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Impact Of Mobile Learning Implementation In Efl/Esl: Systematic Review

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ABSTRACT

This paper examines the impact of mobile learning implementation in EFL/ESL through a systematic review and meta-analysis of literary productions in various scientific journals (Computers & Education, British Journal of Educational Technology, The Internet and Higher Education, Journal of Educational Technology & Society, Education and Information Technologies). A mixed-method approach with an integrated mixed synthesis design was used in this study, which followed the PRISMA 2020 guidelines. The study included (23) papers, extracted from four scientific journals, resulting in (33) effect sizes, which were checked for reliability using the MMAT 2018 tool. The results showed that the overall effect size was (0.9524) with a confidence interval of 95% (0.76 to 1.14), which indicates a very large effect size. The predictive inference for effect size ranged (-0.12 to 2.02). The results clarified the theoretical foundations, instructional design, language skills, stages of language learning, and tools used in EFL/ESL. The study recommended the implementation of mobile learning in EFL/ESL, providing support and assistance to learners, and conducting more research on the topic.

Keywords: Mobile learning, EFL, ESL, Systematic review, Meta-analysis.

1. INTRODUCTION

Mobile learning has gained immense popularity due to the accessibility and availability of portable devices and smartphones worldwide. In Saudi Arabia, for example, more than 90% of the population relies on mobile electronic devices for communication and information [1]. Various tools such as Social Media, Augmented Reality, Virtual Reality, Expert Systems, and Internet of Things have contributed to the development of Mobile Learning and its ability to provide flexible and diverse learning environments. Contemporary learning approaches such as Seamless Learning, Self-Learning, Lifelong Learning, and Situated Learning have contributed to the continuous dissemination of these tools in educational environments [2–5]. Mobile learning has been found to support students' cognitive and skill-based achievements in all theoretical and practical domains [6].

The use of mobile learning in developing English language skills for non-native speakers (EFL/ESL) is an important research topic in the field of educational technologies [7]. Researchers have conducted various studies on the impact of mobile learning on language skills, vocabulary acquisition, motivation, and factors affecting its effectiveness [8]. There are high trends among English as a foreign language (EFL) teachers towards the use of mobile learning in teaching English [9]. The effectiveness of mobile learning has been investigated in the development of the four fundamental language skills of English as a foreign/second language (EFL/ESL) as well as other linguistic functions such as guessing, persuading, and suggesting [2, 8, 10–14].

The study [15] used a mixed-methods design using survey and semi-structured interviews to collect data on students' readiness levels to use mobile learning to acquire English language skills as a foreign language. The results

indicated a high level of readiness among students towards using mobile learcning, while also highlighting some of the challenges they face, including a shortage of educational materials, auditory and visual aids, oral practice environments, large class sizes, and teaching methods. It is recommended that mobile learning services be extended to the educational process itself, integrating it into the technologies used in flipped classroom and blended learning, as well as in professional development and on-the-job training.

Mobile learning has great potential to enhance the effectiveness of teaching and learning processes and improve access to education for learners worldwide. Therefore, it is important to develop specialized and general applications to communicate with learners, including universities in Saudi Arabia. Future studies can focus on exploring ways to enhance the effectiveness of mobile learning through various approaches, such as integrating artificial intelligence, machine learning, and data analytics [2, 3].

As alluded to in the introductory section, a conspicuous void exists in the realm of systematic review and meta-analysis studies concerning the effect of mobile learning on English as a foreign or second language (EFL/ESL) education. In addition, the terms "mobile learning" and "meta-analysis" or "systematic review" were scoured with EFL/ESL/TESOL/English-language synonyms in databases such as DirectScience, Scopus, Springer, and EBSCO. Nevertheless, only a handful of these studies focused on the area of EFL/ESL learning through mobile learning. Given the paramount importance of such research in enhancing scientific research, identifying gaps, providing a theoretical framework for researchers and interested parties, and exploring the future direction of scientific production in the field of EFL/ESL learning, the problem of this study and its dimensions becomes readily discernible. This problem involves providing the field with a comprehensive, methodological, and meta-analytic study that illustrates the gaps, research needs, impact factors, previous studies, and recent trends in mobile learning research in the last decade in the area of EFL/ESL learning. The problem can be framed as the need for a systematic review and meta-analysis of scientific papers to measure the impact of mobile learning on EFL/ESL learning and how it has been employed in scientific production since 2010, while considering language skills and characteristics.

To formulate the study questions, the researcher utilized the SPIDER tool, as [16] suggest that questions for systematic reviews and meta-analyses are built by breaking down their concepts and key terms according to multiple models agreed upon by the majority of research studies based on the type and purpose of the study. Two of these tools include quantitative and mixed-methods research. These tools also help to develop research strategies and inclusion/exclusion criteria. Based on these tools, the following main study question was formulated: What is the impact of mobile learning implementation on learning English as a foreign or second language in scientific research studies from 2011 to 2020?

The present study aims to achieve several objectives. Firstly, it intends to measure the impact of mobile learning implementation on teaching English as a foreign/second language for non-native speakers within the timeframe of 2011 to 2020, as specified by the study's scope of sources. Secondly, the study aims to evaluate the suitability of mobile learning implementation in teaching English as a foreign/second language for non-native speakers within the selected sources during the same period. Lastly, the study seeks to identify the various ways in which mobile learning is utilized in teaching English as a foreign/second language for non-native speakers within the chosen sources from 2011 to 2020. The importance of this study lies in several aspects. Firstly, it seeks to contribute to educational technology field with meta-analysis and systematic review studies in mobile learning and teaching English as a foreign/second language for non-native speakers. Secondly, it aims to enrich the theoretical field in educational technology by identifying research gaps and the direction of mobile learning implementation studies in teaching languages for non-native speakers from 2011 to 2020. Thirdly, the study serves as a vital source for

understanding the theoretical framework and previous studies of the methodology, philosophy, and trends of mobile learning implementation in teaching languages for non-native speakers, providing a scientific theoretical framework for researchers and those interested in mobile learning and educational technology. Additionally, the study aims to predict and forecast the trajectory of research in the field of mobile learning implementation in teaching English as a foreign/second language for non-native speakers, which will contribute to serving research centers, institutions, and mobile device manufacturers. Lastly, the study provides a documented scientific source for decision-makers in educational institutions to determine the feasibility of using mobile learning in teaching English as a foreign/second language for non-native speakers and training.

2. LITERATURE REVIEW

2.1 Mobile Learning

Mobile learning has become increasingly popular in the field of education due to the widespread use of portable devices and smartphones worldwide. These devices provide the principles of accessibility, availability, diversity, social connectivity, interaction, individuality, and portability, which are essential for achieving effective learning outcomes [14]. In Saudi Arabia, for example, more than 90% of the population relies on mobile electronic devices for communication and information, and this percentage is expected to increase to 97.1% by 2025 (Statista, 2021).

The availability of various applications, software, and communication systems, such as Social Media, Augmented Reality (AR), Virtual Reality (VR), Expert Systems (ES), and Internet of Things (IoT), has contributed to the development of Mobile Learning (ML) and its ability to provide flexible and diverse learning environments. These tools align with contemporary learning approaches such as Seamless Learning, Self-Learning, Lifelong Learning, and Situated Learning, which have contributed to their continuous dissemination in educational environments [2–5].

Studies have confirmed that mobile learning features support many cognitive and social theories, such as Connectivism Theory, Social-Constructivism Theory, and Shareable Learning, making it attractive to researchers to study its features and potential use in teaching and learning processes [3, 6]. Mobile learning has also been found to support students' cognitive and skill-based achievements in all theoretical and practical domains, as confirmed by the results of the Technology Acceptance Model (TAM) [6].

Given the flexibility and potential of mobile learning and its applications, there has been increased interest in implementing its systems and creating specialized and general applications to communicate with learners, including universities in Saudi Arabia. Researchers have recommended extending mobile learning services to the educational process itself, integrating it into the technologies used in flipped classroom and blended learning, as well as in professional development and on-the-job training. Overall, mobile learning has great potential to enhance the effectiveness of teaching and learning processes and improve access to education for learners worldwide.

2.2 Learning English for Non-native Speakers of English

Teaching English for Non-Native Speakers (EFL/ESL) is one of the strategic objectives for the majority of the world's countries that adopt English as a target language after their mother tongue. Given the widespread use and applications of English in providing knowledge, it has become an area that researchers have studied extensively. Study [8] conducted a systematic review of mobile-assisted English language learning research from 2000 to 2018, covering several areas in his research questions, including the annual publication rate, teachers' attitudes towards the use of mobile devices in language teaching, its impact on motivation, its effect on language skills, its effect on vocabulary acquisition, the factors affecting its effectiveness, and the learning outcomes studied by mobile learning research.

The use of mobile learning in developing English language skills for non-native speakers (EFL/ESL) is one of the most important ways to benefit from the advancements in educational technologies, communications, online interactions, applications, and systems, making

it a highly important research topic in the field of educational technologies [7]. Cavus et al. [9] confirm that there are high trends among EFL/ESL teachers towards the use of mobile learning in teaching English, citing that the rapid development in communication technology and its mobile applications facilitates teachers' roles in professional practices related to language teaching. Chen et al.'s [2] analytical study also notes an increase in the number of researchers and teachers who research and employ mobile-assisted language learning in teaching English. Seraj et al. [15] employed a mixed-methods design using survey and semi-structured interviews to collect data on students' readiness levels to use mobile learning to acquire English language skills as a foreign language. The results indicated a high level of readiness among students towards using mobile learning, while also highlighting some of the challenges they face, including a shortage of educational materials, auditory and visual aids, oral practice environments, large class sizes, and teaching methods. The results of the semi-structured interviews, which focused on three axes of EFL/ESL learners' readiness, including availability, ease of use, and positivity towards mobile learning, and four themes related to EFL/ESL learners' problems, such as personal and linguistic proficiency, teacher effectiveness, and their use of native language to teach oral communication skills.

Several studies have investigated the effectiveness of mobile learning on the four fundamental language skills of English as a foreign/second language (EFL/ESL), including listening, speaking, reading, and writing, as well as other linguistic functions such as guessing, persuading, suggesting, and others [2, 8, 10–14]. Sun and Sihes [17] conducted a meta-analysis of the professional competence of English teachers at the secondary level in China between 2015 and 2019, concluding that the teachers had an average level of educational competence and demonstrated proficiency in technological communication and mobile learning. Additionally, Cabrera-Solano's [18] study, which was applied to 42 university students who recorded their achievements as voice or video files using smartphones and saved them to Google Drive for five months, found that the use of digital portfolios was effective in improving students' pronunciation and fluency skills. The cloud storage's free space also enabled students to keep audio and video files of their language skills, increasing their motivation to speak English.

Furthermore, [19] study aimed to measure the effectiveness of mobile learning in acquiring English language concepts and students' attitudes towards learning it at the College of Education at Jerash University. The study included 21 students as a control group and 22 students as an experimental group who used mobile learning. The results showed statistically significant differences in favor of the experimental group attributed to the use of mobile learning, as well as significant differences in students' attitudes towards learning English attributed to mobile learning. The study recommended activating the use of mobile learning in teaching English.

Despite attempts to apply contemporary technologies such as mobile learning to solve the problems faced by English as a Foreign Language (EFL) learners, studies still show the existence of many difficulties and challenges. Methodological studies and contemporary multidimensional analyses of linguistic studies, methods, and acquisition strategies suggest that there are problems in mastering English language skills that stem from multiple reasons, including language itself, as well as methods and approaches used in its acquisition. For instance, studies conducted by [20–22] related to reading and writing skills revealed the problems associated with the interference of English with the native language, weak linguistic vocabulary, grammatical structures, syntax, spelling, punctuation, word choice, organization, understanding of rhetorical genres and structures, cognitive anxiety, as well as difficulty understanding the semantic meaning of vocabulary, proverbs, and sayings due to cultural and environmental differences.

Similarly, studies by [2, 23] showed that contemporary challenges of acquiring speaking and listening skills were related to differences in pronunciation, interference of the native language, intonation and stress, pronunciation of some English consonants, dialectical differences, sound levels, and speech speed investigated the problems faced by EFL

teachers, such as negative student attitudes towards learning English, language weakness, and lack of motivation [24, 25]. They recommend that teachers use various strategies, such as encouraging students to create a suitable learning environment for them, including mobile learning, and using appropriate teaching strategies, including mobile technology, to make learning English available, flexible, and easily accessible.

Due to the abundance and diversity of studies that have addressed mobile learning in developing English language skills for non-native speakers, systematic review and meta-analysis can contribute to examining the phenomenon, analyzing the cumulative effect size, research frameworks and methodologies, and quantitative and qualitative interpretations of study results and scientific literature.

2.3 Systematic Review and Meta-analysis in Mobile Learning

Systematic reviews and meta-analyses are considered the most comprehensive methods for identifying the general direction of scientific research, research gaps, research methodologies used in the field, reasons for repetition, and cumulative effect size variables [26]. These multidimensional methodologies combine research ideas to construct theories [16]. According to [27], the terms systematic review and meta-analysis are intertwined and interconnected. With the development of knowledge, its forms, outputs, and the abundance of scientific production, meta-analysis has become part of systematic review studies in most research. The quality of systematic reviews and meta-analyses is demonstrated by the evidence pyramid term presented by [28], which illustrates the levels of quality and strength of evidence in scientific research. Systematic review and meta-analysis studies are positioned at the top of the pyramid, indicating the highest quality of evidence in scientific studies.

Martin et al. [29] conducted a systematic review of 619 research articles from 12 scientific journals in the field of distance learning and education between 2009 and 2018. Their findings indicate that despite a decrease in the number of studies between 2015 and 2016, the number of studies returned to growth between 2017 and 2018. The majority of studies were quantitative and focused on higher education. The same study confirms that there is still a need for further research on other levels and topics.

Sharifi et al. [30] conducted a meta-analysis of 140 studies with 158 effect sizes to determine the effect of computer-assisted language learning (CALL) on English language teaching compared to traditional face-to-face teaching. They found a medium effect size for CALL teaching methodology (+0.5), which had an impact on English language learning and development. Furthermore, they found that web-based CALL was more effective than non-web-based CALL with an effect size of (+0.54). Qualitative analysis of the results identified four important factors in language learning: type of interaction, communication style, language context, and exposure period.

Kim and Park [31] conducted a systematic review and meta-analysis of the effect of mobile learning on nursing education based on 11 experimental and quasi-experimental studies. Their findings indicate a large cumulative effect size (95%) for learning outcomes such as learning (g=1.54), knowledge (g=1.47), and performance confidence (g=1.54). No significant differences in variance and heterogeneity were found after conducting the meta-analysis, and the statistical results did not detect any major bias in these studies.

Xie et al. [3] conducted a systematic review of the use of mobile technology in personal and adaptive learning in scientific journal research between 2007 and 2017. Their findings suggest that mobile technology has been applied to various aspects of personal and adaptive learning, such as personalized recommendation systems, adaptive learning paths, and mobile learning analytics. The authors concluded that mobile technology can promote learners' self-regulation and personalized learning, but there is still a need for further research to explore the effectiveness of mobile learning interventions in diverse educational contexts.

Al-Emran et al. [32] conducted a systematic review of the Technology Acceptance Model (TAM) in the context of mobile learning and found that most studies were conducted in higher education, with surveys being the most

commonly used data collection tool. In a review of academic publications on mobile learning in nursing spanning from 1971 to 2016, Chang et al. [33] found that mobile learning had significantly progressed in the last decade, covering diverse research topics and issues. Fu and Hwang's [4] study on indicators of cooperative learning through technology found that cooperative mobile learning research is increasing, with a strong positive correlation between modern mobile phone technology and cooperative learning. Wu et al. [34] reviewed trends in mobile learning research using the meta-analysis strategy.

3. Theoretical Framework

Mobile learning is an interdisciplinary field that draws upon theories from various disciplines [35–38]. The main theories in this field include behavioral theory, cognitive theory, constructivism, social theories, communication theory, social emotional learning, and others, leading to the development of multiple approaches in building models of educational technologies that consider the overlap of these theories.

According to [35], an independent theory within a pedagogical framework for mobile learning should take into account the affordances of mobile devices and the context of mobile learning. The literature suggests that communication theory, collaborative learning, and experiential learning are three approaches to learning theories that can have the highest impact in building an independent theory for mobile learning [37]. Mobile learning can be viewed from two perspectives: the technological perspective, which is related to human-computer interaction or technology in a broader sense, and the human perspective in terms of society, culture, and cooperation in dividing tasks [38]. These perspectives constitute the nucleus of building an independent concept of formal learning and the expansion of lifelong learning and personal learning.

In addition to the above-mentioned theories, situational learning, problem-solving learning, context awareness learning, conversational learning, activity theory, navigationism, and location-based learning are also important theories in mobile learning [36]. These theories have various applications in mobile learning such as multimedia, virtual reality, interactive broadcasting, mobile games, simulations, and mobile performance support systems. Mobile learning technology can play an important role in providing a compatible social and environmental framework that supports the learning process, interaction, and collaboration.

4. METHODOLOGY

4. 1 Approach

Systematic reviews follow procedures, tools, and designs prepared by the researcher that answer research questions and achieve objectives. This method is closest to the Pragmatic Philosophy, which sees truth as a phenomenon that is diverse and accepts different perspectives that achieve objectives in reaching knowledge [39]. As for Systematic review which mostly involves Meta-analysis, that is based on the results of diverse studies and research in research methodologies and designs, falling under the name of Synthesis Research, it delve to go throw systematic procedures depending of scientific models, like Cochrane, PRISMA and etc.

The writing of the review report will involve presenting the findings of the systematic review in a clear and concise manner, and drawing conclusions and making recommendations based on the evidence. Overall, conducting a systematic literature review using the PRISMA 2020 model is an excellent way to gain a comprehensive understanding of a complex phenomenon such as the impact of mobile learning on learning EFL/EFL. The approach of this tool for conducting a meta-analysis involves identifying and specifying the inclusion and exclusion criteria for relevant studies, as well as searching and consulting various sources to obtain data. The tool then assesses the risk of bias in the selected studies and determines the appropriate effect measures for each outcome. Synthesis methods are used to analyze the collected data, including identifying possible causes of heterogeneity and conducting sensitivity analyses. Finally, the results are interpreted and discussed in the context of existing evidence, and any limitations of the review processes and implications for practice and policy are addressed.

4.2 Study Population, Sample, and Selection Procedures

The study population comprises scientific articles and theses that were digitally published from 01-01-2011 to 31-12-2020 in the following scientific publishers:

1. Computers & Education Journal
2. British Journal of Educational Technology
3. The Internet and Higher Education Journal
4. Journal of Educational Technology & Society
5. Education and Information Technologies Journal

The study population was selected based on the possibility of accessing full digital texts from digital publishers 1 to 5, which were classified based on the h5-index indicator, indicating the number of articles published in the last five years and cited at least that many times during the same period. The sources in the study are peer-reviewed articles and the Google Scholar researcher classification is closely related to influential impact factor classifications like Scopus and Web of Science. The researcher did not select paper-based studies due to high bias rates and did not include non-English studies due to the unavailability of auto-process services. [40, 41]. The search was conducted on May 5, 2022, and the sources included titles, abstracts, keywords, and full articles. Table (4.1) shows the inclusion and exclusion criteria according to SPIDER Tool.

Table (4.1) Inclusion and Exclusion Criteria

	Inclusion	**Exclusion**
Sample	Students and learners for educational purposes - all levels	Non-educational purposes
Phenomenon of Interest	Using mobile learning (all synonyms) to learn English as a foreign or second language (EFL / ESL) for educational purposes	E-learning or computer-based learning, and any other language
Design	Groups (all designs)	Proposed framework, rooted theory, unclear
Evaluation	Language learning outcomes (four skills - vocabulary - grammar - comprehension - learning performance)	Unclear
Research Type	Scientific article (quantitative /mixed) / digital text / English language / published between 2011-2020	Theses / conference papers / digital images / paper-based / non-English language

The study followed specific procedures to identify research questions, determine the necessary scientific evidence (quantitative or mixed), and identify data sources and studies to search. The scientific journals specified in the study were searched using flexible strategies to find the most relevant sources related to the research question and sub-questions. Detailed procedures were used in the source search strategy.

The sources research terms are as following: ("Mobile learning" OR "m-learn" OR "mlearn" OR "%phone" OR "ipad" OR "tablet" OR "portable" OR "PDA" OR "ubiquitous") AND ("English" OR "language" OR "efl" OR "esl" OR "listening" OR "speaking" OR "read" OR "writing" OR "grammar" OR "vocabulary" OR "speech").

The researcher utilized Mendeley reference management program to organize sources and conducted semi-automated filtering operations to eliminate duplicates from the Computers & Education journal. Systematic reviews, meta-analyses, and previous literature analysis were excluded based on specific criteria. The researcher merged all studies into one folder and exported them to a Microsoft Excel file that included author names, year of publication, journal name, study title, study abstract, and keywords. Using Microsoft Word, the

researcher created a correspondence that numbered and listed the study title, abstract, and keywords. The Excel file and PDF file were sent to a specialist in systematic reviews to conduct the initial screening of a sample of titles, abstracts, and keywords, and discuss the coding concepts until agreement was reached. The coding elements and sample results were adopted by the second author, and inclusion and exclusion criteria were applied to select the final studies for data extraction and collection phase. The Rayyan.ai platform was used to assist in managing and simplifying the process of reviewing a large number of studies and selecting the most relevant ones. This platform allowed the creation of a review project, importation of studies, screening of studies in duplicate, extraction of data, and analysis of results.

4.3 DATA COLLECTION

Data collection was conducted based on two coding tables developed by the researcher and presented to the expert in systematic review, meta-analysis, and adjustment according to his suggestions. The tables were then approved by the second author. The general coding table for all studies includes: (study code, first name of the main researcher and date, study date, study country, original language, study methodology, study design, tools, statistical analysis, type and level of participants, devices used, mobile applications, number of participants (male-female), summary of procedures, and summary of results). The quantitative coding table for quantitative studies includes: (study code, group design, mobile (M), mobile (SD), mobile (N), control (M), control (SD), control (N), pretest (M), pretest (SD), posttest (M), posttest (SD), sample (N), pretest-posttest (r), P-value, T-value). Where (M) represents the mean, (SD) represents the standard deviation, (N) represents the sample size, (r) represents the correlation coefficient, (P) represents the probability value, and (T) represents the test value.

During the data collection phase, some challenges were faced in collaboration with the expert in systematic review. They were resolved using scientific and statistical methods, and the website https://atozmath.com/Menu/StatisticsMenu.aspx was used for statistical data processing, which was then inserted into the Comprehensive Meta-Analysis Software (CMA v.4) [42]. The study [43] lacked quantitative data for inclusion in the quantitative analysis. Despite contacting two of the authors, the required quantitative data was with the third author, which we could not obtain. Therefore, it was not included in the quantitative analysis for effect size [92-95].

4.4 Research Appraisal and Risk of Bias

In this study the authors applied Mixed Methods Appraisal Tool 2018 (MMAT) to assess bias risks and identified biased studies due to publication or inadequate results/sample size; the level of agreement between the authors was around 90%, and all the studies were over moderate, except disagreement about the quality of one study, which was evaluated again to have agreement. In the meta-analysis, random effects were used for effect size due to sample size differences and to generalize the results of this sample to all similar communities [44]. Statistical coefficients, including Fisher's Z-value, mean differences, and standard deviation differences, were calculated to compare and analyze the results between studies [45–47]. While some studies used I-squared to determine heterogeneity, a study confirmed that relying on I-squared to determine the difference in effect size between studies is not valid [48]. To evaluate possible bias and its impact, the study used several statistical methods from Comprehensive Meta-Analysis (CMA) software, including Funnel Plot, Classic fail-safe N, Orwin fail-safe N, Begg and Mazumdar Rank Correlation Test, Egger's Test of the Intercept, and Duval and Tweedie's Trim and Fill [49].

5. RESULT AND DISCUSSION

5.1 Studies Selection Flowchart

The study adhered to the PRISMA 2020 model and began by conducting a thorough search of sources for relevant studies. The initial screening involved applying inclusion and exclusion criteria to identify studies that met the requirements of the study. The selection process is illustrated in the flowchart below.

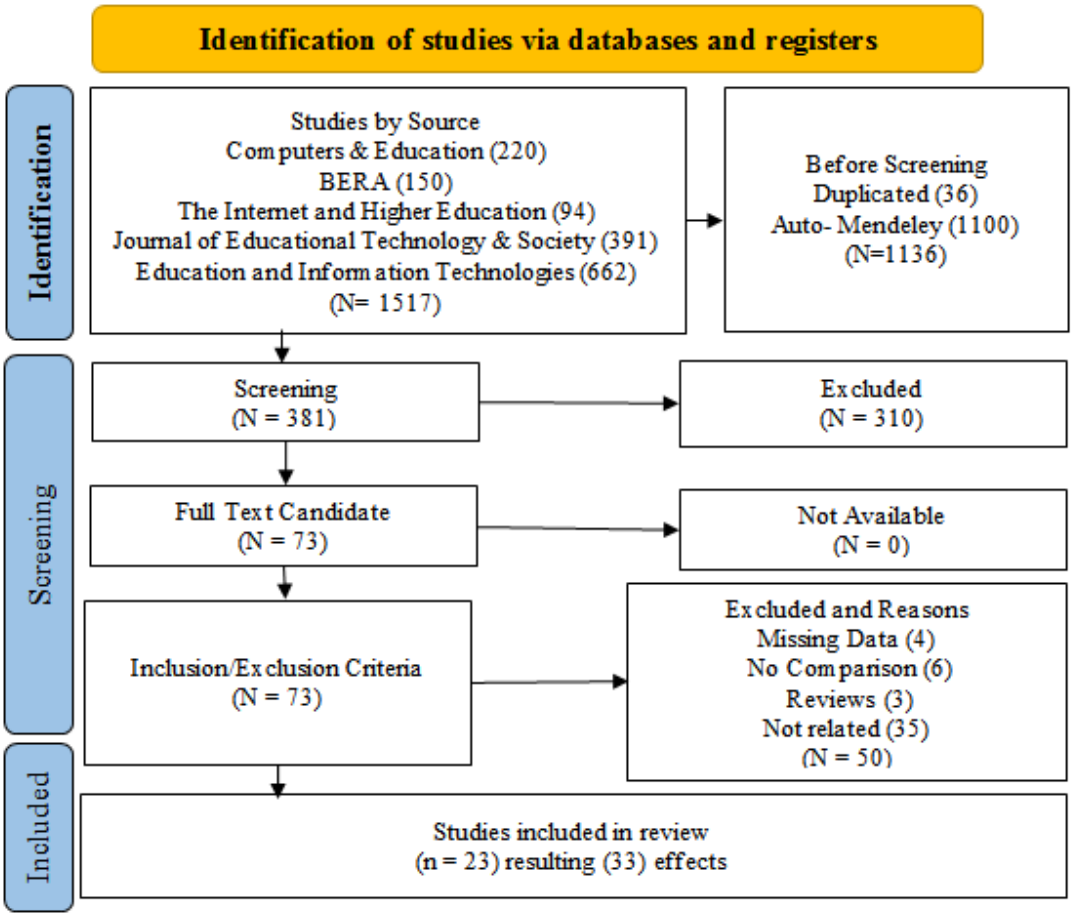


Figure (5.1) Studies Selection Process Flowchart From: [50]

The study selection process was guided by the PRISMA 2020 design guidelines, as presented in Figure (5.1). A total of 1,517 studies were initially found, with the majority from the Education and Information Technology journal (662 studies) and the least from the Information and Technology in Higher Education journal (94 studies), in addition to 220 studies from Computers & Education, 150 studies from BERA, and 391 studies from the Journal of Educational Technology & Society. Following semi-automated screening, 1,136 studies were excluded, including 36 duplicates and 1,100 studies that did not meet the initial search criteria. The titles, abstracts, and keywords of 381 studies were examined, resulting in the exclusion of 310 studies that were not relevant to the current study. After applying the inclusion and exclusion criteria to the full-text sample of 73 articles, 23 studies were selected, resulting in 33 effect sizes.

It should be noted that several studies were excluded despite meeting the inclusion and exclusion criteria. The reasons for excluding [51, 52] were that their samples measured the impact of mobile learning at different levels and without prior tests. Study [22], which employed a three-arm study design, was also excluded due to the fact that the experimental sample was bilingual – Chinese and English. Additionally, [53] was excluded because their study examined the dependent variable of three languages: English, Swedish, and Chinese. In qualitative studies, [54, 55] were excluded because they did not provide clear data.

5.2 Characteristics of the Included Studies

Table (5.1) Included Studies

Study Code	**Journal**	**Country**	**L2**	**Participants (M/F)**	**Level**	**Devices**	**Mobile Apps**
Hayati, A., 2011	British Journal of Educational Technology	**Iran**	**Persian**	**45**	**University**	**Cellphone**	**SMS**
Sandberg, J., 2011	Computers & Education	**Holland**	**Dutch**	**(42/33) 75**	**General Education**	**Smartphone**	**Designed app**
Tai, Y., 2012	Educational Technology and Society	**Taiwan**	**Chineese**	**(14/21) 35**	**General Education**	**Smartphone**	**Not mentioned**
Hsu, C., 2013	Computers & Education	**Taiwan**	**Chineese**	**108**	**General Education**	**Smartphone**	**Designed app**
Sandberg, J., 2014	Computers & Education	**Holland**	**Dutch**	**(47/59) 106**	**General Education**	**Smartphone**	**Designed app**
Lin, C., 2014	Computers & Education	**China**	**Chineese**	**84**	**General Education**	**Smartphone**	**Raz-Kids**
Wu, Q., 2015	Computers & Education	**China**	**Chineese**	**70**	**University**	**Smartphone**	**Designed app**
Shadiev, R., 2015	Educational Technology and Society	**Taiwan**	**Chineese**	**59**	**General Education**	**Tablet**	**Digital e-book**
Kim, H., 2016	Educational Technology and Society	**S. Korea**	**Korean**	**262 (141/121)**	**General Education**	**Tablet**	**Not mentioned**
Pham, X., 2016	Computers & Education	**Taiwan**	**Chineese**	**2744**	**University**	**Smartphone +Smart watch**	**Designed app**
Huang, C., 2016	Educational Technology and Society	**Taiwan**	**Chineese**	**80**	**General Education**	**Smartphone**	**Not mentioned**
Ho, S., 2017	Educational Technology and Society	**Taiwan**	**Chineese**	**90**	**University**	**Smartphone**	**Not mentioned**
Wu, T., 2017	Educational Technology and Society	**Taiwan**	**Chineese**	**(38/56) 94**	**University**	**Smartphone**	**Designed app**
Cavus, N., 2017	British Journal of Educational Technology	**Turkey**	**Turkish**	**(17/20) 37**	**General Education**	**Smartphone**	**Designed app**
Wu, W., 2017	Educational Technology and Society	**Taiwan**	**Chineese**	**50**	**University**	**Smartphone**	**LINE**
Lin, C., 2018	Educational Technology and Society	**Taiwan**	**Chineese**	**49**	**University**	**Smartphone**	**Facebook, Recoding**
Melati, M., 2018	Education and Information Technologies	**Iran**	**Persian**	**(90/0) 90**	**University**	**Smartphone**	**WhatsApp, GRE vocabulary flashcards**

Study Code	**Journal**	**Country**	**L2**	**Participants (M/F)**	**Level**	**Devices**	**Mobile Apps**
Liu, G., 2018	British Journal of Educational Technology	**Taiwan**	**Chineese**	**(23/13) 36**	**University**	**Smartphone**	**Designed app**
Rezaee, A., 2019	Education and Information Technologies	**Iran**	**Persian**	**(78/42) 120**	**University**	**Smartphone**	**WhatsApp**
Chen, Y., 2020	Computers & Education	**Taiwan**	**Chineese**	**274 (173/103)**	**University**	**Smartphone**	**Designed app**
Wang, Z., 2020	Educational Technology and Society	**China**	**Chineese**	**(49/6) 55**	**University**	**Smartphone**	**WeChat**
Xiangming, L., 2020	Computers & Education	**China**	**Chineese**	**(52/106) 158**	**University**	**Smartphone**	**WeChat**
Motlagh, H., 2020	Education and Information Technologies	**Iran**	**Persian**	**(61/0) 61**	**University**	**Smartphone**	**Telegram**

Despite using five scientific sources for the research, the eligible studies included in the final sample were from only four scientific journals as shown in Table (5.1), none of the studies from The Internet and Higher Education journal met the eligibility criteria. Educational Technology and Society was the most popular journal among the selected studies, accounting for nearly 40% of the total publications. Computers & Education was the second most popular journal, accounting for approximately 26% of the total publications. The British Journal of Educational Technology accounted for approximately 13% of the total publications, while Education and Information Technologies accounted for nearly 9% of the total publications. It should be noted that Computers & Education journal publishes some issues under the name Computers and Education, but we adopted the common name of the journal, which is Computers & Education. Furthermore, it is worth mentioning that the Educational Technology and Society journal was previously published under the name Journal of Educational Technology and Society before officially changing the name in April 2020 issue, and we have used the new name in our statistics.

The included 23 studies were conducted in different countries, languages, and educational settings, reflecting the diversity and complexity of m-learning implementation in EFL/ESL contexts. However, some patterns and trends can also be observed from the table. First, most of the studies were done in Taiwan (52.2%), which indicates that this country has a strong interest and investment in m-learning research and practice. China (13.0%) and Iran (13.0%) were also relatively well-represented in the table, while other countries such as Holland (8.7%), South Korea (4.3%), and Turkey (4.3%) had fewer studies. This suggests that there may be some regional or cultural differences in m-learning adoption and usage among EFL/ESL learners and teachers. Chinese was the dominant L2 language used in the studies (73.9%), followed by Persian (13.0%). This may reflect the popularity and demand of learning these languages in the global market, as well as the availability and accessibility of m-learning resources and applications for these languages. However, this also implies that there is a lack of research on m-learning for other L2 languages, such as English, Spanish, French, etc., which may have different linguistic features and learning challenges.

The educational level of the participants varied, with 43.5% conducted with university students, 34.8% in general education, and 21.7% using mixed participants. This shows that m-learning can be applied to different age groups and learning contexts, ranging from formal to informal settings. However, it also raises some questions about how m-learning affects learners' EFL/ESL skills at different stages of their language development, and whether there are any differences or similarities among learners with different backgrounds and prior knowledge. The research method utilized in the studies was predominantly quantitative (69.6%), with various designs such as semi-experimental + pre-post (26.1%), before-after (21.7%), and sectional study (17.4%). This indicates that most of the studies aimed to measure the effects or outcomes of m-learning on EFL/ESL skills using statistical tests or analyses. However, this also suggests that there is a need for more qualitative or mixed-methods studies that can explore the processes or experiences of m-learning from learners' or teachers' perspectives using methods such as interviews observations case studies. The most commonly used research tool was test/questionnaire (56.5%), followed by interview (13.0%) and analysis (4.3%). This implies that most of the studies relied on standardized or self-reported measures to assess learners' EFL/ESL skills or perceptions. However, this also implies that there is a need for more diverse and authentic tools that can capture learners' actual performance or behavior using methods such as portfolios recordings logs etc.

The number of participants ranged from 35 to 2744, with a total of 4728 participants across all studies. This shows that some studies had large samples while others had small samples which may affect their generalizability or validity. The male-to-female ratio was reported in 8 studies with a ratio of 0.71 71 males to 100 females among the reported participants. This indicates that there may be more female than male participants involved in m-learning research which may reflect their preferences or attitudes towards m-learning. However, this also indicates that there may be some gender differences or biases in m-learning research which may affect their results or implications.

Regarding mobile apps, 17 (73.9%) studies used designed apps, 2 (8.7%) studies used Facebook and Recoding, 1 (4.3%) study used Raz-Kids, 1 (4.3%) study used LINE, 1 (4.3%) study used WeChat, and 1 (4.3%) study used Telegram. The most commonly used app was a designed app, with the majority of studies (73.9%) utilizing it. It's interesting to note that the studies conducted in Taiwan utilized predominantly Chinese as the L2 language and had a higher percentage of university student participants compared to the studies conducted in South Korea, Iran, and Turkey. This may suggest a focus on academic-oriented mobile learning interventions in Taiwan. Additionally, the high percentage of studies utilizing designed apps (73.9%) indicates a trend towards customized mobile learning tools tailored to specific learning goals and objectives. However, the limited number of studies conducted outside of Taiwan and the low diversity of L2 languages used in the studies may limit the generalizability of the findings to other EFL/ESL contexts. Future research may benefit from exploring mobile learning interventions in other countries with varying L2 languages and participant demographics.

The descriptive overview of the 23 studies reveals some strengths and weaknesses of the existing literature on m-learning implementation in EFL/ESL contexts. On one hand, the studies demonstrate that m-learning can be a viable and effective way to enhance learners' EFL/ESL skills across different countries, languages, and educational settings. The studies also show that m-learning can offer various affordances such as flexibility, interactivity, authenticity, feedback, collaboration, etc., that can facilitate learners' language learning process and outcome [56]. Moreover, the studies provide some evidence of the positive effects of m-learning on EFL/ESL skills, such as improving learners' listening comprehension, speaking fluency, reading comprehension, writing accuracy, vocabulary knowledge, grammar proficiency, etc.

On the other hand, the studies also reveal some limitations and challenges of m-learning implementation in EFL/ESL contexts. One limitation is that most of the studies were conducted in Taiwan or China using Chinese as

L2 language which may limit their generalizability or applicability to other contexts or languages. Another limitation is that most of the studies used quantitative methods or tools to measure learners' EFL/ESL skills which may not capture their actual performance or experience using m-learning. A third limitation is that most of the studies did not report or control for some important variables such as learners' prior knowledge motivation attitude etc. which may affect their m-learning outcomes. A fourth limitation is that most of the studies did not compare different types or features of m-learning applications such as gamification personalization adaptivity etc. which may have different impacts on learners' EFL/ESL skills [2].

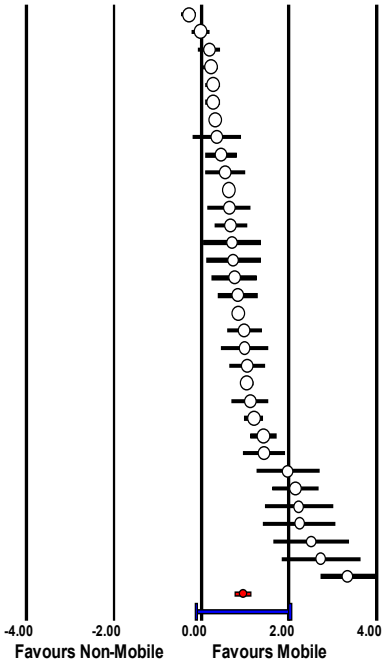
Figure (5.2) Word Cloud

According to the word cloud shown in Figure (5.2), the features of mobile applications used in EFL/ESL learning for non-native speakers of English are dominated by internet connectivity, mobile network access, GPS location tracking, video and audio capabilities, and touch screen functionality. These features were found to be the most prevalent among the characteristics of mobile devices and applications used in the studies included in the present systematic review and meta-analysis.

5.3 Meta-Analysis and Effect Size

Mobile Learning Implementation in EFL/ESL

Study name	Subgroup within study	Hedges's g	Lower limit	Upper limit	Z-Value	p-Value
Xiangming	Reading	-0.2882	-0.4466	-0.1298	-3.5660	0.0004
Hsu	Learning performance	-0.0193	-0.2066	0.1680	-0.2024	0.8396
Kim	Vocabulary	0.1823	-0.0599	0.4246	1.4752	0.1401
Xiangming	Learning performance	0.2169	0.0599	0.3740	2.7080	0.0068
Xiangming	Listening	0.2613	0.1034	0.4191	3.2446	0.0012
Xiangming	Writing	0.2660	0.1081	0.4240	3.3015	0.0010
Chen	Vocabulary	0.3254	0.2196	0.4311	6.0284	0.0000
Sandberg a	Learning performance	0.3594	-0.1778	0.8967	1.3113	0.1897
Tai	Grammar	0.4479	0.1074	0.7884	2.5781	0.0099
Huang	Learning performance	0.5430	0.1009	0.9851	2.4072	0.0161
Chen	Reading	0.6290	0.5161	0.7418	10.9228	0.0000
Wu Q	Vocabulary	0.6303	0.1554	1.1053	2.6011	0.0093
Shadiev	Learning performance	0.6731	0.3044	1.0417	3.5783	0.0003
Cavus	Listening	0.7078	0.0568	1.3589	2.1309	0.0331
Wang	Vocabulary	0.7321	0.1177	1.3465	2.3353	0.0195
Wu T	Vocabulary	0.7578	0.2562	1.2593	2.9613	0.0031
Lin b	Comprehension	0.8355	0.3933	1.2777	3.7030	0.0002
Chen	Learning performance	0.8435	0.7234	0.9636	13.7653	0.0000
Liu	Listening	0.9863	0.6034	1.3692	5.0491	0.0000
Motlagh	Vocabulary	0.9879	0.4617	1.5140	3.6800	0.0002
Rezaee	Speaking	1.0427	0.6432	1.4423	5.1152	0.0000
Chen	Listening	1.0435	0.9153	1.1717	15.9506	0.0000
Tai	Vocabulary	1.1123	0.6966	1.5280	5.2440	0.0000
Xiangming	Speaking	1.1987	0.9949	1.4025	11.5261	0.0000
Sandberg b	Vocabulary	1.4216	1.1374	1.7059	9.8022	0.0000
Lin b	Learning performance	1.4349	0.9588	1.9110	5.9071	0.0000
Lin a	Speaking	1.9819	1.2754	2.6884	5.4983	0.0000
Mellati	Vocabulary	2.1518	1.6354	2.6681	8.1673	0.0000
Hayati	Comprehension	2.2261	1.4630	2.9892	5.7177	0.0000
Cavus	Reading	2.2427	1.4309	3.0544	5.4149	0.0000
Cavus	Vocabulary	2.5138	1.6618	3.3658	5.7829	0.0000
Cavus	Comprehension	2.7352	1.8485	3.6219	6.0460	0.0000
Wu W	Reading	3.3431	2.7382	3.9481	10.8311	0.0000
Pooled		0.9524	0.7606	1.1442	9.7320	0.0000
Prediction Interval		0.9524	-0.1176	2.0220		



Random Effect

Figure (5.3) Forest Plot of Effect Sizes

The researchers used a random effect model for their meta-analysis of effect sizes, which allows for different treatment effects across studies and communities. This model can generalize the

overall effect to similar communities, but it has some limitations and depends on the tau-squared value [48]. Therefore, they used a forest plot figure (5.3) to synthesize the effect size of mobile learning on teaching English as a foreign or second language from 2011 to 2020. They analyzed 33 effect sizes from quantitative studies with the CMA 4 program and the Hedges' standard mean difference index (g=0.9524). The forest plot figure (5.1) shows that mobile learning was favored over non-mobile learning when the values were positive, and vice versa when they were negative. The effect sizes for each study were displayed in ascending order (-0.2882, 3.3431) and within the bounds of lower limit (-0.4476) and upper limit (3.9481).

Table (5.2) Pooled Effect Size and Null Hypothesis Test

	Effect size and 95% confidence interval						Test of null (2-Tail)	
	N	est	σ_M	$\boldsymbol{\sigma^2}$	Lo	Up	Z	P
Fixed	33	0.57	0.0204	0.0004	0.53	0.61	28.17	0
Random effects	33	0.952	0.0978	0.0096	0.76	1.14	9.73	0

Table (5.2) shows that the average true effect size is (0.9524) with a range of (0.7606) to (1.1442). This means that the true effect size could be anywhere in this range. The Z-score of (9.732) with ($p < 0.001$) tells us that the average effect size is not zero for similar studies. We used the random effects model to estimate the average effect size because it varies across studies. We can apply our findings to other studies in the same population.

Table (5.3) Prediction Interval and Heterogeneity Statistics

	Prediction Interval		Between-study		Other heterogeneity statistics			
			Tau	Tau^2	Q	Df	P	I^2
Fixed					618.6	32	0	94.8
Random effects	-0.12	2.02	0.51	0.26				

The Q-test checks if all studies have the same effect size. If they do, the Q-test value should be (N-1), where (N) is the number of studies. Table (5.3) shows that the Q-test value is (618.6) with (32) degrees of freedom and ($P < 0.001$). The Tau-squared value is (0.283), which means that the studies are different. So, we reject the idea that they have the same effect size. It also shows other statistics for fixed and random effects models. The random effects model assumes that the true effect size varies across studies. But this does not depend on the Q-test or P-value, which only tell us if there is any difference in effect sizes. We also need to know how much they differ. That's why we use the predictive inference value. It shows that I^2 is (94.8), which means that most of the variation in effect sizes is due to real differences and not chance. I2 does not tell us how different the studies are, but the prediction interval does. The table also shows that Tau-squared and Tau measure the variance and standard deviation of true effect sizes in Hedges's g units.

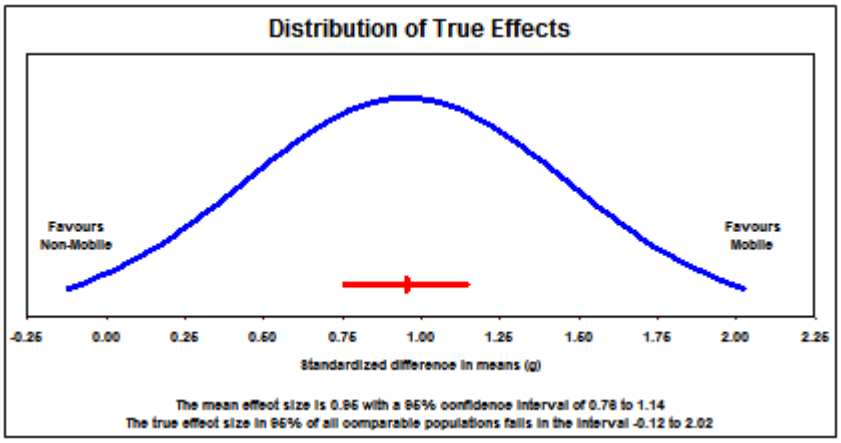


Figure (5.4) Distribution of True Effects and Interval Prediction

Figure (5.4) shows the true effect size distribution. The average effect size is (0.95) with a range of (0.76) to (1.14). This means that any study in this meta-analysis has an effect size between these values with 95% confidence. For any study in a similar population, the effect size could be between (-0.12) and (2.02) with 95% confidence, but more likely near (0.95).

Based on the previous analyses, [48] suggest using the right statistic for each question. The Q-test value asks "Is there any difference in effect size variation?", the I2 value asks "How much of the variation is due to real effects and not chance?", the Tau-squared value asks "How much do real effects vary?", and the Prediction Interval value asks "What is the range of real effects?" This value also shows how different real effects are on the same scale as the average effect size. This value helps us predict the effect size for future studies. This study shows that future studies could have an effect size from (-0.12), which is negative for mobile learning, to (2.02), which is very high for mobile learning. But figure (4.4) shows that the likely effect size is between (0.50), which is average, and (0.80), which is high.

To check if the results are stable, we did some tests with CMA 4 software and found that they did not change when we removed some studies with big sizes or high effects. We did a One Study Removed test as shown in figure (4, 14) and saw that deleting one study did not affect the overall effect size much. The smallest effect size value ranges from (0.8783) to (0.9524), and they all show that mobile learning has a significant impact on teaching English as a foreign or second language. The weights are similar and stable. The overall effect size is the average of the individual effects. Each study adds about (3%) to the average. No study is too big or small. Most studies affect the effect size and heterogeneity.

5.4 Publication Bias

Publication bias is a significant concern in meta-analyses, including longitudinal studies. The overestimation of the overall effect size may result from the omission of studies due to various reasons, including researchers' choices and journal preferences for positive outcomes. The use of a funnel plot can reveal the existence of publication bias, and several statistical tests, including Classic Fail-safe N and Orwin Fail-safe N, can measure its magnitude. In this study, Classic Fail-safe N was 7581, indicating that we need to include 229.7 missing studies for each study in the meta-analysis to invalidate the overall effect size. Orwin Fail-Safe N was 999, meaning that 999 studies with an average effect size of -0.01900 are required to make the overall effect size negative. Begg and Mazumdar Rank Correlation Test showed a significant correlation between effect size and standard error (Kendall's tau = 0.31250, P-value = 0.01057). Finally, Egger's Regression Intercept Test indicated no significant publication bias (intercept = 0.057, t-value = 0.833, P-value = 0.414). These tests provide a more accurate assessment of the level of publication bias and its impact on the overall effect size.

5.5 Subgroups Analysis

The study conducted a meta-analysis to examine the effect of mobile learning on Learning English as a foreign or second language, specifically analyzing its impact on

language skills and their mediators. The overall average effect size was found to be large (0.9524), indicating a significant very large positive effect on all language skills studied. To study the effect size of each skill, the analysis used subgroups and moderators to determine the contribution of each mediator variable to the overall effect size. The Random Effects model was used among studies at each level of the variable and mediator, and the Fixed Effects model was used to combine levels of the mediator variable to calculate the overall effect size. The variance between each study (tau-squared) was assumed to be the same for all levels of the mediator variable or subgroups.

The subgroups meta-analysis, depicted in Figure (4, 18), revealed that only one study was included for each of the grammar and writing skills, requiring their exclusion from the subgroup analysis, though they were still included in the overall analysis of English language. Each diamond in the plot represents the random effect size and its confidence interval for the subgroup, with the blue horizontal line below each diamond indicating the prediction interval. All overall effect size means for the subgroups were to the right of the zero effect value, indicating a preference for mobile learning in teaching English as a foreign or second language. Each language skill was discussed in detail in the language skill moderator section.

The study conducted a moderator analysis for the language skill variable, excluding the grammar and writing skills, which had only one study each. The analysis revealed no statistically significant difference between the levels of the mediator variable (language proficiency), as indicated by the Q-value (9.845) with a degree of freedom (5) and a p-value of 0.08.

In the multivariate analysis of the moderator variable (publication year), the years 2013 and 2019 were excluded due to having only one study. For the remaining years from 2011 to 2020, the null hypothesis stating no individual differences in effect sizes between the studies included in all years except for 2012, 2015, and 2016, was rejected. The analysis showed that there were differences in effect size means between mobile-assisted and non-mobile-assisted learning of English as a foreign language in favor of mobile-assisted learning in the publication years 2011, 2014, 2017, 2018, and 2020. For the years 2012 and 2015, the null hypothesis of no individual differences in effect size means for the studies published in those years was accepted, with Z-values of 1.74 and 1.83 and p-values of 0.08 and 0.07, respectively. The null hypothesis was also accepted for the year 2016, with a Z-value of 1.01 and a p-value of 0.31. Table (4, 14) shows the distribution of effect sizes among the median variables - publication year.

Finally, the Q-value tests of the moderator variable (Publication Year) revealed a Q-value of 37.99 at degrees of freedom (7) and a p-value of $0.00 < 0.05$. This indicated a rejection of the null hypothesis that there are no statistically significant differences between the mean effect sizes for levels of the moderator variable (Publication Year) and a conclusion that there are statistically significant differences in favor of mobile learning. All statistical results were taken into consideration.

6. CONCLUSION

In conclusion, the results of quantitative analysis show that the use of mobile learning technology and its applications has a significant effect size (g=0.945) on teaching English as a second language. This is supported by the quantitative analysis of the four basic language skills: listening, speaking, reading, and writing, as well as other language-related skills such as vocabulary and grammar, learning performance, comprehension, and learning outcomes such as retention and language learning strategies such as collaborative learning and continued learning. These findings are consistent with previous systematic reviews on mobile learning [8, 57–63].

Furthermore, the studies included in this research paper have shown various ways in which mobile learning can be used to improve language learning skills. Three main directions can be identified: (1) using mobile learning technology to teach English vocabulary, (2) using mobile learning technology to facilitate listening and speaking skills, and (3) using mobile learning technology to enhance reading and writing skills. Studies have shown that mobile learning can be effective in teaching

vocabulary [64–66], improving oral proficiency [22, 67, 68], and enhancing reading skills [56, 69, 70] Additionally, mobile learning can be used to promote creative interaction in language learning [71, 72] and can have a positive effect on student motivation and performance [73–75]. The results of the current paper encourage an attempt to take advantage of the innovations in educational technologies in teaching English, especially the mobile innovations [76–90].

In summary, the findings of this research paper indicate that mobile learning can be an effective and engaging way to teach English as a second language and improve English vocabulary proficiency. The use of mobile learning technology can also enhance language learning skills in listening, speaking, reading, and writing, and promote continued learning and collaborative learning strategies. These quantitative findings support the use of mobile learning technology in language learning and highlight the potential benefits for both students and educators.

7. LIMITATIONS

Despite the promising results of this study, there are several limitations that should be taken into account. Firstly, the studies included in this research paper were mainly conducted in specific contexts and settings, such as universities or language schools, which may limit the generalizability of the findings to other settings. Secondly, the studies were conducted using different mobile learning applications and devices, which may have different features and capabilities, and therefore, may affect the results differently. Finally, the studies were conducted using different research designs, which may have different levels of rigor and validity.

Therefore, there is a need for more rigorous and comprehensive research on m-learning implementation in EFL/ESL contexts that can address these limitations and challenges. Some suggestions for future research are: (a) to conduct more studies in different countries languages and educational settings using diverse and authentic L2 materials; (b) to use more qualitative or mixed-methods approaches or tools to explore learners' processes or experiences using m-learning; © to report or control for more variables such as learners' background motivation attitude etc. that may influence their m-learning outcomes; (d) to compare different types or features of m-learning applications such as gamification personalization adaptivity etc. that may enhance learners' EFL/ESL skills [91].

8. RECOMMENDATIONS

In order to overcome the limitations of the current study and encourage future research in the field of mobile learning in EFL/ESL, several recommendations are proposed. Firstly, it is recommended that more studies are conducted in different contexts and settings to increase the generalizability of the findings. Secondly, the use of standardized mobile learning applications and devices is suggested in order to minimize the potential impact of different features and capabilities. Thirdly, consistent research designs should be used to increase the rigor and validity of the studies. Finally, the potential impact of mobile learning on other aspects of language learning, such as pronunciation, cultural awareness, and pragmatic competence should be investigated. These recommendations are intended to promote more comprehensive and reliable research in the field of mobile learning in EFL/ESL, and to contribute to a deeper understanding of the effectiveness and potential of this approach to language learning.

9. SUGGESTIONS FOR EDUCATORS AND PRACTITIONERS

1. Examine the impact of mobile language learning apps on motivation and engagement.
2. Analyze the effectiveness of gamification on language proficiency.
3. Explore the use of augmented reality in language learning.
4. Investigate the use of social media for language learning purposes.
5. Examine the effectiveness of chatbots in providing personalized language learning experiences.
6. Analyze the effectiveness of using mobile technology to teach writing skills.
7. Explore the use of artificial intelligence in mobile language learning applications.

8. Incorporate mobile learning technology in language learning curricula.

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