Implications of Mobile Learning for Sustainable Inclusive Education: A Systematic Review

Mª del Carmen Pegalajar-Palomino
Faculty of Humanities and Educational Sciences, Department of Pedagogy, University of Jaen
mcpegala@ujaen.es
https://orcid.org/0000-0002-2795-7502

Abstract: The evolution of wireless technology and the development of mobile applications cover more and more areas of human activity. These can be used not only for communication, but also for educational purposes. This research aims to analyze implications of Mobile Learning as a didactic strategy for the development of an inclusive education that is committed to improving education for sustainable development. Following the quality standards of the PRISMA statement, a systematic review of research focused on didactic experiences that use Mobile Learning for the attention of students with educational needs in the context of education for sustainable development has been carried out. The Web of Science (WoS) and Scopus databases have been used during the period 2010-2020, obtaining a sample of 21 publications. Results reveal the growing interest of the international scientific community in this research. It is a didactic strategy that facilitates the teaching-learning process for students with functional diversity, a tool to support the teaching task and a promoter of an inclusive education that is committed to sustainable learning. Among its limitations, aspects related to the teacher, the implementation of mobile technology in the teaching-learning process or its use as a learning tool stand out. Mobile Learning has become a new educational paradigm, which establishes a binomial between technology and education to respond to the objectives of the 2030 Agenda. It has become a new educational paradigm in line with our model of society based on information and knowledge and access to Information and Communication Technologies. In this way, a binomial has been established between technology and education that aims to implement benefits for the agents involved at a quantitative and qualitative level for the implementation of an inclusive education that caters to students with functional diversity and is committed to improving education for sustainable development.

Keywords: Mobile Learning, E-learning, Inclusive Education, Sustainability, special needs education.

1. Introduction

Mobile Learning is focused on the use of mobile technology as a support for the development of the didactic process (Kukulska et al., 2011). This methodological strategy favors instant and accessible learning for students from anywhere and at any time, capable of creating knowledge, satisfying their curiosity, enhancing collaborative learning or enriching learning experiences (McQuiggan et al., 2015). The introduction of Mobile Learning in education aims to change the teaching-learning process towards a model based on teaching innovation (Middleton, 2015), expanding the scope of the teaching process beyond the context of the educational institution (Sattarov and Khaitova, 2019).

The adoption of the 2030 Agenda for Sustainable Development is committed to ensuring inclusive, equitable and quality education, while promoting lifelong learning opportunities for all people. In addition, it points out how the expansion of technologies and global interconnection have great potential to overcome the digital divide between the poor and the rich, developing knowledge societies and scientific and technological innovation (UN, 2015). Including the Sustainable Development Goals in the curriculum implies analyzing the socio-cultural context of classrooms in order to transform it and incorporate a global vision of social reality into the educational process (Dieste, Coma and Blasco, 2019; Jiménez and Felices, 2018; Mesa, 2019; Ortega and Pagés, 2017).

Thus, Mobile Learning is a didactic strategy capable of promoting a teaching-learning environment that is committed to equity and equal opportunities among students, in response to the provisions of the 2030 Agenda. Therefore, it is about taking advantage of the potential of Information and Communication Technologies in the educational field to strengthen educational systems, disseminate knowledge among students, provide access to information, as well as promote quality learning that is committed to the development of a more sustainable society in which all students have a place, regardless of their characteristics, needs, expectations and/or individual interests.

2. Literature Review

Different authors underline the importance of technologies for the advancement of the Sustainable Development Goals (Chin and Jacobsson, 2016; Seegolam, Sukhoo and Bhoyroo, 2015; Tjoa and Tjoa, 2016). The new communication tools and learning environments based on web 2.0 technology represent a real potential towards the development of a new learning process, being the focus of interest towards education for sustainable development (Boulahrouz, Medir and Calabuig, 2019).

Therefore, it is proposed to use technologies to solve problems such as poverty, exclusion, economic and social development or climate change, associated with the rational use of resources provided by nature (Ziemba, 2017); it is, therefore, a means to support and meet the needs of students in an inclusive environment (Hamburg and Lütgen, 2019). Education, from this perspective, must respond to social demands to train students in a comprehensive manner and establish relationships between classroom teaching and the society in which it develops (Boni and Calabuig, 2017).

The literature review reveals the development of didactic experiences using digital technologies for Education for Sustainability, primarily climate change and biodiversity, as well as for citizenship education and urban planning (Caragliu, Del Bo and Nijkamp, 2011; Navadakhsh and Motlaq, 2009; Moore, Rydin and Garcia, 2015).

The use of mobile devices in the educational context facilitates student-centered learning (Chih-Hung and Chin-Chung, 2021; Tinoco and Tinoco, 2018). An important feature of Mobile-Learning is that the traditional transfer of knowledge from teacher to student is changed and students can actively participate in the learning process (Navarro et al., 2016).

More specifically, and in the context of inclusive education, it allows helping students with disabilities to be independent and improve their quality of life (Gentry et al., 2010). It enables a personalized learning process according to the individual needs of each student (Diegmann et al., 2015; Lai, Chen and Lee, 2019), providing the user with access to broader and more flexible information sources and teaching resources (Ally, Grimus and Ebner, 2014; McQuiggan et al., 2015; Reychav and Wu, 2015).

The implementation of Mobile Learning in the classroom favors student interest and motivation towards learning (Diacopoulos and Crompton, 2020; Fombona and Pascual, 2013; Soykan and Özdamlı, 2017), knowledge acquisition (Chee et al., 2017) and the development of digital competencies (Gómez, Atienza and Mir, 2015; Prasad, 2016; Sevillano and Vázquez, 2015; Sungkur, Panchoo and Bhoyroo, 2016). In addition, it enhances the creation of collaborative learning environments (Nguyen, Barton and Nguyen, 2015; Shadiev et al., 2018; Wilkinson and Barter, 2016) and the development of basic skills (information search and retrieval and organization) and higher skills (problem solving, decision making and critical thinking) (Ramos, Herrera and Ramírez, 2010). In turn, it enables the development of digital competencies (Gómez, Atienza and Mir, 2015; Prasad, 2016; Sevillano and Vázquez, 2015; Sungkur, Panchoo and Bhoyroo, 2016).However, some aspects must be taken into account for an effective implementation of Mobile Learning in the classroom, related to the connection to a fast and wireless Internet network, the appropriate screen size of the devices, as well as the language used for the configuration of the applications (Royle, Stager and Traxler, 2014). In addition, there are some disadvantages derived from their possibilities as a source of distraction for the student, due to the excess of information available on the network, and the technical problems that can cause the immersion of these applications in the classroom (Gikas and Grant, 2013). Rataj and Wójcik (2020) point out how the successful implementation of mobile learning in the classroom depends on the acceptance of the technology by the users involved.

Other research (Boude and Sarmiento, 2017; Sánchez et al., 2019) highlights the lack of technopedagogical training of teachers as one of the limitations in the implementation of Mobile Learning, as well as the scarcity of technological resources available to educational centers and the need to have previous didactic experiences that serve as a reference for teachers (Fernández, 2018; Florian and Beaton, 2018; Stenman and Petterson, 2020). In addition, and in relation to the teacher, this methodology is influenced by their expectations of effort, performance, confidence, system functionality and social influence (Al-Adwan, Al-Adwan and Berger, 2018; Chao, 2019).

The literature analysis reveals different review research works related to the study of the scientific production on Mobile Learning (Hinojo, Aznar and Romero, 2018), the pedagogical, technological and social interaction aspects of this methodology (González and Sosa, 2021), its implications towards learning practices (Crompton and Burke, 2018) and the use of innovative pedagogies from mobile devices (Burden et al., 2019). In addition, technological and pedagogical variables for the implementation of Mobile Learning from an inclusive perspective have been examined (Crisol, Herrera and Montes, 2020), as well as the review of scientific evidence on the use of Information and Communication Technologies for Education for Sustainable Development (Boulahrouz et al., 2019).

3. Method

3.1 Objetives

This research bets on Mobile-Learning as a didactic strategy for the development of an inclusive education, which values diversity as an enriching element of the teaching-learning process and as an enabler of human development. The aim is to achieve a "school for all" that is committed to quality education for sustainability and responds to the global challenges of the planet. It must offer an educational response to students with educational needs, understood as those who present barriers that limit their access and participation in the teaching-learning process due to disability, severe behavioral, communication and language disorders, vulnerability, high intellectual abilities, late incorporation into the educational system or personal conditions or school history.

This work aims to answer the following research questions:

- RQ1: What is the international scientific production during the period 2010-2020 on the use of Mobile Learning for an inclusive education based on sustainability?
- RQ2: What mobile applications have been used in these experiences for the development of an inclusive and sustainable education?
- RQ3: What are the potentialities of Mobile Learning for inclusive education and sustainable learning in students with educational needs?
- RQ4: What are the limitations derived from the implementation of Mobile Learning in a teaching-learning process that addresses inclusive education and sustainable development in students?

3.2 Design

The methodology used in this research responds to a systematized literature review, being its main characteristics: a) systematic, which has scientific rigor and is not arbitrary; b) complete, including all the production with scientific rigor related to a specific topic; c) explicit, detailing the procedure to locate the sources and the criteria taken into account; d) reproducible, the process can be checked by other researchers (Onwuegbuzie and Frels, 2015).

This work performs a systematic review of the literature in the international databases Web of Sciences (WoS) and Scopus has been carried out during the period 2010-2020, both inclusive. The search was carried out from December 2020 to March 2021. These databases have been selected because of their recognition and prestige in the field of science worldwide, guaranteeing strict scientific quality criteria. For its part, the review has been limited to the last 10 years to analyze the most current documents on the research problem; in addition, it has been found that prior to 2010 research on Mobile Learning, inclusive education and sustainable development has been relatively scarce at the international level. In addition, the research has been limited to works published in Spanish and English, as these are the most widely used languages at the international level, in addition to Spanish being my native language.

The search and selection of the publications included in this work has been carried out by three independent researchers, experts in conducting review research and whose lines of research are related to the area of Inclusive Education and Educational Technology. In this research we have followed the quality standards set out in the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement to ensure the internal consistency of the systematic review (Urrútia and Bonfill, 2010), these being: description of the eligibility criteria, sources of information and search for publications; selection process of the papers; procedure for data extraction and synthesis of the results obtained. In addition, the criteria of the Database of Abstracts of Reviews of Effects Reviews (DARE) of the Centre for Reviews and Dissemination (CDR) of the University of York have been used through the following questions:

- Are the inclusion and exclusion criteria for publications appropriate and described?
- Is the literature search likely to have covered all studies of relevance to the topic?
- Have the reviewers assessed the quality and validity of the included studies?
- Are the basic data adequately described?

2.3. Procedure

The process for the systematic analysis of the literature requires an initial search of the publications in the selected databases. Thus, the preliminary analysis for the search of the documents is carried out according to the search equation based on the key descriptors that are part of this work: "Mobile Learning", "Mobile Devices", "Educational Needs", "Inclusive Education" and "Education for Sustainability". These terms have been used both in Spanish and English, in the title, abstract and keyword sections of each of the databases, being complemented through the AND and OR operators.

The second phase includes the filtering of the results based on the inclusion and exclusion criteria of the publications, which are described in Table 1:

Table 1: Inclusion and exclusion criteria for publications

Inclusion criteria	Exclusion criteria
▪ Articles published in quality scientific journals pose a peer review process. ▪ Research that describes didactic experiences based on the implementation of Mobile Learning as a methodological strategy for a teaching-learning process that addresses inclusive education and sustainable development. ▪ Publications written in Spanish or English. ▪ Publications related to the areas of knowledge of Social Sciences and Educational Research. ▪ Documents published between 2010-2021, inclusive. ▪ Open access publications, available for consultation.	▪ Duplicate works. ▪ Theoretical or review studies. ▪ Articles not related to the general objective of this work. ▪ Publications with restricted access. ▪ Books or book chapters, communications to congresses, doctoral theses, Final Degree or Master's Theses, etc.

In the third phase, the quality of each of the publications was evaluated by reading the full text, with the intention of ensuring the affinity and relevance of the publication according to the general objective of this research. This evaluation yielded a total of 21 publications that serve as primary sources of data for this literature review. Figure 1 shows the process followed for the search, selection and review of the publications up to the establishment of the definitive sample.

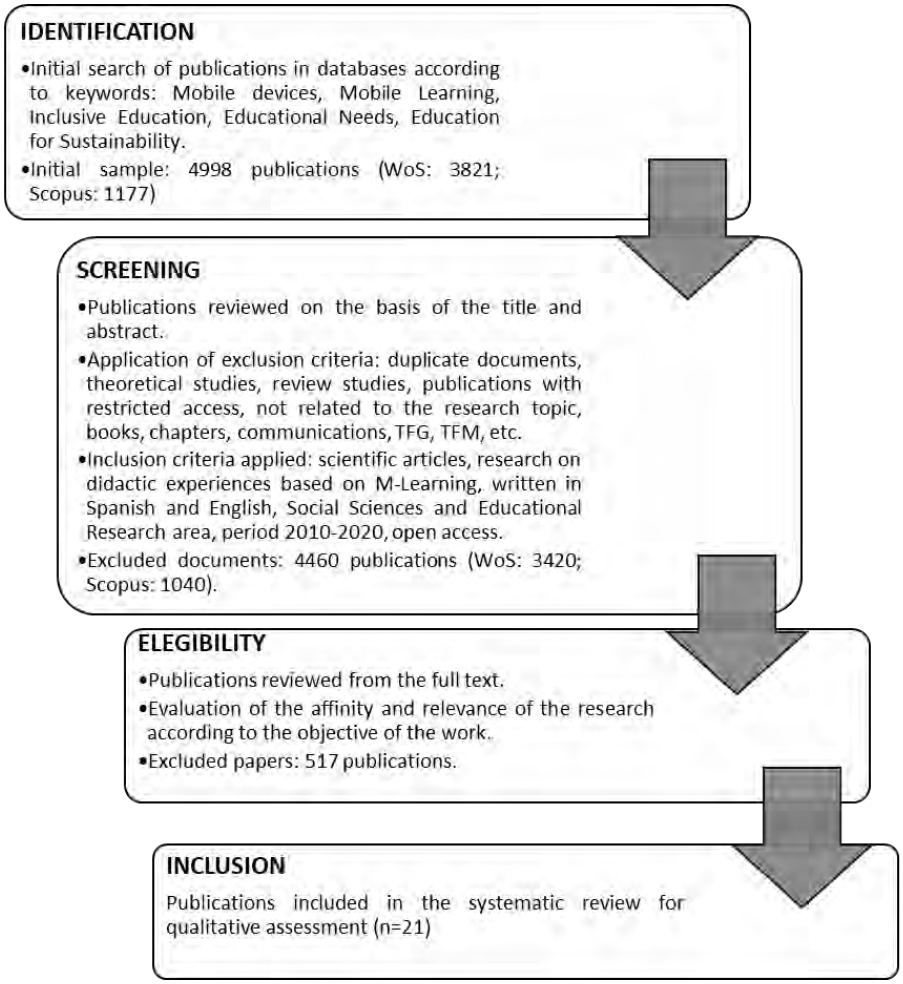

Figure 1: Flow chart for the sample search and selection process

3.3 Data analysis

Publications management software "Mendeley" was used to organize the selected publications in each database. Once the definitive sample had been established, the debugging and extraction of information for each of the publications was carried out using Microsoft Excel software. This made it possible to analyze and synthesize the information qualitatively according to the research questions and the variables considered of interest by the research team.

4. Results

4.1 Analysis of scientific production

The evolution of publications on Mobile Learning, inclusive education and sustainable learning has been growing in recent years, specifically from 2013 onwards, as shown in Figure 2. This reveals the interest of the international scientific community in the implementation of didactic experiences based on mobile learning as a strategy for the development of quality inclusive education, which is committed to sustainable development and considers attention to diversity as a learning opportunity for all.

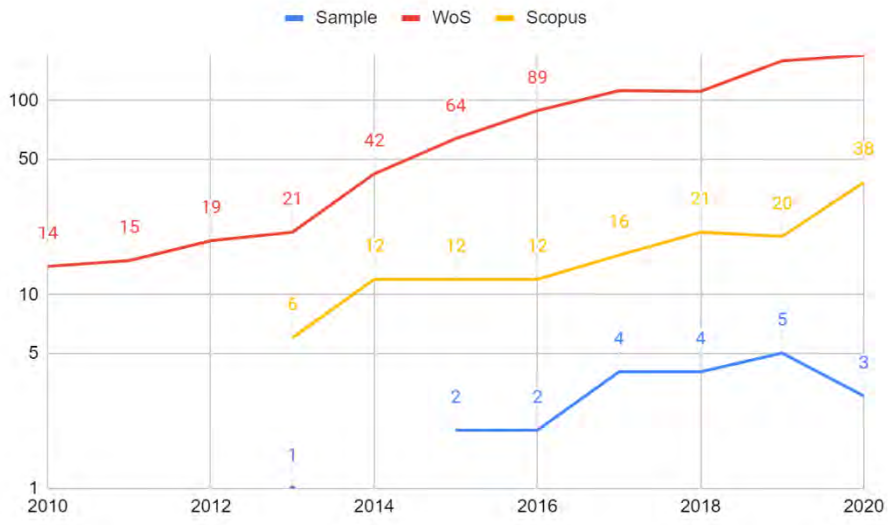

Figure 2: Evolution of publications on Mobile Learning and sustainable inclusive education

According to the geographical location in which these teaching experiences have been developed, Figure 3 shows how Spain is the country with the highest volume of publications in scientific journals of international impact on Mobile Learning and sustainable inclusive education (18.2%), followed by Turkey, Saudi Arabia and Colombia (9.1% respectively).

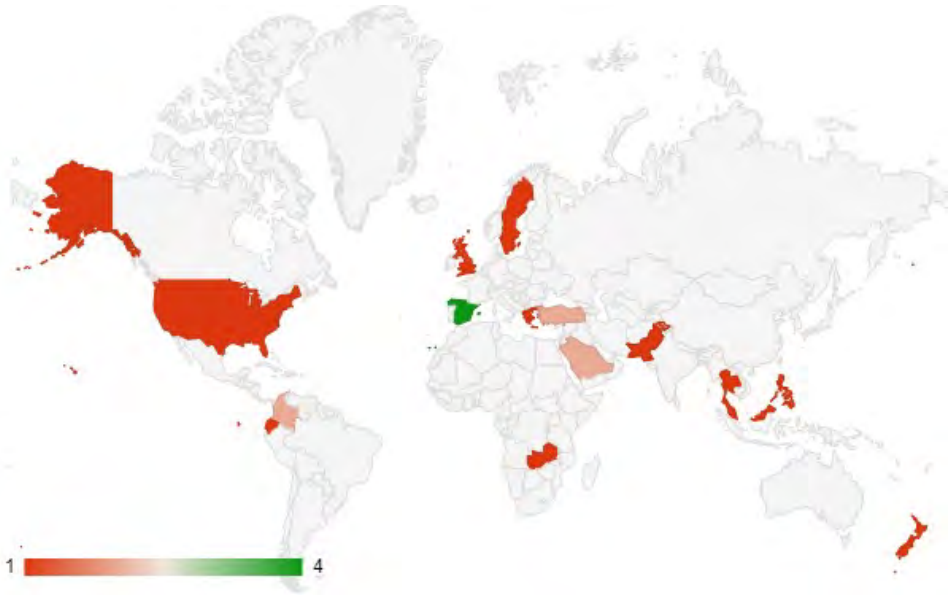

Figure 3: Distribution of publications according to geographic location

4.2 Mobile applications for inclusive and sustainable education

Mobile applications used in the didactic experiences respond to the characteristics of students with educational needs for the development of inclusive and sustainable education. In general, they are inexpensive mobile platforms that are easy to access for both teachers and students and that enable the development of functional, dynamic and interactive didactic experiences capable of facilitating the teaching-learning process for students with educational needs. Figure 4 shows how these applications are related to the learning of communication skills for students with educational needs (28.6%), reading and writing (23.8%), basic mathematical concepts (19.0%) and Augmented Reality (14.3%).

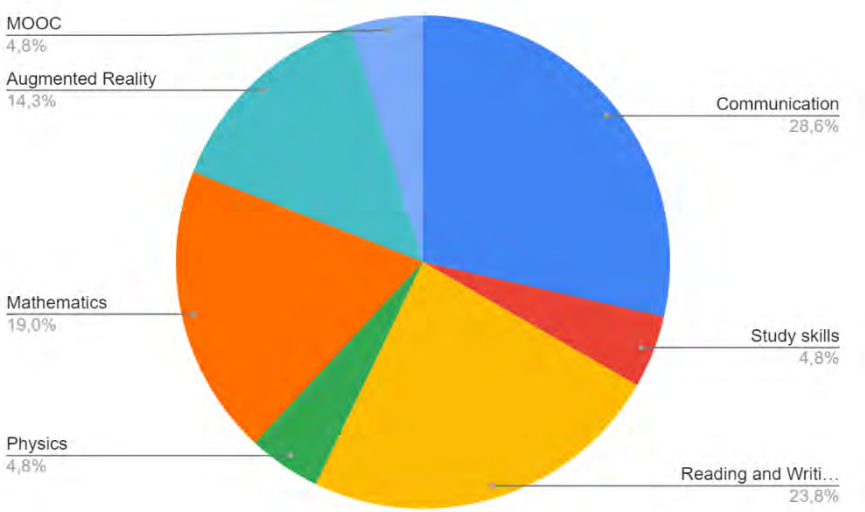

Figure 4: Distribution of publications according to the type of mobile applications

Taking as a reference the educational stage in which such experiences have been developed, Figure 5 shows that most of the publications deal with the use of Mobile Learning for students with disabilities in Primary Education (43.5%), followed by Secondary Education (17.4%) and Higher Education (13.0%).

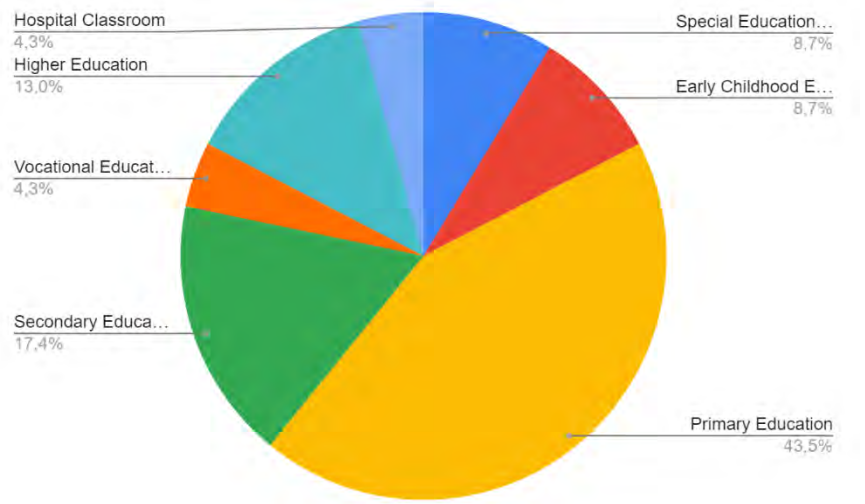

Figure 5: Distribution of publications according to educational stage

Regarding the type of disability of the students targeted by the didactic experiences, Figure 6 shows that 43.4% of the publications deal with the implementation of mobile platforms aimed at students with intellectual disabilities (Down syndrome, autism) or hearing impairment (severe and/or profound, with cochlear implant). In addition, 34.8% of the publications reviewed focus on students with learning difficulties (dyslexia) and visual impairment.

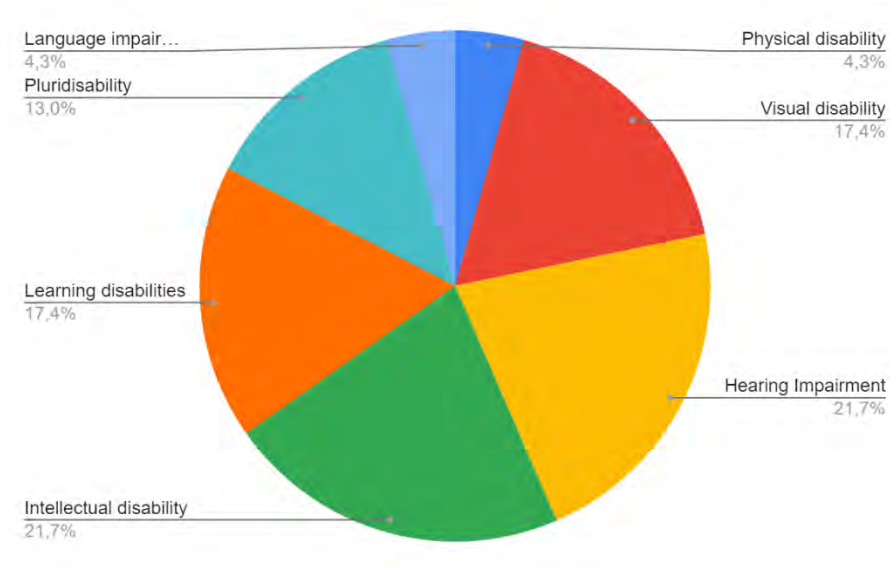

Figure 6. Distribution of publications according to type of disability

4.3 Potential of Mobile Learning for Inclusive Education and Sustainable Development

The analysis of the publications has revealed some of the possibilities of Mobile Learning as a didactic strategy applied to a teaching-learning process that addresses inclusive education from a perspective related to sustainability, as shown in Table 3.

In the first place, its functionality as a facilitating element in the teaching-learning process of students with functional diversity stands out. The creation of learning environments supported by mobile devices allows mediation in student learning (Kamaruzaman et al., 2016; Lersilp and Lersilp, 2019; Pegalajar and Colmenero, 2013), favoring access to knowledge and assimilation of information (Cano et al., 2018; Hayhoe, et al., 2015; Walker, McMahon, Rosenblatt and Arner, 2017) based on the development of innovative learning experiences that connect with the immediate reality in which the student develops (Cano et al., 2018; Park, So and Cha, 2019; Walker et al., 2017; Willacy and Calder, 2017). It is, therefore, an opportunity to improve academic performance (Bigueras, Arispe, Torio and Maligat, 2020; Cárdenas and Inga, 2020; Gkeka, Agorastou and Drigas, 2020; Ojanen et al., 2015; Parvez et al., 2019; Tangarife, 2018), learning feedback (Cano et al., 2018; Willacy and Calder, 2017), as well as to increase motivation and concentration in the study (Cano et al., 2018; Gkeka et al., 2020; Nordström et al. , 2019; Parvez et al., 2019).

In addition, it is a strategy to support the teaching task and improve the quality of educational practice. The incursion of Mobile Learning in the field of inclusive education has added new values associated with the necessary collaboration between family-school for the development of innovative didactic experiences (Ojanen et al., 2015; Willacy and Calder, 2017), capable of developing effective methods based on meaningful learning for students with functional diversity (Cárdenas and Inga, 2020; Karanfiller, Göksy and Yurtkan, 2017).

Finally, it highlights the use of mobile technology as a guarantee for the development of an inclusive, equitable and quality education that promotes equal learning opportunities for all. It serves to reduce many of the barriers faced by students with disabilities, limiting their learning and the participation of all students in the teaching-learning process. It is an alternative that facilitates the implementation of individualized teaching (Al-Megren and Almutairi, 2019; Jiménez, Serrano and Prendes, 2017; Karanfiller et al., 2017; Pegalajar and Colmenero, 2013; Walker et al., 2017; Willacy and Calder, 2017), which meets the needs and characteristics of students and the context in which it is developed, in addition to promoting the participation in the classroom of students with functional diversity (Bülbül, Yigit and Garip, 2016; Kamaruzaman et al., 2016; Yousaf et al., 2018), their normalization and inclusion in the school context (Cano et al., 2018; Cárdenas and Inga, 2020; Kamaruzaman et al., 2016; Lersilp and Lersilp, 2019). It also relies on collaborative work among peers (Bülbül et al., 2016; Cano et al., 2018; Cárdenas and Inga, 2020); Nordström et al., 2019), allowing students with difficulties to compensate for their deficits in the teaching-learning process (Bigueras et al., 2020; Nordström et al., 2019).

Table 3: Potentialities of Mobile Learning for inclusive education and sustainable development

Dimensions	Indicators	References
Facilitator of the sustainable teaching-learning process	Mediation of learning at the communicative, cognitive, visual and auditory levels	Kamaruzaman et al. (2016); Lersilp and Lersilp (2019); Pegalajar and Colmenero (2013)
	Promotes access to knowledge and assimilation of information	Cano et al. (2018); Hayhoe et al. (2015); Walker et al. (2017)
	Offers innovative, interactive and fun learning opportunities through the exploration and manipulation of everyday life situations	Cano et al. (2018); Park, So and Cha (2019); Walker et al. (2017); Willacy and Calder (2017)
	Improves academic performance	Bigueras et al. (2020); Cárdenas and Inga (2020); Gkeka, Agorastou and Drigas, (2020); Ojanen et al. (2015); Parvez et al. (2019); Tangarife (2018)
	Allows for learning feedback	Cano et al. (2018); Willacy and Calder (2017)
	Promotes motivation and concentration towards study	Cano et al. (2018); Gkeka et al. (2020); Nordström et al. (2019); Parvez et al., (2019)
Supporting teaching for sustainable education	Shows teachers and families the importance of developing effective instructional methods	Ojanen et al. (2015)
	Support for the development of innovative didactic experiences in the teaching-learning process of students	Cárdenas and Inga (2020); Karanfiller, Göksy and Yurtkan (2017)
	Enables family-school collaboration	Willacy and Calder (2017)
Promotes sustainable inclusive education	Facilitates the development of individualized teaching according to the needs of students, their families and teachers involved in the teaching-learning process	Al-Megren and Almutairi (2019); Jiménez, Serrano and Prendes (2017); Karanfiller et al. (2017); Pegalajar and Colmenero (2013); Walker et al. (2017); Willacy and Calder (2017)
	Allows students with disabilities to participate in the classroom, assuming new responsibilities	Bülbül, Yigit and Garip (2016); Kamaruzaman et al. (2016); Yousaf et al. (2018)
	Promotes collaborative work among peers	Bülbül et al. (2016); Cano et al. (2018); Cárdenas and Inga (2020); Nordström et al. (2019)
	Promotes the normalization and inclusion of students with disabilities in the school context	Cano et al. (2018); Cárdenas and Inga (2020); Kamaruzaman et al. (2016); Lersilp and Lersilp (2019)
	Compensate for the difficulties of students with disabilities	Bigueras et al. (2020); Nordström et al. (2019)

4.4 Limitations of Mobile Learning for Sustainable Inclusive Education

The integration of Mobile Learning as an effective teaching strategy for inclusive quality education that addresses individual needs and offers learning opportunities to all for the sustainable development of society also encounters some limitations, as shown in Table 4.

The teacher is defined as one of the fundamental educational agents involved in the development of sustainable inclusive education. They are responsible for transmitting knowledge to future generations, who will be in charge of transforming the knowledge society towards values related to sustainability. For this reason, it needs a process of permanent training and digital competence training that allows it to know the didactic possibilities of these tools in the educational field (Del Cerro and Morales (2018); Gkeka et al. (2020); Ojanen et al. (2015); Pegalajar and Colmenero (2013); Tangarife (2018); Willacy and Calder (2017). Likewise, it must have positive perceptions and attitudes towards the development of educational innovation processes and the use of technologies to improve the quality of their teaching practice (Hayhoe et al., 2019). Finally, the need for support and incentives from the Administration, through the different educational policies for the development of this type of innovative didactic experiences that require time, effort and risk on the part of the teacher, stands out (Del Cerro and Morales, 2018).

In addition, the incorporation of this technology in the teaching-learning process of students with functional diversity requires the participation of the educational community for an effective implementation, as well as individualized support for students with disabilities (Ojanen et al., 2015). In addition, this new conception of the training process requires a series of changes in the teaching-learning process, which must be adjusted to the needs of the students to whom it is addressed (Bülbül et al., 2016; Willacy and Calder, 2017). It is necessary to

prepare teaching guides that serve as a support tool for teachers for their effective implementation in the classroom (Cano et al., 2018). On the other hand, it is of interest the realization of interdisciplinary projects that advocate the use of such technologies in the teaching process of students with disabilities (Tangarife, 2018), as well as the importance of the student's continued use of this strategy in their training process for the development of a quality inclusive education (Nordström et al., 2019).

Finally, and taking into account the nature of mobile technology as a learning tool, it is necessary to carry out a prior assessment to identify possible individual needs of the students to whom it is addressed, as well as the context in which it is developed (Bigueras et al., 2020; Cano et al., 2018; Cárderas and Inga, 2020); Hayhoe et al., 2015). Therefore, applications should be subject to a process of continuous updating and improvement, including different levels of learning and degrees of difficulty (Al-Megren and Almutairi, 2019; Karanfiller et al., 2017; Parvez et al., 2019); Tangarife, 2018). In addition, sometimes, access to such devices may be costly or subject to technical difficulties inherent to the use of technology (Walker et al., 2017; Willacy and Calder, 2017), as well as accessibility problems for students with disabilities (Park et al., 2019).

Table 4: Limitations of Mobile Learning for sustainable inclusive education

Dimensions	Indicators	References
In relation to the role of the teacher	Updated teacher training	Del Cerro and Morales (2018); Gkeka et al. (2020); Ojanen et al. (2015); Pegalajar and Colmenero (2013); Tangarife (2018); Willacy and Calder (2017)
	Positive perceptions and attitudes towards ICT and educational innovation	Hayhoe et al. (2015)
	Continuous support and incentives from the Educational Administration	Del Cerro and Morales (2018)
Regarding the implementation of technology in the sustainable teaching-learning process	Involvement of families and the educational community for an effective incorporation of these tools in the classroom	Ojanen et al. (2015)
	Reorganization of the teaching-learning process to facilitate the participation of students with disabilities	Bülbül et al. (2016); Willacy and Calder (2017)
	Individualized support for students to use the applications efficiently	Nordström et al. (2019); Willacy and Calder (2017)
	Investment of time resources for the development of the teaching-learning process	Cádernas and Inga (2020); Nordström et al. (2019)
	Shortage of interdisciplinary projects based on the use of mobile platforms for students with disabilities	Tangarife (2018)
	Development of teaching guides as support material for teachers	Cano et al. (2018)
	Lack of continuity among students regarding the use of the mobile application after the development of the didactic experience	Nordström et al. (2019)
In relation to mobile technology as a learning tool	Pre-assessment of the mobile platform to identify its functionality, the learning environment and the individual needs of the targeted learners	Bigueras et al. (2020); Cano et al. (2018); Cárderas and Inga (2020). Hayhoe et al. (2015)
	Updating and redefinition of the mobile platform with different degrees of difficulty and levels of student learning	Al-Megren and Almutairi (2019); Karanfiller et al. (2017); Parvez et al. (2019); Tangarife (2018)
	High cost of accessing mobile devices and difficulties arising from the technical properties of the technology	Walker et al. (2017); Willacy and Calder (2017)
	Difficulties in accessibility of the platform for students with disabilities	Park et al. (2019)

5. Discussion

The interest of this work lies in the need to improve the quality of life for all and promote shared economic prosperity, social development and environmental protection of all countries, responding to the Sustainable Development Goals proposed by the United Nations in 2015 in the document "Transforming our world: the 2030 Agenda for Sustainable Development".

The analysis of the publications reveals the growing interest among the international scientific community in this topic. It alludes to the implementation of Mobile Learning as a didactic strategy for a teaching-learning process based on the principle of inclusion as an enriching element for all (Muntaner, 2019). In addition, it bets on education for the sustainable development of the student with functional diversity, expanding the scope of the teaching-learning process outside the classroom (Ally et al., 2014; McQuiggan et al., 2015; Reychav and Wu, 2015; Sattarov and Khaitova, 2019).

From the perspective of teaching innovation (Middleton, 2015), the didactic experiences described reveal how mobile technology enables the development of a new learning process based on sustainable development (Boulahrouz et al., 2019; Ziemba, 2017). It is a means to respond to the demands of students in an inclusive environment (Hamburg and Lütgen, 2019), establishing relationships between the classroom and the context in which it unfolds (Boni and Calabuig, 2017). Mobile applications allow the creation of virtual teaching environments that enable students with educational needs to have access to ubiquitous, universal and personalized learning (Echeita, 2017), responding to an inclusive, equitable and quality education as approved in the 2030 Agenda (UN, 2015).

Among the possibilities of Mobile Learning as a didactic strategy for sustainable inclusive education towards students with functional diversity, it is worth highlighting the mediation capacity of mobile devices in a student-centered teaching-learning process (Chih-Hung and Chin-Chung, 2021; Pegalajar and Colmenero, 2013; Tinoco and Tinoco, 2018), which facilitates the construction of knowledge, the resolution of learning problems and the development of skills and abilities in the student from anywhere and anytime (Cano et al..., 2018; Park et al., 2019; McQuiggan et al., 2015; Willacy and Calder, 2017). In addition, its use as a support tool for the teaching task that bets on educational innovation (Cárdenas and Inga, 2020; Karanfiller et al., 2017) and guarantees principles based on equity and equal opportunities for all is highlighted. Even, its potential to promote sustainable inclusive education, capable of guaranteeing individualized attention to the student, responding to their particular needs and enhancing their normalization in the environment in which they develop, is highlighted (Al-Megren and Almutairi, 2019; Lai et al., 2019; Walker et al., 2017). Mobile technologies are tools with enormous potential to develop the Sustainable Development Goals (Chin and Jacobsson, 2016; Seegolam et al., 2015; Tjoa and Tjoa, 2016) from the context of inclusive education (Bigueras et al., 2020; Nordström et al., 2019). It favors autonomy and improvement of the quality of life of the student with disabilities (Gentry et al., 2019), interest and motivation towards study (Diacopoulos and Crompton, 2020), knowledge acquisition (Chee et al., 2017) and the development of digital competences (Gómez et al., 2015; Sungkur et al., 2016; Sevillano and Vázquez, 2015).

Mobile Learning has become a new educational paradigm in line with our model of society based on information and knowledge and access to Information and Communication Technologies. In this way, a binomial has been established between technology and education that aims to implement benefits for the agents involved at a quantitative and qualitative level for the implementation of an inclusive education that caters to students with functional diversity and is committed to improving education for sustainable development.

In addition, this work has highlighted some of the limitations of Mobile Learning as an effective teaching strategy for inclusive quality education that supports sustainable development: In relation to the teacher, the implementation of Mobile Learning in the educational context requires adequate technopedagogical training (Boude and Sarmiento, 2017; Del Cerro and Morales, 2018; Gkeka et al..., 2020; Sanchez et al., 2019; Tangarife, 2018; Willacy and Calder, 2017), as well as favorable attitudes and perceptions to integrate technology in the classroom (Al-Adwan et al., 2018; Chao, 2019; Hayhoe et al., 2015). Regarding the implementation of technology in the teaching-learning process, it is necessary to reorganize the didactic process to facilitate the active participation of students with functional diversity (Bülbül et al., 2016; Willacy and Calder, 2017), individualized student support to facilitate the effective use of these applications (Nordström et al., 2019) or the development of teaching guides as didactic support material (Cano et al., 2018). Finally, and for the use of mobile technology

as a learning tool, it is necessary the previous evaluation of the mobile platform (Bigueras et al., 2020; Cárdenas and Inga, 2020), the constant updating and redefinition of these tools according to the needs of the targeted students (Al-Megren and Almutairi, 2019; Tangarife, 2018), as well as the difficulties of accessibility for students with functional diversity (Park et al., 2019; Royle et al., 2014).

As suggestions for improvement, it is proposed to facilitate the technological training of active teachers, providing them with strategies and skills to implement mobile technology in their daily work in the classroom. Mobile technology should be incorporated into the teaching-learning process not as a simple didactic tool, but as a resource capable of offering an inclusive educational response that is committed to the sustainable development of the student. To this end, and from the educational field, it is necessary to focus on teaching innovation as a fundamental element for a quality educational system. This requires a highly qualified teacher, with professional skills to implement ICT in the classroom, motivation and positive attitudes towards the use of ICT for sustainable development in an inclusive school context.

6. Conclussions

Mobile Learning is defined as a learning strategy that is committed to the development of the goals set out in the 2030 Agenda, focused on the transformation of society towards a more sustainable world. The didactic experiences reviewed combine three key concepts: mobile technology, inclusion and sustainable education, with the intention of transforming the didactic process, improving the quality of education, and favoring equal opportunities for all students.

This work performs a generalist analysis, since it analyzes the development of didactic experiences based on the implementation of Mobile-Learning for any educational stage or type of disability in students, this being one of the main limitations of the research. However, and for future research, the possibility of going deeper into the use and implications of Mobile Learning for students with a specific type of disability is considered, as well as analyzing the perceptions of the main educational agents involved in the implementation of this strategy in the classroom (family, teachers and students). This will allow us to determine the point of view of each of them and, as a consequence, to analyze the factors that favor or hinder its implementation in the school context.

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