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ARTICLE

Open Educational Resources (OER) in Brazilian theses and dissertations between 2002 and 2019

Recursos Educacionais Abertos (REA) nas teses e dissertações brasileiras entre 2002 e 2019

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Abstract: An analysis of the research scenario on integrating OER in the teaching-learning process is systematized. We analyzed 118 pieces of research produced in Brazil from 2002 to 2019, composing a set of 25 dissertations, 57 academic theses, and 36 professional theses. The texts were extracted from the databases of the CAPES Catalog of Dissertations and Theses and the Digital Library of Dissertations and Theses (BDTD, from the Portuguese Biblioteca Digital de Teses e Dissertações). The scenario design started from the aggregation of results focusing on a) the temporal evolution of the research, b) the localities, c) the administrative dependence of the Teaching Institutions, and d) the area of knowledge. Complementarily, the findings from the four guiding questions made it possible to conclude that there were few pieces of research investigating the integration of OER in the teaching-learning process, especially within the context of Technical and Vocational Education (TVE) and Graduate School. Moreover, the study revealed that, among the 5Rs of OER, the practice most promoted by the pieces of research within the scope of the teaching-learning process was reuse, which is directly associated with retain and redistribute. This indicates the need to expand and strengthen the continuing education actions aimed at the practice of the other two Rs: revise and remix. Finally, the study pointed out the need for research that performs articulations with educational public policies so that they may generate creation and sharing, in addition to consolidating the international open education movement.

Keywords: Open Educational Resources, Open Education, Educational Public Policies, Technical and Vocational Education, Systematic Review.

Resumo: Sistematiza-se análise acerca do cenário das pesquisas sobre a integração dos REA no processo ensino-aprendizagem. Foram analisadas 118 pesquisas produzidas no Brasil entre 2002 a 2019 compondo um conjunto de 25 teses, 57 dissertações acadêmicas e 36 dissertações profissionalizantes. Os textos foram extraídos das bases de dados do Catálogo de Teses e Dissertações da CAPES e da Biblioteca Digital de Teses e Dissertações (BDTD). O delineamento do cenário iniciou a partir da agregação de resultados com foco na: a) evolução temporal das pesquisas; b) localidades; c) dependência administrativa das Instituições de Ensino e d) área do conhecimento. Complementarmente, os achados oriundos das quatro perguntas orientadoras possibilitaram concluir que existiam poucas pesquisas que investigavam a integração dos REA no processo ensino-aprendizagem, principalmente no contexto da Educação Profissional e Tecnológica (EPT) e da Pós-Graduação. Além disso, o estudo revelou que dentre os 5R dos REA, as práticas mais fomentadas pelas pesquisas no âmbito do processo ensino-aprendizagem são o reusar que está associado diretamente ao reter e ao redistribuir. Isso sinaliza para a necessidade de se ampliar e fortalecer as ações de formação continuada voltadas para a prática dos outros dois R que são o revisar e o remixar. Para finalizar, o estudo apontou a necessidade de pesquisas que realizem articulações com as políticas públicas educacionais, para que possam gerar criação e compartilhamento, além de consolidar o movimento internacional da Educação aberta.

Palavras chave: Recursos educacionais abertos, Educação aberta, Políticas públicas educacionais, Educação Profissional e Tecnológica, Revisão sistemática.

1. Introduction

The educational scenario established due to the COVID-19 pandemic revealed deficiencies that traditional education and teaching have relative to the integration of technologies in the teaching-learning process. This pointed to the need to «advance from the condition of users of technologies (located in the field of consumption) to the condition of creators, co-producers, and multipliers of knowledge», especially free and open knowledge (Mallmann & Mazzardo, 2020, Subchapter 4 of Chapter I).

This process demands the training of teachers with Technological-Pedagogical Fluency (Educause, 2019; Mallmann et al., 2013; Pelzel, 2019), capable of giving didactic-pedagogical meaning to integrating technological resources guided by epistemological and political conceptions. Continuing education is encouraged by current public policies and institutional programs, such as the United Nations Educational, Scientific, and Cultural Organization (UNESCO). In this sense, UNESCO highlights the potential of OER and encourages the 5Rs, which include the reuse, adaptation, production, and sharing to improve access to knowledge in formal and informal education (Law No. 13005/2014; UNESCO, 2015, 2017, 2019).

Efforts to produce and disseminate Open Educational Resources (OER) have been taking place since 2002 when the term was created during the Educational Forum on the Impact of Open Courseware for Higher Education in Developing Countries (UNESCO, 2002). In this sense, in the guidelines for Open Educational Resources in Higher Education (UNESCO, 2015), OER are defined as

> teaching, learning, and research materials in any medium available in the public domain made available under open licenses, allowing access, use, repurposing, reuse, and redistribution by third parties, with few or no restrictions. The use of open technical standards improves access and reuse potential (UNESCO, 2015, p. v)

Thus, OER are centered on three basic principles: a) free educational content for teaching, learning, research, and knowledge production; b) licenses with flexibility for publication, distribution, and legal reuse of educational resources; and c) open technical formats to allow modification. The studies by Wiley (2007, 2014) are references to the five freedoms (5Rs) of openness of OER. The author originally defined open content through the 4Rs, which include the freedoms/rights to reuse, revise, remix, and redistribute. However, in 2014, they made it explicit that they considered the freedom to retain a principle underlying open content (Blessinger & Bliss, 2016).

Thus, the 5Rs (Wiley, 2007, 2014) are the freedoms to:

- Retain: make copies (download, duplicate) and control copies of the resource;
- Reuse: use in various manners (virtual environment, website, blog, video, image, sound, text, etc.);
- Revise: adapt, adjust, modify, or alter the content, which includes translating it into another language, braille, or sign language;

- Remix: combine the original or adapted content with other open content to create a resource;

- Redistribute: share with others copies of the original or adapted content, as well as the remixed versions.

In this scenario, this article contributes by systematizing studies on the state of the art of Brazilian dissertations and theses about OER. Gaps for future studies are pointed out that may foster the integration of OER into the teaching-learning process at the most diverse levels and modalities of teaching, as well as implement and create demands for educational public policies to consolidate Open Education.

The present text is structured in four sections: introduction, methodology, discussion, and conclusion. In the methodology, a thorough report is made of the entire systematic review process adopted. The discussion topic presents the data and respective analyses that project the recent scenario of Brazilian dissertations and theses involving OER. Finally, the conclusion resumes the main points of this systematic review and points out viable paths to strengthen and foster the integration of OER in the educational context.

2. Methods

In the literature, one may find the systematic review process is conducted in different numbers of stages, ranging from three to ten (Costa & Zoltowski, 2014; Gomes & Caminha, 2014; Lupepso et al., 2016; Munzlinger et al., 2012; Okoli, 2019; Sampaio & Mancini, 2007; Santana, 2019). Upon analyzing the methodological stages suggested by the authors above, it was possible to observe that they basically consist of performing three steps: planning, execution, and summarization. This is in line with the words of Kitchenham (2004), who stated that there are different suggestions for conducting a systematic review, but the process is usually divided into three main phases: planning, conducting, and reporting.

With minor modifications, this systematic review rested on the three stages proposed by Munzlinger et al. (2012), subdivided into nine substages (Figure 1).

To outline the scenario of Brazilian dissertations and theses regarding OER, the period from 2002 to 2019 was delimited in the databases of the CAPES Catalog of Dissertations and Theses (CAPES CTD, from the Portuguese Catálogo de Teses e Dissertações)[1] and the Digital Library of Dissertations and Theses (BDTD, from the Portuguese Biblioteca Digital de Teses e Dissertações)[2] according to the stages described below. The time interval was determined from the year the term OER was coined (UNESCO, 2002) to the year preceding this systematic review.

[1] Available at https://catalogodeteses.capes.gov.br/catalogo-teses/#!
[2] Available at https://bdtd.ibict.br/vufind/

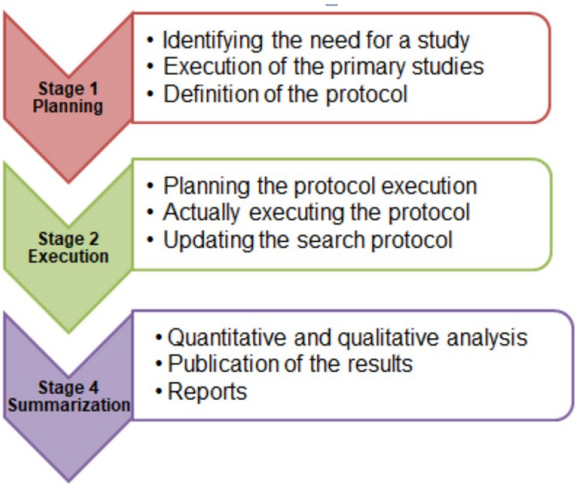

Figure 1. Stages of the systematic review. Source: Lauermann (2022, p. 54) based on the stages proposed by Munzlinger et al. (2012)

2.1. Planning and formalization of the research via protocol

The first stage of a systematic review is planning, which consists of identifying the need for a study, the execution of the primary studies, and the definition of the protocol to be followed during the review. The identification of the need is linked to the choice of theme and problem. Thus, the generating theme for this systematic review was «The scenario of the dissertations and theses about OER carried out in Brazil from 2002 to 2019», and the guiding research problem was «What were the pieces of research involving OER carried out in the teaching context of Technical and Vocational Education (TVE)?». The interest in TVE was because it was the scope of the doctoral research by Lauermann (2022).

The substage of execution of the primary studies encompasses the previous studies carried out in various resources related to the theme (books, scientific articles, reports, theses, dissertations, etc.) that supply the researcher with information about the area, helping them mature the theme and research problem. This is in addition to enabling the identification of keywords related to the theme/problem.

To continue the methodological process, the following objectives were listed: 1) to map and analyze the state of the art of the dissertations and theses about OER developed in Brazil and 2) to uncover theoretical or research gaps.

From the objectives, the following guiding questions were specified:

1) Which pieces of research sought to investigate the integration of OER into the teaching-learning process?
2) At which levels of teaching were the pieces of research carried out?
3) How has the promotion of the practice of the 5Rs (Wiley, 2007, 2014) been taking place in the teaching-learning process?
4) How were the public policies of induction to OER articulated in the pieces of research developed within the context of the teaching-learning process?

Subsequently, to encompass all the dissertations and theses carried out in Brazil involving OER, «Recursos Educacionais Abertos» («Open Educational Resources») and the acronym REA (OER) were stipulated as keywords. The last substage of the first stage is the creation of the protocol, which is a methodological sequence of steps that will conduct the research process. According to Munzlinger et al. (2012), a protocol consists of the transcription of the items defined in the previous substages (identification of the need, problem, objectives, and questions that guided the research), selection criteria (inclusion and exclusion), and definition of the databases to be searched. «A predefined protocol is necessary to reduce the possibility researcher bias» (Kitchenham, 2004, p. 4), and it «may be updated during the later phases» (Munzlinger et al., 2012, p. 7).

Following this guidance, the protocol[3] that guided this systematic review was created. Complementing the protocol, the fields of the form[4] used to catalog the data during the reading of the examined pieces of research were defined. It is in this substage that the selection criteria are defined. Thus, based on the guidelines by Munzlinger et al. (2012), Inclusion Criteria (IC) and Exclusion Criteria (EC) were listed to obtain coherent and consistent results (Table 1).

Table 1. Inclusion and exclusion criteria. Adapted from Lauermann (2022, p. 58)

Inclusion Criteria	IC1) Master's or doctoral research carried out from 2002 to 2019
	IC2) Existence of a full text
	IC3) Pieces of research developed with intervention in the teaching-learning process
	IC4) Pieces of research that articulated with public policies of induction to OER
	IC5) Pieces of research that focused on the practice of the 5Rs, not necessarily all
Exclusion Criteria	EC1) Pieces of research that did not address or superficially addressed the OER theme
	EC2) Pieces of research not fully available for downloading or reading
	EC3) Duplicate research
	EC4) The piece of research only mentions OER in the availability of the final product of the professional master's program, provided under a Creative Commons license (Open Educational Resource)

During the searches, it was noticed that many professional master's studies were listed because they contained the term «Recurso Educacional Aberto» («Open Educational Resource») among the information (metadata) provided to the CAPES repository about the availability of the final product, thus the creation of the criterion EC4.

The choice of the two databases, CAPES CTD and BDTD, was motivated by their national scope and the amount of research they contain. It should be noted that, as the focus of the review was concentrated on the scenario of research on OER in Brazil, the databases chosen were Brazilian.

[3] The protocol may be consulted in Appendix A of the doctoral dissertation by Lauermann (2022).
[4] The form for cataloging the data is available in Appendix B of Lauermann (2022).

2.2. Execution of the protocol

The protocol execution stage comprises the substages of planning the protocol execution, actually executing the protocol, and updating the search protocol (Munzlinger et al., 2012).

It is in the substage of planning the execution of the protocol that the search string is defined, in addition to its calibration and adaptation according to the searched database. The search string is formed by keywords and logical operators (AND, OR, NOT, etc.) and is used to search digital databases.

The search string was initially defined as follows: «Recurso Educacional Aberto» OR «Recurso Digital Aberto» («Open Educational Resource» OR «Open Digital Resource»). First, search tests were performed using only the term «Recurso Educacional Aberto» («Open Educational Resource») and its plural in the CAPES CTD database. During these tests, this database was found to differentiate between lowercase and uppercase letters. Moreover, other tests were performed, such as using the truncation character (asterisk/*) and double quotes or parentheses encompassing the search string. However, the first did not guarantee the sequential search for the words in the string, allowing them to be randomly distributed in the text, and the use of quotes or parentheses did not return any records.

During testing, two more terms were added to the set of keywords in the search string: «objeto de aprendizagem aberto» («open learning object») and «material educacional aberto» («open educational material»), in addition to their respective plurals, as it was observed that these terms were used in the texts with the connotation of open educational resources. The result of the search for these terms and their respective plurals was the same. Subsequently, a test was performed with the combination of the terms, which were previously tested separately, using the logical operator OR to observe the behavior of the system.

Hence, after the calibration tests performed using the CAPES CTD database, the following search string was obtained considering the most comprehensive result:

> "RECURSO EDUCACIONAL ABERTO" OR "Recurso Educacional Aberto" OR "Recurso educacional aberto" OR "recurso educacional aberto" OR "RECURSOS EDUCACIONAIS ABERTOS" OR "Recursos Educacionais Abertos" OR "Recursos educacionais abertos" OR "recursos educacionais abertos" OR «recurso digital aberto» OR «recursos digitais abertos» OR «objetos de aprendizagem abertos»
>
> («OPEN EDUCATIONAL RESOURCE» OR «Open Educational Resource» OR «Open educational resource» OR «open educational resource» OR «OPEN EDUCATIONAL RESOURCES» OR «Open Educational Resources» OR «Open educational resources» OR «open educational resources» OR «open digital resource» OR «open digital resources» OR «open learning objects»)

It is important to mention that the CAPES CTD search system is stable and reliable; however, one must consider the particularity of the system to differentiate lowercase from uppercase letters. Subsequently, we performed search tests in the BDTD database, which does not distinguish between lowercase and uppercase letters. As in the previous case, we first tested the search for each of the terms [«recurso educacional aberto» («open educational resource»), «recurso digital aberto» («open

digital resource»), and «objeto de aprendizado aberto» («open learning object»)] and their respective plurals isolatedly. From the result of these searches, tests were carried out combining more than one term in the same search string. Hence, after this calibration stage, the search string used in the BDTD was

> "Recurso educacional aberto" OR "Recursos educacionais abertos" OR «Objetos de aprendizagem abertos» OR «Recursos digitais abertos»
>
> («Open educational resource» OR «Open educational resources» OR «Open learning objects» OR «Open digital resources)

With the search strings defined, we proceeded to the substage of the actual execution of the protocol. It is at this time that the protocol is updated since, as it is executed, one may encounter situations that reflect the need to adjust it. It is important to mention that the team that executed the protocol, formed by two doctoral candidates and a scientific initiation student, held three meetings, which generated adjustments that rendered the protocol clearer and more objective. This was important so that the understanding was common to all and there was no discrepancy in the findings. Even after this final protocol refinement, it was agreed that the doubts should be clarified as a team. Such meetings were called by Gomes and Caminha (2014, p. 406) «consensus meetings» and are defined as «discussion spaces to solve mishaps that may come to arise, avoiding biases or excessive dissonance among those conducting the research».

The execution of the protocol involves the selection, classification, and reading of the pieces of research. The selection was carried out in two moments. First, a preliminary selection was made based on reading the titles, keywords, and abstracts of the pieces of research without their more in-depth reading, as proposed by Arimoto (2016) and Okoli (2019). Subsequently, the potentially relevant studies were selected and read in full.

Hence, the preliminary selection of the studies was carried out based on the following metadata: title, keywords, and abstract. The CAPES CTD database was searched from February 10 to 19, 2020, and the BDTD database from February 20 to 21, using the search strings previously mentioned, returning the set of studies presented in Table 2. When the information in the metadata was not enlightening, the piece of research was sought in full by downloading the file to avoid leaving relevant studies out of the systematic review, as advised by Sampaio and Mancini (2007).

Table 2. Number of studies from the initial search. Source: Prepared by the authors

	CTD da CAPES	BDTD	Total
Dissertations	30	14	44
Academic theses	68	40	108
Professional theses	91	17	108
Total	189	71	260

After applying exclusion criteria EC1, EC2, EC3, and EC4, 122 studies were selected for reading, as shown in Table 3. Of this total, 57 pieces of research came from

the CAPES CTD database, corroborating the results obtained by Teodoroski (2018), although it is not possible to identify the exclusion criteria adopted by the author.

Table 3. Pieces of research selected after applying the exclusion criteria. Source: Prepared by the author.

		Dissertations	Academic theses	Professional theses	Total
CAPES CTD database	Initial Search1	30	68	91	
	EC1	5	3	3	
	EC2	2	6	0	
	EC3	11	36	14	
	EC4	0	0	52	
	Subtotal1	12	23	22	
BDTD database	Initial Search2	14	40	17	
	EC1	0	1	0	
	EC2	1	2	1	
	EC3	0	0	1	
	EC4	0	0	0	
	Subtotal2	13	37	15	
	Total	25	60	37	122

Note 1: Subtotal1 = Initial Search1 – (EC1+EC2+EC3+EC4)
Note 2: Subtotal2 = Initial Search2 – (EC1+EC2+EC3+EC4)
Note 3: Total = Subtotal1 + Subtotal2
Note 4: The pieces of research that fit more than one exclusion criteria, e.g., EC1 and EC4, are listed in only one criterion (column) for there to be no duplicity in counting the same piece of research.

After reading the 122 selected pieces of research, it was found that four addressed the OER theme superficially, so they were excluded as per criterion EC1, leaving a set of 118 pieces of research composed of 25 dissertations, 57 academic theses, and 36 professional theses. The information about the selected studies was recorded in the fields of the form (database, title, author, type of research, advisor, year, abstract, keywords, etc.[5]), and disregarded studies were also recorded (title, author, abstract, link to the file, and reason for exclusion) in a separate tab of the spreadsheet identified by «excluded pieces of research», used to catalog the information about the pieces of research, as recommended by Okoli (2019).

2.3. Summarization

The summarization stage includes the organization of the quantitative and qualitative indicators of interest to the research obtained through the process of extracting data from the analyzed publications, in addition to the publication of the results obtained from the systematic literature review (Munzlinger et al., 2012), which will be presented and discussed in the following section.

3. Results

The results discussed in this section are an excerpt from the systematic review that makes up the doctoral research of Lauermann (2022). In the first part, the quantitative and qualitative data will be systematized with the purpose of presenting the scenario

[5] The complete spreadsheet may be found in Appendix B of Lauermann (2022).

of research on OER in Brazil. Subsequently, the data will be analyzed focusing on the guiding questions:

1) Which pieces of research sought to investigate the integration of OER into the teaching-learning process?
2) At which levels of teaching were the pieces of research carried out?
3) How has the promotion of the practice of the 5Rs been taking place in the teaching-learning process?
4) How were the public policies of induction to OER articulated in the pieces of research developed within the context of the teaching-learning process?

Thus, to map the scenario of research involving OER in Brazil, data were collected on the distribution of the studies: a) over the years, b) by state, c) by administrative dependence, in addition to the public/private ratio, and d) by area of knowledge.

Figure 2 shows the distribution of the pieces of research over the years. One may observe that although the term OER was coined in 2002, the first doctoral dissertation was only published in 2008. In this research, Dutra (2008) based themselves on the concept and characteristics of OER and the open licenses to define Open Learning Objects and propose a set of recommendations for the encapsulation and use of such objects to support formative evaluation and reusability. The records obtained by Heredia (2015) from the articles indexed in the Web of Science database also point to the first publication in 2008. However, the mapping carried out by the author is limited to the diagnosis and characterization of scientific production on OER within the scope of higher education.

From 2009 to 2013, research on OER remained modest, with only four more studies. It was only from 2014 onward that research involving this theme took off, reaching its peak in 2017. This increase in the number of publications from 2014 was also found in the studies by Teodoroski (2018), whose mapping in theses and dissertations dates from 2010 to 2015. Contrary to the findings in the present systematic review, the research by Borges et al. (2020), carried out from 2014 to 2018, pointed out 2017 as the year with the lowest number of scientific productions in Brazil and Spain. The authors highlighted that the most significant number of publications occurred in 2015, for which the present study also found a considerable number of pieces of research.

It is inferred that the growth from 2014 is related to the incentive generated from the publications of the Guidelines for Open Educational Resources (OER) in Higher Education by UNESCO et al. and COL (2011) and the Paris OER Declaration by UNESCO (2012), on the world stage, and the launch of the OER Notebook, a notebook for teachers by Educação Aberta (2013), and the book titled «Recursos Educacionais Abertos – práticas colaborativas e políticas públicas» («Open Educational Resources – collaborative practices and public policies») by Santana, Rossini, and Pretto (2012) on the national stage.

Another hypothesis that arises is linked to the increase in undergraduate programs in the distance learning format promoted by the Open University of Brazil

(UAB) from 2006 onward. According to a consultation of the e-MEC Portal[6], one may observe that the expansion of these programs intensified from 2014 onward. Therefore, it is considered that the production of didactic materials for such programs caused the need to deepen the studies on copyright and, consequently, on Creative Commons licenses and OER, which may have been reflected in the composition of the research themes. In addition, it is thought that there may be a relationship between the UAB guidelines regarding the production of these materials for distance learning programs and the proliferation of OER, which also affects the feeding of government and institutional repositories of educational resources

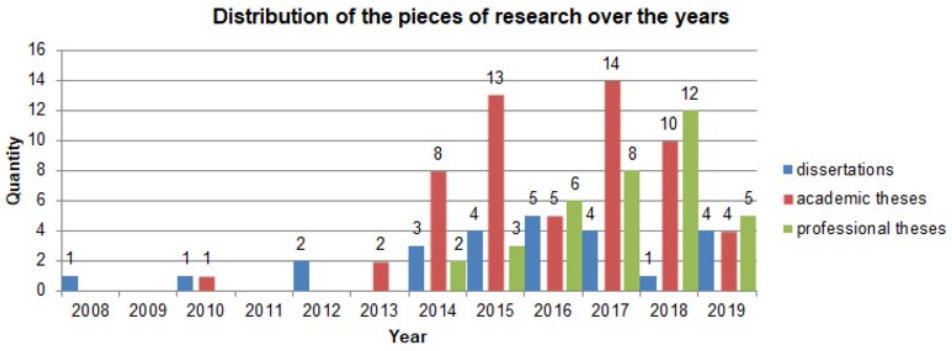

Figure 2. Pieces of research over the years. Source: Lauermann (2022, p. 74)

Regarding the distribution of the pieces of research by Brazilian states (Figure 3), it was found that Paraná (PR) emerged with a total of 30 studies, followed by São Paulo (SP) with 24 and Rio Grande do Sul (RS) with 23. If we consider the distribution by region, the South region of Brazil had the highest number of pieces of research, totalizing 58, followed by the Southeast with 36.

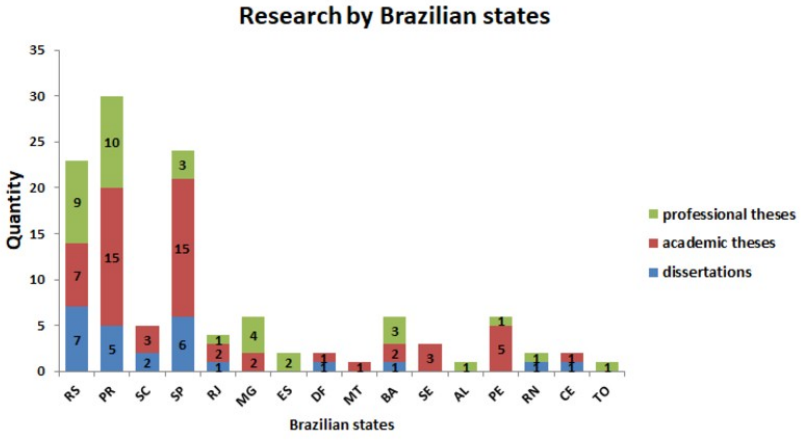

Figure 3. Pieces of research in the Brazilian states. Source: Lauermann (2022, p. 75)

It is believed that this number of publications in the state of Paraná may have been promoted by initiatives such as the Portal REA Paraná (Paraná OER Portal), a program of open educational practices and resources created in 2014 from the joint

[6] Available at http://emec.mec.gov.br/.

action between the Federal University of Paraná (UFPR) and the Federal University of Technology – Paraná (UTFPR). Similarly, in RS, the REAMAT project[7] was created for collaborative OER writing on mathematics topics and their applications. Moreover, in its Strategy 7.10, the RS State Education Plan (PEE, from the Portuguese Plano Estadual de Educação) (Law No. 14705 of June 25, 2015) encourages the production and integration of OER in school practices. Similarly, in São Paulo, the movement in favor of OER was fostered by Portal REA Brasil (Brazil OER Portal), created in 2008, and by the publication of Decree No. 52681 of November 26, 2011, by the Municipal Department of Education of São Paulo, with Article 1 providing that intellectual works produced for educational, pedagogical, and related purposes within the scope of the municipal public education system must be licensed for free use, including copying, distributing, and transmitting, observing the conditions of preservation of attribution to the author and non-use for commercial purposes.

It is also pointed out as a hypothesis the growing initiatives of teaching institutions to implement digital repositories/collections to store and disseminate the resources and research produced and make them public. It is assumed that these initiatives may have contributed to the search for information and the development of studies on copyright and OER.

The analyzed data revealed that the federal institutions concentrated most of the productions, a total of 67, followed by the private institutions with 30 and state institutions with 21 pieces of research. One may deduce that the return on investments of governments and funding agencies affects the amount of research carried out in federal public institutions. Adding the federal institutions (57%) and the state institutions (18%), we observed a number of pieces of research from the public network (75%) far higher than that of the private network (25%), as shown in the chart in Figure 4. This reinforces the struggles for the valorization of education and research, especially considering recent years, with public education in the three spheres being so devalued and research being threatened by cuts in graduate scholarships and blockades of resources from the ministries.

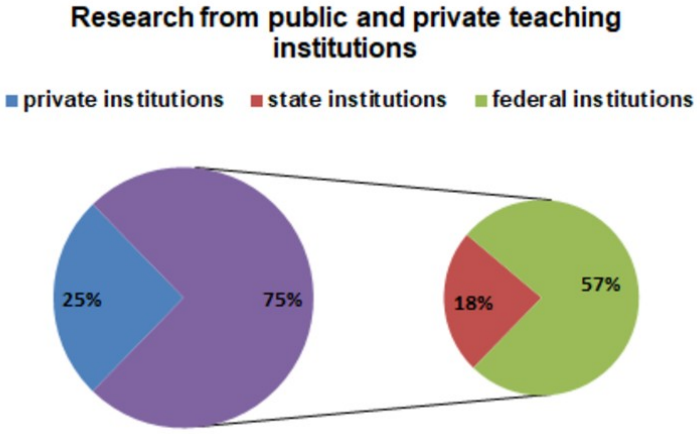

Figure 4. Pieces of research from public and private teaching institutions. Source: Lauermann (2022, p. 78).

[7] Available at https://www.ufrgs.br/reamat/index.html

To conclude this first part of data analysis and discussion, Figure 5 presents the distribution of research related to the OER theme by area of knowledge, considering the CAPES table of areas of knowledge and the information registered on the Sucupira Platform about the evaluated and recognized Programs. From it, one may determine that the area of Education emerged with 32 pieces of research, corresponding to 27% of the research about OER produced in Brazil. This result is in line with the analyses produced by Heredia (2015), who also highlighted in the first place the area of Education among the areas of knowledge referenced in the articles that were part of their body of research.

Figure 5 also reveals that the Interdisciplinary area appeared in second place with 24 pieces of research, equivalent to 20%, followed by the Teaching area with 21 (18%). It was already expected that the areas of Education and Teaching would stand out due to the close relationship of OER with the teaching-learning process, but the revelation of these data is due to the dissemination of OER in other areas such as Electrical Engineering, Agronomy, Law, Administration, and Art.

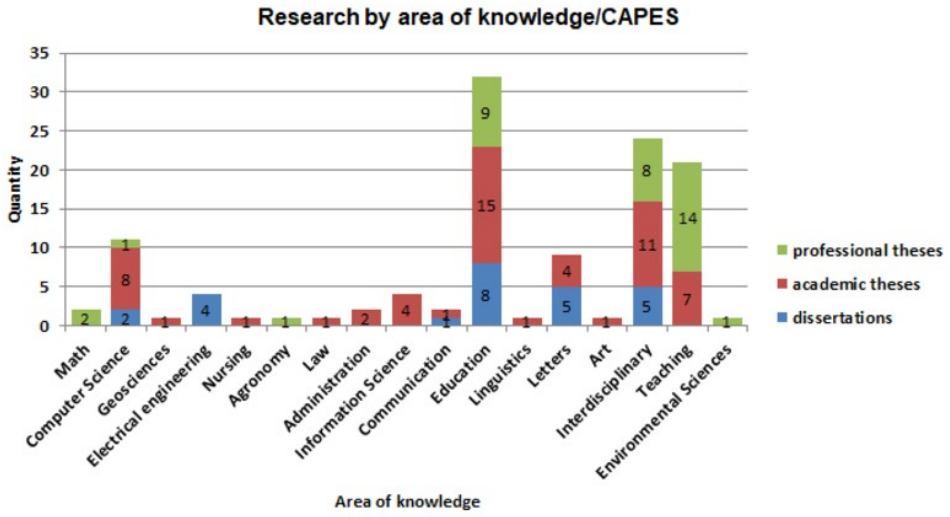

Figure 5. Pieces of research by area of knowledge. Source: Lauermann (2022, p. 78)

Moving on to the second part of this data analysis, to answer the guiding question of «Which pieces of research sought to investigate the integration of OER into the teaching-learning process?», the 118 selected pieces of research were explored. Of the 25 dissertations analyzed, 12 conducted research with OER in the context of the teaching-learning process in loco (in person or remotely). In turn, among the theses, there were seven pieces of research among the 57 academic master's theses and 12 among the 36 professional master's theses, totalizing 31 pieces of research[8] corresponding to only 26%. This result signals a field of research still lacking studies related to integrating OER in the teaching-learning process.

It is inferred that the longer time required to carry out doctoral research favors the development of long-term research inserted in the teaching-learning context, which is why the proportion of research at this level is higher than that of the master's

[8] The list of the 31 pieces of research may be found in Appendices D and E of Lauermann (2022)

level, either academic or professional. In addition, it was observed during the analysis that most professional master's programs require the development of a final product, in these cases an OER, which may have contributed to the higher proportion of research developed in the teaching-learning process compared to the academic master's programs, given that, in many cases, the application for evaluating such resources was carried out in the classroom. These results show the importance of this type of study, both to disseminate the integration of OER in the educational context and to provide knowledge of the challenges experienced and advances achieved regarding integrating OER into school practices.

To answer the second guiding question of «At which levels of teaching were the pieces of research carried out?», the 118 selected studies were considered, not just those developed during the teaching-learning process. The result of this analysis is represented in the chart in Figure 6, in which one may observe that, among the doctoral and academic master's research, the studies focused on Higher Education stood out compared to those on Elementary School, High School, TVE, and Graduate School. This did not occur for the professional master's programs, for which there was a higher concentration of studies in Elementary and High School. It is inferred that this results from the fact that many researchers are inserted in this teaching context, which may have aroused their interest in developing the final products of their theses aimed at their areas of activity.

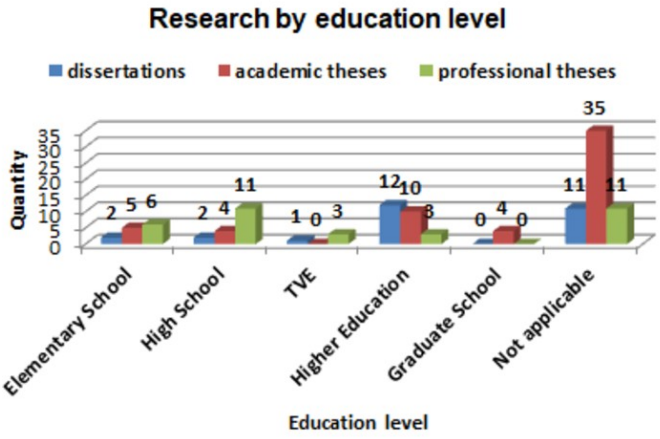

Figure 6. Pieces of research by education level. Source: Lauermann (2022, p. 80)

It is important to highlight that some of the pieces of research were carried out at more than one level of education, as was the case of the five occurrences of doctoral research developed in Elementary School, High School, and TVE that come from only three pieces of research.

The 57 pieces of research classified as «Not applicable» were focused on: a) the technological area, with the development of tools for the production, adaptation, and/or evaluation of OER; b) the technological area, with the production of OER or repositories; c) university management; d) non-formal education; e) continuing education; f) repositories; g) information management; h) the teaching-learning process without intervention (theoretical) or i) with theoretical reflections about OER.

Another fact that Figure 6 reveals is that, of the 118 pieces of research analyzed, 32% were conducted in Basic Education, while only 4% in TVE and 4% in Graduate School. Such data indicate a lack of research integrating OER into these educational contexts. The findings regarding TVE converge with the results of an exploratory study commissioned by UNESCO-UNEVOC in 2017 with the objective, among others, of mapping the scenario of using OER in Technical and Vocational Education and Training (TVET). The data collected from June to November 2017 revealed that TVET is an almost neglected area in the OER space. By the end of this study, no substantial research on OER in TVET had been conducted (UNESCO-UNEVOC et al., 2018). In other words, the Brazilian scenario reflects the international scenario regarding the lack of research on this topic in the context of TVE.

In this sense, to further refine the results of the present systematic review, we listed the pieces of research that sought to investigate the integration of OER into the teaching-learning process in loco developed in TVE, and only three studies were obtained, presented in Box 1.

A more detailed analysis of these pieces of research may be found in Lauermann (2022). However, it is worth making some notes here. Although the research by Quadros (2016) is a study of OER production and application in the teaching-learning process in loco, its primary focus was on the resource developed and on gamification, without delving into how the integration of OER was dialogued with students. Similarly, both Vieira (2015) and Fetzner Filho (2015) did not discuss with their students the integration of OER in the teaching-learning process. The students carried out their activities without being aware of the principles underlying OER or that they were using OER. This form of integration of OER into school practices does not contribute to their promotion, much less to raising awareness of their basic principles of democratization of knowledge.

Box 1. Pieces of research carried out in the teaching-learning process in loco in the context of TVE. Source: Lauermann (2022, p. 81)

Type	Research	Education Level
DD	Quadros, G. B. F. de. (2016). A gamificação no ensino de línguas online. [Doctoral Dissertation]. Catholic University of Pelotas.	Higher Education (pilot research) Technical Course and High School
PM	Vieira, M. de A. (2016). Cenários futuros sobre as culturas docentes: um estudo sobre a livre colaboração. [Professional Master's Thesis]. Federal Institute of Education, Science, and Technology of Espírito Santo.	Technical Course in Informatics integrated into High School
PM	Fetzner Filho, G. (2015). Experimentos de baixo custo para o ensino de Física em Nível Médio usando a placa Arduino-UNO. [Professional Master's Thesis]. Federal University of Rio Grande do Sul.	Technical Course in Electromechanics integrated into High School and Technical Course in Mechanics integrated into High School

From the analysis of the 31 studies stemming from the first guiding question, we sought to answer the third one: «How has the promotion of the practice of the 5Rs

been taking place in the teaching-learning process?». Thus, the result represented in Figure 7 was obtained. At this time, it should be noted that the same piece of research may promote the practice of more than one R and that, although production is not part of the 5Rs, we chose to maintain it in the analysis to signal that much of the incentive to reuse comes from the application in the teaching-learning process of OER produced during the research.

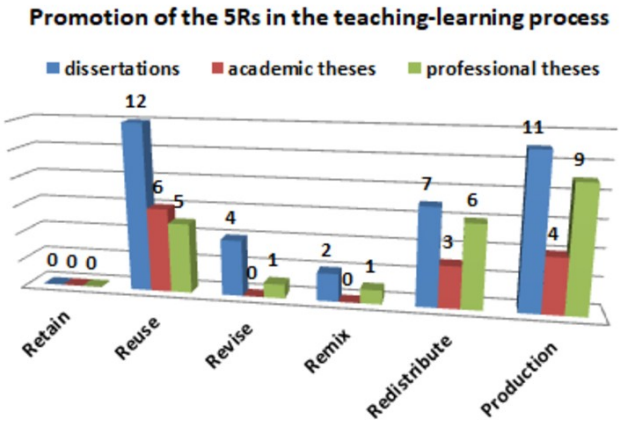

Figure 7. List of the promotion of the 5Rs in the teaching-learning process. Source: Lauermann (2022, p. 84)

Another necessary observation is that, although the studies do not directly mention retaining, this practice is linked to reusing, revising, or remixing since, to carry out these three practices, it is necessary, before all else, to retain the resource, i.e., download or copy it. Moreover, the fifth R, retaining, was only introduced in 2014 (Blessinger & Bliss, 2016; Wiley, 2014).

The chart in Figure 7 also reveals that the practices most promoted by the pieces of research in the teaching-learning process were reuse and redistribute. These data are in line with what researchers have found in all editions of the Small Open Online Course (SOOC) «REA: Educação para o Futuro» («OER: Education for the Future») (Mallmann et al., 2017) and the studies by Coletto and Braga (2022), who concluded that remixing is not a current practice because it presents technical difficulties and there is incompatibility of licenses and a lack of tools.

In addition, it was observed during the reading of the pieces of research that many of the resources produced during the studies, called OER, were not distributed with the permissive licenses, which mischaracterized them as OER. Likewise, it was found that many of the OER produced during the pieces of research were not made available on the Internet, thus impacting the practice of the R of redistributing and, consequently, compromising the continuity of the virtuous cycle (Mallmann, 2018; Windle et al., 2010).

The analysis of the pieces of research also alerted to the need to deepen and broaden the discussion about OER in the educational context so that teachers and students may differentiate them from other educational resources, thus minimizing mistakes made evident in some pieces of research, such as considering YouTube videos made available under a standard license as OER or considering a repository as an OER.

It is understood that to be educational, a resource needs to have pedagogical intentionality so that the didactic transposition occurs in the context of the teaching-learning process, as is the case of articles, slides, images, videos, and maps, among others. A repository, in turn, is a place used to store such items.

Finally, we resorted again to the 31 pieces of research to answer the question of «How were the public policies of induction to OER articulated in the pieces of research developed within the context of the teaching-learning process?». Thus, we arrived at the data represented in the chart in Figure 8, which reveal that, of all the pieces of research analyzed, only five doctoral studies, i.e., 16%, articulated in their writings the national public policies of induction to OER in the teaching-learning process, with 71% not even mentioning them.

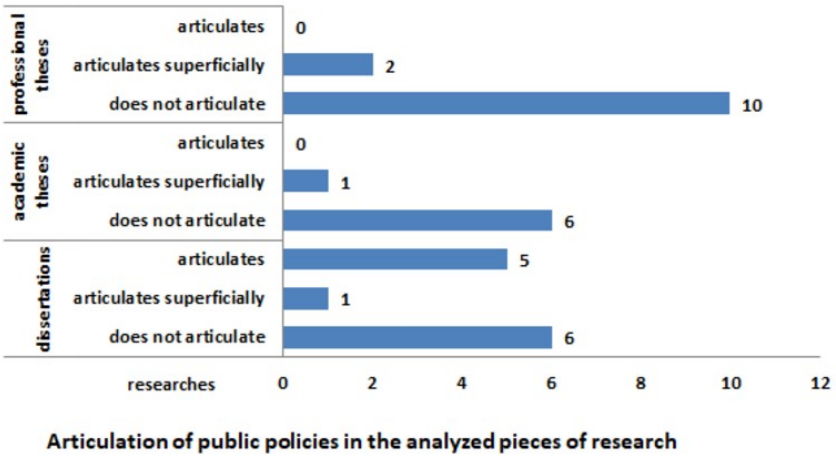

Figure 8. Articulation of public policies in the analyzed pieces of research. Source: Lauermann (2022, p. 86)

These results are concerning, considering that it is from the educational public policies that the demand for teacher training and financing of actions aimed at research and the promotion of OER until its effective integration into teaching practice occurs. It is also worth noting that some of the analyzed studies mentioned the importance of public policies to promote OER but did not point to any of the existing national or regional policies. In turn, others articulated educational public policies, yet focused on special education, curriculum, initial and continuing education, distance education, rural education, environmental education, and digital inclusion, among others.

4. Conclusions

Research on OER was expanded since the mapped reviews analyzed the period from 2002 to 2019. Advances were made in the understanding of OER because, in addition to the qualitative analyses related to the scope of this review, it broadened the spectrum of analysis by systematizing records of research conducted by year, administrative dependence, the public/private relationship, area of knowledge, and education level.

After applying the screening and analysis criteria of the studies categorized in this systematic review, we arrived at a set of 118 pieces of research, including 25 doctoral dissertations, 57 academic master's theses, and 36 professional master's theses. The amount of research found in the most diverse areas of knowledge shows the relevance of the theme involving OER to consolidate Open Education.

It was observed that, although OER are gaining space in public policies, there is a need to create more promotion to encourage and expand the OER movement in public and private teaching institutions. Support for the advancement of OER in the educational context may be made possible by the government through a) financing of OER initiatives and institutional repositories; b) research; c) teacher capacity-building; d) encouraging open access; e) creating public policies integrated into initial and continuing education programs that enable the effective integration of OER into teaching practices. There is still a mismatch between these practices and the guidelines established in official documents.

In this sense, initial and continuing education programs are presented as potential strategies to disseminate the integration of OER into the educational context insofar as they can promote critical reflections from problematizing dialogues around topics such as OER, open licenses, closed licenses, and copyright. Other viable paths may be free courses, interdisciplinary dialogues in schools, teaching, research, and extension projects, and events such as congresses, symposia, seminars, etc. Another evidence derived from the results was the need for more research on integrating OER into the teaching-learning process within the context of TVE and Graduate School. The development of such research may contribute to expanding knowledge about OER in these educational spaces and the practice of the 5Rs.

However, even though there are still obstacles to be overcome, such as the implementation of public policies and lack of funding, one cannot fail to highlight institutional initiatives such as the Educopédia, EduCapes, Portal Dia a Dia Educação of Paraná, the Fiocruz Institutional Repository (ARCA), REliA, the GEPETER OER Repository, the REA.br project, and ProEdu, among others, which strengthen and disseminate OER in the educational context.

In conclusion, it is recorded that educational public policies play a crucial role in this scenario that aims to disseminate knowledge by integrating OER into school spaces. There is still a vast field of research to be explored so as to contribute with directions for the implementation of policies, including institutional ones, to leverage the democratization of access to knowledge through open education.

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