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Mobile Learning for English Language Acquisition: Taxonomy, Challenges, and Recommendations

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ABSTRACT Mobile learning (m-learning) is increasingly becoming a popular global trend, especially among English language learners. However, despite the growing interest in mobile English language learning, there have been no reviews of research conducted on this subject. This paper represents the first attempt to provide a comprehensive analysis of the existing literature (2010–2015) to identify the taxonomy and distribution of research as well as to identify the advantages and challenges and provide some recommendations to facilitate the effective use of mobile English language learning and its applications. Following a review protocol, articles on mobile English language learning from six major databases (IEEE Xplore, ScienceDirect, Web of Science, ERIC, SpringerLink, and Wiley Online Library) were reviewed. Applying inclusion and exclusion criteria, 133 related articles were identified. The results show that the majority of studies were conducted on application m-learning technologies. Pure mobile applications were the most widely-used applications in the English m-learning context. Meanwhile, concerns regarding quality, usability, integration, financial costs, security and privacy, pedagogical practice, and safety were found to be the main challenges of mobile English language learning. Finally, some recommendations are provided for users, developers/providers, and researchers. The results of this paper can assist users, researchers, policymakers, and practitioners in the education sector to allocate the necessary resources and make plans to mitigate the challenges and facilitate the effective use of mobile English language learning in educational practices.

INDEX TERMS Mobile learning, English language, pure mobile application, blended application, taxonomy.

I. INTRODUCTION

The English language is widespread across the world and is commonly used in many fields as the primary language for communication. Furthermore, many learners around the world have started learning and using the English language in preference to their mother tongue. Most countries have also recognized the importance of the English language in education and have addressed deficiencies by making English language learning a primary factor in their planning and strategy [25]. Owing to the importance of the English language in non-native English-speaking countries, applying modern tools to support learners in learning English is a critical issue [20]. Furthermore, the English language is necessary in many areas of research, such as in publishing research articles and conference proceedings [60]. Most research articles are written and published in English, as it is the main language used in education and other academic fields [131].

Computers and other tools are useful in supporting learners studying English as a second language. Instructors need to work with technology to enhance learners' performance [102]. Mobile applications are the latest technological developments to assist in English language learning.

The term 'pure mobile application' refers to software programs that are used only with mobile technologies, that

is, they are not applicable to computers or e-learning technologies. Pure mobile applications refer to game techniques, game applications for learning, non-games that use other applications, tools (mobile devices with pre-installed software for the learners), or media that use videos, voices, pictures, and short message services/multimedia message services (SMS/MMS). The term 'blended mobile applications' refers to software programs that use mobile technologies within other technologies, for example, computers. Blended mobile applications can be games, non-games, media, or text message applications.

While mobile devices have limitations, they also have many advantages compared to computers. They are cheaper than computers, many students already own them, and they are accessible almost anywhere and at any time due to their mobility [10]. Mobile phone usage was found to have improved the outcomes of learners in the Philippines, Mongolia, Thailand, India, and Bangladesh, as they increased educational access and thus encouraged new learning [137]. Moreover, mobile learning (m-learning) can help learners to collect information and create an environment to support them, irrespective of time or location [47], [156].

In recent times, instructional designers and educators have challenged the use of mobile technology in learning. Nonetheless, investigation of the scope of m-learning and the impact of using its latest technology in education have received relatively little attention in research [7]. Indeed, within the existing literature, the findings of previous studies have been contradictory. While there have been numerous valuable syntheses of previous studies on m-learning, there are areas which require more examination [153]. Additionally, although the prospects of using mobile devices to support learning are promising, particularly due to the multimedia capabilities, portability, connectivity, and flexibility of these devices, there is a lack of empirical evidence to show that mobile technology improves student learning, specifically among the English language learner (ELL) population. In fact, m-learning is still very much on the fringes of classroom pedagogy for language learning [16], [30].

Despite the optimism concerning the potential of mobile technology for language learning, several authors have claimed that there is a lack of high-quality empirical evidence to support it [46], [138]. The lack of fundamental understanding about the main aspects of electronic learning could negatively affect student learning. Therefore, increasing the quantity of evidence-based research to identify ways for improving the quality of learning is recommended [61].

A. RESEARCH SIGNIFICANCE AND RESEARCH OBJECTIVES

Currently, learning English is becoming an increasingly popular trend, and developing mobile assisted-learning tools is a critical issue in the English-language education field [20], [157], [158]. There have been various review studies on mobile and ubiquitous learning [7], [79], [153], [159]–[163]. These reviews have focused on different aspects of m-learning such as m-learning apps, learning games, pervasive learning, and research trends. However, despite the growing interest in mobile English language learning, there have been no reviews of the research conducted on mobile English language learning. Therefore, this study is the first attempt to systematically review and analyse the published papers on mobile English language learning to identify the research taxonomy, advantages, and challenges, as well as to provide recommendations to users, developers/providers, and researchers in the education sector. Therefore, the main objectives of this study are:

- To identify the taxonomy and distribution of research studies on mobile English language learning and its applications.
- To identify the advantages and challenges of mobile English language learning and provide some recommendations to facilitate its effective use.

Consequently, the research questions (RQs) that have been formulated for this study are as follows:

RQ1. What is the taxonomy of mobile English language learning studies?

RQ2. What is the distribution of papers published on this topic?

RQ3. What are the advantages of mobile English language learning?

RQ4. What are the challenges facing this research area?

RQ5. What are the recommendations that can facilitate the effective use of mobile English language learning?

The systematic review approach is 'the most reliable and comprehensive statement about what works' [89]. The 'systematic literature review (SLR) provides a means for the evaluation and interpretation of the available research which is pertinent to a specific topic area, research question, or a phenomenon of interest' [164]. In fact, conducting an SLR helps to summarize the current empirical evidence and identify gaps in the research. In addition, systematic reviews involve identification and synthesis of all available evidence, both quantitative and qualitative, to generate a sound, empirically derived answer to a focused research question. SLR is an accurate, clear, and transparent form of literature review that has widely been used by previous researchers to recapitulate the existing research in different fields [165]–[169]. Consequently, following a systematic methodology, we conducted an SLR to review and analyse selected research articles from 2010 to 2015 from six major databases: IEEE Xplore, ScienceDirect, Web of Science, ERIC, SpringerLink, and Wiley Online Library. Finally, the relevant information was extracted from selected papers and reports based on our research questions.

This study attempts to provide a comprehensive analysis of the existing literature to understand the taxonomy, advantages, and challenges of mobile English language learning and thus to provide some recommendations to facilitate its effective use. The results of this study are expected to expand the existing body of knowledge on m-learning, mobile language learning, and English language learning to help users,

researchers, policymakers, and practitioners in the education sector allocate the necessary resources and make plans to support future research and applications and thus improve educational practices.

The remainder of this study is organised as follows: Section 2 presents the research methods used for selecting the literature. Section 3 presents the results of the review. Section 4 discusses the results and presents the advantages, challenges, and recommendations. Section 5 lists the limitations of the study and Section 6concludes the paper.

II. METHOD

A systematic literature review of research articles published between 2010 and 2015 was conducted, as 2010 was the year of the highest rate of mobile phone sales (IDC reference). M-learning spending was the highest between 2010 and 2015 [44]. In 2010, the first iPad was launched and since then there has been an explosion of so-called m-learning-focused initiatives [73]. We restricted our search to articles on the role of m-learning in enhancing English language learning using a systematic search procedure [170].

A. REVIEW PROTOCOL

We developed a research protocol to document our research question, search strategy, database selection, inclusion and exclusion criteria, and quality assessment criteria. Our process followed the steps described in Fig 1.

1) RESEARCH QUESTION

To conduct a systematic review, the primary research question had to be formulated first. After specifying the research questions, the review procedure involved building search strategies to recognize and extract relevant studies [171]. The intent of this review was to identify the taxonomy of research studies on mobile English language learning and its applications, to outline the distinguishing features of this emerging line of research, to identify the advantages and challenges of mobile English language learning and its applications, and to provide some recommendations to mitigate the challenges and facilitate its safe and effective use.

2) SEARCH STRATEGY

To create a comprehensive search strategy, we first identified keywords and then alternative ways of expressing them. We consulted with fellow academics to ensure we had covered all possible alternatives. The search was conducted at the beginning of February 2016. We altered the search string to fit the formatting requirements for each database. The general strategy was as follows:

((m-learning) OR (m-learning) OR (mlearning) OR (personalized learning) OR (ubiquitous learning) OR (u-learning) OR (anytime and anywhere learning) OR (mobil∗ learn∗)) AND (English language).

3) LITERATURE DATABASES

We conducted the primary search from online research databases (IEEE Xplore, ScienceDirect, Web of Science (WoS), SpringerLink, Wiley Online Library, and the Education Resources Information Center (ERIC)), journal publications, and conference proceedings. We searched all available educational databases, irrespective of whether they offered scientific or technical literature.

4) STUDY INCLUSION/EXCLUSION CRITERIA

To ensure we included the most relevant research, we restricted the publication period from January 2010 to December 2015. Only papers written in English were included. We used the following criteria to determine if an article would be included in the present study:

- The article was published between 2010 and 2015;
- The full text was available (i.e. conference abstracts were excluded);
- The topic was English language acquisition through m-learning;
- The article was written in English.

B. SELECTION PROCESS

1) JOURNALS AND CONFERENCE ARTICLES

In the first stage, all non-published journal and conference articles were excluded manually.

2) FULL TEXT AVAILABILITY

In the second stage, any article for which the full text was not available was excluded. This included conference abstracts, letters to the editor, opinion pieces, advertisements, and others.

3) FULL TEXT UNAVAILABLE

In the third stage, any article that was not fully accessible from the available databases was excluded.

4) USE OF TECHNOLOGY FOR ENGLISH LANGUAGE ACQUISITION

In the fourth stage, articles whose titles or abstracts did not show any evidence of having investigated the use of technology for English language learning were excluded.

5) NON-ENGLISH LANGUAGE ARTICLES

In the fifth stage, any article that was not written in English was excluded.

6) USE OF m-LEARNING TECHNOLOGY FOR ENGLISH LANGUAGE LEARNING

In the sixth stage, after a complete reading of the full texts of all included articles, those that did not report on the use of m-learning for English language learning were excluded.

7) DUPLICATES

In the last stage, any duplicated article was excluded.

C. DATA REPORT PROCESS

Finally, all included articles were classified into two categories: non-application and application articles. After the initial categorization, they were further classified into finer distinctions based on their research focus. All articles were then summarized and their data were entered into tables,

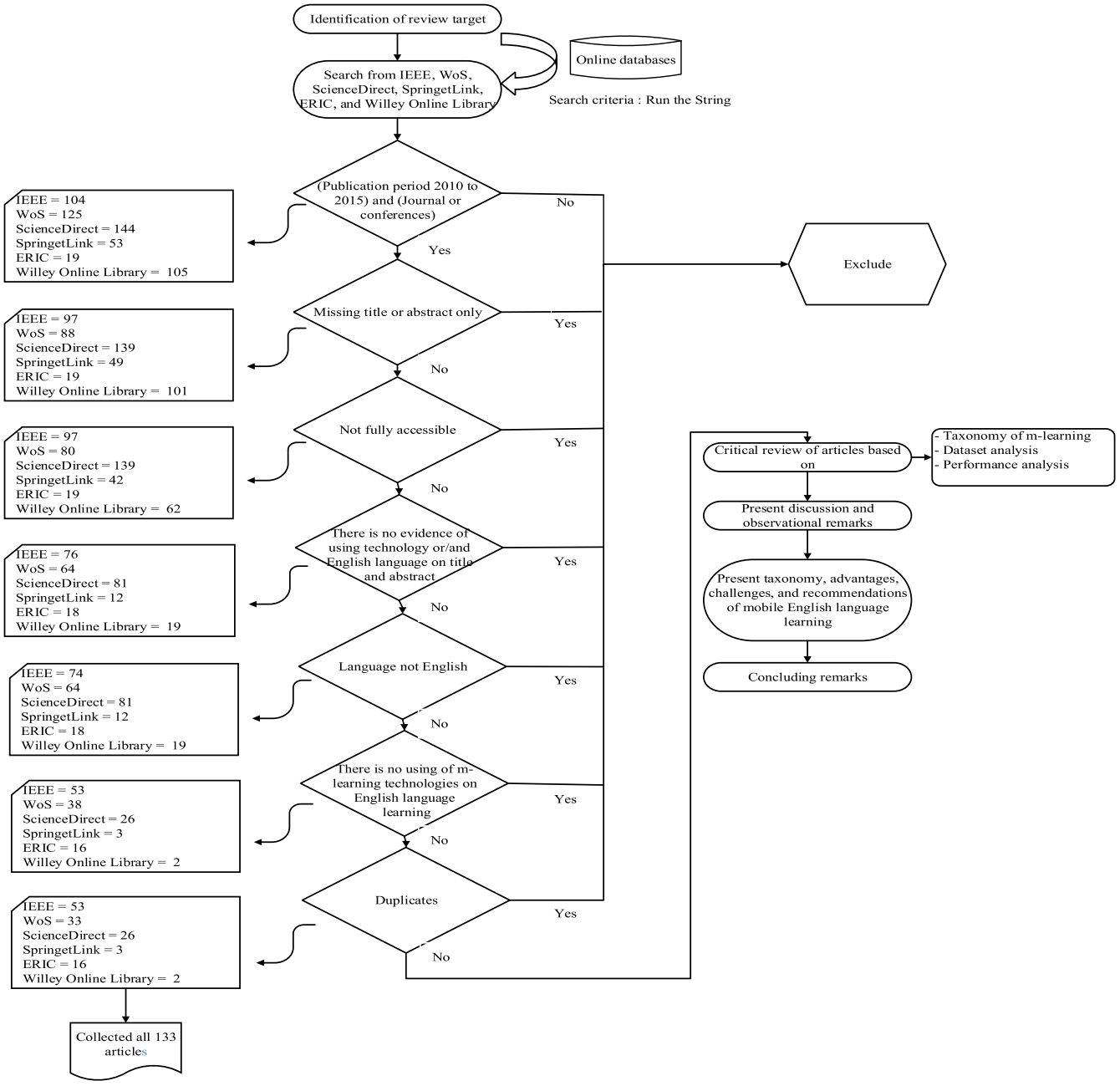

FIGURE 1. Flowchart of the study selection.

including the source database, author(s), year of publication, purpose, problems in the research, results, audience, assessment, English language skills targeted, and mobile language technologies used. These items were selected in alignment with the objective and research questions of this review. Following the completion of this step, the analysis stage was started to answer each of the research questions.

III. RESULTS

From all the databases (2010 to 2015), 550 articles were found, with 104 from IEEE Xplore, 144 from ScienceDirect, 125 from WoS, 53 from SpringerLink, 19 from ERIC, and 105 from Wiley Online Library. Upon applying the inclusion criteria at the title/abstract level, only 270 articles were included. Full-text analysis resulted in 138 included articles. Five articles were duplicates; therefore, the final number of included articles was 133.

As mentioned above, the included articles were divided into two groups: non-application and application articles (Figure 2). Thirty-two articles dealt with non-application. Of these, 24 reviewed or surveyed m-learning without any application, four articles were concerned with modelling and framework issues, two were concerned with the design architecture or structure of the target system, and two others

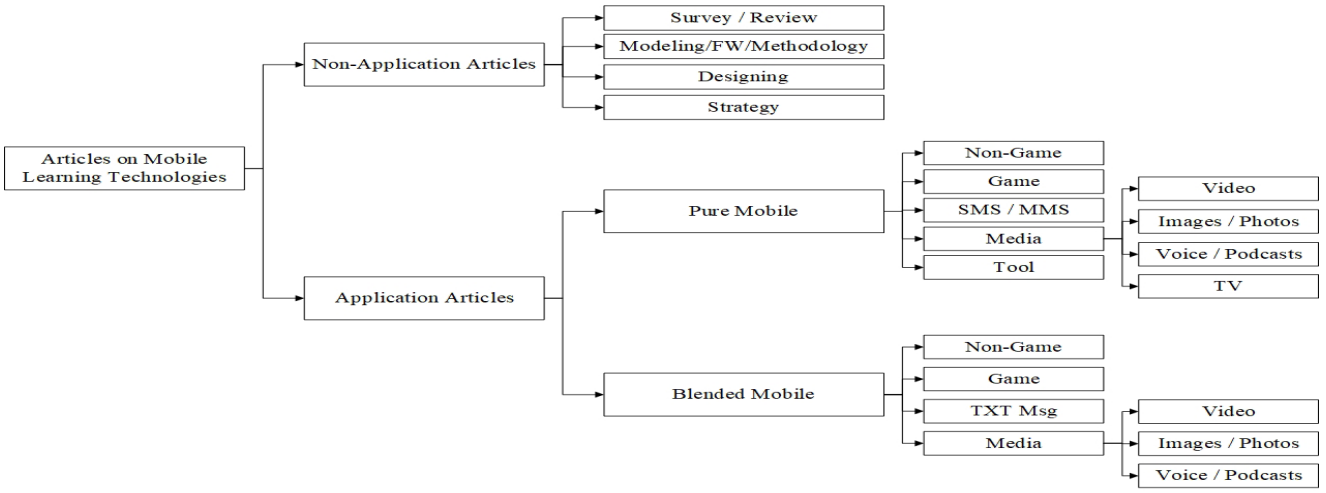

FIGURE 2. Taxonomy of research literature on m-learning and its applications.

studied strategies that are used in m-learning. In contrast, the remaining 101 articles dealt with the use of applications in English learning. Of these, pure mobile application articles accounted for 59, while 42 articles were on blended applications that combined m-learning with e-learning. Both these have sub-categories of game and non-game applications and media applications. However, SMS/MMS use pure applications while text messages use blended applications.

A. TAXONOMY

1) NON-APPLICATION ARTICLES

a: REVIEW AND SURVEY ARTICLES

The review articles were divided into two parts. The first part included articles that reviewed applications, systems, or projects [3], [13], [16], [106], [137]. The second part included general review articles [51], [53], [129]. The survey articles concentrated on previous usage of mobile applications and tools [29], [39], [62], [64], [72], [76], [83], [92], [96], [105], [107], [122], [123], [138], [148], [154]. Only four of the articles mentioned the English skill used, including [3], in which vocabulary was reviewed; and [92] and [154], in which writing was reviewed; and [39], in which listening skills were reviewed.

b: MODELLING/FRAMEWORK/METHODOLOGY

The second category of the taxonomy represents all the articles that developed a model, framework, and/or methodology to improve general English skills without mentioning any specific skill. Articles containing a review of methodology [26], investigation of theories and models [1], [38], and designing mobile tools [90] were included in this category.

c: DESIGNING

Designing refers to the system architecture and structure of applications that enhance learners' learning outcomes. Two such articles, [99], [151], which targeted English vocabulary and general English skills respectively, were identified.

d: STRATEGY

Two articles reported on the strategies that mobile applications use. The first one was a comparison between two strategies [8] and the second one investigated many strategies [148]. The objective of both the articles was to find the best technique for improving vocabulary.

2) APPLICATION ARTICLES

a: PURELY MOBILE APPLICATIONS

(i) NON-GAME

This sub-category contains all the applications that did not show any evidence of using games, SMS/MMS, or media. Articles belonging to this sub-category were as follows: learning one English skill, such as vocabulary [22], [52], [67], [74], [112], [140], [142], [143]; reading [41], [55], [145]; pronunciation/speech [80], [104], [117], [146]; learning two or more English skills but not all [34], [111]; and learning all English skills (speaking, listening, reading, writing, and vocabulary skills) [12], [42], [87], [97], [99], [120], [125].

(ii) GAME

The articles that applied mobile game applications to improve learners' English performance include learning one English skill, such as vocabulary [86], [114], [115], writing [58], learning two or more English skills but not all [44], [49], [124], and learning all English skills [56], [65], [68].

(iii) TOOLS

The articles that studied the use of mobile devices to improve only the learners' performance in learning the English language covered one English skill, namely listening [17], [23], [85], [110] and writing [45], learning two or more English skills but not all [33], [57], [59], and learning all English skills [5], [36], [48], [91], [95], [109].

(iv) SMS/MMS

Only three articles addressed the use of SMS/MMS. Two of them sought to improve vocabulary [6], [130], while the other attempted to enhance all English skills [31].

(v) MEDIA

Many types of media were covered in the seven pure application articles. For example, podcasts and music were used for all English skills [9]; for listening, images, and voice [74]; and for conversation [66]. TV was used for all English skills [37]. Video was employed for vocabulary [94], [152], and for all English skills [43].

b: BLENDED APPLICATIONS

(i) NON-GAME

Blended applications for non-game use appeared in articles for learning only one English skill, such as speaking/pronunciation [70], [136], [147], vocabulary [2], [9], [21], [101], [134], [150], reading [18], [24], [50], [75], [78], [108], [118], [144], translation [132], and listening [98]. Blended applications for non-game use appeared in articles for learning two or more English skills but not all [84], [88] and learning all English skills [11], [14], [27], [40], [69], [103], [121], [126], [135].

(ii) GAME

Articles that applied mobile game applications to improve learners' English performance include those that aided in learning one English skill, such as writing [93], vocabulary [141], or reading [77]. Applications that offered the capability to learn two or more English skills but not all were examined [128], and learning all English skills were examined [82], [149].

(iii) TEXT MESSAGE

Text messaging is now commonplace as an alternative means of mobile communication. However, only one article analysed the use of text messaging; in this article, text messages were used to learn all English skills [133].

(iv) MEDIA

Seven blended application articles used many types of media, such as music/podcasts for learning all English skills [113], photos for learning all English skills [81], and videos for learning two English skills [28], [116]. Media were used exclusively for learning listening skills by [54].

B. DISTRIBUTION RESULTS

In this section, we list our results by year of publication, journal, and distribution of articles based on the English skills targeted.

1) DISTRIBUTION BY YEAR OF PUBLICATION

Figure 3 shows the publication trends for the three categories of articles (review, pure, blended) for each year. In general, the publication rate increases each year for each of the three categories. In addition, pure applications were the most frequent topic in m-learning publications for the last two years in a row.

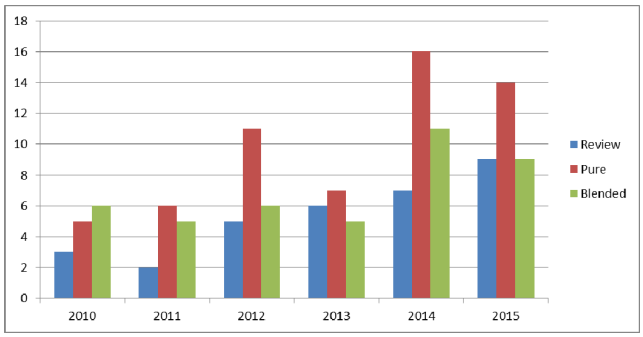

FIGURE 3. Number of included articles in different categories by year of publication.

2) DISTRIBUTION BY ENGLISH TOPIC

In this study, the English skills targeted were divided into three main categories: one English skill (vocabulary, reading, listening, speaking, writing, or translation), two or more but not all English skills, all English skills, or not specified (merely says English language). Figure 4 shows the total number of articles by English skill category. The study also shows the taxonomy of English skills. Sixty out of 133 articles mentioned that their study targeted all English skills but some of them did not provide any such information. Thirteen out of 133 carried out their research to improve or study two or more English skills at the same time, but not all English skills. Finally, 26 out of 133 articles focused on vocabulary acquisition and improvement. Vocabulary acquisition is the most targeted single English skill.

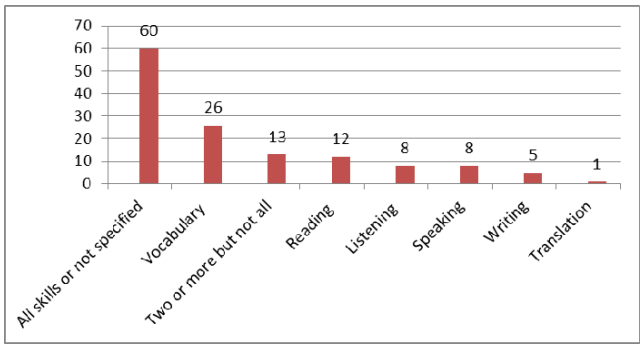

FIGURE 4. Number of included articles in different categories by English skill.

3) LANGUAGE ACQUISITION PROBLEMS

Forty-one out of 133 articles developed an application to solve the problem of low motivation amongst learners (Table 1). Sometimes students are less motivated to learn the English language and quickly give up [127, 139]. Accordingly, enhancing students' English learning performance and motivation is a prospective area of research

TABLE 1. Number of publications with different English problems.

Problem with English language learning	No.	% (n=13
Motivation	41	30.82
Lack of identifying needs, reports, studies, or testing the effect of technologies	39	29.32
Language difficulties, limitations of vocabulary, or lack of reading materials	17	12.78
Others	16	12.03
Lack of equipment or poor current equipment, technique, or software	8	6.02
Culture	5	3.76
Lack of standardized curriculum and teaching methods	5	3.76
Unqualified English teachers or poor teaching quality	2	1.51

interest [82]. Other issues include the need to study the effects of applying a new technology in the classroom [109], lack of studies [148], lack of research on using m-learning [75], or testing these technologies in the education sector [99]. Using these technologies may help learners to obtain skills required to survive in a complex, highly technological, knowledge-based economy [35]. These issues are discussed in 81 of the 133 articles.

Other problems relate to vocabulary difficulty and limitations [18], lack of reading materials [55], and disabilities related to language learning [23]. This issue combines two English skills because of the strong relationship between a reader's vocabulary and reading comprehension [15]. The problems of poor or missing equipment [91], technique [80], or software [70] are also important issues. Culture is an issue as well [28], as adopting a new culture and dealing with different socio-cultural environments is challenging. Moreover, some learners prefer informal learning to formal learning due to cultural factors [3].

Unstandardized curriculum and teaching methods create additional issues. The teaching of non-English majors is discouraging because of over-crowded classrooms, traditional curriculum, traditional classroom teaching methods, and the limited time a teacher has with each student [146]. Another problem is the availability of qualified English teachers. To enhance students' performance, teachers need to be qualified and skilled [57]. Finally, the category 'others' covers all remaining English problems such as context-aware learning [128] and pedagogical needs [66].

4) DISTRIBUTION BY DEMOGRAPHIC FACTORS

Most of the articles in this field (55 of 133 articles) studied the effects of m-learning among university students. One hundred and two articles referred to the perspective of participants of the same type, while about 13 studied mixed participant types, such as teachers and students together. It is also noteworthy that six articles did not mention their research participants at all. Most research studies did not include teachers and educators as research participants. The classification of participants for the sample taken in the research presented in the current article is given in Table 2.

TABLE 2. Demographic factors.

Participants	No.	% (n=133)
University students	55	41.35
School/Pre-school students	20	15.03
Learners/users/students (non-specific)	19	14.28
Others	12	9.02
Mixed: Students and teachers school/university	11	8.27
None	6	4.52
Foreign workers and migrant learners	4	3.01
Teachers	4	3.01
Mixed: School and university students	2	1.51

5) DISTRIBUTION BY ASSESSMENTS AND EVALUATIONS

The articles used many types of assessments to evaluate the learners' acceptance of and achievement with m-learning. Surveys/questionnaires (76/133) and tests (63/133), specifically pre-tests and post-tests (39/133), were used as the main assessment techniques to evaluate learners' performance. Learners were divided into two or more groups (59/133), which were randomly assigned, except in the studies by [17], [22], [23], and [118], in which learners were divided based on their English performance, and the m-learning technologies were assigned to the lower performing group.

6) DISTRIBUTION BY SIGNIFICANCE OF USE

According to the conclusions of the authors of 106 of the 133 articles reviewed, the use of m-learning techniques improved the learning achievements of the users. Twenty-one of the remaining articles did not show any evidence of improvement, nor were there any differences between other teaching styles and applying mobile technologies. The remaining six articles showed non-significant results.

7) APPLICATIONS ASSOCIATED WITH IMPROVED LEARNING OUTCOMES

Of the different approaches to English language acquisition, some were more effective than others. Of the research articles in this area, pure application (8 of 8 media and 2 of 2 SMS/MMS) and blended application (4 of 4 media and 1 of 1 message) studies demonstrated greater improvements in learners' English language performance. Game studies in both pure (9 of 10) and blended (5 of 7) applications made them the second-most useful way to learn the English language by using m-learning technologies.

IV. DISCUSSION

The present study revealed some interesting findings, identified some problems with the existing research, and classified

the existing literature on m-learning for English language acquisition. This section discusses the results to obtain a clear picture of the research taxonomy and present the advantages and challenges addressed in the studies examined herein. Finally, some recommendations are provided for users, developers, and researchers. The sections below report the results of a review according to the five research questions.

A. RQ1: WHAT IS THE TAXONOMY OF MOBILE ENGLISH LANGUAGE LEARNING STUDIES?

The taxonomy presented in this report shows that pure mobile applications were the most commonly used application types, but blended applications were also widely used, between 2010 and 2015. Additionally, this study found a significant difference between the use of pure and blended game applications. Games were more popular in mobile technologies. This study also represents the taxonomy of English skills targeted in m-learning. The majority of the articles mentioned that their study covered all English skills, while some of them did not provide any information. Some articles carried out research to improve or study two or more English skills at the same time, but not all English skills. In contrast, a few of the articles focused on vocabulary acquisition and improvement. In the studies other than the 60 that focused on all English skills or did not mention which English skills were studied, vocabulary was the most emphasized English skill reported by researchers. This finding reinforces the findings of [3] and [112], in which vocabulary appeared to be the most important English language skill to master.

B. RQ2: WHAT IS THE DISTRIBUTION OF PAPERS PUBLISHED ON THIS TOPIC?

1) LANGUAGE ACQUISITION PROBLEMS

The results also illustrate the problems that mobile technologies researchers have been interested in resolving. The present study shows that motivation is the area that received the most attention. This finding is in line with the claims of [32]. The second most common language learning problems addressed were the lack of an identified need for mobile technologies of this type and the difficulty in testing their effects. Together, these three issues appear in more than half the articles sampled. However, as *motivation* can be considered an educational factor, *lack of identification of needs and testing the effect of technologies* are also priorities for the researchers of the articles reviewed, as most of them have a background in computer science.

2) DEMOGRAPHIC FACTORS

This study demonstrates another interesting finding regarding the background of the participants in the research on m-learning for English language acquisition. The results revealed that in 55 out of 133 articles, the research participants were university students. Moreover, most of the participants were of the same type, rather than a mix, such as students with teachers. However, we believe that mixing participants could be a better way to get a complete picture of the efficacy of an instructional technique, especially in studies related to students and educators because using different types of participants may cover all possible perspectives. Moreover, with younger learners, language acquisition technique applications have been shown to lead to improvement [63]. Therefore, there is a need for research to focus on young learners to get a clear perspective on m-learning in the classroom. This may also be one of the factors contributing to the lack of efficacy in the interventions of the 27 articles which have shown non-significant results or no evidence of improvement. Therefore, further in-depth research in this area should be conducted to identify all the factors that can prevent the effective use of mobile technologies in language learning.

3) ASSESSMENTS APPLIED IN THE ARTICLES

Evaluation of learners' performance revealed that there are only two real methods field researchers can adopt: tests and surveys, both of which function by dividing the learners into two or more groups. Further research is also needed to examine the different sampling techniques used in these studies, as most of the chosen articles used random sampling techniques to select their research participants.

4) THE SIGNIFICANCE OF USING MOBILE LEARNING TECHNOLOGIES

Our study shows that most articles have demonstrated the significance of using m-learning technologies. Although this is a positive finding, it begs the question of why this technology has not been widely implemented in the field of education, particularly in language learning. Further investigation is needed to determine the factors that affect the integration of this technology into the education system.

5) IMPROVED LEARNING OUTCOMES

Our study found that media and games technologies have the greatest chance of improving learners' outcomes, and that this result may be due to increased engagement and enjoyment whilst learning. This result is consistent with the findings of [61]. We also found that SMS, MMS, and online messaging technology can similarly improve learners' performance. However, these pure and blended technologies received less attention than the others, as they made up only 24.06% of the total sample. Due to popularity, low cost, and ease of use, future studies are advised to pay more attention to these technologies and their potential for use in language acquisition.

C. RQ3: WHAT ARE THE ADVANTAGES OF MOBILE ENGLISH LANGUAGE LEARNING?

1) BENEFITS RELATED TO MOBILE DEVICES

MOBILITY/PORTABILITY

Mobility or portability [71] refers to the small size of the device [64], its handiness, and the fact that it can be carried in the pocket [5], giving it 'anytime and anywhere'

availability [92]. Moreover, mobile devices add value to the traditional way of learning [50] by encouraging the use of new teaching methods in non-traditional classroom situations.

2) BENEFITS RELATED TO SOCIAL CONNECTIVITY/INTERACTION

Social connectivity or interaction [110] refers to collaborative learning [123], which implies that users can share information and communicate easily.

3) BENEFITS RELATED TO CONTEXT SENSITIVITY

Context sensitivity [97] refers to the multi-functionality and many affordances of mobile devices [41], which make their use more flexible [74] and accessible [130], thus reinforcing the concept of anytime and anywhere learning.

4) BENEFITS RELATED TO INDIVIDUALITY

Individuality [129] refers to the ability of mobile devices to customize and personalize [55] learning for individual learners based on their needs, learning styles, and interests.

5) BENEFITS RELATED TO AFFORDABILITY/FEASIBILITY

The low cost of mobile devices [105] compared to computers makes them more accessible to all types of users.

6) BENEFITS RELATED TO FEATURES/FUNCTIONS AND APPLICATIONS/SOFTWARE

Mobile devices allow users to take pictures, write notes, make voice recordings or short videos, listen to music, watch audio-visual material, use bilingual dictionaries or language study software, play games, listen to radio, send text messages, engage in social networking, and make regular phone calls [43].

7) BENEFITS RELATED TO WIDESPREAD USAGE

All types of mobile devices are becoming more widely prevalent than ever before [80].

8) BENEFITS RELATED TO BROADENING THE SCOPE OF LEARNING BEYOND THE TRADITIONAL STYLE

Mobile devices and related technologies have shifted the paradigm of technology-supported classrooms. Using such technologies can help with learning aims, like improving learners' achievement and retention, supporting all levels of difficulty in learning, and reaching learners that would not otherwise have the chance to participate in education [64].

9) BENEFITS RELATED TO CONVENIENCE

Because mobile devices are always in users' pockets, they are more conveniently accessible than textbooks or computers [142].

10) BENEFITS RELATED TO INFORMAL AND FORMAL LEARNING

M-learning has the potential to revolutionize language learning and instruction with the use of mobile devices as personal learning tools to synergize in-class and out-of-class language learning spaces [141].

11) BENEFITS RELATED TO SUPPORTING DIFFERENT TYPES OF DAILY ACTIVITIES

Mobile devices can support a great amount of learning during the many activities of daily life, that is, spontaneous learning in unplanned settings outside of the classroom and outside of the normal environment of home and office [137].

12) BENEFITS RELATED TO THE SITUATING OF INSTRUCTIONAL ACTIVITIES

Learners can use mobiles as complementary devices to traditional methods of instruction and assessment [6].

13) LEARNER-CENTRED APPROACH

Mobile devices can reinforce this approach because it allows the user to start learning when he/she wants to learn [12].

14) BENEFITS RELATED TO ENJOYABLE/ATTRACTIVE PRESENTATION

M-learning has a positive effect on learners' engagement, which makes learning more enjoyable and motivates learners to more proactive participation [48].

15) BENEFITS RELATED TO IMMEDIATE FEEDBACK AND AVAILABILITY OF INFORMATION

Immediate feedback and availability of information on mobile devices are valuable tools for teaching [74].

16) BENEFITS RELATED TO SELF-STUDY

Another benefit for learners from mobile devices is that they can develop the habit of self-learning and review what they have been taught whenever they want [140].

D. RQ4: WHAT ARE THE CHALLENGES FACING THIS RESEARCH AREA?

Although attractive, m-learning is still not a complete solution to the challenges of English language learning. Researchers are concerned with the many challenges related to m-learning and its effective use in English language instruction.

1) CONCERNS REGARDING QUALITY

Some learners and teachers have negative perspectives about the future of m-learning [13] due to various concerns regarding the quality and unique challenges associated with mobile device use in learning. Some of these challenges include the following: Some young learners do not have natural inclinations towards technology use, and therefore, they lose interest in using mobile devices quickly if they are not continually given new and innovative devices [75]; most learners cannot use all the technological features of advanced mobile devices [83]; learners who are using m-learning for the first time may take a while to adjust to the new style of learning [144]; students may get distracted and unable to concentrate when using mobile devices [138], which can cause disruptions in the learners' academic and personal lives [75]; the surrounding environment could be a source of

distraction for language learners [43]; m-learning in general does not respond in real-time to learners' actions in the same way a good teacher does, and this form of learning is not suitable for more in-depth learning tasks that require time to process [114]; learners with different ability levels of mobile device-use may have different learning outcomes [75]; and some of the m-learning applications that are attractive to learners may not have linguistic content [94].

Interface designers are also concerned with application design, which they consider a big challenge [19]. Some researchers are concerned that the technology applied might not be appropriate to the learning environment [75]. Most mobile assisted language learning (MALL) applications lack the fundamentals of theory and methodology [94]. M-learning itself lacks standardization and comparability [138], and its applications are designed mostly by non-experts. These designers have designed the applications in a manner similar to the face-to-face method of teaching [14]. Despite the huge growth of mobile devices, people are unable to change their habits at the same pace [138]. Finally, there is variability in the data processing rates among devices [68].

2) CONCERNS REGARDING USABILITY

As long as learners can accept and use m-learning in their studies, they can improve their performance and abilities. Some limitations that may affect usability include dependency on networks. The small size of mobile devices may cause problems such as poor presentation of graphics [64] and poor audio-visual quality [106], low screen resolution [144], restricted bandwidth, slow processing speed, limited storage space [16], limited message length [106], limited input function [69], keyboard restrictions [13], lack of processing power [83], short battery life [68], and limited applications. Some mobile devices lack certain features, such as the iPad's lack of a camera [91]. Lack of connectivity [98], platform and architecture problems [80], portable operationality [148], computing ability, and inadequate memory [146] are other potential problems. The difficulty of reading on a small screen [27], lack of homework completion [97], students treating the devices as toys outside of class [140], Internet connection speed, and examinations on mobiles are other cumbersome problems that need to be resolved. Besides these, inconvenience in viewing the learning materials, the failure to motivate learners [43], lack of universal access to modern cell phones [8], limitations of access in rural and remote areas [137], technical problems in posting materials to websites using mobile devices [141], the lack of comfort when holding a mobile device, the lack of the tactile feel of pages, the difficulty in marking up material and annotating, and the difficulty in answering easy questions [74] are among the host of other problems.

3) CONCERNS REGARDING INTEGRATION

There are significant challenges to integrating m-learning technologies into the language-learning classroom [90]. According to [83], it is no easy task to adopt e-learning or m-learning. Mobile applications cannot replace traditional school classrooms [67], and some researchers consider it as only a delivery channel [56]. Students regard m-learning as an intrusion into their lives outside of school [103]. Some parents do not allow their children to use mobile devices outside the home because they are afraid the children will lose the devices [140]. M-learning can also take away from class time [36]. Thus, m-learning may present challenges to teachers who often experience severe limitations of time availability to accomplish effective and efficient instruction with general-purpose applications [129].

4) CONCERNS REGARDING FINANCIAL COSTS

There are some financial challenges as well that learners face in the adoption of m-learning. These challenges include the high cost of Internet [103], the high cost of the devices themselves [105], and the cost that comes from unrelated information that distracts a user easily [75]. Poor educational institutions are also confronted with the financial challenges of adopting m-learning, which can create educational gaps between them and wealthier schools [95]. Furthermore, some applications must be paid for, which can place limits on usage among students and institutions [5].

5) CONCERNS REGARDING SECURITY AND PRIVACY

According to the study by [48], students who are stronger than others may take the mobile devices off beginner users and 'do it for them'. M-learning also raises on-campus Internet security issues [68].

6) CONCERNS REGARDING PEDAGOGICAL PRACTICE

Students lack sufficient opportunities to practice their language skills with teachers, classmates, and native English speakers. Some schools lack the English learning tools (hardware and software) for appropriate individual language instruction [82].

7) CONCERNS REGARDING SAFETY

There are also potential health risks related to the use of mobile devices [75].

E. RQ5: WHAT ARE THE RECOMMENDATIONS THAT CAN FACILITATE THE EFFECTIVE USE OF MOBILE ENGLISH LANGUAGE LEARNING?

1) RECOMMENDATIONS TO USERS

Users, including both students and teachers, should be aware of the recommendations from previous studies to maximize their efficacy. For example, users recommend that young learners should receive the combined-strategy instruction of online reading directly from teachers to improve their reading skills [118].

2) RECOMMENDATIONS TO DEVELOPERS/PROVIDERS

Crowdsourcing application developers are recommended to use a leader board for users with the highest reputation points.

Developers have created a crowd-sourced Filipino-English dictionary mobile application, which has been recommended for the Android audience [132]. Researchers recommend that m-learning content be richer to support vocabulary learning. Mobile devices can also be designed for speaking and writing activities in the classroom [2]. It has been suggested that student curiosity and authenticity could be triggered by different types of online tools [134].

3) RECOMMENDATIONS TO RESEARCHERS

Future research is required to examine whether variables such as gender or language ability affect the quality of student participation in m-learning. It is also recommended that further studies investigate whether Gilly Salmon's five-stage mobile device model impacts students' language acquisition achievement, compared to conventional teaching methods (once students become familiar with the technology) [1]. Researchers were asked to first investigate language-learning belief patterns [9]. Second, they were asked to explore the impact of repetitive listening to podcasts on skills and performance in English language learning and its relationship to self-efficacy, comprehension, and language-learning beliefs. Last, the long-term effects of mobile technologies on cognitive and effective constructs should be investigated with longitudinal and experimental research. It is recommended that more app-based research should be carried out to investigate the different aspects of applications from various perspectives [122], and to allow teachers to obtain MALL training opportunities.

Further research should also include comparison groups, progress in individualized instruction, and applications for commercial and extensive purposes. Moreover, future studies should investigate how English language teachers accomplish blended learning lessons. Another study [97] recommended two observational studies that researchers should conduct: teachers' interactions with students and technology as the data source. They also recommended adding interviews to observational studies to reduce the potential bias towards students with good attendance. These recommendations can be summarized in two points: First, to extend the scope of the study design and data analysis from students, technologies, and context of use to include researchers, teachers, and the effects of the study; second, adapt the study protocols and methods to the individual participants. Using interviews or observational assessments to test the use of mobile devices is also highly recommended for future research [81].

V. STUDY LIMITATIONS

The first relevant limitation of this literature survey is the number and identity of the source databases, although we believe that the chosen sample of sources comprise a broad, representative collection. Second, we confirm the fact that a snapshot of research activity on this vital trend of m-learning does not necessarily reflect the reality of its application or its impact; it simply reflects the response of the research community to the trend, which happens to be our objective in this article. Third, the rapid pace of progress in this field hardly allows for any timelines in a survey. This study has not included articles from 2016 because the study began that year and the research and revision process has been lengthy.

VI. CONCLUSIONS

Mobile technology is still in its infancy. Therefore, its application in learning is a great challenge for instructional designers and educators. The aim of this study was to provide a comprehensive analysis of the existing literature to understand the taxonomy, advantages, and challenges of mobile English language learning and thus to provide some recommendations to facilitate its effective use.

The keywords used in the research may not cover all the relevant areas. Therefore, the present study recommends that future studies use a more extensive list of keywords to retrieve a greater number of studies on m-learning and its relevant aspects. The results of the systematic review could provide educators and researchers with a comprehensive view of research trends in m-learning usage in English language learning.

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