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State of knowledge on teaching and learning functions in the Upper Years of Elementary School[1]

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ABSTRACT

This article presents the state of knowledge of research addressing the study of functions in the upper years of Elementary School. The methodological procedures are of a bibliographic nature, involving a survey of Theses and Dissertations in the databases of the Digital Library of Theses and Dissertations (BDTD) and the Catalog of Theses and Dissertations of the Coordination for the Improvement of Higher Education Personnel (CAPES). After selection, eight dissertations were included in the corpus of analysis, organized into two categories: (i) Generalization of patterns and construction of the concept of function; and (ii) Use of technological resources in the study of functions. The results show similarities among the research, highlighting the use of technological resources for teaching and learning functions, the application of problems and contextualized activities, as well as the generalization of patterns for the construction of the concept of functions. These elements enable students to perceive the applicability of mathematical knowledge in real-life situations.

KEYWORDS: Technological resources. Contextualized activities. Mathematical knowledge. Generalization of patterns.

1 INTRODUCTION

The processes of teaching and learning are numerous, continuous, formal, and informal, occurring in both school environments and beyond. Given the complexity of these processes, flexible and diversified teaching becomes necessary, incorporating various possibilities and forms of teaching and learning.

Mathematics education, in particular, carries a perception of a science that is difficult to comprehend. Thus, enabling the construction of mathematical knowledge often requires employing new strategies and adopting different pedagogical practices. This is because, as defined in the National Common Curricular Base,

> [...] mathematical knowledge is necessary for all students in Basic Education, either due to its great application in contemporary society or its potential in forming critical citizens, aware of their social responsibilities (BRASIL, 2018, p. 265).

Mathematical literacy begins to be developed from Early Childhood Education, providing students with the development of logical and critical thinking necessary for their participation in society. It is at this level of education that students develop important skills such as communication, reasoning, and argumentation.

Among the subjects addressed in Elementary School is the study of functions, a topic that begins to be addressed from intuitive notions. These ideas are expanded in the upper years of Elementary School and in subsequent studies, based on their different representations. During the upper years of Elementary School, students establish generalizations and connections between variables, functions, and equations, developing techniques for problem-solving related to this content (BRASIL, 2018).

Regarding the construction of the concept of function by the student, Brito and Almeida (2005) consider it relevant to explore intuitive perception in order to describe a situation, thus highlighting its variational aspect. According to Sierpinska (1992 apud Trindade, Moretti, 2000), there are epistemological obstacles that arise for the student during the study of functions, including the notion that a function necessarily has an analytical description, which highlights the use of algebraic representation for function teaching. Duval (2012) emphasizes the importance of the notion of representation for the apprehension of different forms of representation of the same object, highlighting the importance of coordination between representation registers for the understanding of the represented object. Trindade and Moretti (2000) consider it important to address verbal representation in the study of functions.

Given the relevance of the study of functions in Mathematics and the importance of understanding how this theme has been approached and disseminated in Brazilian scientific productions, it becomes essential to conduct a systematic review. As Vosgerau and Romanowski (2014, p. 184) emphasize: "[...] review studies are necessary and fundamental to synthesize, evaluate, and point out trends, but, mainly, to indicate points of weakness in order to favor critical analysis of the accumulated knowledge in the area".

This study was guided by the following research questions: What do scientific researches on the study of functions in the Upper Elementary School have in common? In what aspects do they differ? How have functions been approached in the Upper Elementary School? Given the aforementioned, the outlined objective was to analyze the convergences and divergences among scientific researches on the study of functions in the Upper Elementary School, identifying both common points and distinctive aspects of these studies.

The following sections present discussions regarding the teaching and learning process of functions. Then, the methodological procedures are detailed, listing the processes of data collection and analysis of the information obtained regarding the scope of this review. Finally, the concluding remarks and the concerns that emerged from this study, which could be further investigated in future works, are presented.

2 TEACHING AND LEARNING OF FUNCTIONS

The function relates elements of two sets, establishing associations between the elements of these sets. According to Ponte (1990, p. 03), the concept of function is one of the most relevant in mathematics, "[...] but its emergence as a clearly individualized concept and as an object of current study in Mathematics dates back only to the end of the 17th century."

In this section, some considerations about the teaching and learning of functions are explored, which are essential for the construction of mathematical knowledge in this field. As noted by Silva (2017, p. 32), "the mathematical content of functions is very important for understanding generalizations and, in some cases, relationships between two or more quantities." This knowledge has significant applications in various everyday activities; however, its application in the classroom sometimes lacks an explicit connection with the students' everyday reality. The content of functions is part of the historical process of the evolution of algebra. In Brazil, it has undergone significant changes over the years. According to Miguel, Fiorentini, and Miorim (1992), algebra has been part of the Brazilian curriculum since 1799, but it was only in the early 1960s that it presented itself as active teaching. According to these authors, algebra was necessary for solving equations and problems.

According to Moraes, Souza, and Bezerra (1959, p. 54), the initial objectives of algebra in the 2nd grade were aimed at solving 1st-degree problems, outlining a specific focus on the practical application of this mathematical branch, with an emphasis on problem-solving and symbolic manipulation as central components of algebra teaching at the time.

Through an investigation of textbooks prior to the 1960s, Miguel, Fiorentini, and Miorim (1992) concluded that algebra teaching was centered on transformations of algebraic expressions and on content that led to mechanical learning. Supporting the ideas of these authors, Silva (2021) points out that, in classroom practice, teachers still carry out traditional activities that precisely follow the textbook sequence, addressing this content without relating it to other areas of knowledge or to students' everyday lives.

The study of functions begins to be introduced from the early years of Elementary School, through intuitive ideas, and is deepened in subsequent years and in other levels and modalities of education. In the upper years of Elementary School, students must understand the meanings of the different numerical variables in an expression, as well as establish connections between variable/function and unknown/equation. This understanding is essential for algebra learning to contribute to transforming a given situation into other representations, such as a problem presented in the native language, expressed through formulas, tables, and graphs (BRASIL, 2018). One of the essential skills for teaching functions in the upper years of Elementary School is:

> [...] to understand functions as one-to-one dependency relations between two variables and their numerical, algebraic, and graphical representations and to use this concept to analyze situations involving functional relations between two variables (BRASIL, 2018, p. 317).

To achieve this goal, classroom activities should seek to stimulate students' curiosity, resorting to investigation, reflection, critical analysis, imagination, and creativity. In this sense, the teacher should aim to develop in students investigative capacity and the production of convincing arguments, drawing on knowledge of functions to understand and act in the society they live in.

3 METHODOLOGY

This is a bibliographic research with a State of Knowledge approach, aiming to map academic productions related to the study of functions in the Upper Elementary School, in order to answer the following review questions: What do scientific researches on the study of functions in the Upper Elementary School have in common? In what aspects do they differ? How have functions been approached in the Upper Elementary School? According to Vosgerau and Romanowski (2014, p. 167):

> [...] review studies consist of organizing, clarifying, and summarizing the main existing works, [...] literature reviews can provide a historical overview of a theme or subject considering publications in a field.

In this sense, a survey of productions was carried out in the following databases: Digital Library of Theses and Dissertations - BDTD and Catalog of Theses and Dissertations of the Coordination for the Improvement of Higher Education Personnel - CAPES. These databases were chosen because they contain Theses and Dissertations from all Brazilian stricto sensu programs, and they are productions of interest to this research. Thus, for the general specification of searches and data collection, the following keywords were used: "functions" and "elementary school", as they are relevant to the object of study of the review.

For the selection of research, the following criteria were used:

- Inclusion criteria: research conducted with students and/or teachers of the upper years of Elementary School, addressing the teaching and learning of functions, and available in full on the internet.

- Exclusion criteria: studies not related to the teaching and learning of functions in the upper years of Elementary School, focused on the early years of Elementary School, High School, Higher Education, and duplicates.

The following results regarding the study of functions in the upper years of Elementary School were obtained in searches in the databases:

- Digital Library of Theses and Dissertations (BDTD): using the terms "functions" AND "elementary school", 664 results were found. Narrowing the searches to from 2013 onwards, 426 results appeared. Of these, two studies met the selection criteria and were included in the corpus of analysis. A review of the last ten years of research on the theme was chosen.
- Catalog of Theses and Dissertations of the Coordination for the Improvement of Higher Education Personnel (CAPES): Similarly, using the terms "functions" AND "elementary school", 480 results were obtained. Narrowing the searches to from 2013 onwards, 69 results appeared. Of these, seven studies met the selection criteria and became part of the corpus of analysis.

In both databases, works that did not meet the inclusion criteria described above were excluded.

According to Vosgerau and Romanowski (2014, p. 182), "the detailed description of the organization process of selection, validation, analysis, and evaluation of the research used is essential, complex, and challenging, but deeply necessary" for the qualitative interpretation and treatment of information, enabling the production of knowledge on the addressed theme.

For the analysis and discussion of results, Bardin's Content Analysis categorization (2021) was adopted, following the three main stages: pre-analysis, analytical description, and inferential interpretation. In the pre-analysis phase, the abstracts, keywords, and methodological procedures of the nine selected productions were read to systematize initial ideas and organize the material to be investigated. In exploring the material, the information was grouped into recording units to define the analysis categories (described in subsection 4.2). In the final stage, the treatment of results, inferences, and interpretations was carried out.

4 DATA ANALYSIS

Nine studies were selected from the databases for analysis. After reviewing the abstracts, titles, and keywords, eight productions were included in the final analysis corpus of this review. In some cases, it was necessary to conduct a more comprehensive reading of the introduction and methodology chapters, as the overall objective was not clearly evident in the abstracts.

For the inclusion of these productions, consideration was given to research that clearly presented the investigated theme, the research problem, and the objectives. Thus, out of the nine initially selected works in the databases, one was excluded for not explicitly presenting the research objectives.

Table 1 presents the identified research in both databases. These studies were organized by year, author, title, and overall objective.

Table 1 – Selected Productions in Databases 2 (2013-2022)

Author/Year	Title	Overall Objective
Sérgio Renato Barcelos (2017)	Software *Modellus* and Mathematical Modeling: relating mathematical concepts to physical phenomena	Apply and analyze the *Modellus* Software in teaching functions in the ninth grade of Elementary School.
Sandra Mara Oselame Riboldi (2019)	The Scratch Programming Language and the teaching of functions: a possibility	Investigate the possible contributions that the Scratch programming language can bring to the introduction of the concept of functions in a ninth-grade class of a state public school in Santa Catarina.
Moises de Oliveira Moura (2019)	Cryptography motivating the study of functions in the 9th grade of Elementary School	Present cryptography as a tool to contextualize the content of functions, particularly, affine functions.
Ana Carolina da Silva Gonçalves (2020)	Using Geogebra in the learning process of concepts and properties of functions	Show that it is possible to integrate the study of functions in the classroom with activities using the Geogebra dynamic geometry software in the Computer Laboratory, working on problems previously elaborated with items following a didactic sequence in increasing order of difficulty and, mostly, with objective answers, in order to facilitate learning and better fix the content.
Paulo Roberto Figueiredo Pamphylio (2017)	The approach of mathematical modeling in problem situations involving linear and quadratic functions in Middle School	Apply Mathematical Modeling in functions, aiming to bring formal Mathematics closer to everyday Mathematics and, thus, bring students closer to their reality.
Carlos Augusto Messias de Campos (2020)	Algebraic reasoning: analysis of performance and competencies presented by 8th and 9th grade students of Elementary School	Identify and analyze the performance and development of competencies presented by 8th and 9th grade Elementary School students when solving problems involving functional relationships.
Cláudia Brasil Coimbra Nascimento (2019)	Active instruction methodology by peers associated with video analysis of experiments: an essay in the introduction of functions in 9th grade classes of Elementary School	Investigate how the Active Methodology IpC^3, associated with video analysis of experiments, can contribute to the learning of 9th grade Elementary School students about functions.
Ana Paula Marques (2019)	Teaching functions in the 9th grade: building	Investigate the possibility of building the concept of function in 9th grade

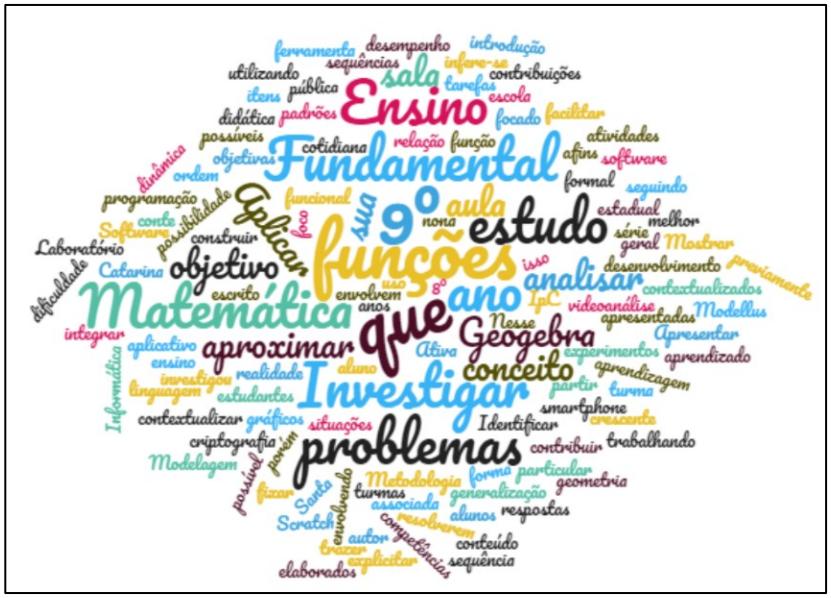
	meanings for functions from generalizations	classes of Elementary School, based on tasks involving sequences and contextualized problems focusing on pattern generalization.

Source: Research Data (2022).

For the selection of the research, productions developed from 2013 to 2022 were chosen. However, based on the data from Table 1, it was observed that the identified works are from the years 2017, 2019, and 2020. In the other years corresponding to the defined time limit, no research related to the study of functions in the final years of Elementary School was produced. This review was exclusively conducted with dissertations because the theses found did not meet the inclusion criteria, which included research developed with students and/or teachers from the final years of Elementary School, addressing the teaching and learning of functions, and available in full on the internet.

Figure 1 displays a word cloud with the main terms provided in the general objectives of the selected productions. The WordClouds software was used to construct this representation. The objectives of the research, as described in Table 1, were organized into a file and sent to the software, resulting in Figure 1 presented below.

Figure 1 – Word Cloud of the objectives of the productions



Source: WordClouds.com Report4 (2022)

Highlighted words such as "mathematics", "functions", "problems", "teaching", "elementary", "investigate", "Geogebra" represent the most recurrent terms. The identification of these words enabled the focus on essential themes for the research analysis process and to support the definition of the analysis categories described in subsection 4.2. It is evident, through the highlighted words, that the central objective of the productions was the study of functions in Elementary School.

4.1 Presentation of literature review data

This stage consists of presenting the studies by treating the data to highlight the main information and characteristics of the works. Table 2 describes the origin of the selected productions, detailing the institution of origin, the program, and the type of program (academic or professional).

Table 2 – Origin of selected Productions

No.	Dissertacion	Program	Instituition
1	Barcelos (2017)	Professional Master's in Mathematics in National Network	UFFS
2	Pamphylio (2017)	Professional Master's in Mathematics in National Network	UNIPAF
3	Riboldi (2019)	Professional Master's in Mathematics in National Network	UFFS
4	Moura (2019)	Professional Master's in Mathematics in National Network	UFT
5	Nascimento (2019)	Professional Master's in Science Education	IFRJ
6	Marques (2019)	Professional Master's in Education and Teaching	UFMG
7	Campos (2020)	Academic Master's in Mathematics Education	UESC
8	Gonçalves (2020)	Professional Master's in Mathematics in National Network	UFRJ

Legend:IFRJ – Federal Institute of Education, Science, and Technology; UFT – Federal University of Tocantins; UFRJ – Federal University of Rio de Janeiro; UFFS – Federal University of Fronteira do Sul; UFMG – Federal University of Minas Gerais; UESC – State University of Santa Cruz.

Source: Research Data (2022).

According to Table 2, all selected research was conducted at public universities. Seven of them are affiliated with Professional Master's Programs, with emphasis on the Professional Master's in Mathematics in National Network – PROFMAT. Regarding the type of program, only one research, by Campos (2020), was developed in an Academic Master's Program. This qualitative-quantitative study involved 8th and 9th-grade students, addressing linear and quadratic functions, with the intention of generalizing algebraic concepts.

In Table 3, the data collection instruments used in the research that make up the analysis corpus will be presented.

Table 3 – Data Collection Instruments Used in the Research

Data Collection Instruments	Author/Year
Direct observation, Pre-test and post-test activities application	Moura (2019); Riboldi (2019); Barcelos (2017)
Application of a Protocol with 11 questions	Campos (2020)
Application of problems/activities using Geogebra	Gonçalves (2020)
Written activities, audio and video recording, field diary,	Marques (2019)

interviews	
Analysis of problem-solving activities based on a teaching proposal using modeling	Pamphylio (2017)
Didactic Sequence	Nascimento (2019)

Source: Research Data (2022).

From the data in Table 3, it is observed that different data collection instruments were used for the development of the research. Among the selected productions, the majority used a qualitative approach for data collection and analysis.

Moura (2019), Riboldi (2019), and Barcelos (2017) used the application of activities as a data collection instrument, which they named pre-test and post-test. In the pre-test, they investigated the students' prior knowledge, and based on the information obtained, conducted meetings for the study of functions. Subsequently, students used the knowledge acquired during the meetings to answer the post-test activities. The three studies involved 9th-grade students in Fundamental Education. According to the authors, these activities developed with the use of technologies arouse students' curiosity and willingness to learn.

Campos (2020) developed a data collection protocol in the form of a notebook containing 11 questions, 7 about functions and 4 about equations. The author provided a preliminary analysis of the possible responses that could be obtained from solving each question. This protocol was applied to 58 students in the 8th and 9th grades. From the data obtained, the author concluded that the students understood the situations addressed and were able to make algebraic generalizations of situations described in natural language.

Gonçalves' dissertation (2020) opted for a sequence of activities on linear and quadratic functions, using Geogebra. The results indicate that the use of Geogebra contributed to a significant understanding of this mathematical object.

Marques (2019) developed two activities to collect data in 9th-grade classes in Fundamental Education. During the application of the activities, the classes were recorded in audio and video, which significantly contributed to the production of research data. The researcher chose to use a field diary describing the observations made during the activities to ensure the recording of relevant situations. The results indicated that the students had little or no contact with sequences, generalizations, and patterns. However, the activities enabled the development of ideas related to these concepts.

Pamphylio (2017) developed a teaching proposal involving modeling for the study of linear and quadratic functions in the classroom. According to the author, the approximation of mathematical knowledge with everyday situations makes classes more attractive and contributes to the development of teaching and learning, also contributing to citizenship education.

Nascimento (2019) developed a didactic sequence using the active methodology IpC (Instruction by Peers), applied in a 9th-grade class in Fundamental Education to investigate knowledge related to linear and quadratic functions. Acquired through conceptual tests formulated and treatment in video analysis of experiments, using the free software Tracker. According to the author,

this practice contributed satisfactorily and promisingly to a differentiated mathematics education.

In the next section, the research will be presented organized into analysis categories.

4.2 Categories of research analysis

For the analysis and discussion of the results, the research was organized into categories, following the stages of Bardin's Content Analysis (2021). According to the author, this is a process that revolves around three stages:

I. Pre-analysis: involving the organization of the research corpus to be investigated;

II. Material exploration: consisting of the process of coding and categorization, followed by analytical description;

III. Treatment of information through inferences and interpretations.

Table 4 presents the analysis categories and the corresponding research. The analysis categories emerged a posteriori, after the construction of the word cloud presented in figure 1, and the analysis of the selected productions.

Table 4 – Distribution of Research According to Categories

No.	Categories	Research	Quantity
I	Generalization of patterns and the construction of the function concept	Marques (2019), Campos (2020), and Pamphylio (2017)	3
II	The use of technological resources in the study of functions	Moura (2019), Barcelos (2017), Nascimento (2019), Gonçalves (2020), Riboldi (2019)	5
Total			**8**

Source: Research Data (2022).

From the categorization, there is a predominance of research related to the use of technological resources in the teaching and learning of functions. Six of the selected productions investigated the use of a technological resource in the study of functions.

Category I - Generalization of patterns and the construction of the function concept

Category I encompasses productions that investigated the construction of the function concept. They focused on generalizing patterns from contextualized situations, relating algebraic contents (functions) to other mathematical knowledge and real-world situations. This approach allowed for the understanding

of the function concept and the construction of knowledge of this mathematical object.

Pamphylio (2017) discusses how mathematical modeling can contribute to the study of linear and quadratic functions in the final years of Elementary School. This approach not only enables the development of skills for generalizing concepts, abstraction, and mathematical logical reasoning but also promotes an approximation between formal mathematics and everyday situations.

Marques (2019) investigated the construction of the function concept from pattern generalization. For this, the author applied tasks involving sequences and contextualized problems to observe the development of algebraic thinking and the apprehension of the function concept.

Campos (2020) sought to analyze the performance and competencies of 8th and 9th-grade students in solving problems and generalizing algebraic knowledge. The results indicated satisfactory performance by students on questions involving linear and quadratic functions.

The results obtained in the research of Marques (2019), Campos (2020), and Pamphylio (2017) reveal the difficulties students face in constructing generalizations of the function concept. It was observed that some students use natural language, others rely on trial and error, while few manage to perceive existing regularities and express them through mathematical language. This demonstrates the importance of addressing generalizations of mathematical concepts, especially the function concept, to effectively promote knowledge construction.

However, the research indicates that the application of investigative activities offers students the opportunity to develop skills necessary for the construction of algebraic thinking. This includes understanding and internalizing the function concept, stimulating them to make generalizations. Furthermore, this approach promotes the development of abstraction and mathematical logical reasoning.

The research examined in this category share similarities in the use of pattern generalization for the construction of the function concept. However, they differ in terms of the approach adopted. Specifically, Pamphylio's research (2017) stands out in exploring mathematical generalizations through Mathematical Modeling.

Category II - The use of technological resources in the study of functions

In this category, research related to the use of technological resources in the study of functions was gathered. These studies analyzed the contributions of using technological resources in the teaching and learning of functions in the final years of Elementary School, with a predominance of research conducted with 9th-grade students. Among the technological resources investigated are the dynamic geometry software Geogebra, Software Modellus, the Scratch programming language, and the free software Tracker.

Moura (2019) sought to establish a connection between the learning of functions and cryptography[5], a technological means of communication that is part of students' reality, although it is little known to them. The author associated the teaching of functions with cryptography to demonstrate to students that

mathematical knowledge can be applicable and useful for the secure use of technology. Furthermore, for the author, this approach:

> [...] proved to be potentially motivating, arousing students' curiosity and instigating the desire to learn. The activities developed [...] can be used in the classroom, aiming to exercise, deepen, and review the content of functions (MOURA, 2019, p. 64).

Gonçalves (2020) investigated the teaching-learning process of functions using the dynamic geometry software Geogebra. Through this resource, contextualized problems were applied to motivate students during classes, aiming for a meaningful learning of this mathematical object. The results of this research demonstrate the motivation and interest of the students, who interacted with each other, shared knowledge, and promoted the learning process of functions.

Riboldi (2019) developed a teaching-learning practice of functions using the Scratch programming language. This approach allowed for the verification of students' prior knowledge and the development of learning, establishing connections between technological knowledge and the content of functions. For the author, this teaching-learning practice using a technological resource aroused students' interest, curiosity, and motivation for learning functions, aspects that could be observed throughout the application of the activities.

Both studies by Barcelos (2017) and Nascimento (2019) offered interesting perspectives by linking the study of functions with the discipline of physics. The studies explored the use of technological resources in the study of functions but with an interdisciplinary approach. Nascimento (2019) investigated the knowledge of affine and quadratic functions through video analysis of physics experiments carried out by students. This approach encouraged students' interest and participation, promoting the construction of concepts in both mathematics and physics. On the other hand, Barcelos (2017) investigated problems related to students' reality related to Kinematics, using these contexts to develop mathematical models based on physics knowledge. This allowed for the construction of function graphs and tables, resulting in differentiated learning and the construction of knowledge related to functions.

The results of the research analyzed in this category demonstrate the existing similarities between the studies, such as the incorporation of technological resources for the teaching-learning of functions and the application of contextualized problems/activities. These approaches allowed students to perceive the applicability of mathematical knowledge in situations experienced in reality.

Overall, the research highlights the importance of technological resources in the learning of functions. They show how teaching strategies that involve students in the construction of knowledge and associate function concepts with other areas such as Physics are relevant. Furthermore, they reveal that the use of digital technologies dynamizes learning spaces, contributing to the teaching-learning process of functions in Basic Education.

5 FINAL CONSIDERATIONS

In this study, we aimed to present, through a literature review, what Brazilian researchers have been investigating regarding the study of functions in the final years of Elementary School. We questioned what scientific research shares in common in this field, in what aspects they differ, and how functions are approached in this school context. It was observed that these studies involve 9th-grade students, starting from the application of activities, with or without the use of technology, to analyze the learning process of functions or related concepts. There was also a concern to relate mathematical knowledge to students' reality, aiming to demonstrate the applicability of the content covered in everyday situations.

It was found that different technological resources were used in these studies, namely, the dynamic geometry software Geogebra, the Modellus software, the Scratch programming language, and the free software Tracker. It is worth noting the emphasis placed on the Geogebra software/application, which allowed for the exploration and visualization of graphs of linear and quadratic functions.

Despite the similarities identified among the productions, it is important to note that each study has a different purpose and presents unique characteristics. Some studies do not use technological resources, while others have 9th-grade students or 1st-year high school students as participants. Two studies used technologies but were developed based on an interdisciplinary proposal relating function knowledge to physics concepts. Moreover, the use of different data collection instruments was observed. This variation stems from the specific nature of each research, which is dedicated to investigating a distinct object and answering a specific problem.

All selected studies proved to be relevant for understanding pedagogical practices and teaching-learning methodologies that are being investigated related to functions. Additionally, they contributed to the analysis of the productions, identifying common and distinctive aspects among them. These results highlight the need for the expansion and deepening of this information.

The results point out gaps in the approach to algebraic and graphical representations of linear and quadratic functions. notably, there is a lack of studies that explore visual variables and symbolic units for a comprehensive interpretation of figurative properties.

ESTADO DO CONHECIMENTO DO ENSINO-APRENDIZAGEM DAS FUNÇÕES NO ENSINO FUNDAMENTAL ANOS FINAIS

RESUMO

Este artigo apresenta o de estado do conhecimento de pesquisas que tratam do estudo das funções nos anos finais do Ensino Fundamental. Os procedimentos metodológicos são de natureza bibliográfica, envolvendo um levantamento de Teses e Dissertações nas bases de dados da Biblioteca Digital de Teses e Dissertações (BDTD) e no Catálogo de Teses e Dissertações da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes). Após a seleção, oito dissertações foram incluídas no corpus de análise, organizadas em duas categorias: (i) Generalização de padrões e construção do conceito de função; e (ii) Utilização de recursos tecnológicos no estudo das funções. Os resultados evidenciam semelhanças entre as pesquisas, com destaque para o uso de recursos tecnológicos para o ensinoaprendizagem das funções, da aplicação de problemas e atividades contextualizadas, assim como da generalização de padrões para a construção do conceito de funções. Esses elementos possibilitam aos estudantes perceber a aplicabilidade dos conhecimentos matemáticos em situações vivenciadas.

PALAVRAS-CHAVE: Recursos tecnológicos. Atividades contextualizadas. Conhecimento matemático. Generalização de padrões.

NOTES

1 The article was presented at the National Symposium on Science and Technology Education (SINECT) / 2022.

2 Digital Library of Theses and Dissertations - BDTD and Catalog of Theses and Dissertations of the Coordination for the Improvement of Higher Education Personnel - CAPES.

3 Instruction by peers.

4 Available at: https://classic.wordclouds.com/. Access on: Aug. 2nd, 2022.

5 It is a field of cryptology that studies secure principles and techniques for virtual communication, as it protects information by encoding data.

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