

Open Educational Resources, Technologies, Science Teaching and their correlations in official documents

ABSTRACT

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This article develops a documentary analysis that aims to map textual references found in official documents that employ terminologies related to Open Educational Resources (OER) and the technologies used in the classroom, such as Information and Communication Technologies (ICT) and Digital Information and Communication Technologies (TDIC), aimed mainly at the science curricular component in the final years of elementary school. To this end, the National Education Plan (PNE), the National Common Curricular Base (BNCC) and the Municipal Territorial Guidance Document (DOM) of Júlio de Castilhos/RS, where the master's research project of which this article is part was developed, were defined as the research corpus. The use of OER, combined with the technological devices currently available, makes it possible for everyone to access information and knowledge in a wide range of formats, such as images, videos, podcasts, texts, among others, free of charge, provided that there are adequate connection conditions and equipment. In this way, OER can be included in the school environment as pedagogical resources to be used infinitely and can even undergo necessary adaptations to each school reality. They can also be constructed and reconstructed by teachers and/or students themselves. The analyses of the documents listed above indicate that, despite their important usefulness and the fact that organizations at a global level such as UNESCO recommend and reiterate the importance of OER + technologies, this line of possibility is weakened in the official guidelines analyzed, mainly in elementary education, which is reflected in a certain scarcity of discussions on the subject, as has been observed in other research in the area.

KEYWORDS: National Education Plan. National Common Curricular Base. Science Teaching. Digital Technologies. Open Educational Resources.

1 INTRODUCTION

In the current classroom routine, various educational resources are used to help in the teaching-learning processes. The most common support materials used by teachers include board, books, visual models and digital resources originating from technological processes, such as images, illustrations, videos and podcasts, for example. Thus, terms related to technology and its entire apparatus are also found in the various guiding documents related to educational processes.

It is worth remembering that the world has not always worked as we know it today. Likewise, educational processes have also undergone and continue to undergo changes. For this reason, Sobrinho Junior and Moraes (2021) pointed out the crucial role of legislation and the importance of it accompanying these transformations. In 1996, Law 9,394/96 was approved, called the Law of Guidelines and Bases for National Education (LDB), which includes guidelines for the entire country that should guide curricula in Basic Education. In its Article 32, paragraph II, the law establishes that one of the objectives of the basic education of citizens is, among other things, to understand technology (BRASIL, 1996). Thus, the issue of technological mechanisms, even if they change over time, is included in all other official documents that were written after the LDB.

Regarding currently accessible technologies, many teachers have already made or make routine use of them in the school environment and in the classroom. These include resources available on the internet, such as videos from YouTube or other platforms, as well as images, illustrations and/or tables, for example. Today, with a simple touch of a finger on a screen, a little patience, suitable equipment and access to the internet, it is possible to have in your hands an infinity of books, videos or images, as long as these materials are available in digital format and with free access.

It is worth emphasizing that, when sharing, copying, adapting and freely using the digital educational resources exemplified above, or others that may be in printed format, they must have open licenses. This prevents the violation of any copyright legislation in force in the country and make these materials, in fact, accessible to everyone.

One way to recognize possible and free pedagogical resources for use is when they are Open Educational Resources (OER). OER are defined and characterized as any material aimed at teaching-learning and/or research processes, in any format (digital and/or printed) that are in the public domain or have copyright under an open license (FURTADO; AMIEL, 2019). The term Open Educational Resources was coined at the 2002 UNESCO Forum (UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION [UNESCO], 2012) and, according to Mallmann and collaborators (2020), these resources are quite flexible:

The OER promote pedagogical freedoms, such as collaborative creation and sharing of educational resources, having as a basic principle the adoption of a flexible copyright licensing regime, which should allow use and reuse, adaptations and recreations (MALLMANN *et al.*, 2022, p. 29).

A few years after their emergence, it is expected that OER will constitute the “educational agenda of governments, institutions and individuals interested in promoting values such as equity, quality and inclusion, also highlighted in the 4th item of the Sustainable Development Goals (SDGs)” (AMIEL; GONSALES; SEBRIAM,

2018, p. 247). The SDGs make up the 2030 Agenda proposed by the UN and are a global plan composed of the economic, social and environmental tripod of sustainable development dimensions (PACTO GLOBAL, s.d.). In this way, OER can be considered important elements to assist in “strategies and public policies to improve the quality of Education and also to reduce inequalities between countries with regard to education” (SILVA; RODELLO, 2020, p. 62).

Regarding the open license present in the various OERs, one of the most common is the Creative Commons type, which has different versions and is used in many countries and also in Brazil (EDUCAÇÃO ABERTA, 2013). Creative Commons is a non-profit organization that, among its functions, seeks to “provide Creative Commons licenses and public domain tools [...] a free, simple and standardized way to grant copyright permissions” (CREATIVE COMMONS, s.d.).

Furthermore, OERs are part of the dynamics of Open Education (OE) which “is a historical movement that seeks to value the tradition of sharing ideas among educators, something that has been greatly favored and expanded with the advent of digital information and communication technologies (DICT).” (MALLMANN *et al.*, 2020, p. 29). It is worth highlighting that “OE presupposes engagement and dialogue between the State, the private sector and civil society and the promotion of a knowledge sharing movement” (SOMAVILA, 2022, p. 5).

OE is not limited to encouraging the production of OER but is a “progressive conception of education” (MALLMANN *et al.*, 2020, p. 29), which is intertwined with the construction of knowledge, considering it as something for everyone and belonging to everyone. In this way, it becomes essential to consider that “at each moment of our civilization, technologies and ways of doing things (techniques) highlight technological progress in the context in which they become popular, regardless of the date of creation or conception of each artifact” (ANJOS; SILVA, 2018, p. 16).

OER are often linked to the use of technology, especially in the current world, where people use smartphones, which are nothing more than smaller computers that are always within reach. Thus, in the school environment, we also live with technological equipment, such as computers, whiteboards, tablets, among others. Therefore, it is clear that there have been changes in pedagogical practices over time.

When considering that, a typical example, as previously mentioned, is the use of diverse and varied educational resources of digital origin in school classrooms. Consequently, two acronyms stand out in this context: Information and Communication Technologies (ICT) and/or Digital Information and Communication Technologies (DICT). For Anjos e Silva (2018, p. 12), the term ICT is understood and refers to “electronic and technological devices, including computers, tablets and smartphones, and other technologies created before the digital phenomenon in contemporary society, such as the telegraph, radio, television and newspaper”.

Thus, ICT refers more to the equipment used, while DICT considers that the instrument used needs to be networked and highlights the digital product originating from these technologies that are made available, and which is necessarily shared on the web and characterized by something in the virtual context, such as, for example, a video, an application, a game, a podcast or an image (ANJOS; SILVA, 2018). Regarding DICT, Almeida and Silva (2011, p. 3) highlighted that “such technologies have become part of culture, taking place in

social practices and redefining educational relationships, even though they are not always physically present in educational organizations”.

Therefore, this work was developed from the perspective of one of the specific objectives of a master's project focused on a pedagogical proposal that investigates the use of OER in the classroom and that will be implemented in the science curricular component in the final years of Elementary Education at a municipal public school located in Júlio de Castilhos/RS. Based on this, a documentary analysis was carried out by surveying the National Education Plan (PNE), the National Common Curricular Base (BNCC) and the Municipal Territorial Guidance Document (DOM) of Júlio de Castilhos/RS, to verify the relationships established in this corpus between OER and the use of technologies.

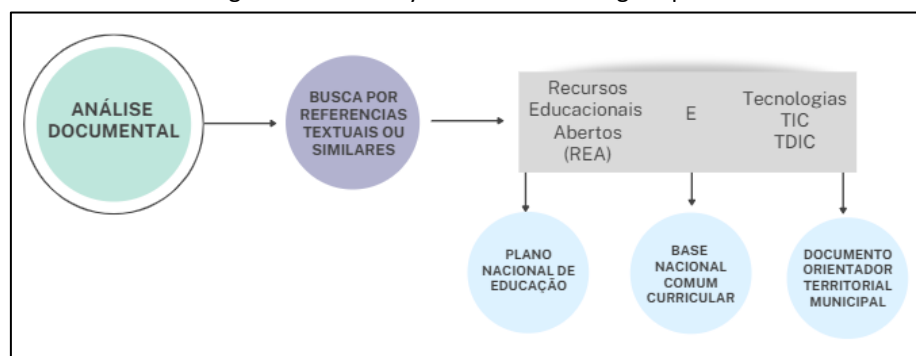
Thus, the work consists directly of mapping textual references present in the research material that use terminology related to OER and some type of technology in the classroom, such as ICT and DICT, aimed mainly at the curricular component of science in the final years of Elementary School.

2 METHODOLOGICAL ASPECTS

This work focuses on the final years of Elementary School, as it is part of a master's research focused on OER and DICT in this context. It is important to understand and verify to what extent these are present in the listed official documents.

As previously stated, the official documents related to the documentary analysis were, initially, the PNE 2014 (BRASIL, 2014a), the BNCC (BRASIL, 2018) and the DOM 2019 (MUNICIPALITY TERRITORIAL GUIDANCE DOCUMENT [DOM], 2019) by Júlio de Castilhos/RS, as shown below (Figure 1). In addition to these, during the research process, the following were added to the set of official documents analyzed: “Planning the Next Decade - Knowing the 20 Goals of the National Education Plan (BRASIL, 2014b)” and the school's “Pedagogical Political Project – PPP 2019” (PROJETO POLÍTICO PEDAGÓGICO [PPP], 2019), which could complement the information and present more indications on the research topics.

Figure 1 - Summary of the methodological path



Source: Authors (2022).

Regarding the documentary analysis carried out, it is worth highlighting that the methodological path has a qualitative approach, which, as highlighted by Lima Junior *et al.* (2021, p. 3), makes the selected official documents the objects of this study, in which the information contained is verified based a focus of interest.

Document analysis is a research process with an investigative and exploratory nature including documents defined in the analysis corpus, which seeks as a result references in the documents analyzed based on the defined research questions (LIMA JUNIOR *et al.*, 2021).

Once the research corpus was established, the next step was to define the search for indicators related to OER and ICT/DICT in these documents. To this end, this research corpus was read in full, where textual fragments that referred to OER, technologies (ICT/DICT) or science teaching were identified. In this sense, words or sets of words considered related to OER and ICT/DICT were searched for, such as “technology”, “resource”, and their variations and derivations. From this search in the documents, excerpts were extracted that are presented and discussed below. In these excerpts (citations from documents) the words from the initial search are highlighted in bold.

It is worth highlighting that this is exploratory research (GIL, 2002), which aims to describe what is explained about OER, ICT and DICT in the selected official documents. Furthermore, this organization of the analysis seeks to highlight what happens regarding these themes starting from the broadest regulations and observing how they reach a school. Thus, the presentation of analyses and discussions is by document, in decreasing order in terms of scope, that is, national documents up to those of the municipality and the school related to the master's research. Thus, it starts with the PNE, moving on to the BNCC and, after that, the municipal DOM and the school's PPP.

3 RESULTS AND DISCUSSIONS

3.1 OER and technologies in the PNE

The National Education Plan in Brazil is currently provided for in the Federal Constitution, which, in its Article 214, determines a ten-year term and constitutes a guiding document with regard to the objectives, goals and strategies for implementing actions to ensure the maintenance and development of education at its various levels, stages and modalities through integrated practices of the public authorities of the different federative spheres (BRASIL, 2014a). Thus, the PNE currently in force, corresponding to the period from 2014 to 2024, was approved based on Law 13.005/2014 (BRASIL, 2014a). In its Article 2, several guidelines are defined. Among them, it is important to highlight the paragraph that brings in its text the direction of “VII - humanistic, scientific, cultural and technological promotion of the country” (BRASIL, 2014a). Therefore, it can be highlighted that, in this context, the document already presents the opportunity to expand the scope of the issue of technologies in educational processes in the country.

In addition to the PNE, there is an official document made available by the Ministry of Education (MEC) on its website, called “Planning the Next Decade - Knowing the 20 Goals of the National Education Plan”, which was prepared mainly by professionals from the Federal University of Pernambuco (UFPE) and in collaboration with the National Association of Education Policy and Administration (ANPAE). This document aims to provide insights into each of the PNE 2014-2024

goals (BRASIL, 2014b). Therefore, we decided to use these two documents as a research framework.

The document “Planning the Next Decade - Understanding the 20 Goals of the National Education Plan” highlights that there are subdivisions in relation to the PNE goals, with a first group classified as structuring aiming to guarantee the right to quality basic education (goals 1 to 7 and goals 9 to 11); a second group, specific to the reduction of inequalities and the appreciation of diversity, essential paths to equity (goal 4 and goal 8); a third block that refers to the appreciation of education professionals (goals 15 to 18) and, finally, a fourth group that mentions higher education (goals 12 to 14) (BRASIL, 2014b).

After reading the two official documents in full, it was possible to identify in the first group some goals that bring with them indications of guidelines and/or concepts of OER and technologies (ICT/DICT) for education as a whole. Initially, goal 2 concerns Elementary Education “To universalize 9 years of elementary education for the entire population aged 6 to 14 and ensure that at least 95% of students complete this stage at the recommended age, by the last year of validity of this PNE” (BRASIL, 2014a). Included in this goal is strategy 2.6, which aims to

[...]develop **pedagogical technologies** that combine, in an articulated manner, the organization of time and teaching activities between the school and the community environment, considering the specificities of special education, rural schools and indigenous and *quilombola* communities (BRASIL, 2014a, online, **our emphasis**).

In the strategy above, although the name OER is not explicitly mentioned, from the emphasis on “pedagogical technologies”, it can be inferred that the possibility of using different resources aimed at teaching activities for the specificities listed or beyond them is open, such as, for example, OER combined with technologies.

Goal 5 of the PNE refers to the literacy process in the initial years of Elementary Education and, therefore, has some strategies highlighted below, which specifically talk about OER and technologies:

5.3) selecting, certifying and disseminating **educational technologies** for teaching children to read and write, ensuring diversity of methods and pedagogical proposals, as well as monitoring the results in the education systems in which they are applied, and they should preferably be made available as **open educational resources**;

5.4) promoting the development of **educational technologies** and **innovative pedagogical practices** that ensure literacy and favor the improvement of school flow and student learning, considering the **different methodological approaches** and their effectiveness;

5.5) supporting the literacy of rural children, indigenous people, *quilombolas* and itinerant populations, with the **production of specific teaching materials**, and developing monitoring instruments that consider the use of the mother tongue by indigenous communities and the cultural identity of *quilombola* communities;

5.6) promoting and encouraging initial and continuing education for teachers to teach children to read and write, with knowledge of **new educational technologies and innovative pedagogical practices**, encouraging the articulation between stricto sensu postgraduate programs and continuing

education actions for teachers to teach literacy (BRASIL, 2014a, online, **our emphasis**).

Goal 7 of the PNE refers to stimulating the quality of “basic education in all stages and modalities, with improvements in school flow and learning” (BRASIL, 2014a). It is possible to highlight the strategies,

7.12) encouraging the development, selection, certification and dissemination of **educational technologies** for early childhood education, primary education and secondary education and encouraging **innovative pedagogical practices** that ensure the improvement of school flow and learning, ensuring the diversity of pedagogical methods and proposals, with preference for free software and **open educational resources**, as well as monitoring the results in the education systems in which they are applied [...].

7.15) universalizing, by the fifth year of this PNE's validity, access to the worldwide computer network via high-speed broadband and tripling, by the end of the decade, the computer/student ratio in schools in the public basic education network, promoting the **pedagogical use of information and communication technologies** [...]

7.20) providing equipment and **digital technological resources** for pedagogical use in the school environment to all public schools providing basic education, including the creation of mechanisms to implement the necessary conditions for the universalization of libraries in educational institutions, with access to **digital computer networks, including the Internet** [...].

7.22) fully **computerizing** the management of public schools and education departments of the States, Federal District and Municipalities, as well as maintaining a national program of initial and continuing training for technical staff of education departments (BRASIL, 2014a, online, **our emphasis**).

In general, all the strategies found in the various PNE goals highlighted above encourage the use of varied pedagogical techniques and technologies that seek to reconcile the reality of the school community with what is done in the classroom in Basic Education. This reveals everything from physical structuring actions (availability of network and equipment), actions aimed at the initial and continued professional development of teachers, to the possibility of using, creating or adapting OER freely and preferably, which may or may not be in conjunction with technologies, in pedagogical planning.

From this perspective, it is also important to highlight the possibility of using pedagogical strategies that help organize time for specific realities (special education, rural schools, indigenous and *quilombola* communities), which may, for example, involve the construction and/or use of OER in conjunction with technological resources to meet these unique demands. Carvalho and Lima (2019, p. 295), for example, emphasized that the mere insertion of digital technologies does not generate changes in the development of teaching and highlighted the need for each and every teacher to appropriate the technologies and their uses so that they can contribute to the processes.

In this set of strategies highlighted above, the possibility of both schools and teachers working in the possibilities of diversity of pedagogical methods is advocated, strongly indicating the use of technologies. Furthermore, the recommendation for the specific use of OER combined with technological resources for the development of new practices in the teaching-learning process

(strategy 5.3) is also highlighted. It is also worth noting that OER, in addition to their daily use in the classroom, can allow teachers, together with students, to build specific educational resources for that school community, meeting unique demands.

Furthermore, in relation to science teaching, for example, OER can even include “simulators and animations, which are available free of charge on various online platforms” (SIQUEIRA; SANTIN FILHO; CIRINO, 2018, p. 89), allowing scientific concepts, even in virtual format, to be experienced by students.

In group three of the PNE goals, it is possible to highlight goal 15 and goal 16, which refer, respectively, to the training of education professionals, highlighting the strategies:

15.6) promoting curricular reform of undergraduate courses and encouraging pedagogical renewal, in order to ensure focus on student learning, dividing the workload into general training, training in the area of knowledge and specific teaching methods and incorporating modern **information and communication technologies**, in conjunction with the common national base of basic education curricula, as addressed in strategies 2.1, 2.2, 3.2 and 3.3 of this PNE [...];

16.4) expanding and consolidating an electronic portal to support the work of basic education teachers, providing free supplementary teaching and **pedagogical materials**, including those in an accessible format (BRASIL, 2014a, online, **our emphasis**).

Based on the assumptions present in these strategies, specifically mentioned above, it becomes possible to point out the need for the use of pedagogical practices that make use of the various technological possibilities available and existing in the curricula of undergraduate courses. And, thus, through the experience of these actions, they can be implemented in professional practice, whenever there is adequate physical structure, equipment and access to the internet network in the school environment.

It is interesting to highlight that the PNE was published in 2014, after the OER Declaration of Paris, in 2012, which was represented by a Brazilian delegation (DECLARAÇÃO REA DE PARIS 2012, 2012). In the Paris OER Declaration, in 2012, there is a list of 10 (ten) suggestions to States mainly related to OER, but also to other technological aspects inserted in the social context. These indicators point to the importance of encouraging the use of OER throughout society, as one of the viable ways to assist “social inclusion, gender equality, as well as teaching with specific needs” (UNESCO, 2012, p. 1).

With this, it is clear that this document also highlights the importance of technological access to subjects as an ally for the promotion and use of OER. To this end, it indicates the need for public policy actions in various sectors of society, such as the promotion of institutions responsible for the training and development of teachers or other people, actions that promote research and investigation on OER and their contexts, as well as actions that allow the sharing of these OER, making them accessible to everyone.

From the above, it is concluded that the PNE, despite including in its text the terminology **open educational resources** and several indications of the use of technologies, does not contemplate in its magnitude the 2012 Paris OER Declaration, especially with regard to OER. Finally, it is worth noting that, as the

PNE is a broad document related to aspects of education in the country as a whole, no direct information related to science teaching was found, but rather more global and comprehensive parameters, which serve as indicators of paths to be followed. For Ferreira and Carvalho (2018), OER in the PNE is a category of educational technologies, from a level in which technologies would be the solution to problems. However, OERs are part of the context of Open Education (OE) and are characterized by being available on the internet as teaching and learning materials with open licenses. Thus, the PNE fails to encompass the broad meaning of OER in educational processes.

3.2 OER and technologies in science teaching found in the BNCC

Since the implementation of the BNCC, Brazilian schools linked to Basic Education have made changes to their curricula, aiming to comply with its guidelines. The BNCC “is a normative document that defines the organic and progressive set of essential learning that all students must develop throughout the stages and modalities of Basic Education” (BRASIL, 2018, p. 7). The existence of the BNCC is advocated in several official documents, such as the Law of Guidelines and Bases of National Education (LDB), the National Curricular Guidelines for Basic Education (DCN) and, specifically, in one of the strategies of goal 2 of the PNE, which indicates its construction as a type of

2.2) agreement between the Union, States, Federal District and Municipalities, within the scope of the permanent body referred to in § 5 of art. 7 of this Law, the implementation of the rights and objectives of learning and development that will configure the common national curriculum base for elementary education (BRASIL, 2014a, online).

This document contains ten general competencies related to pedagogical practice, which seek to gather indicators of teaching-learning processes. Furthermore, in a correlated manner, there are also eight specific Natural Sciences competencies for Elementary Education (BRASIL, 2018). The documentary analysis began with the specific skills of Natural Sciences, with emphasis on items 3, 4, 6 and 8.

3. Analyzing, understanding and explaining characteristics, phenomena and processes related to the natural, social and **technological (including the digital)** world, as well as the relationships established between them, exercising curiosity to ask questions, seek answers and create solutions (including technological ones) based on the knowledge of Natural Sciences.

4. Evaluating political, socio-environmental and cultural applications and implications of science and its **technologies** to propose alternatives to the challenges of the contemporary world, including those related to the world of work. [...]

6. Using different languages and **digital information and communication** technologies to communicate, access and disseminate information, produce knowledge and ethics. [...]

8. Acting personally and collectively with respect, autonomy, responsibility, flexibility, resilience and determination, using knowledge from Natural Sciences to make **decisions regarding scientific-technological** and socio-environmental issues and regarding individual and collective health, based on

ethical, democratic, sustainable and supportive principles (BRASIL, 2018, p. 324, **our emphasis**).

The specific skills highlighted above do not explicitly provide the possibility of using, creating and/or adapting OER for teaching-learning processes. However, they highlight that the use of technologies and scientific knowledge can be applied in collective actions, based on “democratic, sustainable and supportive” principles.

Based on these assumptions, basic characteristics of OER, such as sharing, use, reuse and adaptations, are seen to allow greater access to educational resources, especially when they are in digital format. Thus, OER can be strategic for working on the skills provided for in the BNCC. Amiel, Duran and Costa (2017), for example, in their article on OER and the Brazilian Open University System, highlighted the direct link between OER and the internet, as well as one of the premises of OE. Those authors also emphasized the experience of higher education institutions from different parts of the world developing partnerships to promote, for example, open textbooks. Furthermore, they pointed out, based on their references, that the Open Education movement remains incipient in Latin America, despite the creation of repositories and initiatives aimed at public policy actions.

In relation to the general skills of the BNCC, it is necessary to highlight numbers 1, 4 and 5.

1. Valuing and using historically constructed knowledge about the physical, social, cultural and **digital** world to understand and explain reality, continue learning and collaborate in the construction of a fair, democratic and inclusive society. [...]

4. Using different languages – verbal (oral or visual-motor, such as Libras, and written), corporal, visual, auditory and **digital** –, as well as knowledge of artistic, mathematical and scientific languages, to express oneself and share information, experiences, ideas and feelings in different contexts and produce meanings that lead to mutual understanding. [...]

5. Understanding, using and creating **digital information and communication technologies** in a critical, meaningful, reflective and ethical way in various social practices (including school practices) to communicate, access and disseminate information, produce knowledge, solve problems and exercise protagonism and authorship in personal and collective life (BRASIL, 2018, p. 9, **our emphasis**).

The three competencies mentioned above serve as parameters for Basic Education and, again here, there is no explicit indication of the use of OER to foster teaching-learning processes. However, these excerpts bring the possibility of democratic and inclusive actions that use different languages such as digital, for example, and encourage the sharing of information/knowledge.

In general, in relation to the analyzed sections, the BNCC does not include OER as a present indication for pedagogical processes, leaving room for them to be used or not based on the knowledge and will of managers and teachers. This means that, given the numerous demands faced by education professionals, it is unlikely that this is a current concern in everyday school life.

3.3 OER and technologies in science teaching found in the Political Pedagogical Project and in the Guiding Document of the municipality of Júlio de Castilhos/RS

As previously mentioned, this documentary analysis is part of a master's project developed with the municipal public education network of Júlio de Castilhos/RS, with the proposal of building OER with students in the science curricular component of Elementary Education. The research site will be a school located in the urban area of the municipality of Júlio de Castilhos that serves preschool, the initial years of elementary school, the final years of elementary school and youth and adult Education. In view of this, there is a concern to analyze and verify whether, and in what way, the aspects investigated are addressed in the documents that regulate education both in the municipality and at the school level.

As previously stated, “the municipality of Júlio de Castilhos prepared the Municipal Territorial Guidance Document of Júlio de Castilhos (DOM), in accordance with the BNCC and the Gaucho Curricular Reference (RCG)” (PPP, 2019, p. 25). Regarding DOM, tables and charts were constructed that reference, in each curricular component, by school year, the thematic units, the objects of knowledge, the BNCC skills, the RCG skills and, finally, the skills of the municipality of Júlio de Castilhos. However, there are no textual references related to general or specific skills in Natural Sciences. This DOM is available directly in municipal schools and/or in the Department of Education in printed form and, as there are no textual references beyond the skills, we decided to also use the school's PPP in search of material for documentary analysis.

The school's PPP was approved by the Municipal Education Council of Júlio de Castilhos/RS on December 26, 2019, with Opinion No. 17/2019. Therefore, the PPP “is a necessity, given that every school needs to record its data, situate itself in the social context, renew itself by planning in the short, medium and long term, systematize its practice, as well as describe its dynamics” (PPP, 2019, p. 7). This document contains the entire organization and performance of activities related to the pedagogical work of “improving the quality of teaching, respecting differences and diversity, continuing education, contextualization, assessment procedures and valuing the student as a subject of the teaching-learning process.” (PPP, 2019, p. 7). To this end, it is worth highlighting some of the school's purposes:

- To encourage students to interact and solve their conflicts through their leading role in the teaching and learning process, acting as participatory citizens of the community, thus relating theory to practice in the teaching of each curricular component and in the set of integrated knowledge. [...]
- To stimulate curiosity, a taste for knowledge, cooperative work, citizenship, autonomy and critical thinking (PPP, 2019, p. 10).

The objectives of Elementary Education include “the understanding of the natural social environment, the political system, the arts, technology and the values on which society is based” (PPP, 2019, p. 12).

Considering that, in previous documents, there were few or no inferences related to OER, thus we do not expect to find this concept in the official municipal document, since it originates mainly from the BNCC. It is also clear that there is no inference regarding the use of technologies in teaching-learning processes aimed

at teaching Science, just something more general, as highlighted in the previous paragraph, with a gap regarding these parameters.

In this context, Carvalho and Lima (2019, p. 307) stood out when they highlighted “that education needs to be integrated with cyberculture and, to this end, adequate infrastructure and training are necessary that provide educators with the opportunity to appropriate DICT as a pedagogical resource”, so that the possibilities and their uses are included in pedagogical practices.

Regarding OER, it is also worth remembering that,

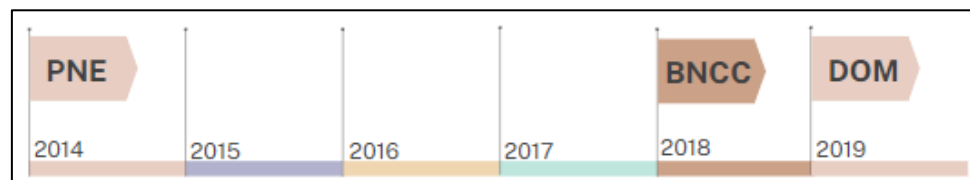
[...] It is a small but persistent movement, and not for that reason insignificant, that brings together researchers, teachers, public managers, members of civil society and activists who seek to think, promote and think about open education (AMIEL; GONSALES; SEBRIAM, 2018, p. 247-248).

In this way, technological devices in the school environment, as well as the production and use of OER, depend on teachers' ability to understand these possibilities.

3.4 OER, technologies and science teaching under discussion

In this work, a path of documentary analysis was followed in a delimited corpus, considering a timeline of the date of publication of these documents. In other words, a document hierarchy, as illustrated in Figure 2.

Figure 2 - Official documents analyzed in a timeline



Source: Authors (2022).

The PNE is a general document on education; for this reason, in its constitution, there are no direct specifications regarding science teaching, but it presents some contextualization about OER and technologies. In the BNCC, guidelines for teaching Science based on specific Natural Sciences competencies are observed, in which there are potential indications for the use of technologies, as well as in general competencies. However, this document does not explicitly mention OER. Regarding the DOM of the municipality of Júlio de Castilhos/RS, there is nothing specific about OER and technologies aimed at Science teaching. Therefore, we consider that when going through the editions of these documents, some guidelines were lost, mainly when referring to OER, which appear in the PNE, but are absent in the other two documents. When analyzing concomitantly, the issue of technologies is not left aside and is addressed in the PNE and BNCC, despite not being found in the DOM.

It is important to highlight that educational resources are essential artifacts in the teaching-learning process at all levels of education, being used by teachers and students in the most diverse ways and with different functions. Regarding OER specifically, there is they might be found in various educational settings in Brazil,

from basic education to higher education. However, to achieve this, it is emphasized once again that it is necessary for this concept/movement to become a constituent part of official guidelines, mainly in the BNCC. Only after explicit mentions in these documents occur, will municipal and school legislation, especially related to Elementary Education, effectively incorporate such aspects.

The use, production, sharing and adaptation of OER are enhanced by technologies, mainly due to their possibility of access via the internet. This enables teachers to create their own OER geared towards their school reality, as well as use them free of charge, due to the open license inherent to OER produced by any author(s). Another practice intrinsic to this resource is the possibility for students to build their own ER, which can be shared within the school space and beyond

However, as we know, there are many difficulties in relation to the structure required for the use and construction of OER. In their research, Silva and Rodello (2020, p. 72) establish a comparison on the use of OER between a Brazilian and a German higher education institution. The authors point out that “as in other South American countries, it is clear that Brazil’s difficulty is related to infrastructure”, thus correlating the use of OER to the conditions of physical structure and equipment in higher education, something that is also problematic in basic education.

Specifically in relation to science teaching, the use of OER combined with the technologies available can be a facilitating device, by enabling access to images, illustrations, simulations, animations, among other things, which bring scientific concepts in a more concrete way to the students’ reality.

Currently, it is possible to see that a variety of devices, equipment, applications and educational resources aimed at teaching science have been used by teachers in the classroom, often on their own initiative and/or in search of assistance in their planning and in organizing the teaching-learning process. Likewise, there is a varied sharing of teaching activities carried out in the classroom by teachers on different platforms, which are often copied without prior authorization, and which could be made available as OER in repositories, for example. Thus, a significant and necessary aspect to be considered in the field of education are the dialogues and discussions related to the type of license for the use of educational resources used and/or routinely produced in the school environment. Furthermore, it is still necessary to discuss the way in which these materials are shared. After all, this is how teachers and students can recognize whether the educational resources available in the classroom can, in fact, be used, adapted and/or shared without violating the copyright legislation in force in our country.

4 FINAL CONSIDERATIONS

This research showed that there are a series of obstacles related to the topic of OER and technologies, including mainly the lack of this set of concepts in the country's educational guidelines listed in this work, with the sole exception of the PNE. It was found here that global movements related to OER and the context of OE, which highlight the use of technologies as allies and emphasize the importance of these resources, appear in the PNE, but the indications decrease in more specific official documents, especially when it comes to parameters/directions for

elementary education. The fact that there is no mention of the term OER in the BNCC ends up reproducing the omission in other curricular documents, which is directly reflected in the absence of discussions on the topic, for example, in municipal documents. As a result, consequences often arise, such as little or total lack of knowledge about these concepts by those working in basic education, which highlights the need for a solid and powerful construction of public policy actions for the production of inherent practices and initiatives.

The possibility of using, reusing, adapting and sharing educational resources, in digital format or not, by teachers and students stands out here, enabling these subjects to create their own OER adapted to their reality, and build networks for sharing, adapting and using OER. Such possibilities could be strategic allies not only in the construction, but also in the consolidation of a national curricular base.

However, it is also important to highlight that the indication of use of technologies in the school space is not enough if the structural and physical conditions suitable for its use are not created. Improvements are needed throughout the country, which range from physical space, availability of a quality and functional internet network, to equipment operating properly and in sufficient quantity. Another factor is the need for actions that aim to include teachers and students in the processes of instrumentalizing technologies. Furthermore, it is important that, when technologies are used, they have a specific function and are included within a more comprehensive plan, aimed at the teaching-learning process.

In view of this, we consider that these movements can be directly inserted into science teaching, as well as in other areas of education, contributing explicitly to free and more democratic access to scientific knowledge. Finally, it is believed that the points highlighted in this report and all their contexts can help everyone understand the importance of adopting OER, whether combined with technologies or not, in basic education in Brazil, as driving forces for sharing unique or common knowledge.

RECURSOS EDUCACIONAIS ABERTOS, TECNOLOGIAS, ENSINO DE CIÊNCIAS E AS SUAS CORRELAÇÕES NOS DOCUMENTOS OFICIAIS

RESUMO

O presente artigo desenvolve uma análise documental que visa mapear referências textuais presentes em documentos oficiais que empregam terminologias relacionadas aos Recursos Educacionais Abertos (REA) e as tecnologias utilizadas em sala de aula, tais como as Tecnologias de Informação e Comunicação (TIC) e as Tecnologias Digitais de Informação e Comunicação (TDIC), voltadas, principalmente, ao componente curricular de ciências nos anos finais do Ensino Fundamental. Para tanto, delimitou-se como *corpus* de pesquisa o Plano Nacional de Educação (PNE), a Base Nacional Comum Curricular (BNCC) e o Documento Orientador Territorial Municipal (DOM) de Júlio de Castilhos/RS, local de execução do projeto de pesquisa de mestrado do qual faz parte o presente artigo. A utilização de REA, aliados aos aparatos tecnológicos disponíveis atualmente, possibilita que, a partir de condições adequadas de conexão e equipamentos, todos possam acessar informações e conhecimento nos mais diversos formatos como imagens, vídeos, podcasts, textos, entre outros, sem custo algum. Desse modo, os REA podem se fazer presentes no ambiente escolar como recursos pedagógicos a serem utilizados de forma infinita, sendo possível passarem inclusive por adequações necessárias a cada realidade escolar, assim como, construídos e reconstruídos pelos próprios docentes e/ou discentes. As análises nos documentos delimitados neste trabalho apontam que, apesar de sua importante utilidade e de organizações a nível mundial como a UNESCO recomendarem e reiterarem a importância dos REA + tecnologias, essa linha de possibilidade é enfraquecida nas diretrizes oficiais analisadas, em especial, para o Ensino Fundamental, o que se reflete em certa escassez inclusive de discussões sobre o assunto, como vem sendo constatado em outras pesquisas da área.

PALAVRAS-CHAVE: Plano Nacional de Educação. Base Nacional Comum Curricular. Ensino de Ciências. Tecnologias digitais. Recursos Educacionais Abertos.

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