by [116], the non-formal environment emphasises the unplanned learning that happens in both formal and informal classroom settings. Thus, for the purpose of this systematic review and in line with the definition of learning environment established by [116], the learning context for the study carried by [78] was classified as informal rather than non-formal. This is because the listening activities used in the research by [78] were prearranged and were designed to aid students in improving listening skills outside of the classroom.

The proportion of learning context recorded in eleven studies is shown in Table 3. The SLR analysis revealed that the formal learning context was the most prevalent, accounting for four studies, followed by the informal learning context, accounting for three studies and the non-formal learning context accounted for two studies. Two studies, on the other hand, did not specify the context in which MALL practices and research occurred. While mobile learning allows for greater flexibility in terms of time and location, most studies describing the advancements in English learning experiences for secondary school and higher education students took place in physical classrooms or on school and university premises.

Numerous learning contexts were utilised to integrate MALL for students at HEIs, indicating the breadth of efforts to globalise learning and equip students with the technological skills necessary to enter the twenty-first century workforce while also adhering to the mandate outlined in the Malaysia Education Blueprint (MEB) 2013–2025 [117]. The MEB 2013–2025 requires Malaysian HEIs to incorporate blended learning in up to 70% of their programmes, which is the generic pedagogical approach at the tertiary level, by including a broad range of technology-based learning opportunities through mobile applications, YouTube videos, internet sites, education websites, and virtual meeting and conferencing [117], [118]. This situation has enabled educators and researchers at Malaysian HEIs to examine the effects of mobile technology on students' English acquisition across a range of contexts (formal, informal, and non-formal) to understand better the differences between learning environments and their affordances.

Interestingly, despite a policy banning secondary school students from using smartphones, innovations in English instruction were most prevalent in the formal learning context, followed by the informal learning context for upper form students (Form 5 and pre-university students) in Malaysia. This scenario could be because the school authorities involved in the studies permitted upper-form students to bring mobile phones to school, allowing teachers to plan formal and informal MALL activities to supplement English instruction without relying on non-formal activities that were more difficult to plan and execute. Nevertheless, due to the current policy prohibiting the use of mobile phones on school grounds [80], [114], [115], [119], [120], MALL integration at the primary school level was conducted exclusively outside of the classroom setting, with both intentional and unintentional learning activities aimed at enhancing students' English language acquisition.

4.6 Types of devices

Table 3 depicts the different types of mobile devices mentioned in the articles chosen for this systematic review. Six of the eleven studies reported utilising smartphones as their primary device for MALL activities, and one study reported using both smartphones and tablets for MALL integration. Meanwhile, the other four studies did not specify the mobile devices utilised for MALL activities.

As shown in Table 3, smartphones were the most often used mobile device for MALL integration in the Malaysian educational context, as demonstrated by six studies that employed smartphones as the major instrument for MALL practices. This conclusion is similar with the findings of a systematic review of the literature undertaken by [111], who discovered that smartphones were the most commonly utilised type of mobile

device during MALL activities. The pervasive use of smartphones in MALL activities may be explained by the high rate of smartphone ownership among Malaysian students, as reported by [5], who highlighted that 86.3% of the respondents under the age of 20 owned a smartphone, including those who are possibly students in Malaysia's school system. Additionally, [113] claimed that students own smartphones irrespective of their demographic characteristics, which may explain why smartphones were the most often used mobile device for MALL activities in Malaysia. Furthermore, a meta-analysis by [10] reported that both smart and non-smart portable mobile devices were widely used and outperformed larger-screen mobile devices in language learning facilitation. This is because handheld devices are more compact, enabling educators and students to do MALL activities in various learning settings, whether formal, informal, or non-formal [10].

4.7 Theories

The systematic review examined the most frequently used theoretical frameworks in MALL research conducted in Malaysia between January 2019 and January 2021. In general, four out of eleven studies were structured around appropriate theoretical frameworks, while seven studies did not specify the theory or pedagogical method utilised in their MALL investigations (see Table 3). The findings of the current SLR corroborates those of [69], who observed that only a few studies performed between 2000 and 2012 were framed around relevant theories.

Two of the studies included in this SLR used acknowledged frameworks for technology adoption and acceptance, including the Technology Acceptance Model (TAM) (1) and the Unified Theory of Acceptance and Technology Use (UTAUT) (1). The TAM and the UTAUT models have been widely, successfully, and appropriately used in information technology (IT) and information system (IS) disciplines to explain, predict, and comprehend individual acceptance and use of technology [121], [122]. [123] also reported similar findings in a comprehensive review of the literature on mobile learning in Saudi Arabia, noting that the TAM and UTAUT frameworks were the most often used frameworks in research on technology adoption and acceptance.

On the other hand, the other two studies used frameworks based on learning theories such as constructivism (1) and Dale's cone of experience, also known as experiential learning (1). The findings support the observations by [69, p. 7] where the learning theories and models studied in MALL research "often originated from grand theories of learning, including constructivism, social constructivism, socio-cultural theory, and situated learning theory".

4.8 Research outcomes

Eleven research papers were analysed in this review. Nevertheless, only nine of the eleven studies were evaluated for their research outcomes since they offered evidence of MALL efficacy in three domains: students' learning performance, perceptions, and technology acceptance. Five studies examined the effect of mobile devices on students' English performance and achievement, three studies examined students' perceptions

and experiences with MALL practices used to enhance and support English acquisition, and one study examined students' acceptance of MALL activities used to learn English. The outcomes were categorised using a framework provided by [68] for categorising research outcomes, namely positive, negative, and neutral.

Each of the nine studies reported positive outcomes. This scenario revealed that every research conducted in Malaysia to establish the efficacy of MALL concluded that utilising mobile devices improved students' learning performance, perceptions, and experiences, as well as their acceptance of MALL activities during the English learning process. Interestingly, when reviewing studies on the use of mobile learning in science education, a study performed by [124] also discovered that regardless of the study's objective, all 49 studies included in their review exhibited positive learning outcomes. The consistency of outcomes across several disciplines of education suggests that mobile technologies, irrespective of subject matter, are adaptive and beneficial for educational application.

Nevertheless, the unanimous positive research outcomes suggest that researchers are less likely to publish studies with negative outcomes than those with positive outcomes. According to [125] and [126], many researchers believe that negative outcomes are statistically insignificant and may reflect poorly on their credibility and academic credentials, leading them to avoid publishing the aforementioned studies. Additionally, this could be due to the penchant of journals and publications in publishing positive findings, which results in publication bias [127], [128]. Publication bias has various effects on the corpus of scientific knowledge, including skewing it towards statistically significant or "positive" outcomes [127], [128].

5 Identified gaps and recommendations for future studies

This systematic review has identified eight research gaps. First, between January 2019 and January 2021, only eleven research performed in Malaysia were published in peer-reviewed journals on three major electronic databases. Furthermore, the eleven studies were undertaken only in Sarawak, as well as in Peninsular Malaysia's east coast, central, and southern regions, namely Kelantan, Terengganu, Selangor, and Negeri Sembilan. As a result, further studies in the MALL discipline are required, especially in the areas of English language teaching in northern Peninsular Malaysia and Sabah, in order to offer a holistic representation of MALL application in English language education in the Malaysian context.

Second, the findings indicated that most MALL research in Malaysia focused on investigating the effects of using mobile devices in the teaching and learning of English. Future research should focus on other purposes, including students' perceptions and attitudes toward MALL, factors that influence Malaysian students' acceptance and use of mobile devices in English learning, behavioural use of mobile devices by Malaysian students, and specific mobile apps that can aid students' English acquisition.

Third, this review uncovered a scarcity of qualitative research on MALL in Malaysia. Future research on MALL in Malaysia should adopt the qualitative research method in order to provide the academic community with in-depth insights and perspectives on the phenomena being examined that quantitative research cannot provide [129].

Fourth, most of the studies were conducted in Malaysian institutions of higher learning. Thus, further research at the secondary and primary school levels in Malaysia is necessary to have a better understanding of the impacts of mobile devices on diverse groups of students throughout the Malaysian education systems, especially in English language education. This proposal is concordant with the recommendations from two of the articles reviewed; [80] and [89] recommended that future research should involve participants from a range of educational institutions in order to improve the heterogeneity of MALL studies.

Fifth, as previously mentioned, the majority of studies in Malaysia were undertaken in a formal learning context for secondary school and higher education students, but none for primary school students. Future research on MALL integration in Malaysian secondary schools and higher education institutions should concentrate on the use of mobile devices in informal and non-formal learning contexts. In contrast, research at the primary school level should focus on the usage of mobile devices in the formal learning contexts to better understand the impact that different learning contexts may have on the efficacy of MALL integration.

Sixth, since seven of the eleven studies lacked a theoretical framework, future research on MALL practices in Malaysia must exhibit academic rigour and the capacity to substantiate provided claims via the inclusion of relevant theories. Without a theoretical perspective, studies will have an unclear framework and vision that suggest methodological flaws [69], [130]. Additionally, the theoretical framework strengthens the academic and educational character of the study's arguments by enabling researchers to add depth to the data analysis by referencing theories presented by subject experts that are often already established or indisputable [131].

Seventh, nine of the studies included in this review had positive outcomes. Future research on the impacts of MALL integration in English language classes in Malaysia should concentrate on recognising intervening variables that may account for the observed positive outcomes. Furthermore, future studies are expected to be transparent in reporting negative outcomes to assist other academics, educators, and stakeholders in averting repeated failed efforts. Finally, teachers' perspectives were mostly absent from this review. It would be beneficial to learn about Malaysian teachers' views and concerns since this would provide valuable data on an essential element of implementing MALL practices in Malaysian classrooms.

6 Conclusion

The present systematic literature review has accordingly addressed the study's overarching research question concerning current MALL research trends and practices in Malaysia by reviewing eleven articles published between January 2019 and January 2021. The findings of this review have provided an up-to-date synthesis of MALL research in Malaysia's English language education system in terms of research purposes, methodology, educational level, learning context, device types, theories, and research outcomes. Despite mobile technology's immense growth and potential, the review has discovered that research on MALL and its implementation in English language instruction in Malaysia's education system is still in its formative stages. Thus,

substantial studies are required to address the gaps identified in the current review so as to establish effective and practical strategies for MALL implementation across all educational levels in Malaysia's English language education system in compliance with Education 4.0 requirements.

7 References

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8 Authors

Nursufyana Ulfa Che Mustaffa has a Bachelor of Education in Teaching English as a Foreign language (TEFL) from the Queensland University of Technology, Australia and a Master of Education specialisation in English Language Teaching from University Utara Malaysia (UUM). She is presently enrolled in UUM, pursuing a PhD in English Language Teaching. Her research interests include English Language Teaching (ELT) and mobile learning, with a specific emphasis on the use of mobile technologies to facilitate English language teaching and learning among Malaysian primary school pupils. She may be contacted by e-mail at n.sufyanaulfa@gmail.com.

Siti Nazuar Sailin is a Senior Lecturer of Educational Technology in the School of Education, College of Arts and Sciences, UUM. Presently, she is the Deputy Dean of Awang Had Salleh Graduate School (AHSGS) in UUM. She graduated from UUM with a Bachelor Degree with Honours in Information Technology (IT) and a Master of Science in Information Technology (IT). She also holds a Master of Information and Communication Technology in Education and a PhD in Educational Technology from Monash University, Australia. She is also a member of the editorial board of *Practitioner Research*, a peer-reviewed journal published by UUM Press. Her expertise and interests include teachers' professional development, educational technology, and online and blended learning. She may be reached by e-mail at sitinaz@uum.edu.my.

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