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A SYSTEMATIC REVIEW OF MOBILE-ASSISTED VOCABULARY LEARNING AND TEACHING IN ESL/EFL CONTEXT

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ABSTRACT

Purpose - The integration of mobile technology in ESL/EFL contexts has garnered significant attention from contemporary researchers, teachers, and learners due to the advancements in technology, dynamic features, and multimodal applications. With this growing interest, there is a need to synthesize the existing literature and identify current trends in the field.

Methodology - This study reviewed research on mobile-assisted second language (L2) vocabulary learning and teaching through two approaches. First, a bibliometric analysis was employed to provide a comprehensive overview of the field, encompassing 774 publications retrieved from the Scopus database. Second, 20 empirical articles were analyzed to determine technological and pedagogical trends in MAVL studies.

Findings - The analysis identified the most frequently used keywords, influential authors, and the most productive countries in MAVL research. Key areas of focus in L2 vocabulary learning and teaching included learners' performance and perceptions, with gamification emerging as a predominant technological feature in recent empirical studies.

Significance - Although the findings are preliminary, they offer valuable insights for conducting future research, emphasizing emerging trends and unexplored areas within MAVL.

Keywords: ESL/EFL, vocabulary, mobile assistance, bibliometric analysis, systematic review.

INTRODUCTION

Mobile learning (m-learning) in second language (L2) research has significantly evolved over the past few decades. The widespread adoption of portable hand-held devices has not only brought convenience to users but also provided valuable support for research and pedagogical practices. As highlighted by Burston (2021), approximately 3,000 studies have been conducted on Mobile-Assisted Language Learning (MALL). Mobile phones, widely used for everyday activities such as banking, entertainment, shopping, and information exchange, have gained broad acceptance. This growing affinity for mobile technology in language learning holds the potential for positive outcomes, as these devices serve as sources of both entertainment and motivation. Kukulska-Hulme and Shield (2008) point out that the "anytime and anywhere" accessibility of mobile devices creates a flexible environment for language learning. This flexibility is further enhanced by their portability, capacity for interaction and collaboration, and ability to support personalized and blended learning experiences (Özdamlı & Çavuş, 2011). Despite certain constraints—such as small screen size, limited features, inadequate battery life, and data storage challenges (Al-Said, 2015)—technological advancements have substantially mitigated these issues. As a result, students increasingly rely on mobile phones for academic activities instead of traditional resources such as printed books and dictionaries (Aygül, 2019; Dizon, 2021). Fujimoto (2012) also noted that the affordance of smartphones have led learners to view them as valuable educational tools. However, McQuiggan (2015) cautions that issues such as the diversity of mobile devices, variable internet quality, and challenges in monitoring usage still persist when using mobile technology for language learning.

In recent years, bibliometric analysis has gained popularity in research, driven by advances in and accessibility to tools such as VOSviewer, Gephi, and Leximancer (Donthu et al., 2021). This method of analysis reveals emerging trends, networking patterns, collaborative relationships, and the organizational structure of disciplines. Such insights aid educators and researchers adopt effective strategies for L2 vocabulary learning while contributing to the broader body of knowledge (Verma & Gustafsson, 2020). Accordingly, this study aims to provide a comprehensive understanding of Mobile-Assisted Vocabulary Learning (MAVL) by identifying influential authors, frequently used keywords, and publication trends by country. It also explores aims, target populations, and sampling methods through thematic and content analysis. Additionally, the study addresses a gap in the literatures, noting a lack of sufficient qualitative inquiry into MAVL.

LITERATURE REVIEW

The researchers have extensively investigated the effective use of mobile technology in English as a Second Language/Foreign Language (ESL/EFL) and Second Language Acquisition (SLA) contexts in Mobile-Assisted Language Learning (MALL). Yükselir (2017) noted that MALL research not only considers the perspectives of learners and educators but also examined the impact of mobile devices on language acquisition. Given the growing volume of research in this field, systematic reviews are critical for understanding current trends and mapping the broader landscape of MALL studies. Systematic

reviews of MALL began emerging in 2010. Early reviews primarily focused on investigating specific language skills and areas addressed in previous studies. For example, Duman et al (2015) examined Social Science Citation Index (SSCI) journals and identified key areas of focus in MALL research, including grammar, vocabulary, pronunciation, reading, writing, listening, speaking, instructional design, integrated skills, achievement, perception, usability, and potential drawbacks. Similarly, Burston (2015) found that vocabulary and both receptive and productive skills were given more priority in MALL studies. Aligining with these findings, Li et al. (2022) identified vocabulary as the most frequently studied topic in the field. A recurring question in MALL research has been how mobile devices effectively facilitate language learning. To address this, Liu et al. (2016) conducted a qualitative analysis of 24 studies from the Web of Science database. The findings revealed that previous studies primarily examined the efficacy and efficiency of mobile technology in supporting language education.

The behaviours associated with perception, motivation, and attitude have been increasingly explored in later MALL review studies. According to Liu (2020), MALL studies have paid attention to attitude, perception, motivation, and overall learning abilities. However, contrasting findings were reported by Dai and Wu (2023), Mustaffa and Sailin (2022) and Zain (2021), who concluded that the primary focus of MALL research has been on the role of mobile devices in improving English language performance. These studies, though insightful, were limited to the Malaysian context, analyzing only 25 articles (Zain, 2021) and 11 studies (Mustaffa & Sailin, 2022) to assess the impact of mobile assisted interventions. In another study, Shadiev et al. (2020) reviewed research conducted between 2009 and 2018 on MALL within familiar contexts. Their findings highlighted that the most frequently addressed elements in the reviewed articles included communicative language teaching, task-based learning, interviews, questionnaires, pretests, and posttests. Similarly, Penelope and Panagiotis (2021) conducted a text analysis of 340 articles published between 2010 and 2020 to uncover trends in the MALL research field. Their findings revealed that the most frequently used terms were language, mobile, learning, MALL, students, and English.

While some synthesis studies (Yükselir, 2017) or meta-analyses (Chwo, 2018; Chen et al.; 2019, Burston & Gianakou, 2022) have been conducted on MALL, bibliometric mapping remains relatively underexplored. Bibliometric analysis, however, is particularly suitable for identifying current research trends. Khodabandelou et al. (2022) emphasized the importance of highlighting and summarizing research trends within the extensive literature on MALL. Unlike traditional review studies, which often have a limited scope in terms of the number of analyzed research articles, bibliometric analysis leverages large datasets to analyze patterns and trends comprehensively. In addition, bibliometric analysis is beneficial for determining research areas through keyword and abstract analysis and identifying influential journals, authors, and publications. As Andres (2009) asserts, such insights unveils key trends and focal points, and the contributions of specific authors, journals, and countries within a particular field. Despite its potential, bibliometric studies on MALL remains inadequate. For instance, Khodabandelou et al. (2022) conducted a bibliometric analysis of L2 learning through mobile assistance, focusing on researchers with high citations, key articles, and prominent research areas. Similarly, Feng and Chen (2022) analyzed MALL research bibliometrically and found that vocabulary, learning environment, learner attitudes, and personalized learning were the most frequently researched areas.

Vocabulary, as the building block of language learning, has attracted significant attention in MALL research (Nawaz et al., 2022) As Wilkins (1972) aptly noted, it is possible to communicate without grammar but not without vocabulary, underscoring the essential role vocabulary plays in language acquisition. This increasing focus is justified by the convenience mobile devices offer, eliminating the

need to carry bulky dictionaries. Considering the importance of mobile technology in language education, Afzali et al. (2017) emphasizes the value of examining its role in vocabulary learning. This is further substantiated by Lin and Lin (2019), through a meta-analysis, identifying a substantial effect size and concluding that MAVL has a positive impact on the language learning process. Despite these findings, there is a need for bibliometric analysis studies in MAVL research to better understand current trends in research areas and teaching and learning practices in ESL/EFL vocabulary. Additionally, past studies often reviewed a limited number of articles and employed less rigorous methodologies, resulting in a partial understanding of this emerging research area.

Based on the aforementioned reasons above and the scarcity of bibliometric analysis in this field, this study employed both bibliometric and content analyses to explore the trends and nature of MAVL. Bibliometric analysis has recently gained popularity in research due to advancement in, and accessibility to, software such as VOSviewer, Gephi, and Leximancer (Donthu et al., 2021). The use of bibliometric analysis uncovers emerging trends, networking patterns, collaborative maps, and the organizational structure of a discipline, enabling educators and researchers to adopt effective strategies for L2 vocabulary learning while contributing to the body of knowledge (Verma & Gustafsson, 2020). The primary aim of this study is to gain a comprehensive understanding of the MAVL field, which would help facilitate investigations into its aims, population, and sampling strategies through thematic/content analysis. Moreover, qualitative inquiry into MAVL remains insufficient in the existing literature, leaving significant gaps to be addressed. This study also focuses on sampling and technological aspects by examining empirical studies indexed in the Scopus database. For example, Pang and Aziz (2021) highlighted the importance of technological tools, sampling strategies, data sources, and geographical contributions. However, this study expands upon prior work with the focus on sampling and technological aspects including specific inclusion and exclusion criteria, which were often lacking in earlier research. In addition, to categorizing mobile applications, this study extends its analysis to explore the features offered by these mobile applications. It also explores language learning domains to identify gaps in MAVL-related language education. Considering the rationale and the limited bibliometric analysis in MAVL, this study provides a bibliometric mapping of MAVL research for an overarching view and a comprehensive content analysis of empirical studies in the field. The study addresses the following research questions:

1. What are the most influential authors, frequently used keywords, and countries with the highest number of publications based on bibliometric mapping in MAVL studies?
2. What are the sampling strategies, technological focuses, and practical domains addressed in MAVL studies?

METHODOLOGY

The methodology of the study was designed to address the research questions by employing two approaches: bibliometric mapping and content analysis.

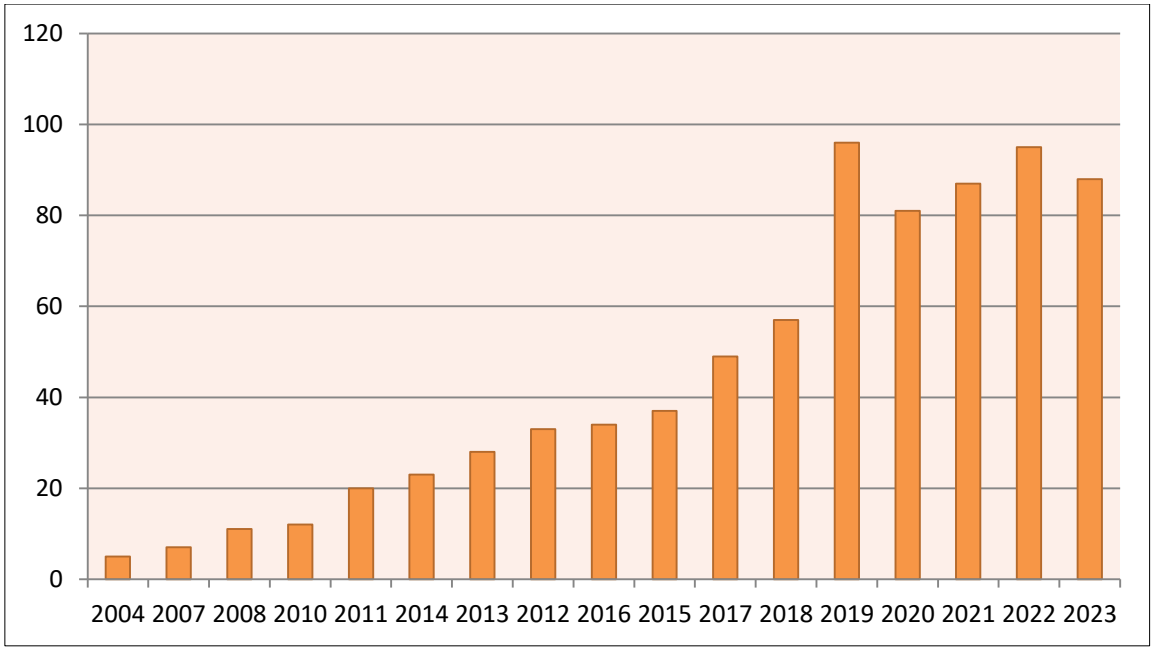
Bibliometric Mapping

To ensure reliable and comprehensive data collection, the Scopus database was chosen as the primary data source for identifying relevant articles for the study. Scopus is widely recognized for its stability and reliability in academic research. A search string TITLE-ABS-KEY ((vocabulary* OR lexical* OR

lexicon*) AND (m-learning* OR mobile*) AND (language*) AND (learn*)) was applied in the advanced search section of Scopus on 25th December 2023. This query yielded a total of 774 articles. At this initial stage, no inclusion or exclusion criteria were employed to ensure a detailed mapping of MAVL research trends. The publication trends across the years, as presented in Figure 1 provide insights into the progression of MAVL research.

Figure 1

Publication Trends across the Years



The trend depicted in Figure 1 highlights the publication record of MAVL research in the Scopus database. Starting from 2004, the number of publications has shown a consistent upward trajectory. The highest number of publications was recorded in 2019 (f=96), followed closely by 2022 (f=95), 2023 (f=88), 2021 (f=87), and 2020 (f=81). Additionally, the types of documents and publication languages are summarized in Table 2, providing further details about the scope and characteristics of the selected articles.

Table 1

Publication Information

Type	*f*	Language	*F*
Articles	397	English	754
Conference paper	273	Portuguese	6
Conference review	40	Spanish	4
Review	30	Russian	3
Book chapter	27	Chinese	2
Book	3	French	2
Retracted	2	Estonian	1
Editorial	1	Lithuanian	1
Erratum	1	Turkish	1
Total	774	Total	774

The data presented in Table 1 shows that the majority of the articles were published in English (f=754), reflecting its status as the lingua franca among speakers of English as a foreign or second language. Other languages featured to a lesser extent, including Portuguese (f=6), Spanish (f=4), Russian (f=3), Chinese (f=2), French (f=2), Estonian (f=1), Lithuanian (f=1), and Turkish (f=1). With regard to publication types, articles were mainly preferred over other types of scholarly publications. Other publication types include conference papers (f=273), conference reviews (f=40), reviews (f=30), book chapters (f=27), books (f=3), retracted publications (f=2), editorials (f=1), and erratum (f=1).

Table 2

Top Five Journals

Name	*f*
Computer Assisted Language Learning (CALL)	16
ReCALL	13
International Journal of Mobile Learning and Organization	11
Computers and Education	6
International Journal of Language Learning and Teaching	6
Total	52

Table 2 highlights the leading journals publishing Mobile-Assisted Language Learning (MALL) studies, as identified in the Scopus database. There journals are distinguished by their publication volume and impact within the field. The top five journals include: Computer Assisted Language Learning (CALL) (f=16), ReCALL (f=13), International Journal of Mobile Learning and Organization (f=11), Computers and Education (f=6), International Journal of Language Learning and Teaching (f=6).

Content Analysis

In the subsequent phase, inclusion criteria were employed to address the second dimension of the study. Initially, only articles published in English were considered, resulting in a subset of 390 articles. From this subset, the five Social Science Citation Index (SSCI) journals were chosen based on their higher impact and the number of articles published on the topic. Given the impracticality of qualitatively analyzing such a large number of studies, the dataset was further refined to 52 articles. Table 2 presents the relevant studies identified through the Scopus database, particularly those pertaining to MALL and the selected journals. The selected 52 articles underwent a detailed review, during which additional inclusion criteria were applied. These criteria are summarized in Table 3 as follows:

Table 3

Inclusion and Exclusion Criteria for Reviewed Articles

Criteria	Explanation
Related to ESL/EFL context	Articles focusing on contexts where the acquisition of L1 and L2 differ were prioritized.
Focus on mobile technology	Studies involving non-mobilte technologies were excluded.

Criteria	Explanation
Selection of empirical studies	Empirical studies were chosen due to their significant contributions to MAVL research.
Vocabulary learning and teaching	Article with a broad focus on vocabulary were excluded, narrowing the scope to learning and teaching aspects.

Searching Process

The search process of retrieving relevant articles entailed three systematic steps, based on the guidelines proposed by Shaffril et al. (2018). These steps ensured a transparent and comprehensive systematic literature review.

Identification

To identify relevant studies, four major keywords—vocabulary, mobile, language, and learn—were derived from the research questions. To maximize the search results, synonyms, variations, and related terms were incorporated. The identification of these keywords were supported by tools such as an online thesaurus, suggested keywords feature in the Scopus database, and expert input. As a result, terms closely related to the main keywords such as *lexical, lexicon, vocabulary, m-learning, mobile learning, language, and learn*—were used. These terms were applied to the advanced search function of the Scopus database using field codes and Boolean operators. This approach yielded a total of 774 studies.

Screening

Screening is the second step in the process which involves selecting relevant articles based on predefined inclusion and exclusion criteria. This step can be conducted manually or automatically by database functions to filter search results according to the study's requirements. In this study, both database filters and manual review methods were employed to ensure the selection of suitable articles. Only empirical studies were included, as these provide primary data essential for the analysis. Moreover, to minimize ambiguity, only articles written in the English language were chosen. Given the study's focus on vocabulary learning and teaching through mobile assistance, articles from the fields of Social Science, and Arts and Humanities were considered appropriate due to their quantity and relevance. Applying these criteria resulted in 384 articles being excluded, leaving 390 articles for evaluation in the third step.

Eligibility

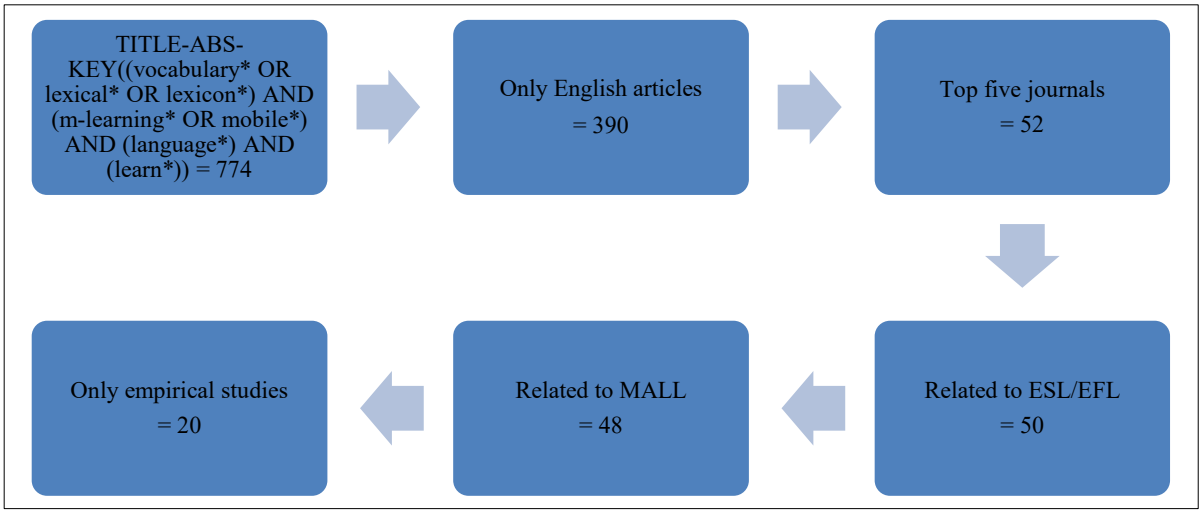
During this stage, the authors examined the titles, abstracts, and key sections of 390 articles to determine their eligibility. As a result of this review, 338 articles were excluded. The remaining 52 articles, published in the top five journals—Computer Assisted Language Learning, ReCALL, International Journal of Mobile Learning and Organization, Computers and Education, and International Journal of Language Learning and Teaching—were selected for further analysis. To ensure alignment with the study's criteria, the articles were further reviewd for relevance to the ESL/EFL context, empirical studies, and mobile-based research focus. This led to the exclusion of 32 additional articles that did not meet the eligibility requirements. Ultimately, 20 articles that satisfied all three stages of review were finalized for the quality appraisal process (see Figure 2).

Quality Appraisal

The quality appraisal process ensures the relevance and appropriateness of the selected articles based on set criteria (Shaffril, 2018). In the current study, the researchers conducted a thorough quality appraisal to confirm that the empirical studies and their analytical strategies adequately addressed the research questions. The selected 20 articles were carefully read and reread by the authors to extract data related to sampling, technological, and practical focus. Each article was evaluated against the criteria presented in Table 1. If discrepancies arose during the analysis, they were promptly resolved through discussion and mutual agreement among the authors. Ultimately, most articles (f=18) satisfied all four criteria, while the remaining two articles met three out of the four criteria (see Table 3 for criteria).

Figure 2

Searching Process



Data Analysis

The study employed a two-phase data analysis approach. In the first phase, bibliometric mapping approach was utilized to identify networks, communication patterns, and trends in the literature, applying a quantitative approach as described by Haddow (2013). The data analysis was performed using VOSviewer, a software program used for visualizing bibliometric maps and conducting social network analysis (van Eck & Waltman, 2014). VOSviewer facilitated the analysis of the most influential authors, highly cited articles, frequent keywords, and productive countries in MAVL research. In the second phase, content analysis was applied to the 20 selected articles to address the second research question. Each of the article was carefully reviewed to extract and analyze data pertaining to the focus area of the study.

RESULTS

The findings of the study are presented in two dimensions, addressing the research questions.
RQ1: What are the most influential authors, frequently used keywords, and countries with the highest number of publications based on bibliometric mapping in MAVL studies?

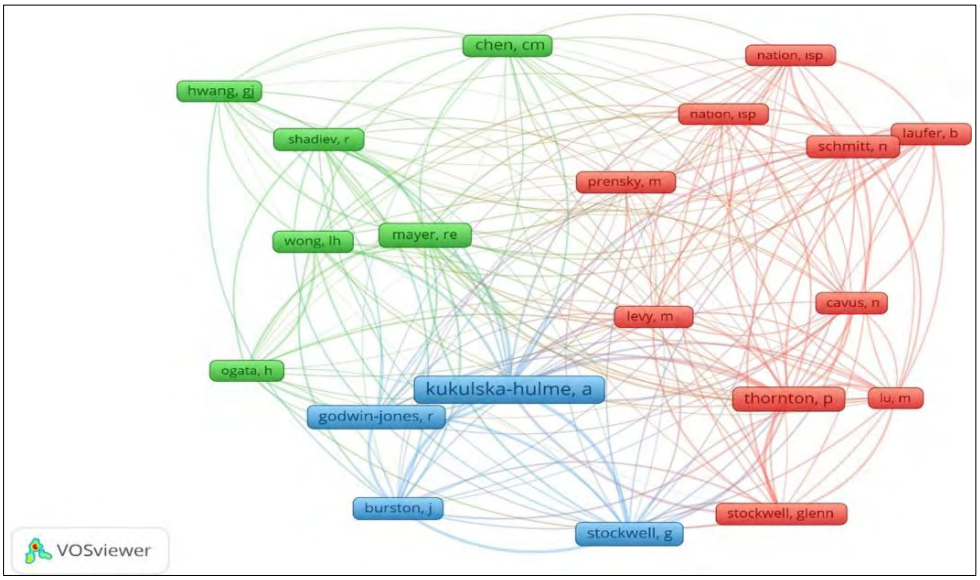
During the scanning process in the Scopus database, 774 studies were scrutinized. The results for this dimension are discussed as follows.

Authors with Greater Influence

To identify the most co-cited authors in MAVL studies, a minimum threshold of 60 citations was applied. The results are shown in Figure 3, which highlights the authors with significant co-citations.

Figure 3

Authors with Co-citations



The illustration in Figure 3 highlights the most influential authors in MAVL research. Among them, Kukulska-Hulme (f=230), Chen (f=133), Thornton (f=125), Stockwell (f=115), and Jones (f=109) emerged as key contributors. The network analysis identified three distinct clusters, represented by green, red, and blue nodes. The green cluster consists of authors who investigated the application of mobile devices in language learning contexts. The red cluster features Paul Nation, Norbert Schmitt, and Batia Laufer, who primarily focused on vocabulary studies, alongside Patricia Thornton, Michael Levy, Nadire Çavuş, and Glenn Stockwell, who emphasized technological aspects. The blue cluster represents researchers dedicated to the broader field of mobile learning (m-learning).

Keywords with Higher Frequency

The analysis identified a total of 3,165 keywords used by researchers. To determine the most frequent keywords, a minimum occurrence threshold of 10 was established for the co-occurrence of author keywords. The process resulted in 24 keywords, which were subsequently grouped into five thematic clusters (see Table 4).

Table 4

Frequently Used Keywords and Their Frequency

Group	Words
Group 1	EFL (27), MALL (45), CALL (12), mobile application (42), foreign language (41), vocabulary (122) mobile assisted language learning (40)
Group 2	Gamification (13), augmented reality (16), motivation (19), language learning (110)
Group 3	Mobile app (17) Natural language processing (15), mobile app (17) machine learning (18), mobile technology (16)
Group 4	Vocabulary acquisition (38) mobile devices (53) mobile learning (143) e-learning (137)
Group 5	M-learning (11), mobile assisted language learning (MALL) (11), technology (20), game-based learning (10)

Figure 4

Frequently Used Keywords

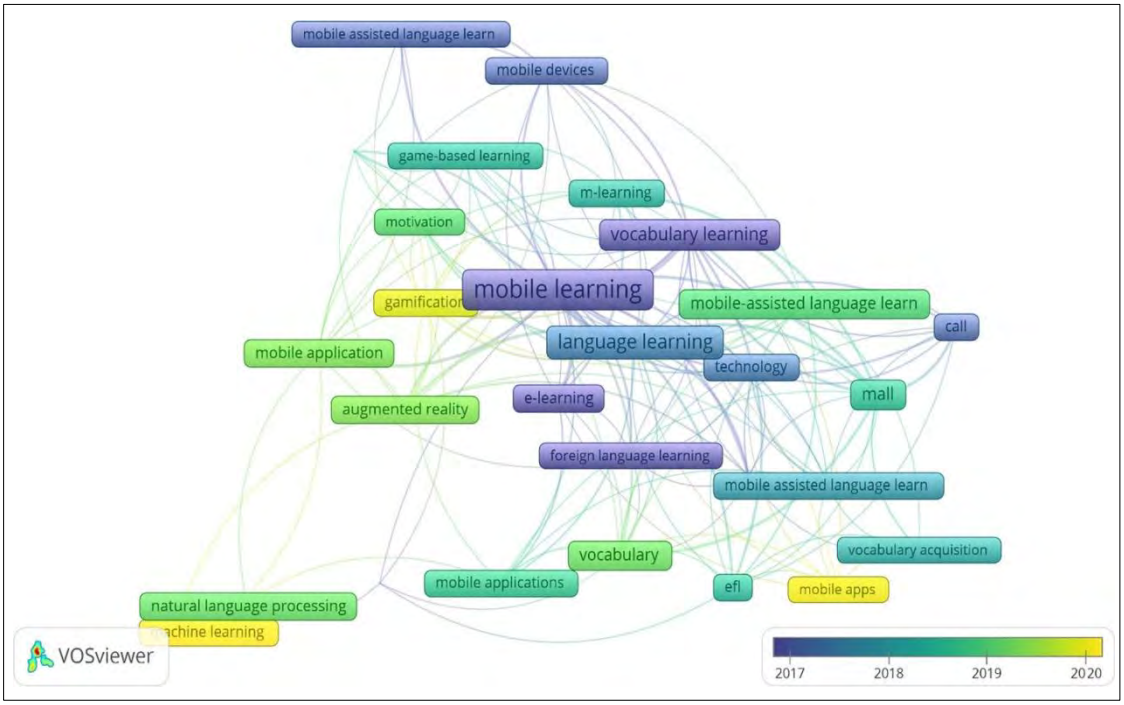


Figure 4 illustrates the temporal evolution of keywords in MAVL studies, highlighting noticeable shifts in research focus across different periods. Although the years are not strictly demarcated, distinct patterns emerged. In 2017, keywords such as *mobile, vocabulary learning, MALL,* and *EFL* dominated the research landscapte. In 2018 to 2019, the focus shifted towards terms like *augmented reality, game-based learning, mobile application*, and *m-learning*. Recent trends indicate emerging keywords in the field which include *machine learning, mobile apps* and *gamification*, reflecting the latest developments in MAVL research.

Countries with Higher Productivity in MAVL Research

To identify the most productive countries in MAVL research, a minimum threshold of six research documents and three citations was established (see Figure 5).

Figure 5

Countries with Higher Productivity

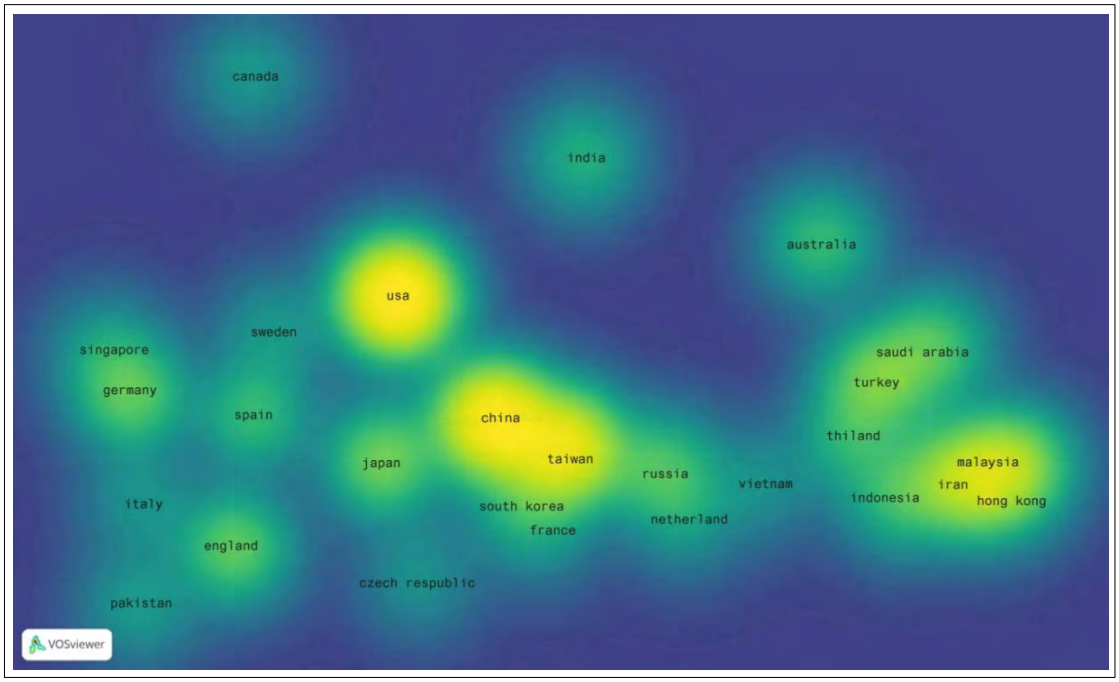


Figure 5 provides an overview of these countries. The analysis revealed that the United States leads the field with the highest number of publications (f = 93), followed by China (f = 75) and Taiwan (f = 73). Other significant contributors include: Japan (f = 50), Malaysia (f = 46), Iran (f = 41), Indonesia (f = 38), Turkey (f = 35), Australia (f = 26), England (f = 26), Saudi Arabia (f = 24), Spain (f=22), Germany (f = 21), Russia (f = 18), Czech Republic (f = 17), and South Korea (f = 14), Netherland (f = 11), Singapore (f= 11).

RQ2: What are the sampling strategies, technological focuses, and practical domains addressed in MAVL studies?

The analysis of the 20 selected articles addressing the second research question revealed diverse sampling strategies.

Sampling Focus

As per the findings, the participants in these studies varied across educational and professional levels. Primary school level (Articles 2 and 14), higher secondary level (Articles 5, 9, and 10), working adults (Article 18), and undergraduate level (Articles 1, 3, 4, 7, 8, 10, 11, 12, 13, 15, 16, 17, 19, and 20). The data indicates that university level participants were most commonly studied, followed by higher secondary and primary school levels. Moreover, in terms of geographical distribution, most of the empirical studies originated from China, Taiwan, the United States, and Hong Kong (see Table 4).

Technological Focus

The reviewed articles showed that researchers utilized a variety of mobile-based applications and online tools. While four studies (Articles 1, 10, 18, and 20) used custom-designed mobile applications and tools developed by the researchers, the majority of the studies used widely available applications accessible through platforms such as the Google Play Store for Android users and the Apple App Store for iOS users. Examples include popular language-learning apps like Babbel and Duolingo (Article 3), the Busuu mobile app (Article 8), and virtual reality tools like Google Cardboard and Google Expeditions (Article 16).

Practical Focus

In terms of practical applications, many studies focused on examining vocabulary performance, followed by learners' perceptions, motivations, and experiences with mobile phones for vocabulary acquisition. A smaller number of studies addressed other important aspects, such as engagement (Article 4), preferences (Article 18), and automaticity (Article 6). Notably, only one study (Article 12) investigated self-regulated vocabulary learning (see Table 5).

Table 5

Themes

Article	Sampling Focus		Technological focus	Practical focus
	Level	Country		
Huang & Hew (2023)	Undergraduate	Taiwan	WeChat Applets	Vocabulary performance
Song et al. (2023)	Primary school	Hong Kong	Mobile Learner-Generated (m-LGC) tool	Motivation, behaviour, and performance
Kessler et al. (2023)	Undergraduate	Turkey	Babbel and Duolingo	Language skills development
Li & Hafner (2022)	Undergraduate	China	Digital and non-digital word cards	Engagement, receptive and productive knowledge of L2 vocabulary
Chen et al. (2019)	Higher secondary	Taiwan	Mobile game-based learning (MGBL)	Vocabulary acquisition and performance
Chen et al. (2021)	Undergraduate	China	Mobile-based vocabulary learning	Vocabulary gains, and automaticity
Kohnke (2020)	Undergraduate	Hong Kong	Alphabet vs Aliens @PolyU	Perception, motivation, and experience
Rosell-Aguilar (2018)	Undergraduate	Spain	Busuu mobile app	Vocabulary knowledge
Uosaki et al. (2012)	Higher Secondary	Japan	SMALL System	Memory retention

Article	Sampling Focus		Technological focus	Practical focus
	Level	Country		
Hsu et al. (2013)	Higher Secondary	Taiwan	Recommendation-based mobile learning	Vocabulary achievement
Jia et al. (2022)	Undergraduate	China	Smartphone-based CSIEC tutoring system	Vocabulary drilling
Lai et al. (2022)	Undergraduate	China	Mobile-based self-regulation	Attitudes and self-regulation skills
Ma (2019)	Undergraduate	Hong Kong	Mobile-based dictionaries	Performance, voices, and experiences
Rachels & Rockinson-Szapkiw (2018).	Primary school	United States	Mobile-based gamification	Language achievement and self-efficacy
Shadieve et al. (2022)	Undergraduate	China	Mobile-based learning system	Effectiveness and learning performance
Xie et al. (2021)	Undergraduate	United States	Google Cardboard and Expeditions)	Content and vocabulary development
Zhang et al. (2023)	Undergraduate	China	Mobile-based 3 dictionaries	Effectiveness, behaviour, and perceptions
Zhang & Zou (2020)	Working adults	Hong Kong	iWORDS app	Perceptions and preferences
Moghari & Marandi (2017)	Undergraduate	Iran	Text messages as a supplementary tool	Grammar feature practice
Wu (2015)	Undergraduate	China	Word Learning-CET6 app	Effectiveness and vocabulary development

DISCUSSION

This study focused on two primary dimensions: bibliometric mapping and content analysis. The bibliometric mapping dimension aimed to construct a general overview of MAVL research, while the content analysis dimension explored current trends in the topic by examining empirical studies. The results provided valuable insights into the MAVL field, discussed in the context of previous MALL research due to the limited scope of MAVL-specific studies.

The first research question attempted to identify the most influential authors, frequently used keywords, and countries producing the most publications in MAVL research. Using VOSviewer, the analysis found that the most influential authors were those already well-known in vocabulary research, such as Paul Nation, Batia Laufer, and Norbert Schmit, due to their ground-breaking contributions. In mobile learning, Agnes Kukulska-Hulme emerged as a significant figure. These findings align with researchers' intuitive knowledge of the field. Additionally, Patricia Thornton's article was identified as the most cited paper, while Agnes Kukulska-Hulme was the most cited author. These findings are consistent with Okumuş Dağdele (2023), who also highlighted Thornton's paper and Kukulska-

Hulme's influence. However, the results contradict Khodanadelau et al. (2022), who identified Wang et al. (2009) and Wu et al. (2013) as the most influential authors in MALL research. This discrepancy likely arises because Khodabandelou et al. (2022) focused on English language learning in general, whereas the current study emphasizes vocabulary learning and teaching. The identification of influential authors aids researchers in familiarizing themselves with key figures and topics within the MAVL domain. Moreover, language learners and educators can benefit from the works of these authors, enriching their vocabulary learning and teaching practices.

According to VOSviewer data, the most frequently used keywords in MAVL studies were vocabulary learning, m-learning, and language learning. These findings align with the study by Dağdeler (2023), which investigated MAVL trends from 2002 to 2022 using thematic analysis. His analysis of 687 research articles similarly identified language learning, mobile learning, and vocabulary learning as commonly used keywords. Furthermore, this study highlights a shift in keyword usage, reflecting advancements in educational technology. Emerging themes such as gamification, machine learning, and augmented reality have become popular in recent years. These findings align with the results of the second research question, where gamification emerged as a predominant feature in the reviewed articles. This trend underscores the increasing integration of technological and pedagogical advancements in MAVL studies. Recently, for instance, the use of augmented reality in a learning context has been preferred. Earlier MAVL studies often relied on Multimedia Message Service (MMS) and Short Message Service (SMS), tools commonly associated with mobile-assisted language learning (MALL). However, with the evolution of mobile technology, MAVL studies have increasingly embraced features like gamification and augmented reality due to their diverse applications. Similarly, machine learning has influenced multiple disciplines, including MAVL, reflecting its growing importance in educational research. These findings are particularly valuable relevant for researchers aiming to explore potential areas and emerging trends for further investigation in MAVL.

Based on the bibliometric analysis, the countries with the highest productivity in MAVL publications were the United States, China, and Taiwan. Likewise, the content analysis of empirical studies revealed that these sam countries were heavily involved in intervention studies. While the order of countries varied slightly between the two analyses, the findings were largely consistent. This finding aligns with Khodabandelou et al. (2022), which also identified China, the United States, and Taiwan as leading contributors to research in the MALL domain. Moreover, according to data from Statista (via Wikipedia), the countries with the highest number of smartphone users globally are China, India, and the United States, respectively. The large base of smartphone users in these countries is likey a key factor driving extensive MALL research. In addition to user demographics, experimental studies on MALL require adequate resources and infrastructure. Both the US and China possess the technological and institutional support for conducting such studies, which explains their dominance in this field. These findings provide valuable information about the global landscape of MAVL research. They also underscore the potential of international collaborations among researchers, which could foster a comprehensive understanding of MAVL and lead to richer, globally-relevant data.

The second research question attempted to review and analyze studies to uncover the types of mobile applications used by researchers and their key features. The findings indicated a preference for personalized systems of vocabulary teaching and assessment, enabling researchers to investigate learners' performance, perceptions, and preferences regarding these systems. While Pang and Aziz (2021) reported that researchers mainly resorted to commercially available applications; the current study revealed a shift towards custom-developed systems. This divergence may stem from the use of different data sources. The present study, relied exclusively on the Scopus database, known for its

comprehensive and consistent research offerings. In contrast to Lin and Lin (2019), who reviewed studies from 2005 to 2018 and noted an emphasis on mobile applications, MMS, and SMS in MALL studies, this study did not apply a date filter, allowing the inclusion of more recent studies (e.g., 2023). While augmented reality and gamification emerged as prominent themes in the current study, a few studies on messaging persisted, showing no contradiction with earlier findings.

Recent MALL research has increasingly focused on learners' attitudes, behaviours, and perceptions (Shadiev et al., 2020; Hussain et al., 2022; Nawaz et al., 2023). However, the current study both aligns and contradicts earlier work. For instance, vocabulary performance was found to be a key area of divergence. as well as alignment with previously published studies on the topic. A notable number of studies employed experimental research designs, examining the effectiveness of mobile learning and exploring learners' perception, motivation, and attitudes. In addition, it was noted that most countries prioritize performance-based research over psychological constructs. This preference could be attributed to the perception that evaluating performance is closer to objectivity and relatively more straightforward than testing motivation, perception, or attitude, which are inherently more subjective.

CONCLUSION

Despite its preliminary nature, the findings of this study provide directions for future studies aimed at advancing mobile-assisted vocabulary learning (MAVL). MAVL is recognized as an emerging area with significant potential in language education. The results of bibliometric and content analyses revealed that MAVL studies are relatively limited in number and often lack international collaborations, which could enhance the depth and reach of research. To address these gaps, it is recommended that researchers investigate unexplored areas within MAVL and actively foster international collaborations. The findings hold practical implications for researchers, teachers, and learners in English as a second/foreign language (ESL/EFL) contexts. For example, incorporating gamification or game-based teaching during and after class could enhance vocabularly learning. Such approaches allow earners to engage with vocabulary games using their smartphones, fostering motivation and engagement in the learning process. Furthermore, technologies like augmented reality offer opportunities for creating authentic English-speaking contexts, further enhancing language acquisition. By integrating appropriate technological tools and relevant pedagogical strategies, the effectiveness of vocabulary learning can be significantly improved. In addition, the findings on influential authors and productive countries provide a foundation for networking among researchers worldwide, potentially advancing MAVL research through international collaboration. While this study has contributed to MAVL literature, its findings are subject to certain limitations. First, only the Scopus database was used, which may have restricted the scope of included studies. Utilizing additional databases could provide a more comprehensive understanding of the topic. Second, only 20 empirical studies published as articles were analyzed. The inclusion of other document types such as conference papers and book chapters, could offer contrasting insights. Lastly, the inclusion and exclusion criteria, along with the generated themes, were influenced by the researcher's subjective decision.

Considering these limitations, future studies can address these gaps by exploring mobile assisted vocabulary learning (MAVL) within ESL/EFL and second language acquisition (SLA) contexts. Researchers are encouraged to conduct systematic reviews of MAVL studies, employing diverse methodological approaches and sampling strategies. While earlier reviews have examined vocabulary in MALL from various perspectives, this study calls for further exploration to deepen the understanding of MAVL and contribute to its growing body of literature.

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