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Review

Using Mobile Devices for Improving Learning Outcomes and Teachers' Professionalization

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Abstract: Teaching in higher education is changing due to the influence of technology. More and more technological tools are replacing old teaching methods and strategies. Thus, mobile devices are being positioned as a key tool for new ways of understanding educational practices. The present paper responds to a systematic review about the benefits that mobile devices have for university students' learning. Using inclusion and exclusion criteria in the Web of Science and Scopus databases, 16 articles were selected to argue why Mobile learning (Mlearning) has become a modern innovative approach. The results point to an improvement in students' learning through Mlearning, factors that encourage the use of mobile devices in universities have been identified, and effective mobile applications in improving teaching and learning processes have been presented. The inclusion of this methodology requires a new role for teachers, whose characterization is also specified.

Keywords: mobile learning; student centered learning; Mobile APP; university students; higher education

1. Introduction

Several studies have pointed to the benefits of using educational technology for teaching and learning processes at all educational stages, particularly in higher education. In fact, authors such as Concannon, Flynn, and Campbell (2005) [1] have warned that systems based on e-learning have led to greater changes in teaching methods and methodologies. Therefore, the reshaping of instructional and technological strategies in educational institutions is evident. Also, there is wide agreement that teachers must be well prepared to face education challenges from this approach. In this regard, authors such as Ausín, Abella, Delgado, and Hortigüela (2016) [2] suggest that, in order to optimize the opportunities offered by information and communication technologies (ICT), teachers should be prepared to update their teaching practices. Instructional processes must fit the demands of the Knowledge Society. This is why there is a strong demand for teacher training in technological skills, to build their own pedagogical (technological) resources and respond to students' needs, while also motivating them to develop autonomy and analytical thought skills for learning [3]. This challenge involves changing teaching methodology and new teaching-learning models in order to improve the training standards used by society in several fields of educational training [4].

Specifically, mobile learning is a relatively new phenomenon that has grown widely in the last few years. Many studies have focused on what are their actual benefits [5], the pedagogical possibilities they offer [6], and the willingness of students and teachers to work under the umbrella

of this methodology [7,8]. Studies have also been carried out with the implementation of the use of mobile learning in higher education, which identified a set of factors classified into seven main categories [9]—ease of use, trust, characters and personal qualities, context, perceived usefulness of use, behavioral intentionality, and use culture of a research model.

A recent study on trends in mobile learning [10] using a review of the 100 most cited mobile learning documents revealed that studies focused more heavily on comparing different mobile learning pathways to find more effective mobile learning approaches rather than comparing the effects of mobile learning with traditional instruction. In addition, the studies focused more on learners' higher thinking performance and their learning behaviors. Other papers have highlighted the focus on research and trends in mobile learning from the analysis of educational patents [11], where it is found that more are inclined to provide personalized, contextualized, easily retrievable, auto-updated, and intelligent pushed learning content.

When talking about mobile devices and their closer relationship with the teaching-learning innovation, the significance of mobile applications (apps) as useful tools in the achievement and acquisition for specific learning cannot be overlooked. In the words of López-Hernández and Silva-Pérez [12], "the apps are agile and intuitive and with a very brief learning curve that makes them motors of specific learning processes" (p. 177). In this regard, one of the main interests of the present study is the identification of some effective APPs for the development of learning experiences in higher education. According to mentioned and to what we know about this area of study, we consider the answers to the following questions (Q1, Q2, and Q3)

- Q1. What factors positively influence Mlearning to improve university students' learning?
- Q2. What mobile applications are used to improve student learning in higher education?
- Q3. What is the teachers' role to embed Mlearning in higher education?

Based on the hypothesis that mobile devices improve university students' learning and the consideration of Mlearning as a modern innovative approach, the following research objectives have been identified:

- Identify factors that influence Mlearning improvement in university students.
- Identify mobile applications that guarantee the improvement of university students' learning.
- Clarify the teachers' role in the 21st century when using Mlearning.

2. Materials and Methods

The method used is systematic literature review (SLR). This is characterized by seeking relevant information in order to identify, assess, and interpret the available investigations to answer research questions about the matter of concern [13]. This process is rigorous and it is essential to have control over the topic to be investigated in order to consider the quality of the studies, to summarize the current evidence regarding any treatment or technology, to identify shortcomings in the study, or to suggest a new theoretical framework concerning this area of research [14].

The procedure followed in this study is consistent with the PRISMA guidelines for the development of systematic reviews [15]. The PRISMA checklist has 32 items [16] that should be considered as selection criteria and analysis of the articles found. From processes of identification, evaluation and interpretation of scientific papers about the study area [17], relevant investigations have been identified in the field of social learning, mobile devices, and the use of ICTs. More specifically, the purpose of this paper is to provide a comprehensive view of the benefits of promoting Mlearning among teachers for the establishment of new paths of educational and innovative methods that enable high-quality education.

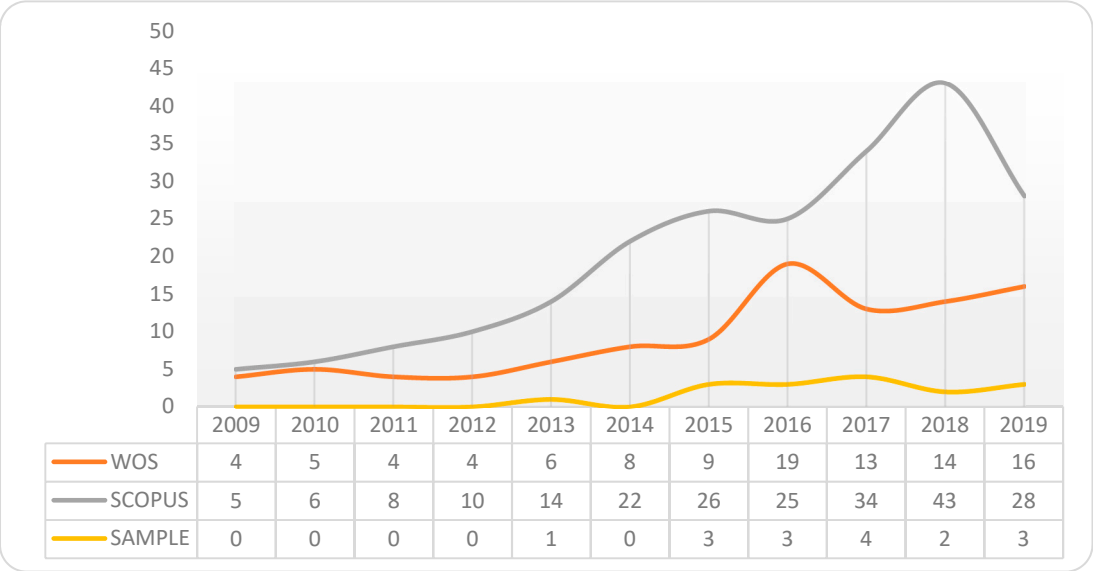
2.1. Sourcing Strategy

For this purpose, we initiated a comprehensive searching in the Web of Science (WoS) and Scopus databases in August/October 2019. The following keywords, extracted from ERIC, were introduced into

the browsers: "Mobile Educational Services," "Higher Education," "Faculty Development," "Mobile Education," "Student Centered Learning," "Mobile APP," "Technologies," "University Students," and "Mobile Learning."

2.2. Eligibility Criteria

Inclusion criteria specified to ensure the relevance, currentness, and pertinence of the paper was to restrict to articles published in the 2009–2019 period. After this initial choice and eliminating duplicates articles, the number of papers was 323—102 in WOS and 221 in Scopus. The next figure (Figure 1) details the process followed the population and sample of the study.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WOS	4	5	4	4	6	8	9	19	13	14	16
SCOPUS	5	6	8	10	14	22	26	25	34	43	28
SAMPLE	0	0	0	0	1	0	3	3	4	2	3

Figure 1. Distribution from 2009 to 2019.

In order to address the systematization of the process, inclusion and exclusion criteria were identified, thereby decreasing the sample size of the study to meet the research objectives. The initial criteria were (1) research area, (2) language, (3) type of publication, (4) sample, and (5) type of evidence.

Only articles included within "Social Sciences" were included. Subsequently, the language criteria was applied, including only articles published in English and Spanish. Grey literature (communications, conference abstracts or doctoral theses) were not considered. The focus of the study was placed on investigations related to the field of education, including exclusively those included in the areas of Social Sciences, Education, and Educational Research. After applying the initial screenings, other more specific ones were applied in order to ensure the pertinence the papers to the pre-established research questions. Thus, we selected articles that provided empirical evidence or showed a relevant review for the study purpose, whose sample or participants were university students or both students and teachers, or that developed APPs to get an improvement of educational processes.

2.3. The Selection Process

The process was characterized by a first reading where the focus was placed on the title and abstract of each paper. Consequently, the second reading focused on examining method, findings, and conclusions. The aim was to ensure consistency between both their findings and how they were linked to the scope of this review study—mobile devices, e-learning, educational technology, and student achievement. Later, a double detailed reading of the manuscripts by two different experts took place, increasing the reliability and validity of the systematic review [18].

Finally, for data analysis and extraction, we carried out a logical order comparison of data and also synthesized all information obtained to achieve a truthful and current study, through the

preparation of each article file. The identifying features of the items taken as reference were the following: (1) author/s, (2) year of publication, (3) type of study, (4) population, (5) sample, and (6) techniques and instruments used.

2.4. Population and Sample

After the procedure described above, we get a population of 323 items, included in WOS and Scopus databases, being 102 and 221, respectively. After apply inclusion criteria, authors carried out a second level of analysis, by examining whole manuscripts and assessing their relevance to the proposed research objectives. Finally, the sample is made up of 16 articles (Figure 2).

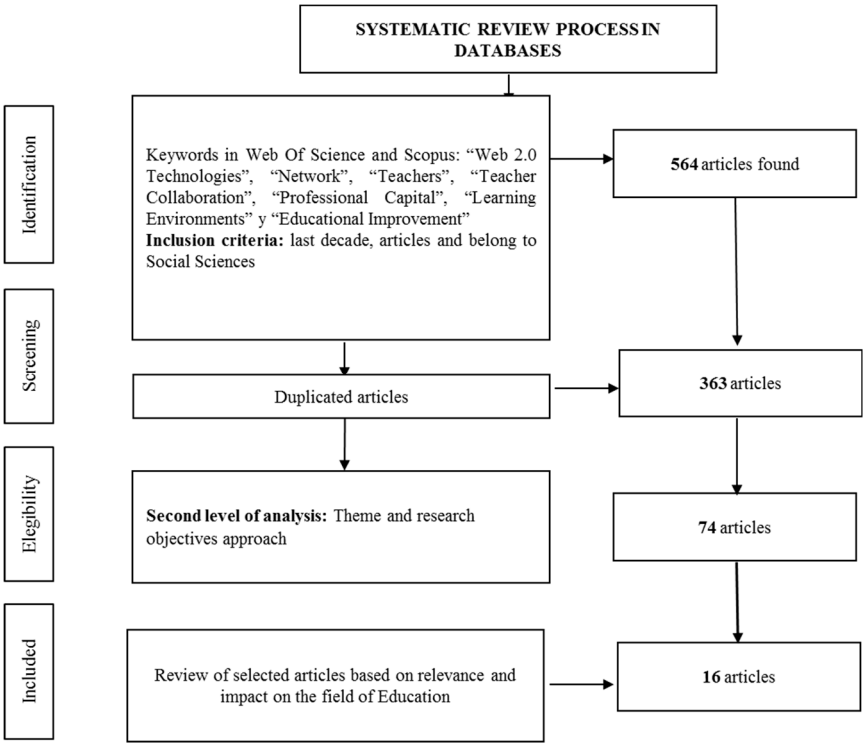


Figure 2. Sample selection flowchart.

3. Results

3.1. Identification of Selected Publications

Based on the methodology used, there are three types of articles—(a) quantitative, where researchers use methods, techniques, and instruments to describe or predict the phenomenon, based on statistical analysis; (b) qualitative, where researchers use techniques and instruments to get a better understanding of the phenomenon; and (c) mixed, where researchers use both quantitative and qualitative methods, techniques and instruments to analyze, describe, and understand the topic of the study.

3.2. Characterization of the Included Publications

The first classification used to categorize articles depends on their method, identifying between quantitative, qualitative, and mixed articles. Most of the selected studies tend to use quantitative methodology. However, we found an investigation where researchers only use qualitative methods and another characterized by the use of a mixed methodology. With regard to the type of study, we have found that most of the studies are transversal (10). However, six of them were of longitudinal design due to their attachment to specific programmes and experimental experiences. Concerning population,

most of the studies have focused on university students due to our focus on post-secondary education. However, some of the studies also include teachers in their sampling to ensure a comprehensive overview of the educational agents involved. The homogeneity found in the studies' populations implies coherence in the analysis of the reality of the effectiveness of Mlearning in teaching/learning processes in higher education. The articles selected to be included among the sample for the systematic review carried out are described below, including their most significant identifying data (Table 1).

Table 1. Characterisation of the selected articles.

Author (s)	Year	Method *	Study	Population	Sample	Instrument
Gan and Balakrishnan	2016	PP	L	Students	38	Q
Altomonte, Logan, Feisst, Rutherford, and Wilson	2015	M	L	University staff and students	1973	Q;I;E
Callaghan	2017	Quan	L	Students	1537	Q
Basantes, Naranjo, Gallegos, and Benítez	2017	Quan	T	Teachers and students	304	Q
Alenezi	2017	Quan	T	Teachers and students	501	Q
Lagos-Reinoso, Mora Barzola, Mejía-Caguana, Peláez-López, and Peláez-Lopez	2018	Quan	T	Teachers and students	140	Q
Huang, Chang, and Wu	2016	PP	L	Students	100	Q; E
Khan, Abdou, Kettunen, and Gregory	2019	Qual	T	Students	16	I
Qi	2019	Quan	T	Students	208	Q
Hao, Cui, Dennen, Türel, and Mei	2017	Quan	T	Students	730	Q
López-Hernández, and Silva-Pérez	2016	Quan	T	Students	411	Q
Althunibat	2015	Quan	T	Students	250	Q
Milošević, Zivkovic, Manasijevic and Nikolić	2015	Quan	T	Students	280	Q
Deng, Ku, and Kong	2018	Quan	T	Students	79	Q
Budke, Parchmann, and Beeken	2019	Quan	L	Students	538	Q
Walker, Voce, and Jenkins	2013	Quan	L	Universities	92	Q

Note: * Qual: Qualitative; Quan: Quantitative; M: Mixed methods; PP: pretest-posttest experimental approach; T: Transversal L: Longitudinal O: Observation; Q: Questionnaire; I: Interview; E: Evaluation Mobile App.

3.3. Description of the Included Publications

The studies included in this systematic review share certain common characteristics: all of them focus on the university environment, analyze the positive impact of Mlearning on the students' learning processes, and provide empirical evidence. Many of them have underlined the positive effects of using mobile devices to improve communication in the classroom. Others describe the changes in

instructional processes, based on experience with the creation of an app. Indirectly, they also analyze new roles of university teachers after the inclusion of technological tools and e-learning and Mlearning systems. One strength of the research is that studies from different countries have been selected, thus providing an overview of the state of the issue worldwide.

For example, Gan and Balakrishnan's research [19] describes a study carried out in higher education classrooms using an interactive mobile messaging application (IMMAP). The Interactive Mobile Messaging Acceptance model was used as a reference to analyse the development of the willingness of 38 university students to use the application after an experiment. The results reveal improvements in communication in the classroom through a greater number and higher quality of interactions, greater student commitment, and active feedback that provides more responsibility to students in the construction of their learning. The study of Altomonte, Logan, Feisst, Rutherford, and Wilson [20] is also oriented toward improving communication but focused on sustainability in higher education, the purpose of which was to explore the opportunities offered by interactive and situated learning (e-learning and Mlearning) for sustainability in environmental disciplines. Contextualized in a management system and supporting a sustainability gateway in a mobile application, they analyzed the impact of e-learning and Mlearning tools to enhance competence in the sustainable education of university students. Through 1937 users, the results aimed to confirm the effectiveness of this type of tools, leading to improved interactive communication, greater contextualization of knowledge, and greater flexibility while maintaining the learning rhythm of students.

From an interdisciplinary perspective, Callaghan's research [21] analyzes the impact of mobile applications in an education living lab, involving experts from different disciplines—English, mathematics, physics, chemistry, geography, and mobile learning. The research provides the elements of collaborative research of a project called Mobile APP, which mobilized 744 participants in the first phase and 793 in the second, finding and assessing many mobile applications through an application evaluation tool developed by them, for subsequent educational application. Similarly, Budke, Parchmann, and Beeken's study [22] was located in a science laboratory. From a pilot test with an experimental and control group, the results found that GreenLab_OS mobile had a higher potential to increase students' self-concept, interest, and enjoyment while decreasing the usual boredom and frustration of the instructional processes.

The study of Basantes, Naranjo, Gallegos, and Benítez [23] was developed at the University of Ecuador with the purpose of analyzing the pedagogical use of mobile devices in higher education. Based on a questionnaire answered by 224 students and 80 teachers, it was determined that mobile devices improved communication, although not all the pedagogical opportunities they offered were explored. Despite finding agreement in pointing to a positive attitude toward the use of mobile devices for educational purposes, there was no effective integration of them. In this regard, they concluded that teachers need to be trained to include mobile technology in their educational practices in order to "incorporate mobile technology in their work as a support tool for the development of their classes, generating an environment of interaction, cooperation and collaboration. However, if not used properly, they can become a distraction for learning" (p. 85).

Also in Ecuador but located in the Faculty of Philosophy, the investigation of Lagos-Reinoso, Mora Barzola, Mejía-Caguana, Peláez-López, and Peláez-Lopez [24] found that 97% of students and teachers used mobile devices for academic purposes, pointing out the benefits for achieving personalized and collaborative learning, overcoming both time and space barriers. This is also the case of Alenezi's study [25], carried out in Saudi Arabia. Its objective was to analyze the differences between the behavior of 204 university students and 297 teachers who use e-learning through five criteria—duration, user satisfaction, ease of use, connectivity, and the benefits of e-learning and Mlearning. The results show that students have ease of use of these educational tools, being aware of the benefits they generate for their learning. Also, they indicate that mobile devices encourage self-learning, increasing their motivation. They also point out that including these learning strategies

affects the teacher's role as a mentor, guiding and supervising students as they learn. The study developed by Huang, Chang, and Wu [26] (2017) focused on motivation and English learning in Taiwan. Through the Super Word King application, they concluded that learning based on mobile games is an effective teaching method for ubiquitous learning activities and English learning, notably for vocabulary acquisition.

In contrast to most research, Khan, Abdou, Kettunen, and Gregory's study [27] used a qualitative methodology to analyze the ways in which mobile devices are used for educational purposes by university students in Bangladesh. It concluded that students know and understand the pedagogical possibilities of mobile devices, identifying five modalities of use—media, the management of learning resources, a tool for effective learning, a way for collaborative learning, and creativity. Qi's study [28] (2019) established a comparative study between "performance improvement" and the stress generated by the use of technology, concluding that Mlearning does not generate techno-stress but rather produces better academic performance. Furthermore, most of the students surveyed had self-efficacy with mobile technology, an aspect that reduces techno-stress.

Another of the studies selected for the systematic review provides a comparative study between USA, China, and Turkey on mobile learning. From a questionnaire to university students from these countries, it was found that university students have a positive attitude toward Mlearning, although many of them have not experienced any experimentation with the use of mobile devices in formal education. The study also pointed out the consideration of cultural aspects when designing and implementing this teaching methodology in order to personalize the instructional processes. In turn, the lack of support, mainly from teachers and the infrastructure supported by the institutions, are identified as the main limitations to ensure its successful implementation. The research of López-Hernández and Silva-Pérez [12] in Spain, who analyzed how MLearning was developed in the university, is also part of this approach. Its results are very inspiring, as they indicate that 75% of university students use mobile devices for learning activities, half of which are used for specific learning tasks, regardless of the resources provided by the university. Despite these good results and the tendency toward self-learning through technological tools, the authors note that the use of a high percentage of university students reduces to consultations in the e-learning platform, with no changes in pedagogical methodology.

The study by Althunibat [29] in Jordan sought to identify the factors encouraging the use of Mlearning. Based on the "Technology Acceptance Model" (TAM), "Theory of Reasoned Action" (TRA), and "Unified Theory of Acceptance and Use of Technology" (UTAUT), the results point to the need to take into account the characteristics of students when implementing mlearning, in order to fit their characteristics. Beyond identifying factors that strengthen Mlearning, the research of Milošević, Zivkovic, Manasijevic and Nikolić [30], at the University of Belgrade, provides the results obtained in research after the application of new technologies, highlighting Mlearning as an innovative approach for university students. Its results indicate that factors such as the expectation of effort, the teacher's role in providing e-learning strategies, the infrastructure, the quality of service, and the innovation ability of the staff affect the development and effectiveness of Mlearning. The benefits of Mlearning are improving the overall quality of the learning process and increasing the students' motivation and satisfaction with the instructional process.

In turn, the study by Deng, Ku, and Kong [31] focused on analyzing the possibilities of mobile devices to perform multitasking and improve communication in instructional processes, finding that instant messaging applications are the most used application in the classroom. However, they indicate that systematization is a good way to mitigate technologies' disruptive impact on learning. Finally, the study by Walker, Voce, and Jenkins [32] presents the results of research carried out in higher education in the United Kingdom. In their study, they found that the development of technology improved learning from a survey of 92 universities. In it, they analyze the educational policies to implement technology, the implementation of the TEL model and its effectiveness in the university.

According to the selected investigations, certain principles can be established to clarify the status of Mlearning internationally. First of all, it is observed that most of them were based on technology acceptance models (TAM) in order to justify the achieved results. In turn, similar approaches have been identified when implementing educational projects and programs that embed technological resources and mobile devices within instructional processes. Most often, their inclusion sought to improve communication in the classroom and break down the space and time barriers of asynchronous learning modalities. Analyzing their degree of implementation by areas of knowledge, according to the research, identified the most suitable areas to include any mobile application in their classroom—foreign languages, technology, science, and mathematics. However, experiences with an interdisciplinary nature have also been identified, where different areas have cooperated to achieve an integrated education. Likewise, all the studies included in the systematic review have praised the benefits of the use of Mlearning, as long as a number of issues are taken into account. Pedagogical knowledge among teachers to design instructional processes, where the use of mobile applications and other technological resources can be fitted, is essential. Not only will they know a broad number of applications to use, but they will also have a good understanding of their teaching possibilities to include them effectively in the classroom. Regarding the students, all the investigations have identified a positive attitude to use the technologies for didactic purposes. In addition, supported by different models of acceptance and experiences, it has been shown that university students tend to use their mobile phones to access knowledge. However, it has become clear that many of them have not yet lived university experiences where the use of Mlearning has been fully integrated. This widespread inexperience makes them unsure of its effectiveness. Another point to consider is the infrastructures involved and access to mobile devices for didactic purposes. As a result of the selection of contextualized studies in different countries, it has been possible to identify that university students from countries where access to a mobile phone, to the Internet, and infrastructures are more limited exhibit an underdeveloped domain. In terms of gender, it has not been possible to establish patterns to determine whether there is equality or hegemony of one gender over another.

4. Discussion

The results found in the systematic review, as a result of the 16 selected studies, can be clustered into benefits and factors that encourage the use of Mlearning in higher education, identification of mobile applications for educational purposes, and new roles of students and teachers to assume new conceptions about instructional processes. One of the factors identified as important for establishing Mlearning in higher education is the increase in teacher-student interactions and the improvement of communication in the classroom. This also has been identified in other studies such as those of Nganji [3], asserting that the main use that people make of mobile devices is indeed communication.

Agreeing with the findings found, Mlearning has been positioned as a tool that ensures individualized and personalized learning processes [33], while students develop autonomy to build their own learning processes [34]. The ease of use and familiarity of mobile devices between students and teachers is another factor widely agreed worldwide. In fact, most investigations have focused on analyzing and developing technology acceptance models [4,8,35,36]. Regarding the didactic possibilities offered by mobile applications in higher education, there are several studies that argue for their use in the university, such as the study of Crompton and Burke [5].

Finally, in the review presented, it has become clear how the roles of students and teachers have changed substantially, as shown in a systematic review of similar character. In this way, students assume a more active role in building their learning, gaining autonomy and responsibility [6,37]. On the other hand, the teacher must assume a role of guide and counsellor, being necessary that he or she should possess a technological knowledge of mobile devices, while also integrating his or her pedagogical knowledge in order to establish the conditions required to foster teaching and learning processes that fit the demands of contemporary society [38,39].

5. Conclusions

The purpose of the systematic review was to provide an overview about the usefulness of Mlearning methodology in improving the teaching and learning processes of university students. From an exhaustive search in WOS and Scopus, we selected studies that would provide answers to the three established research questions. The conclusions obtained in this paper in relation to the proposed questions are set out below.

- **Q1.** What factors positively influence Mlearning to improve university students' learning? The studies included in the present paper have identified a set of factors that promote the success of Mlearning and justify why it is taking place worldwide. One of the most influential factors is teachers' technological and pedagogical knowledge of mobile applications. Empowering students and involving them in their own learning process is key, as a way to encourage self-learning and increase motivation. Stimulating the use of mobile devices as a closer communication tool is another positive factor in the use of Mlearning. Also, the management of learning materials and spending time with students and teachers to get used to considering Mlearning an effective learning tool that enables students to collaborate and offers them freedom to develop their creativity are very important. Another point to consider is the ease of use of mobile devices shown by students. Making students see the benefits of using these learning tools and helping them to get used to this new understanding of learning will make them develop self-efficacy with mobile technology. However, infrastructure plays a critical role, particularly in contexts with disadvantaged socio-economic conditions. In this regard, teachers have a leading role in changing instructional processes, but it is not enough if the university infrastructure does not support the promotion of interactive spaces for learning and Mlearning.
- **Q2.** What mobile applications are used to improve student learning in higher education? Much of the empirical research identified has been developed around the development of one or more mobile applications created for specific pedagogical purposes. An example of this is the interactive mobile messaging application (IMMAP), focused on improving communication in the classroom. A study set in the so-called Mobile App project has also been identified, in which different applications were analyzed by exploring their pedagogical possibilities. Applications for language learning have also been identified. The Super Word King application demonstrated its usefulness for learning English, particularly in the acquisition of vocabulary. Overall, there was unanimity in stating the benefits of using mobile applications in teaching and learning processes. Although very diverse applications have been found, it has become evident that applications focused on improving communication in the classroom and outside is the most widely used worldwide. Other curricular areas such as science tend to use a wide diversity of mobile applications in living lab education.
- **Q3.** What is the teachers' role to embed Mlearning in higher education? The inclusion of Mlearning implies a transformation of teaching and learning processes, thus affecting the role of teachers in instructional processes. Many studies have shown that transmissive roles of teachers are outdated, and they need to be alphabetized digitally in order to meet the requirements of the knowledge society. Currently, there is a predominant role of creating appropriate conditions for students to develop the needed autonomy to build their own teaching and learning process. Assuming the role of guide and supervisor is key to redirect, support, and counsel students who need it in order to give them the confidence to take responsibility for their own teaching and learning processes. In addition, the transformation of virtual learning environments and the use of technological tools forces teachers not only to know technology but also to have the necessary pedagogical knowledge to use it for didactic purposes.

Strengths and Limitations of this Systematic Review

The nature of the presented paper has made possible to provide an overview from the literature on how Mlearning strategies and e-learning systems positively impacts on students' achievement,

increasing their motivation and empowering them to acquire autonomous and ubiquitous learning. This study has collected relevant studies in this field over the last decade, identifying different methodological approaches and different scenarios in the establishment of e-learning and Mlearning programs in higher education worldwide. The selected studies are contextualized in different countries, indicating that the presented systematic review proposes an analysis of the use of mobile devices and Mlearning systems worldwide, identifying common elements between them and others derived from the context in which they are situated. Another of the strengths of the paper has been the comprehensive approach in applying the inclusion and exclusion criteria when selecting research that fits the proposed objectives.

However, there are limitations that must be considered. Firstly, the systematic research based on the selection of certain key words has allowed an in-depth screening of many studies. However, it is possible that the use of some keywords may have neglected relevant investigations. Similarly, we have excluded all those that focused exclusively on analyzing student acceptance levels of technology and Mlearning and those contextualized in other educational stages. In turn, investigations, whose participants were exclusively teachers, were excluded because it was interested in collecting the voice of university students, useful mobile applications for acquiring particular learning and establishing a connection between Mlearning systems, and increasing the performance of university students.

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References

1. Concannon, F.; Flynn, A.; Campbell, M. What campus-based students think about the quality and benefits of e-learning. *Br. J. Educ. Technol.* **2005**, *36*, 501–512. [CrossRef]
2. Ausín, V.; Abella, V.; Delgado, V.; Hortigüela, D. Project-Based Learning through ICT. An Experience of Teaching Innovation from University Classrooms. *Formaciónuni* **2016**, *9*, 31–38.
3. Nganji, J.T. Towards learner-constructed e-learning environments for effective personal learning experiences. *Behav. Inf. Technol.* **2018**, *37*, 647–657. [CrossRef]
4. Gómez-Ramirez, I.; Valencia-Arias, A.; Duque, L. Approach to M-learning Acceptance Among University Students: An Integrated Model of TPB and TAM. *Int. Rev. Res. Open Distrib. Learn.* **2019**, *20*. [CrossRef]
5. Crompton, H.; Burke, D. The use of mobile learning in higher education: A systematic review. *Comput. Educ.* **2018**, *123*, 53–64. [CrossRef]
6. Kearney, M.; Schuck, S.; Burden, K.; Aubusson, P. Viewing mobile learning from a pedagogical perspective. *Res. Learn. Technol.* **2012**, *20*. [CrossRef]
7. Leem, J.; Sung, E. Teachers' beliefs and technology acceptance concerning smart mobile devices for SMART education in South Korea: Teachers' beliefs concerning smart mobile devices. *Br. J. Educ. Technol.* **2019**, *50*, 601–613. [CrossRef]
8. Kaliisa, R.; Palmer, E.; Miller, J. Mobile learning in higher education: A comparative analysis of developed and developing country contexts. *Br. J. Educ. Technol.* **2019**, *50*, 546–561. [CrossRef]
9. Hamidi, H.; Chavoshi, A. Analysis of the essential factors for the adoption of mobile learning in higher education: A case study of students of the University of Technology. *Telemat. Inform.* **2018**, *35*, 1053–1070. [CrossRef]
10. Lin Lai, C. Trends of mobile learning: A review of top 100 highly cited papers. *Br. J. Educ. Technol.* **2019**, in press. [CrossRef]
11. Chiang, F.; Zhu, G.; Wang, Q.; Cui, Q.; Cai, Z.; Yu, S. Research and trends in mobile learning from 1976 to 2013: A content analysis of patents in selected databases. *Br. J. Educ. Technol.* **2016**, 1006–1019. [CrossRef]

12. López-Hernández, F.A.; Silva-Pérez, M.M. Factors of Mobile Learning Acceptance in Higher Education. *Estudiossobre Educ.* **2016**, *30*, 175–195. [CrossRef]
13. Kitchenham, B. *Procedures for Performing Systematic Reviews*; Keele University: Keele, UK, 2004.
14. Kitchenham, B.A.; Budgen, D.; Pearl-Brereton, O. Using mapping studies as the basis for further research - A participant-observer case study. *Inf. Softw. Technol.* **2011**, *53*, 638–651. [CrossRef]
15. Moher, D.; Liberati, A.; Tetzlaff, J.; Altman, D.G. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Ann. Intern. Med.* **2009**, *151*, 264–269. [CrossRef]
16. Hutton, B.; Catalá-López, F.; Moher, D. La extensión de la declaración PRISMA para revisiones sistemáticas que incorporan metaanálisis en red: PRISMA-NMA. *Med. Clínica* **2016**, *147*, 262–266. [CrossRef]
17. Fink, A. *Conducting Literature Research Reviews: From the Internet to Paper*; SAGE Publications: Thousand Oaks, CA, USA, 2005.
18. García-Martínez, I.; Martín-Romera, A. Potenciando la coordinaciónpedagógica a travésdelliderazgo de losmandosmediosenEducación Secundaria. Revisiónsistemática. *Bordón* **2019**, *71*, 55–70. [CrossRef]
19. Gan, C.L.; Balakrishnan, V. Enhancing classroom interaction via IMMAP–an interactive mobile messaging app. *Telemat. Inform.* **2017**, *34*, 230–243. [CrossRef]
20. Altomonte, S.; Logan, B.; Feisst, M.; Rutherford, P.; Wilson, R. Interactive and situated learning in education for sustainability. *Int. J. Sustain. High. Educ.* **2016**, *17*, 417–443. [CrossRef]
21. Callaghan, R. Developing mobile teaching practice: A collaborative exploration process. *Technol. Knowl. Learn* **2018**, *23*, 331–350. [CrossRef]
22. Budke, M.; Parchmann, I.; Beeken, M. Empirical Study on the Effects of Stationary and Mobile Student Laboratories: How Successful Are Mobile Student Laboratories in Comparison to Stationary Ones at Universities? *J. Chem. Educ.* **2018**, *96*, 12–24. [CrossRef]
23. Basantes, A.V.; Naranjo, M.E.; Gallegos, M.C.; Benítez, N.M. Mobile Devices in the Learning Process of the Faculty ofEducation Science and Technology of the Technical Universityof the North in Ecuador. *Formación Univer* **2017**, *10*, 79–88. [CrossRef]
24. Lagos-Reinoso, G.G.; Mora-Barzola, K.; Mejía-Caguana, D.; Peláez-López, R.; Peláez-López, J.C. M-learning, uncaminohaciaaprendizajeubicuoen la educación superior del Ecuador. *Rev. Ibérica Sist. Tecnol. Inform.* **2019**, *18*, 47–59.
25. Alenezi, A. Checking on Preferential Choices of E-learning & M-learning: A Case Study of Northern Border University, Saudi Arabia. *Int. J. Emerg. Technol. Learn* **2017**, *12*, 98–116.
26. Huang, Y.L.; Chang, D.F.; Wu, B. Mobile Game-Based Learning with a Mobile App: Motivational Effects and Learning Performance. *J. Adv. Comput. Intell. Intell. Inform.* **2017**, *21*, 963–970. [CrossRef]
27. Khan, M.S.H.; Abdou, B.O.; Kettunen, J.; Gregory, S. A Phenomenographic Research Study of Students' Conceptions of Mobile Learning: An Example FromHigher Education. *Sage Open* **2019**, *9*, 1–17. [CrossRef]
28. Qi, C. A double-edged sword? Exploring the impact of students' academic usage of mobile devices on technostress and academic performance. *Behav. Inform. Technol.* **2019**, *38*, 1–18. [CrossRef]
29. Althunibat, A. Determining the factors influencing students' intention to use m-learning in Jordan higher education. *Comput. Hum. Behav.* **2015**, *52*, 65–71. [CrossRef]
30. Milošević, I.; Živkovic, D.; Manasijevic, D.; Nikolić, D. The effects of the intended behavior of students in the use of M-learning. *Comput. Hum. Behav.* **2015**, *51*, 207–215. [CrossRef]
31. Deng, L.; Ku, K.Y.L.; Kong, Q. Examining predictive factors and effects of in-class multitasking with mobile phones. *Interact. Technol. Smart Educ.* **2019**, *16*, 49–58. [CrossRef]
32. Walker, R.; Voce, J.; Jenkins, M. Charting the development of technology-enhanced learning developments across the UK higher education sector: A longitudinal perspective (2001–2012). *Interact. Learn. Environ.* **2016**, *24*, 438–455. [CrossRef]
33. Carvalho, A.; Areal, N.; Silva, J. Students' Perceptions of Blackboard and Moodle in a Portuguese University. *Br. J. Educ. Technol.* **2011**, *42*, 824–841. [CrossRef]
34. Wang, Y.; Wu, M.; Wang, H. Investigating the determinants and age andgender differences in the acceptance of mobile learning. *Br. J. Educ. Technol.* **2009**, *40*, 92–118. [CrossRef]
35. Mojarro-Aliaño, Á.; Duarte-Hueros, A.; Guzmán-Franco, M.; Aguaded, I. Mobile learning in university contexts based on the unified theory of acceptance and use of technology (UTAUT). *J. New Approach Educ. Res. (NAER J.)* **2019**, *8*, 7–17. [CrossRef]

36. Hao, S.; Cui, M.; Dennen, V.P.; Türel, Y.K.; Mei, L. Analysis of mobile learning as an innovation in higher education: A comparative study of three countries. *Int. J. Mob. Learn Organ.* **2017**, *11*, 314–339. [CrossRef]
37. Lepp, A.; Barkley, J.E.; Karpinski, A.C. The relationship between cell phone use and academic performance in a sample of US college students. *Sage Open* **2015**, *5*. [CrossRef]
38. Evans, C. The effectiveness of m-learning in the form of podcast revision lectures in higher education. *Comput. Educ.* **2008**, *50*, 491–498. [CrossRef]
39. Gallagher, M.S.; Crompton, H.; Traxler, J. KakaoTalk Meets the Ministry of Education: Mobile Learning in South Korean Higher Education. In *Mobile Learning and Higher Education*; Routledge: Abingdon, UK, 2018; pp. 136–147.