Artigo

Digital literacy in higher education: a systematic literature review

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Resumo

The article aims to analyze international publications on digital literacy in higher education, through a systematic literature review. We used the Education Resources Information Center (ERIC) academic database. 41 articles on digital literacy were found in the period between 2008 and 2019, published by researchers from 16 countries, with the highest number presented by the United States. The topics covered in the articles are related to activities with immersive resources; digital literacy associated with psychological aspects; levels of digital literacy; impacts of personal characteristics on the appropriation of digital literacy; methodologies and strategies for the development of digital literacy and theoretical proposals; policies and reflections, most of them about research reports. There has been an increase in the number of publications on digital literacy in recent years. The results do not allow generalizations, however, they point to gaps for future research, given the variety of topics covered in the analyzed articles.

Keywords: Digital literacy. Systematic review. Education. Digital Information and Communication Technologies (TDIC, in Portuguese abbreviation).

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Letramento digital no ensino superior: uma revisão sistemática da literatura

Abstract

O artigo tem como objetivo analisar publicações internacionais sobre letramento digital no ensino superior por meio de uma revisão sistemática da literatura. Utilizou-se a base de dados acadêmica *Education Resources Information Center* (ERIC). Foram encontrados 41 artigos sobre digital literacy no período entre 2008 e 2019, publicados por pesquisadores de 16 países, com o maior número apresentado pelos Estados Unidos. Os temas tratados nos artigos estão relacionados a atividades com recursos imersivos; letramento digital associado a aspectos psicológicos; níveis de letramento digital; impactos de características pessoais na apropriação do letramento digital; metodologias e estratégias para desenvolvimento do letramento digital e propostas teóricas; políticas e reflexões, a maioria sobre relatos de pesquisa. Observou-se um crescimento do número de publicações sobre letramento digital nos últimos anos. Os resultados não permitem generalizações, entretanto, apontam lacunas para pesquisa futura, dada a variedade de temas tratados nos artigos analisados.

Palavras-chave: Letramento digital. Revisão sistemática. Educação. Tecnologias Digitais de Informação e Comunicação (TDIC).

Alfabetización digital en la educación superior: una revisión sistemática de la literatura

Resumen

El artículo tiene como objetivo analizar publicaciones internacionales sobre alfabetización digital en la educación superior, a través de una revisión sistemática de la literatura. Se utilizó la base de datos académicos del *Education Resources Information Center* (ERIC). Se encontraron 41 artículos sobre alfabetización digital entre 2008 y 2019, publicados por investigadores de 16 países, el mayor número presentado por Estados Unidos. Los temas tratados en los artículos están relacionados con actividades con recursos inmersivos; alfabetización digital asociada con aspectos psicológicos; niveles de alfabetización digital; impactos de las características personales en la apropiación de la alfabetización digital; metodologías y estrategias para el desarrollo de la alfabetización digital y propuestas teóricas; políticas y reflexiones, la mayoría se trata de informes de investigación. Ha habido un aumento en el número de publicaciones sobre alfabetización digital en los últimos años. Los resultados no permiten generalizaciones, sin embargo, apuntan a lagunas para futuras investigaciones, dada la variedad de temas cubiertos en los artículos analizados.

Palabras clave: Alfabetización digital. Revisión sistemática. Educación. Tecnologías Digitales de Información y Comunicación (TDIC).

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Introduction

A significant number of innovations are constantly coming together with possibilities presented by Digital Technologies of Information and Communication (TDIC, In Portuguese abbreviation). Thus, the widespread use of mobile digital devices for personal and professional use significantly modifies different sectors of society, such as the economic, political, social and cultural sectors.

According to data from the Comitê Gestor da Internet no Brasil – CGI.br [Internet Managing Committee in Brazil] (2016, 2019), access to digital technologies has been expanding in recent years among the general population, more accentuated in the younger section of the population that arrived at 90% among 16 to 24 age group, "[...] which indicates that the Internet has become a fundamental element of socialization and a basic tool for those entering the labor market" (CGI.BR, 2019, p. 23). Grows, therefore, the importance of deepening studies on the use of digital technologies in education, its benefits and challenges, especially for teachers.

This work started from concerns arising from the classroom and an epistemological curiosity about what scientific research in international publications points out in terms of the challenges of digital literacy in higher education. The paper aimed to better understand digital literacy in academic environments, in order to expand and deepen the knowledge on this topic by investigating what has been studied and researched on digital literacy in the field of higher education in international academic contexts, in English-language publications. It involved a systematic literature review as a research method, looking for publications in the Education Resources Information Center (ERIC) database.

The search for articles was carried out in March 2020. 41 articles were found, in the period from 2008 to 2019, with the term *digital literacy* from 16 different countries. First, this text introduces the concept of digital literacy, then, it deals with the definition of *systematic literature review* to then analyze the data found. It closes with considerations about the pedagogical implications of the research carried out.

Digital literacy

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The notion of *literacy* in Portuguese was initially used to make a distinction between the process of learning written skills and teaching writing in the school environment with the sociocultural appropriation of the language (TFOUNI, 1988). Some authors (SOARES, 2002; KLEIMAN, 2007; ROJO, 2007) propose the pluralization of the term, since in digital environments there are infinite possibilities for interaction with various types of texts.

The term *digital literacy* was coined by Gilster (1997) at the beginning of the diffusion of the internet. The author argues that digital literacy is related to critical thinking and information assessment, rather than technical knowledge. For the United Nations Educational, Scientific and Cultural Organization - UNESCO (2011, p. 4), "[…] digital literacy is as relevant as traditional literacies – such as reading and writing, mathematics, or the management of social behaviour".

Thus, a digitally literate individual is one who "[…] knows when and how to effectively employ digital resources to resolve an information need" and "how to evaluate digital documents" (MEYERS; ERICKSON; SMALL, 2013, p. 358). In the view of Gilster (1997), a digitally literate person is someone who

has acquired four skills that include: a) making a critical assessment of the content found on the network; b) read texts in a non-linear or hypertext model; c) conduct research on the internet; d) build knowledge, combining information produced on the internet, browsing and conducting research.

However, in the view of other authors (SOARES, 2002; BUZATO, 2007), there are limitations to define digital literacy in terms of skills or competences, because they do not take into account the different social relationships in which the appropriation of technologies can be established. And it is still necessary to be careful with conceptual formulations, as they can omit broader cultural uses of the internet, which are relatively easy to acquire and become obsolete in short periods of time, (BUCKINGHAM, 2006, OLIVEIRA NASCIMENTO; KNOBEL, 2017). In addition to knowledge about digital technologies and skills to manage them, appropriation is essential, that is, knowing why to use them, when, how, where and, still, doing it critically, obeying criteria of safety, ethics in the management and use of data in communication (GILSTER, 1997).

This discussion points to the need for educators to adopt digital literacy experiences in all areas of the learning environment, so that they can use the internet appropriately and critically and teach their students (ROSAEN; TERPSTRA, 2012, LANKSHEAR; KNOBEL, 2006). However, this is not an easy task.

The appropriation of a new technology goes beyond knowledge and demands a set of skills and attitudes. It is up to the researcher to carry out studies that present results that can be turned into benefits for the teacher and his students in the classroom. Thus, we discuss here the importance of digital literacy in education and, even more so, in higher education, an environment where teachers are trained to educate children, young students and adults, which indicates the relevance of carrying out a systematic review of literature on digital literacy in higher education.

Systematic review

The tradition of literature reviews comes from medicine and other medical sciences and is used to communicate evidence-based studies in practice. In the UK, systematic reviews have emerged from an identified need for better evidence-based research within the medical profession. In the early 1990s, the UK government identified a gap between research professionals, arguing

that academics were conducting a research agenda with little perceived use (TRANFIELD; DENYER; SMART, 2003). In order to fill this gap, the UK government advised medical professionals to establish networks of evidence with the mission of filling and updating research databases using systematic techniques. The idea was to formulate and promote evidence-based policy, thus allowing researchers to have a complete picture of what had already been accomplished by other researchers. The fundamental principles of systematic reviews spread across different sciences in the United Kingdom and began to be practiced in research in other areas such as management (TRANFIELD; DENYER; SMART, 2003; DENYER; NEELY, 2004 apud PITTAWAY; THORPE; MACPHERSON; HOLT, 2005).

According to the Evidence for Policy and Practice Information and Co-ordinating Centre – EPPI-Centre, the purpose of a systematic review is "[…] to compile the best available research on a specific issue […]", emphasizing that research procedures must be defined in advance and informed in the reporting of results to ensure that the work can be replicated with the guarantee of minimizing possible biases. Gough, Oliver and Thomas (2019) point out that systematic reviews on the results of research already carried out provide a reliable account of the current state of knowledge, which can also be called an evidence base, about a specific problem that evaluates and synthesizes the results with rigorous, explicit and responsible methods.

Essentially, a proposal to define a systematic review involves the announcement of a rigorous, replicable, scientifically responsible and transparent method. The definitions also emphasize that the research must use processes of exhaustive search for material published in a certain area of knowledge and not only in those that are publications of qualified journals. Thus, researchers should investigate all the literature within their research protocol (THORPE; HOLT; MACPHERSON; PITTAWAY, 2005; TRANFIELD; DENYER; SMART, 2003; GOUGH; RICHARDSON, 2018; GRANT; BOOTH, 2009; EPPI-Center , 2004), also including works classified as grey (or gray) literature, such as technical reports, ongoing research and annals of congresses (KITCHENHAM, 2004; HOPEWELL; CLARKE; MALLETT, 2005; SCHMUCKER; BLUEMLE; BRIEL; PORTALUPI; LANG ; MOTSCHALL; SCHWARZER; BRASSLER; MUELLER; VON ELM; MEERPOHL, 2013; PAEZ, 2017).

Several authors propose a set of steps to be followed in a systematic review protocol (RAMOS; FARIA; FARIA, 2014; SAUR-AMARAL, 2011; GOUGH; THOMAS; OLIVER, 2012; RAMOS; FARIA, 2012; KOFINAS; SAUR-AMARAL, 2008;

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TRANFIELD; MOUCHEL, 2002). Briner and Denyer (2012) organize the research protocol in five main steps, as illustrated in Figure 1.

Figure 1

Systematic review steps
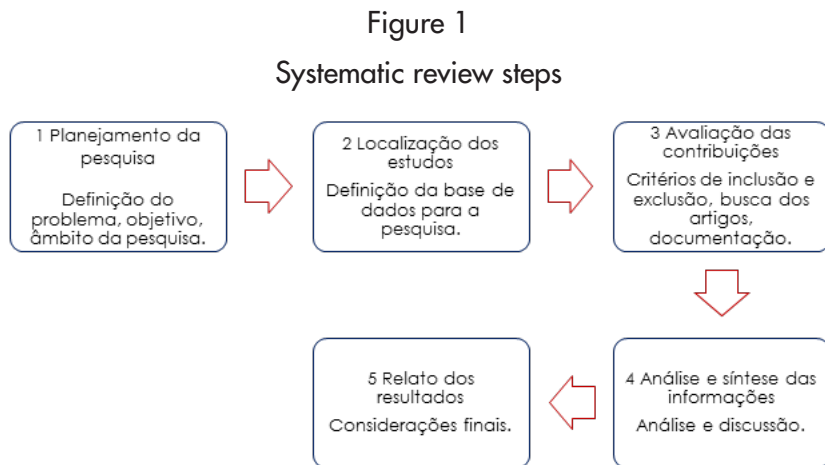
Source: Adapted from Briner and Denyer (2012, p. 115).

In the next lines, there is a sequence of the steps of the systematic review adapted to the exposed model.

Research planning

The research problem refers to challenges in the use of Digital Technologies of Information and Communication (TDIC, In Portuguese abbreviation) in education, linked to the need to develop skills for teachers and students to appropriate these technologies. Thus, the objective is to investigate what has been studied and researched on digital literacy in the area of higher education, in international academic contexts with the aim of expanding and deepening knowledge on this topic.

Study database

From a collection of publications in English, a systematic review of the literature was carried out, selected in the ERIC database. The choice of articles with the term *digital literacy* in the title is justified due to the selection of articles that have this subject as the central focus.

ERIC is a digital library of educational research and information available on the Internet, sponsored by the Institute of Education Sciences of the United States Department of Education. Having chosen the database, the research on digital literacy was continued on the ERIC website (https://eric.ed.gov/).

In the research planning stage, a protocol was defined that includes the inclusion and exclusion criteria for studies on digital literacy.

Evaluation of contributions

In this stage, the work was the search of the articles and their organization. The inclusion criteria were: articles related to higher education with the term *digital literacy* in the title, published in peer-reviewed journals, available for free download. The exclusion criteria were: works that were not articles; articles not related to higher education; texts that did not have the exact term *digital literacy* in the title; articles that have not been published in peer-reviewed journals and are not available for free download.

Thus, the following criteria were identified: title: "digital literacy" (in quotation marks, to find the exact term), peer-reviewed journal articles, full text available on ERIC, on "higher education" (http://eric.ed.gov/?q=title%3a%2 2digital+literacy%22&pr=on&ft=on&ff1=pubJournal+Articles&ff2=eduHigher+ Education). The database showed 41 articles, which were sent to us by email. We also considered articles that had in their title the terms: Digital Literacies; Digital Information Literacy; Digital, Discipline-Specific Literacy; Digital Online Media Literacy. These titles were considered for analysis because they are all related to digital literacy and because they were included in the list of ERIC results in the search. Thus, we consider as priority the replicability criterion of the systematic review.

In the next step, when each article was analyzed, it was possible to view the base information, such as type of publication, educational level, authoring institution and country of the researchers (https://eric.ed.gov/?id=EJ1156711).

The abstracts were copied into a Microsoft Word table and all articles downloaded and saved in PDF in a Windows folder. These documents were also saved in Google Drive for sharing between the authors during research, writing the article and for future use.

Analysis and discussion

41 articles on digital literacy were found in the ERIC database, published from 2008 to 2019, according to the criteria adopted in the research: peer-reviewed articles, available in the ERIC database for free download, related to higher education

Quantitative analysis

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Of the studies analyzed, 32 were also classified (according to the ERIC database) as linked to post-secondary education and higher education. It should be emphasized that there are articles that address various educational levels, in addition to higher education. Graph 1 shows the distribution of selected articles in relation to the year of publication.

Graphic 1
Number of articles per year
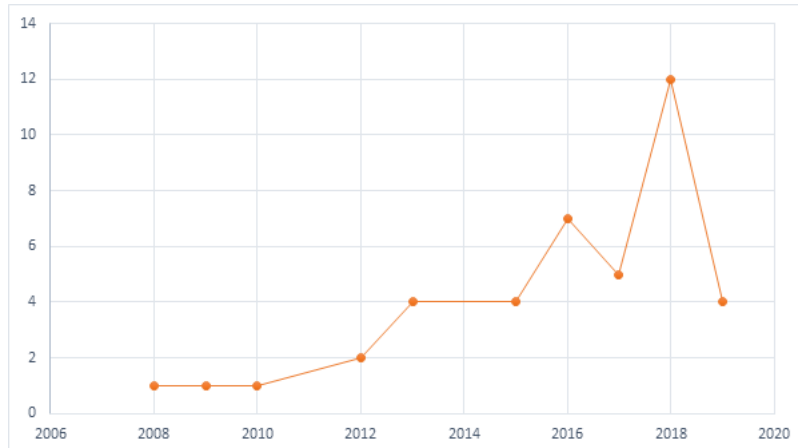
Source: The authors.

All articles found in the ERIC database on digital literacy in higher education were considered within the criteria adopted. In 2008, 2009 and 2010, there was one publication on the theme in each year. In 2012, two publications; in 2013 and 2015, four. In 2016, the number of publications increased to seven, decreasing to five in 2017 and rising to twelve in 2018. There is a decrease in 2019, the year in which four articles were published. The totality of the publications of 2019 may not have been made available in the database, which would lead to the supposition that the number of that year could be greater.

It is interesting to note in graph 1 that there was a considerable increase in articles published between the years 2015 and 2018. In 2019, this number returns to the level of 2015.

The articles found are of the research report type, information analysis and results of the application of tests / questionnaires. This information was taken from the ERIC data. Most articles deal with research reports (37), representing 90% of publications. The rest are: two on information analysis (5%) and two on tests / questionnaires (5%).

The identification of the origin of the authors showed articles from universities in 16 different countries, with emphasis on the United States, with eleven

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articles, and Turkey, with seven. Three articles are from the United Kingdom, South Africa and Singapore. Canada, Lebanon and Japan appear with two articles each. The following countries published one article: New Zealand, Indonesia, Spain, South Korea, Israel, Australia, Italy and the Isle of Man. We observed that there are no articles by authors from Brazil. Recent research in Portuguese on the production of the subject of digital literacy (articles by one of the authors awaiting publication) identified 98 articles on digital literacy and education in the last five years, and 22 on teacher training in the last 10 years. These results may indicate the preference of Brazilian researchers for publication in journals in Portuguese.

In addition, Brazilian researchers working on the theme adopt different names such as: digital literacy, digital literature, digital alphabetization. The themes of the selected articles revealed a choice for the analysis of research problems, which were grouped into categories that emerged from the research.

The categories coded to facilitate the attribution to the analyzed articles were as follows:

✓ Activities with immersive resources (IR): 4 articles.

✓ Digital literacy associated with psychological aspects (PSY): 12 articles.

✓ Levels of digital literacy (LDL): 4 articles.

✓ Impacts of personal characteristics on the appropriation of digital literacy (IDL): 6 articles.

✓ Methodologies, strategies and resources (MSR): 8 articles.

✓ Theoretical, political, reflections (TPR) proposals: 7 articles.

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Graph 2
### Percentage of themes of selected articles

Source: The authors.

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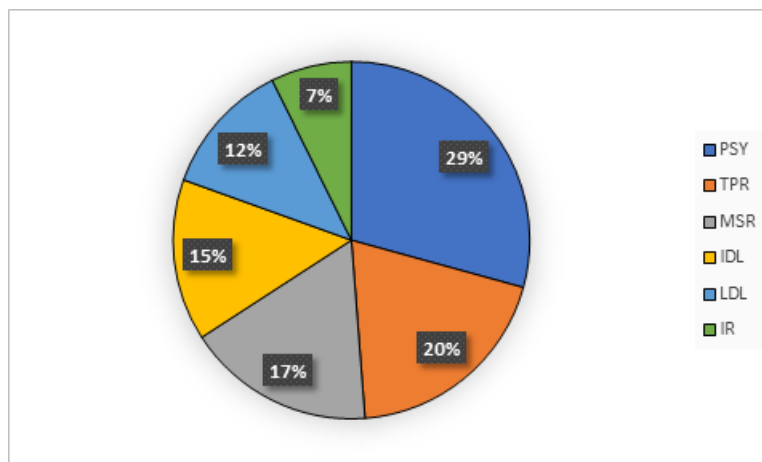
The interest in the study of digital literacy associated with psychological aspects (29%) is highlighted among the themes that emerged in the categories, with an expressive representation of the category that included proposals for methodologies, techniques and resources for teaching digital literacy (19%). With slightly lower representativeness, we verified the category of theoretical and political proposals, reflections on digital literacy in education (17%) and impacts of personal characteristics of research participants on the competence profile for digital literacy (15%). The categories research on levels of digital literacy and the application of activities with immersive resources represented 10% each.

Graph 3 shows the distribution of articles by countries, relating them to the authors' universities.

Graph 3

Distribution of articles by theme and by country
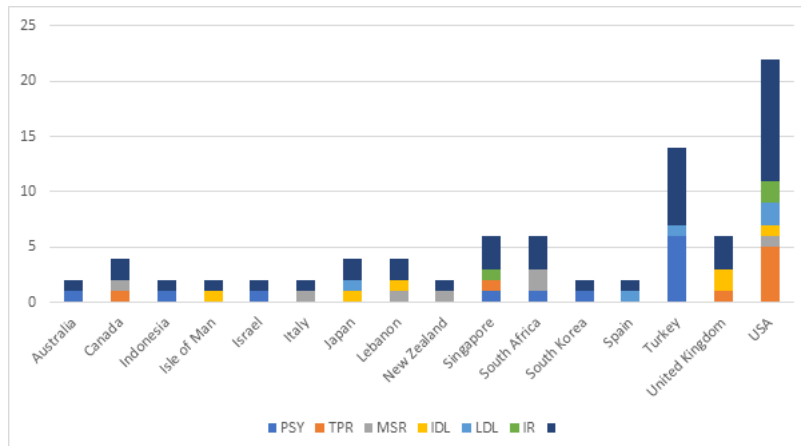
Source: The authors.

Graph 3 highlights different situations in relation to the topics investigated. Among the countries that had greater representativeness in the research are the United States with 11 articles that show a certain variety and deal with *theoretical proposals, political issues and reflections* – four articles (BLUMMER, 2017; CORDELL, 2013; MARTZOUKOU; ELLIOTT, 2016; SPARKS; KATZ; BEILE, 2016); *methodologies and strategies* – two articles (HALLAQ, 2016; HILL, 2016); *impacts of personal characteristics on the appropriation of digital literacy* – one article (ENGLISH, 2016); *levels of digital literacy*, with one article (DAVIS, 2009); and *activities with immersive resources* – three articles (HUNTER; SILVESTRI; ACKERMAN, 2018; BURGESS; PRICE; CAVERLY, 2012; JENSEN; PAIGE; SWEREDOSKI; YANOFF, 2010). Secondly, in terms of the number of articles analyzed, there is Turkey with seven articles that address two themes: *digital literacy associated with psychological aspects* – six articles (ÖZDEN, 2018; ATA; YILDIRIM, 2019; ÇOCUK; YANPAR YELKEN, 2018; ÖNGER; ÇETIN, 2018; ALTUN, 2019; OZDAMAR; OZATA; ROYLE, 2015); and *digital literacy levels* – one article (ÇAM; KIYICI, 2017).

With three articles in total, there are South Africa, the United Kingdom and Singapore. South Africa comes up with two articles on *methodologies, strategies and resources* (STEYN, 2018; TAKAVARASHA; CILLIERS; CHINYAMURINDI,

2018); and one on *digital literacy associated with psychological aspects* (CHINYAMURINDI; DLAZA, 2018). Two articles by UK authors report on impacts of personal characteristics on the appropriation of digital literacy (HALL; NIX; BAKER, 2013; JONES; LEA, 2008); and one, on theoretical, political, reflections (GRUSZCZYNSKA; MERCHANT; POUNTNEY, 2013). We found an article from Singapore on activities with immersive resources (CHAN; CHURCHILL; CHIU, 2017); one, about digital literacy associated with psychological aspects (KEBBLE, 2018); and one, on theoretical, political, reflections (TANG; CHAW, 2016).

Canada, Lebanon and Japan published two articles each. Canada published an article on *methodologies, strategies and resources* (HANBIDGE; SANDERSON; TIN, 2015); and one, on *theoretical, political, reflections* (ANDEMA; KENDRICK; NORTON, 2013). Lebanon published an article on *impacts of personal characteristics on appropriation* (MELKI, 2015); and one, on digital literacy levels (DE COURSEY; DANDASHLY, 2015). Japan published one article on *impacts of personal characteristics on the appropriation of digital literacy* (COTE; MILLINER, 2017); and one, on *digital literacy levels* (COTE; MILLINER, 2018).

The countries that presented a single article were: Australia, South Korea, Spain, Indonesia, Isle of Man, Israel, Italy and New Zealand with the following topics: Australia (SON; PARK; PARK, 2017) *on digital literacy associated with psychological aspects*; South Korea (KIM, 2019) on *digital literacy associated with psychological aspects*; Spain (GÓMEZ-TRIGUEROS; RUIZ-BAÑULS; ORTEGA-SÁNCHEZ, 2019) on *digital literacy levels*; Indonesia (DURRIYAH; ZUHDI, 2018) on *digital literacy levels*; Isle of Man (CREER, 2018) on *impacts of personal characteristics on the appropriation of digital literacy*; Israel (PIETERSE; GREENBERG; SANTO, 2018) about *digital literacy associated with psychological aspects*; Italy (FEOLA, 2016) about *digital literacy associated with psychological aspects*; and New Zealand (NOVEMBER; DAY, 2012) on *methodologies, strategies and resources*.

There are, therefore, articles of various themes seen from different angles, by different researchers from different countries, which makes possible a diversified look at the challenges of digital literacy. The main results indicate that researchers carry out studies on digital literacy in higher education for several reasons: the educational, cultural, social and political differences in each country and, in addition, to the particular interest of researchers.

Discussion

Among the selected articles, there were some with little or insufficient information about the research problem and objectives, which made it difficult to analyze the results. Although the search excelled in using the term "digital literacy" (with quotation marks) in the title, to guarantee the search for the exact term, even so, nine articles were found that did not obey this command. These articles were considered for analysis for consistency with the guidelines of the systematic review.

One aspect that limits systematic review in the area of education is the availability of databases that offer peer-reviewed articles and access to original documents through a free access policy. The ERIC database, among several researched, was the only one that offered these conditions, which is why it was chosen.

This article presents an analysis and synthesis of information from a quantitative point of view, a methodological approach that privileges numbers of publications distributed throughout the researched period, location of authors of the articles and research themes. A path that does not favor the analysis of research problems in depth, but allows presenting results that can sharpen curiosity for the deepening of different aspects related to digital literacy.

The number of articles found within the criteria adopted in the research does not allow generalizations. However, it points to multiple possibilities for future research, given the variety of topics covered in the analyzed articles. Regarding the type of methodology used, the conclusion, as pointed out by Ramos, Faria and Faria (2014), confirms that Brazil and Portugal have no tradition in scientific research related to systematic review methods focused on the education area, which was observed in the present research. Hence the commitment of Brazilian researchers in the development of this type of study, and its dissemination, in order to contribute to the academic community in our country.

Final considerations

The impact of new technologies on education is significant, insofar as digital technologies are present in education, whether in the aspects of academic management, or inside and outside the classroom. Considering the

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relevance of digital literacy of teachers and students, this article sought to better understand this theme through research using the method of systematic literature review. For that, we used the ERIC database, where we searched for peer-reviewed articles available for free download.

The research dealt with in the present study was carried out in March 2020. 41 articles on digital literacy in higher education, from 2008 to 2019, were identified in the ERIC database. The survey results show an increase in the number of articles in recent years. Most of the articles deal with research reports (90%). Within the search criteria, we found articles by authors from universities based in 16 different countries, however, none of them were authored by Brazilian researchers. Thus, Brazil is not among the countries with a significant number of articles on the topic.

The selected articles dealt with the following themes: activities with immersive resources; research on digital literacy associated with psychological aspects, such as attitude, perception, learning styles, belief in self-efficacy, among others; levels of digital literacy; impacts of personal characteristics on the appropriation of digital literacy; methodologies, strategies and resources for the development of digital literacy; theoretical and political proposals; in addition to reflections.

The research results show the need for teachers to seek the appropriation of new digital technologies for use in education. Future research should seek a better understanding of the ways to develop digital literacy for teachers and also for students.

This could happen in a number of ways depending on the learning situation. For the development of digital literacy skills of teachers in training, it is suggested the inclusion of optional subjects (electives) in the curricula of formation programs, mainly in education programs. In addition, it is recommended to include mandatory subjects with content related to the use of Digital Information and Communication Technologies in the curriculum, including subjects related to literacies, scientific methodology, didactics etc. In addition to theoretical subjects, it could be a good alternative to offer practical activities, laboratory classes, scientific initiation and extension activities.

For teachers, it is recommended to create communities of practice among teachers, in which more experienced peers could help others to develop,

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in addition to holding workshops in which teachers could share experiences of activities carried out with their students and colleagues.

Systematic reviews can generate recommendations and new concerns for researchers and educators. In this article, research has focused on the context of higher education, but the possibilities for research at other levels and modes of teaching are numerous. The contribution that the article can bring to the research community is to generate more questions, doubts and concerns, thus providing opportunities for further investigations in the field of digital literacy.

It is relevant to continue researching the theme in the face of the challenges by the pandemic caused by Covid-19, since several institutions adopt remote education, mediated by digital technologies, which requires the development of digital literacy and indicates the urgency of further investigations on the topic.

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