Contemporary trends in studies on mobile learning of foreign languages: a meta-analysis

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Abstract- *Previous research has provided a review of the literature on the state of research on mobile learning, but the use of m-learning and MALL to formal and informal learning of foreign languages needs further study. The need to review the language learning assisted by mobile devices emerges from a globalized context, in which pedagogy must question itself to plan and design research drawings in which mobile learning assumes a fundamental importance in teaching practice aimed above all at new generations of students.*
This study adopts a meta-analysis approach to systematically review the literature, thus providing a more complete analysis and synthesis of 83 studies from 2009 to 2018. Previous studies focus on the effectiveness and design of the mobile learning system.
The search for databases and citations was performed by limiting the keywords referring to m-learning and to MALL. Compared to existing reviews, the results confirm revealing a skill-based approach to language learning with an emphasis on vocabulary, learning factors that influence students' perceptions and availability to use new cellular technologies.
Keywords – MALL, m-learning, foreign language learning (FLL), meta-analysis

1. Introduction

Mobile learning (m-learning) is increasingly becoming a global trend, especially among students in second language learning courses. Due to globalization, foreign language learning (FLL) has become increasingly important [1]. The diffusion of courses on mobile devices or mediated by digital technology has become so widespread in the contemporary context, which now exist without distinction for all disciplines. Only six years ago, most of the courses

languages and information technology. In reality, the enormous diffusion of courses on mobile devices is the effect of the massive diffusion of e-learning technology. From this first phase users' opinions were focused on effectiveness, preparation and flexible skills. Al-Emran, et al. [2]reported that students tend to use mobile phones compared to other devices such as tablets or PCs when using online courses. MALL is a subset of both mobile learning (m-learning) and computer-assisted language learning (CALL). MALL has evolved to support students' language learning with the increasing use of mobile technologies. Thanks to MALL, students are able to access

foreign language learning materials and communicate at any time with their teachers and colleagues. The analysis of the studies[3] on courses in foreign language learning on mobile devices brings out the tendency to focus on grammar and vocabulary followed by pronunciation and reading.

Letterature review

m-learning, from CALL to MALL, a difficult cohabitation.

International scientific literature is opposed to proposing m-learning as an evolution of e-learning and MALL as an evolution on a mere technological basis of CALL [4]. It is preferred to differentiate educational trends, user perspectives and learning outcomes in the two models and systems. If until 2012 the literature reported discussions and studies almost exclusively on CALL and e-learning, starting from 2013 in scientific papers this gap emerges strongly and the focus of the research moves towards the study of MALL and e-learning. Baran[5] points out the need

for theoretical approaches and pedagogical practices specific to these new models, a variety of research methodologies and professional development models concerning MALL and their professional repercussions.

Meta-analysis: from e-learning to m-learning, from CALL to MALL, a difficult cohabitation

Meta-analysis on m-learning and MALL applied to foreign language learning can be grouped as those on future applications of MALL research [6], m-learning applied to foreign languages[7]recent trends in learning foreign languages [8]results in terms of learning [9]. The meta-analysis on MALL and m-learning shows a model similar to those on Mall and m-learning conducted separately that provide similar results.

The meta-analysis of Bozdoğan [6]examines 32 MALL documents published between 2010 and 2015, excluding m-learning studies. In addition to the classical themes related to learning through MALL, the integration of social media, the effects on language acquisition and the design of specific mobile applications is among the research perspectives.[7] identify the taxonomy and distribution of research, as well as the advantages and challenges and provide recommendations to facilitate the learning and effective use of English mobile language. Educational data mining (EDM) combines data mining techniques with educational data for foreign languages to provide students, instructors and researchers with knowledge that can benefit academic processes. [9] selected 208 documents, from which it emerged that the DM is mainly used to predict the performance of the students, to verify the motivation of the students and to provide feedback to the instructors. Although DM have a lot to offer language learners, it is not used to its full potential.

Table 1
Meta analisys on mall e m-learning applicato all'apprendimento delle lingue (2009-2018)

Author	Dates covered	Number of papers
Bozdoğan (2015).	2010-2015	32
Uzunboylu & Genc (2017)	2005-2017	32
Elaish, et al. (2017).	2010-2015	133
Bravo et al. (2018)	2012-2017	208

2. Materials and Methods
Research Goal

This paper aims to outline current research trends in language learning assisted by mobile devices and mobile learning platforms and to provide significant pedagogical implications by analyzing research from 2009 to 2018; a grounded theory based qualitative meta-analysis procedure was fulfilled.

Then, the following research questions were asked to see the general framework of MALL research and m-learning applied to foreign language learning (2009-2018):

1. Which theoretical tendencies, design and strategies are used to teach which language skills?

2. What are the learning and teaching contexts of the implementation of m-learning and MALL?

3. Risks and opportunities for mobile learning of foreign languages?

Sample and Data Collection

Qualitative coding and iterative categorizing traditionally used in the grounded theory [10] tradition has been used to synthesise and analyze data collected from selected papers through databases (eg Scopus, Psycinfo and Google Scholar), journals (eg Computer & Education, Computer Assisted Language, Learning, System, Quarterly TESOL, Journal of Language Learning and Teaching) and search for relevant and selected research citations. Due to the nature of the methodology, a (re) selection and continuous analysis was performed during which the coding took place. The conference proceeding were not excluded to remain objective and to avoid prejudices. Thirty-five papers met the criteria form the data for the analysis. Keyword serched included the terms "foreign language mobile learning, MALL, language learning in m-learning, mobile learning and language skills (speaking, reading, writing, listening, vocabulary and grammar)". Explicit coding, as stated by Glaser and Straus [10], produced key codes such as MALL and MALL skills, technological tools, learning characteristics, research results, and challenges / limitations.

In the first stage, any paper for which the full text was not available was excluded. This included conference abstracts, letters to the editor, opinion pieces and advertisements. In the second stage, papers whose titles or abstracts did not show any evidence of having investigated the use of technology for English language learning were excluded. In the third stage, any paper that was not written in English was excluded. In the fourth stage, after a complete reading of the full texts of all included papers, those that did not report on the use of m-learning or MALL for foreign language learning were excluded. In the last stage, any duplicated paper was excluded. Finally, all the included papers were classified into two categories: applied and non-applied papers. After the initial categorization, they were further classified into distinctions based on their research objective. All the papers have been summarized and their data entered in the tables, including the source database, the author, the year of publication, the purpose, the problems in the research, the results, the public, the evaluation, the competences targeted linguistics and mobile language technologies used. These elements were selected in line with the objective and research questions of this review. At the end of this phase, the analysis phase was started to answer each of the research questions.

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Data Analyses

From all the databases (2009-2018), 382 papers were found, with 104 by Google Scholar, 100 by PsycInfo, 53 by Scopus, and 125 by WoS. Applying the inclusion criteria at the title / abstract level, only 157 items were included. The full-text analysis involved 88 items. 5 papers were duplicated; therefore, the final number of the included papers was 83. As mentioned above, the included papers were divided into two groups: applied and non applied papers (Tables 2 and 3). 28 papers concerned non-application. Of these, 24 examined m-learning or MALL without any application, 4 papers covered the strategies and design used in both systems. On the contrary, the remaining 55 papers concerned the use of applications in the learning of the foreign language. Of these, the papers for pure mobile applications represented 20, while 35 papers concerned the mental abilities and the skills learned by the users.

3. Results and discussion
  1) The non-applied papers

The non-applied papers are divided as follows: The review papers are of two types: the first examine applications, systems or projects, the latter are general. The 10 survey papers focused on the previous use of mobile applications and tools (4 dealt with vocabulary acquisition and writing and listening skills). A third classification consists of 3 papers of general pedagogy in which a model, a structure or a methodology for the teaching of foreign languages in general is developed. Two reviews of the aforementioned topics were included in this category.
A final category of four papers concerns the design (2) and strategies (2) of applications that improve students' learning outcomes.

Tab.2 The non-applied papers

Type of papers	Topic	Number of papers
Theoretical trends and methodology		
Review	Application, system and progects	5
Review	General topic	4
Survey papers	Previous usage of mobile applications and tools	10
Paper	General Pedagogy	5
Design and strategy		
Paper	App design	2
Paper	App strategy	2

  2) The applied papers

This section contains for the most part theoretical papers on learning a linguistic competence (vocabulary n= 7,

reading n= 3, pronunciation n= 4, writing n= 2, on multiple skills n= 3). A subcategory concerns mobile gaming applications to improve linguistic performance, of the 10 selected papers 7 specifically related to learning English. Numerous papers (n = 16, of which 9 to solve the problem of low motivation among students) throughout the period analyzed in this study analyze the type of mobile devices to improve the performance of students in learning a foreign language. Finally, the media involved in the learning process concern the use of SMS and MMS to improve vocabulary (n = 3), use of many media to improve language skills. Example music media (n = 7), for listening, images and voice (1) and for conversation (1). Also 2 studies concern the use of TV in improving language skills.

Tab.3 2)   The applied papers

Type	Theme	Number of publications
Paper	Linguistic skills	19
Paper	Learning games	10 (7)
Paper	Student performance	16
Paper	Media	10

  3) Distribution results

In this section, we list our results by year of publication, table 4 shows publication trends for each year.

Tabella 4. Distribution of papers by year of publication.

year	Number of publications
2018	17
2017	14
2016	8
2015	9
2014	8
2013	8
2012	4
2011	3
2010	6
2009	5

In general, the publication rate increases every year. Specifically, the application papers are of topic on m-learning were more 'frequent in the last two years.
In table 4 specific abilities of foreign language learning have been categorized: vocabulary, reading, listening, speaking, writing or translating.

Linguistic abilities	Number of paper
Vocabulary	**16**
Reading	**3**
Listening	**7**
Speaking	**4**
Writing	**2**
Translating	**2**

Thirty-four out of 83 papers said that their study covered all language skills, but some of them did not provide any such information. Furthermore, 16 papers out of 83 focused on acquiring and improving vocabulary. A single study denounces the lack and need to study the effects of applying m-learning in the classroom.

4) Distribution results by demographic factors

Most of the papers (54 of 83 papers) studied the mobile learning of foreign languages among university students. In 69 papers the participants were of the same type, while about 13 have mixed participants, which in most cases are teachers and students together. Although it should be noted that there are few studies on just teachers. The overwhelming majority of papers (67 out of 83) measure assessments in terms of learning of participants through tests, and according to the conclusions of the authors of the 75 papers reviewed, the use of m-learning and MALL techniques improved the learning outcomes of users. The remaining papers showed no significant results[11].

Discussion

The present study revealed some interesting results, identified some problems with existing research and classified the existing literature on m-learning and MALL for the acquisition of foreign languages. The following sections report the results of a review based on the three research questions.

A: Which theoretical tendencies, design and strategies are used to teach which language skills?

From the among the selected papers it is clear that mobile applications are commonly used in informal learning, but these applications are having great formal development between 2009 and 2018 in MALLs and in the m-learning applied to foreign languages. This study also represents the taxonomy of language skills aimed at learning foreign languages. Most of the papers investigate all language skills, but the greatest number concerned the acquisition and improvement of vocabulary in which vocabulary seemed to be the most important skill to master.

B: What are the learning and teaching contexts of the implementation of m-learning and MALL?

The present study shows that the construct of motivation is the area of mental abilities that received the most attention. A common problem in e-learning studies in general is the lack of identification of needs and the subsequent assessment of the effect of technologies on users[12]. The evaluation of student performance revealed that there are only two real methods that field researchers can use: tests and surveys (interviews and observations could also be used).

Most of the research participants are university students, and there are no parallel studies on students and teachers. Moreover, with the younger students, the use of m-learning and MALL for the acquisition of foreign language have led to improvements. Therefore, research should focus on young students to have a clear perspective on m-learning in the classroom. Media and gaming technologies are more likely to improve student outcomes and this may be due to immersive engagement during learning. Even online messaging technology can improve student performance.

Many of the papers analyzed showed the importance of using m-learning technologies, but we also see the low use in education, especially in language learning. It seems clear that subsequent research will have to investigate the motivations that hinder this technology in the educational system.

C: Risks and opportunities for mobile learning of foreign languages?

Among the advantages reported in the studies portability is considered an added value if compared to traditional classroom learning, since the ubiquitous dimension could also generate opportunities for collaborative learning. M-learning is heavily employed in informal learning and is seeking through scientific experimentation to also enter into the formal area of education. The mobile devices are by their nature flexible and accessible thanks to the multi-functionality (use bilingual dictionaries or language study software, play, listen to the radio, send text messages, etc.) of the instrument that exceeds the physical limits of the frontal lesson. But not only learning with others, but also personalized and individualized learning, according to the times and the ways of the students. Students consider m-learning an intrusion into their lives outside of school[13].

M-learning has a positive effect on student involvement, which makes learning more enjoyable and motivates students to participate more proactively. Immediate feedback and availability of information on mobile devices are valuable tools for teaching. they can develop the habit of self-learning.

Among the disadvantages, research has narrowed the focus over the last 5 years, as the pervasiveness of mobile devices overcame the difficulties of use that were described in the studies between 2009-2013. Although attractive, m-learning is not yet a complete solution to the challenges of learning a foreign language. Some students and teachers have negative perspectives on the future of m-learning due toconcerns about quality and teaching related to the use of mobile devices in learning. Students who use m-learning for the first time describe disorientation can be distracted and unable to concentrate before adapting to the new style of learning. M-learning and MALL in general being a pre-set tool does not respond in real time as the feedback a teacher can give [14]. The students denounce, still the lack of experiencing what has been learned with native speakers.

Students still report the difficulty of carrying out complex tests with respect to processing times granted by mobile devices. Even the different levels of initial skills in the use of mobile devices can lead to different learning outcomes. In general, although there are some papers, mobile language learning applications (MALL) lack the fundamentals of theory and methodology and M-learning applications are mainly designed by non-experts. Among the problems that may hamper learning, technological dependencies should not be underestimated [15]. Reductions in the potential of m-learning and MALL include the small size of mobile devices, poor presentation of graphics or poor audio-visual quality. Internet connection speed, reduced processing speed, limited storage space and mobile phone exams are complicated problems that can only be solved with the evolution of technology. Although there are several experiments integrating m-learning technologies in the foreign language learning room, mobile applications can not replace traditional classrooms Finally, many schools with significant geographical differences lack the tools for learning a foreign language (hardware and software).

Limits of the study

The first relevant limitation of this literature survey is the number and identity of source databases, although we believe that the chosen sample of sources includes a large and representative collection. Secondly, we confirm the fact that a comparison between the research activity on the theme of m-learning and MALL does not necessarily reflect the reality of its application simply the response of the research community to the trend. This study did not include all the 2018 papers because the study started that year and the research and review process has been long.

4. Conclusions

The development and application of mobile technologies associated with learning foreign languages is still being defined and experimentation therefore represents a major challenge for educators and educators. The purpose of this study is to provide a complete analysis of the existing literature to understand what are the theoretical trends, the design and the strategies used to teach, which language skills, what are the learning and teaching contexts of the implementation of m-learning and MALL and, finally, the advantages and challenges of mobile learning of foreign languages and therefore research the best strategies to achieve effectiveness.

Keywords used in the research may not cover all relevant areas; in future research developments, a broader selection of keywords is recommended to retrieve more m-learning and MALL studies. The results of the systematic review could provide educators and researchers with a comprehensive view of research trends in the use of m-learning and MALL in foreign language learning.

On the side of delineating the MALL research trends, this research has shown an orientation based on the skills towards language education mediated by mobile devices. Wang and Smith [16], point out that if the tasks of mobile learning are not compulsory students are reluctant to be involved in these tasks. Therefore, MALL activities must be integrated into traditional learning, otherwise they will not be successful if based on the spontaneity of the study. Another problem raised was the hesitancy of students to use mobile devices for educational purposes that are generally perceived as personal and private. MALL's studies are more focused on the study of European foreign languages and the growing interest and enthusiasm of teachers and students is considered a rich sector to be explored in future research also for its intercultural nature. Within a technological world, highly globalized and characterized by the knowledge economy, the use of mobile devices can be used by students to acquire skills necessary for adaptation in this changing world. The anthropological aspect of the culture of belonging is another problem on a global scale, that is, the adoption of a new culture and dealing with different socio-cultural environments from one's own.

Specifically for foreign language learning, some limitations to these studies concern vocabulary difficulties and the lack of reading or the area of disability related to the specifics of this learning. Future research is also needed to examine whether variables such as gender or linguistic ability influence the quality of student participation in m-learning.

There is a lack of studies on repetitive listening about self-efficacy, understanding and deep beliefs about language learning. Finally, the long-term effects of mobile technologies on cognitive and mental components, and the potential harm to mobile devices should be investigated.

The use of such technologies can support the traditional lesson and its learning objectives, can improve performance, support levels of learning difficulties and reach students in economic difficulty that could be excluded from the educational process.

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