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State of the knowledge about Statistical Education in the context of Early Childhood Education

Mauren Porciúncula [1]

Isadora Batisti [2]

ABSTRACT

This paper is an excerpt of a master's research in development, which aims to: carry out a State of Knowledge, based on academic productions, to identify a Statistical Education in the context of Early Childhood Education, available in the Brazilian digital library of thesis and dissertations (BDTD), in the periodical portal of the Coordination for the Improvement of Higher Education Personnel (CAPES) Foundation of the Ministry of Education (MEC), in the Catalog of Theses and Dissertations and in the Brazilian Meeting of Graduate Students in Mathematics Education (EBRAPEM). In searches from 2008 to 2020, 13 researches were retrieved, being three doctoral theses, three master's dissertations, four research projects and three papers. Such works composed the textual corpus of this part of the research, elements that evidence the importance of the insertion of Statistical Education in Early Childhood Education, with contributions to the construction of a critical, questioning subject, capable of transforming their reality, through the teaching of Statistics.

KEYWORDS: Statistical Education.Child education. Academic Research. State of Knowledge.

[1] PhD in Computer Science in Education from the Federal University of Rio Grande do Sul, Porto Alegre, RS, Brazil. Orcid: http://orcid.org/0000-0003-1161-8220. *E-mail:* mauren@furg.br.

[2] Graduated in Pedagogy Degree from the Federal University of Rio Grande, Rio Grande, RS, Brazil. Orcid: https://orcid.org/0000-0002-3187-1103. *E-mail*: isadorabatisti@yahoo.com.br.

Estado do conhecimento acerca da Educação Estatística no contexto da Educação Infantil

RESUMO

Esse artigo é um recorte de uma pesquisa de mestrado em desenvolvimento e tem como objetivo: realizar um Estado do Conhecimento, baseado em produções acadêmicas, para identificar a Educação Estatística no contexto da Educação Infantil, disponibilizadas na Biblioteca Digital Brasileira de Teses e Dissertações (BDTD), no Portal de periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) fundação do Ministério da Educação (MEC), no Catálogo de Teses e Dissertações e no Encontro Brasileiro de Estudantes de Pós-Graduação em Educação Matemática (EBRAPEM). Em buscas no período de 2008 a 2020, foram recuperados 13 trabalhos, sendo três teses de doutorado, três dissertações de mestrado, quatro projetos de pesquisa e três artigos. Tais trabalhos compuseram o *corpus* textual desta parte da pesquisa, apresentando elementos que evidenciam a importância da inserção da Educação Estatística na Educação Infantil, com contribuições para a construção de um sujeito crítico, questionador,capaz de transformar sua realidade, através do ensino da Estatística.

PALAVRAS-CHAVE: Educação Estatística.Educação Infantil. Pesquisas Acadêmicas. Estado do Conhecimento.

Estado del conocimiento sobre la Educación Estadística en el contexto de la Educación Infantil

RESUMEN

Este artículo forma parte de una investigación de maestría en desarrollo y tiene como objetivo: realizar un Estado del Conocimiento, a partir de producciones académicas, para identificar la Educación Estadística en el contexto de la Educación Infantil, disponible en la Biblioteca Digital Brasileña de Tesis y Disertaciones (BDTD), en el Portal de revistas de la Fundación Coordinación para la Perfeccionamiento del Personal de Educación Superior (CAPES) del Ministerio de Educación (MEC), en el Catálogo de Tesis y Disertaciones y en el Encuentro Brasileño de

Estudiantes de Posgrado en Educación Matemática (EBRAPEM). En las búsquedas de 2008 a 2020 se recuperaron 13 trabajos, tres tesis doctorales, tres disertaciones de maestría, cuatro proyectos de investigación y tres artículos. Dichos trabajos constituyeron el corpus textual de esta parte de la investigación, presentando elementos que muestran la importancia de insertar la Educación Estadística en la Educación Infantil, con aportes para la construcción de un sujeto crítico, cuestionador, capaz de transformar su realidad, a través de la enseñanza. de Estadística.

PALABRAS CLAVE: Educación Estadística Educación Infantil. Investigación académica. Estado del conocimiento.

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Introduction

This paper presents a State of Knowledge, carried out in the first half of 2021, on academic publications in the area of Statistical Education in Early Childhood Education, available in the Brazilian Digital Library of Theses and Dissertations (BDTD), in the periodical Portal of the Coordination of Personal Improvement Higher Education Foundation Ministry of Education (MEC), and in the Capes Theses and Dissertations Catalogue. Furthermore, as it is a subject with few theses and dissertations available in these repositories, it was also decided to carry out this search at the event Brazilian Meeting of Graduate Students in Mathematics Education (EBRAPEM), as it contemplated research projects, dissertations and theses, within the scope of Mathematics Education, of Brazilian Education and Teaching Programs, under development or defended.

According to Morosini and Fernandes (2014), the corpus of analysis for the State of Knowledge can be elaborated by texts that are part of events in specific areas, which encompass the “thought” of the academic community. According to these authors, "state of knowledge is identification, registration, categorization that lead to reflection and

synthesis on the scientific production of a certain area, in a certain space of time, bringing together journals, theses, dissertations and books on a specific theme" (MOROSINI; FERNANDES, 2014, p. 155). Despite being observed just over a dozen researches, the search exercise provided a more comprehensive view of the theme.

This paper is justified insofar as it seeks to highlight possibilities for advances in the construction of scientific knowledge, from the research compiled, between the years 2008 to 2020, for this State of Knowledge. When analyzing such publications, it was possible to understand and show what were the main contributions of these studies and what still needs to be advanced and discussed in the area of Statistical Education, for the first stage of Basic Education.

In the next sections, we present the motivation for the production of this State of Knowledge, the exposition of the methodological procedures, referring to the theme of this research, the description and analysis of the data contemplating the results and discussions of the works that fit in the textual corpus, and finally, final considerations.

Why research Statistical Education in Early Childhood Education?

Before presenting the methodological processes, the analysis of the results, as well as the final considerations about the searches of the aforementioned research, it is understood that it is necessary to elucidate, in this section, the causes that mobilized the production of this State of Knowledge. In this way, we intend to answer the following question: Why research Statistical Education within the scope of Early Childhood Education?

In view of this, some aspects were considered for this process, starting with the configuration of Early Childhood Education in Brazilian Education, above all, through what is described in the educational normative document, namely, the National Common Curricular Base - BNCC (Brazil, 2018) . According to the document (BRAZIL, 2018, p.36), “Early Childhood Education

is the beginning and foundation of the educational process." This stage is integrated into Basic Education, as well as Elementary School and High School. Furthermore, as expressed in the Base, the child's entry into the first stage of Basic Education means experiencing a structured socialization environment and creating new affective bonds, in addition to family bonds. In this way, the insertion in Early Childhood Education allows the beginning of the construction of different aspects of children, whether in the cognitive, social and affective areas.

Therefore, in view of the requirements for Early Childhood Education, proposed by the BNCC, various learning and development objectives are conveyed through its fields of experience, which enable children already at this school stage to play an active role in the most diverse spaces. . For this, the document includes aspects such as the promotion of challenging environments, which encourage students to solve problem situations, perceive the reality around them, and make children produce knowledge and meanings about themselves and about the society in which they belong.

In this sense, it is understood the importance of providing the critical and reflective development of children in relation to Statistics Education, starting with Early Childhood Education, since Statistics is a science present in the daily lives of subjects and manifests itself in different spaces, with approaches in the various topics in our social environment. In addition, the BNCC expresses the possibility of working with statistical activities, in situations where children in Early Childhood Education can research, build simple graphs and tables, classify, compare, and develop other statistical concepts, through interactions and games.

It is worth emphasizing that this paper refers to a part of master's research still in development. Therefore, it is intended to continue the research in this area, to present new developments and different discussions in relation to the possibilities and challenges of Statistics in the field of Early Childhood Education, as well as to present in a detailed way the documents

that guide this stage and its relationship with Statistics. The following section presents the methodological paths followed during the search for research in the area of Statistics in the context of Early Childhood Education, based on a qualitative design described below.

Methodology

This research is characterized by a qualitative approach, based on the theory of Content Analysis, by Bardin (2016), with the objective of analyzing, from a State of Knowledge, the academic productions, which present Statistical Education in the context of Child education. In view of the above, between March and May 2021, searches were carried out in different databases, as explained above. The keywords used were: Statistical Education and Early Childhood Education, since these descriptors specifically contemplate the researched theme, that is, they focus exclusively on the area of Education, linked to the first stage of Basic Education. No filter or restriction was used in relation to the period of publication of the works, except in the Capes Theses and Dissertations Catalog. In BDTD/IBICT, the advanced search tab was activated. On the Capes journal portal, search by subject and advanced search were used. On the Capes Theses and Dissertations Catalog platform, the descriptors were searched through the search tab. For EBRAPEM, the Annals tab was activated in the discussion group (GD) of the Statistics thematic axis. The selection of the corpus of this State of Knowledge took place in three reading moments, in this order: the titles; of abstracts; of objectives, methodologies and final considerations.

In the BDTD/IBICT, with the descriptors: Statistical Education, AND Infantile Education, three researches were retrieved (two theses and one dissertation). All disregarded papers were submitted to an elimination strategy comprising two criteria: 1) repeated searches, 2) papers that were far from the scope of the search. Therefore, some researches were discarded

because they did not contemplate the objective proposed for this study, that is, the publications did not articulate Statistics with the stage of Early Childhood Education.

After a thorough reading, only one thesis was selected. In the Capes periodicals portal, with the descriptors: Statistical Education AND early childhood education, 22 papers were reached. After reading the second stage and applying the elimination strategy, one paper was excluded and three were selected. Without applying the specific filters, the searches carried out with the same descriptors in the Capes Theses and Dissertations Catalog resulted in 6,627 works. In this way, specific filters were used, applied in different areas, such as: knowledge area, evaluation area, concentration area, in order to delimit our searches within the intended context, such as: Education, Science and Mathematics Teaching, Mathematics, Probability and Statistics, Teaching-Learning, among others. After using these filters, the number of these works reduced to 1,673 works.

After reading all the titles of the productions, only seven works were selected, one of which had already been found in another database and was soon disregarded. From a more detailed reading, one of them was disregarded for not having as a target audience, children from Early Childhood Education, leaving five productions, being two doctoral theses and three master's dissertations. In the XII annals of EBRAPEM, in 2008, only one work was selected. In the XX annals, of the year 2016, two works were selected and in the XXII annals, of the year 2018, one work was selected. Repeated research projects and works that departed from the scope of the research were discarded. Thus, three doctoral theses, three master's dissertations, four research projects and three papers were retrieved for the analysis of this research.

After the selection of these works, the analysis was based on the Content Analysis methodology, proposed by Bardin (2016). For Bardin (2016), the key to content analysis is the critical exposure of research. The author presents the criteria for organizing content analysis in three

phases, which are characterized as chronological poles: 1) pre-analysis; 2) exploration of the material; 3) treatment of the results achieved and interpretation (BARDIN, 2016).

The first phase, the pre-analysis, corresponds to the organization itself of the material and its reading, which the author also calls "floating reading". The documents subject to analysis are chosen, with the formulation of hypotheses, objectives of the analysis, as well as the composition of indicators that lead to the final interpretation. Even though these factors do not occur chronologically, they are closely linked. Thus, during the categorization process, the materials collected during our searches were classified. As a categorization process, the themes and objectives of the productions were scrutinized.

In the second phase, the exploration of the material, four categories and themes were defined for the *corpus* of this paper, namely, 1st category-Publications that address formative and/or collaborative contexts linked to Statistical Education in Early Childhood Education; 2nd category-Publications on classification in Early Childhood Education; 3rd category-Publications that expressed document analysis and/or proposals in the classroom on Statistics in the context of Early Childhood Education and 4th category-Publications on probability in Early Childhood Education. Subsequently, the stage of treatment of obtained results and interpretation took place. In the following section, the analysis of the results will be presented through the thematic categories of this State of Knowledge.

Presentation and analysis of results

For the first category, Formative and/or collaborative contexts linked to Statistical Education in Early Childhood Education, the publications shown below were gathered in Table 1.

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TABLE 01 - 1st category of analysis: Publications that address formative and/or collaborative contexts linked to Statistical Education in Early Childhood Education.

Source/Document	Title	Authors	Main goals
BDTD/IBICT (Thesis)	Professional development of teachers in collaborative contexts in statistical literacy practices	Conti, Keli Cristina, 2015	Understand the learning and professional development of teachers and future teachers of Early Childhood Education and the early years of Elementary School from the perspective of statistical literacy in collaborative contexts.
CAPES/MEC JOURNALS PORTAL (Paper)	The study of statistics in a collaborative context: the pie chart	Conti, Keli Cristina, 2018	Understand the process of professional development from the perspective of statistical literacy in collaborative contexts.
CAPES THESIS AND DISSERTATION CATALOGS (Thesis)	The learning of teachers who teach Mathematics to children when they enter a training space on stochastics	Oliveira, Debora de, 2013	Investigate how the teacher mobilizes his knowledge about stochastics to promote mathematical learning for children; to identify the problematization process generated by the teacher when teaching mathematics to children; to analyze how the practices shared by teachers in a training space contribute to their continuing education.
CAPES THESIS AND DISSERTATION CATALOGS (Thesis)	The professional development of Childhood Educators: an approach to Statistical Education	Souza, Antonio Carlos de, 2013	Investigate how the study group can make it possible to expand the teachers' professional knowledge, bringing them closer to Statistical Education; verify which evidence of professional learning they reveal during their participation in the study group; and to identify which existing practices were the most potentiators of learning.

Source: Authors' collection (2022)

It is verified that the main objectives of the works, highlighted in this category, lean towards an investigation in the field of Statistical Education, in the perspective of contexts of formation and/or collaboration. In this way, it can be seen that the central focus of the selected productions turns to the development and learning of teachers. Therefore, we will begin with a characterization of the doctoral thesis of Débora de Oliveira (2013). The author investigated a formative space, containing learning with a focus on Stochastics, portrayed by teachers who teach Mathematics, in a public school in the city of São Paulo. The teachers who participated in continuing education are hired by the Municipal Department of Education of São Paulo, and work in the following stages: Early Childhood Education and the early years of Elementary School.

The thesis by Antonio Carlos de Souza (2013) was grouped in this category, carried out with a group of six teachers, seeking to enable the expansion of professional knowledge of the research participants, bringing them closer to Statistical Education. Regarding Elementary Education, during Souza's research (2013), the National Curricular Common Base - BNCC (BRAZIL, 2018) had not yet been implemented. The author brings the reference of the National Curriculum Parameters – PCN (BRAZIL, 1997), in the Information Treatment and National Curriculum Framework for Early Childhood Education block – (RCNEI, 1998), which does not address this thematic block.

Another selected thesis was by Keli Cristina Conti (2015). The researcher sought to understand learning and professional development from the perspective of Statistical Literacy in a collaborative context, constituted through the training of teachers, future teachers of Early Childhood Education and early years of Elementary School, with nine participants, including the researcher. This group was formed voluntarily to investigate Statistics in the school environment. The guiding question was: "What evidence of professional development do teachers and future

teachers of Early Childhood Education and the early years of Elementary School present in collaborative contexts in statistical literacy practices?".

This research articulates with another work by the same author in 2018, being an excerpt from her doctoral thesis, Conti (2015), where she seeks to describe one of these meetings held during her doctorate, emphasizing the sector chart and the types of representations graphics. As in the research by Oliveira (2013), Conti (2015) also included in her research both the Early Childhood stage and the early years of Elementary School. Like the other works presented in this section, Souza (2013) considered the context of Early Childhood Education and Elementary School in her studies. However, her research focused only on the first year of Elementary School and not on the entire cycle of the Initial Years, like the other researches.

Oliveira (2013) adhered to a qualitative approach, with content analysis by Bardin (1977) and Franco (2008). Field research with continuing education participants was divided into two modules, the first of which took place in early September 2011 until December of the same year. The research took place between September and December 2011, with weekly meetings with 36 teachers, working in teaching, coordination and direction, being 24 from Early Childhood Education, nine from the early years of Elementary School, three coordinators and one director.

The second module started in March 2012, being a prerequisite to have participated in the previous module, covering discussions and activities related to stochastic reasoning. Ten fortnightly meetings were held, with thirteen teachers and data were collected through admission questionnaires, audio, recordings, oral and written records, activities carried out and their socialization, in addition to the evaluation of training.

Souza (2013) presented a qualitative research, with ten weekly meetings, from September to December 2010, with the researcher and six teachers, one from the first year of Elementary School and the other five from Early Childhood Education. He developed Content Analysis using different materials: interviews, videos, photos as well as a field diary.

In her thesis, in the narrative form, Conti (2015) carried out a case study called “Estatisticando”, in a group composed of active teachers and undergraduate students of the Pedagogy and Mathematics courses. Regarding data collection, Conti (2015) used audio and video recordings, a research diary, an identification form for the participants' profile, filled out individually, as well as analysis of materials provided by the research participants. She held twenty meetings between September 2010 and December 2011. At first, she introduced 20 people interested in participating in the group. However, during the meetings, the group had nine participants, including three teachers with experience in Early Childhood Education.

The paper by Conti (2018) aimed to describe one of the six collaborative meetings held in his doctoral thesis, seeking to expand the reflections of this study, which has a methodology characterized as qualitative, turning specifically to the chapter: concept under analysis of data, and focused on the study of the pie chart and its graphical representations.

Oliveira (2013) addresses training spaces, such as active environments, capable of promoting changes in the educational environment and critical reflection on teaching practices. She highlighted that the learning of teachers, participants in the research, was evidenced, such as: “appropriation of some ways of problematizing situations; the importance of learning specific knowledge – Mathematics; the mobilization and/or production of stochastic knowledge” (OLIVEIRA, 2013, p.81).

Souza (2013) pointed out that, during the course of the meetings, the group was able to become familiar with Statistical Education, through exchanges of study experiences with regard to Probability, Statistics and Combinatorics. Another important point deals with the approach to statistical graphs presented by Conti (2015; 2018), with the participants of the "Estaticando" group, reflecting on their practices and the importance of teachers evaluating the context and suitability for the types

of graphs. These considerations highlighted the need to know the specificities of students, considering their maturity, age group and origin. No publication was exclusively dedicated to Early Childhood Education, although Souza (2013) has worked predominantly with professionals in this segment.

TABLE 02 - 2nd category of analysis: Publications on classification in Early Childhood Education

Source/Document	Title	Authors	Main goals
CAPES THESIS AND DISSERTATION CATALOGS (Dissertation)	Classification in early childhood education: what books propose and how it is addressed by teachers	Cruz, Edneri Pereira, 2013	To investigate how Classification has been treated in Early Childhood Education, considering the activities proposed in Mathematics textbooks and the performance of teachers in class.
CAPES/MEC JOURNALS PORTAL (Paper)	Strategies used by preschool children to classify	Barreto, Monik; Guimarães, Gilda Lisbôa, 2016	Investigate the strategies that children from kindergarten (5 years old) used to classify.
CAPES THESIS AND DISSERTATION CATALOGS (Dissertation)	Classification in preschool children: contributions from Flex Memo	Almeida, Girliane Castro de, 2017	Analyze the relationships established by children using classificatory thinking in the memory game with Flex Memo.

Source: Authors' collection (2021)

In this category, it can be seen that the main objectives have children in the Early Childhood Education stage as their target audience. These objectives are similar, since the analyzes carried out in these studies contemplate the classification process through instruments used in everyday school life, whether through textbooks or pedagogical games.

The first publication listed for this category was the research, by Edneri Pereira Cruz (2013). She sought to investigate how classification is worked in Early Childhood Education by analyzing the activities of ten collections in Mathematics textbooks intended for this stage, as well as the teaching practice of two teachers in the classroom with semi-structured interviews.

The next publication was the paper by Monik Nawany da Silva Barreto and Gilda Lisbôa Guimarães (2016), the authors analyzed strategies to classify 20 students from Early Childhood Education, aged five or six. Girliane Castro de Almeida's dissertation (2017) analyzed the development of logical structures of thought, emphasizing classification and having Jean Piaget as the main theoretical support of her research. The game "Felix memo" is a card toy that aims to provide children with the expansion of their mental schemes and, therefore, their learning. Almeida (2017) had eight preschool children as subjects of his research (four from level I and four from level II).

Cruz (2013) summarized her procedure in three stages, namely: analysis of textbooks, classroom observation and semi-structured interviews with early childhood teachers from 30 different schools from private schools. She made observations in the classroom and semi-structured interviews with two teachers of Early Childhood Education, in view of the records of the activities carried out with the children during the moments of their observations in the classroom.

The authors Barreto and Guimarães (2016) used the Piagetian clinical method with twenty children, between five and six years old. The researchers used three different classification situations to present to the children, namely: classifying based on a given criterion, identifying the criterion used and creating classification criteria. The period in which the interviews were carried out was not identified in the authors' paper. According to Barreto and Guimarães (2016), the activities were extracted and adapted from textbooks and, in the face of difficulties brought in the literature, the authors also decided to use manipulative materials to provide flexibility in classification.

Almeida (2017) carried out a field study in an exclusive school for children of preschool age, with participant observation, semi-structured interviews and individual and group meetings with the subjects of his research, for the memory game with the toy "Flex Memo". For 23 days, she followed the children's routine and in two different moments, being individual and collective, outside the context of the classroom. For data collection, Almeida (2017) used materials such as an observation script, field diary, video recordings and photographs.

Cruz (2013) pointed out that activities on classification were present in Mathematics textbooks and were worked on in the classes in which their observations were carried out, based on activities found in books, logic blocks, toys, school materials, when he found the possibility of addressing the classification in activities in Early Childhood Education in the same line of research by Barreto and Guimarães (2016). Cruz (2013) exposed the relevance of the teacher in the selection and guidance of the proposed activities and the importance of valuing different perspectives in the classification, so that they can corroborate the formation of excluding categories.

According to Barreto and Guimarães (2016), the results of their studies allowed them to identify a more satisfactory performance in relation to the classification activity through a given criterion, according to the authors, as it is an activity presented repeatedly in textbooks. Even so, the children responded assertively, allowing the authors to highlight the possibility of achievement in Early Childhood Education.

In this perspective, we realize that the research listed for this category brings different ways of working with classification activities, among them, with the "Flex Memo" toy, presented in the summary by Almeida (2017). However, it also showed that there was a lack of definition of criteria in classification activities by the children themselves.

It is also noteworthy that the studies proposed in the research by Barreto and Guimarães (2016) showed few resources to identify which strategies were used by children to classify. The authors also investigated other works on how classification in Early Childhood Education has been treated and, among these, is

the one by Cruz (2013), which makes up the second category of this paper. Both researches pointed out the process of classifying as being of extreme importance for the construction of the logical-mathematical thinking of the child, as well as used as analysis of their data different materials, such as textbooks, concrete and manipulable materials, the most recurrent classification activities with pre-defined criteria and groupings, without the child's participation in this process. Cruz's research (2013) showed new possibilities in relation to classification activities and their importance for the process of developing the logical structures of children's thinking.

The works in this category on classification have demonstrated the viability of this approach, since Early Childhood Education. Furthermore, the words Statistics and Statistical Education were researched in the works that compile this category, in order to observe how the authors relate the concept of classification with Statistical Education in the context of Early Childhood Education. In Cruz's research (2013), for example, the word Statistics appeared seven times during her writing. Cruz (2013) suggested in the conclusions of her dissertation, the investigation of classification as a step in carrying out a statistical research with children.

In the paper by Barreto and Guimarães (2016), the word Statistics appeared twice in the body of the text, the first time as a keyword in the abstract and the second time when the authors comment on the importance of classifying, discussing the essentiality of classification in statistical teaching, exemplifying the organization of the information collected, with the classification of data being crucial.

Such research linked and validated the concept of classification with statistical work in the first stage of Basic Education. However, another important point to be highlighted is that the research showed that there was a lack of definition of a criterion in the classification activities by the children themselves. Almeida (2017) emphasized the small amount of national academic productions related to the topic, as well as the lack of proposals regarding classification thinking.

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TABLE 03 - 3rd category of analysis: Publications that expressed documental analysis and/or proposals in the classroom on Statistics in the context of Early Childhood Education.

Source/Document	Title	Authors	Main goals
EBRAPEM annals XII (Research project)	Statistical education in childhood	Souza, Antônio Carlos, 2008	To verify the stages of a didactic-pedagogical proposal for the approach of Statistics in Early Childhood Education and the meaning that children attribute to some statistical notions.
CAPES THESIS AND DISSERTATION CATALOGS (Dissertation)	Statistical education for children: teaching learning in a research trajectory	Santos, Cibele Elisangela dos, 2017	To investigate how pedagogical actions favor the Statistical Education of children aged 3 to 6 years enrolled in public preschools in Campinas, considering their different ages (3 to 6 years old).
EBRAPEM annals XXII (Research project)	Statistical literacy in early childhood education: analyzing pedagogical possibilities in Jaboatão-PE	Lira, Flávia Luíza de, 2018	To analyze possibilities for the teaching of Statistics from the perspective of the development of statistical literacy in Early Childhood Education by CMEI teachers in the municipality of Jaboatão-PE.
CAPES/MEC JOURNALS PORTAL (Paper)	In search of meanings for statistical education in early childhood education, dialogues with a researcher	Ciríaco, Klinger Teodoro; Santos, Cristiane Afonso de Lima, 2020	Identify papers published in editions of scientific events in the area of Mathematics Education to characterize practices to be developed (2013 -2017); to establish points of articulation of the investigated theme from the perception of Professor Celi Espasandin Lopes, a reference in Brazil when the subject is Stochastics in childhood.

Source: Authors' collection (2021)

The main objectives listed in this category are similar because they correspond to an analysis of possible practices with statistical approaches, developed with children in Early Childhood Education. These practices were identified in books, pedagogical proposals and/or documents, aimed at this stage. The characterization of the research was carried out by presenting the publication by Antonio Carlos de Souza (2008). This research is a part of a dissertation that investigated the steps of a pedagogical proposal for the Statistical approach in Early Childhood Education, verifying the meaning that children attribute to statistical notions. Souza's research (2008) included a group of 17 preschool-age students. The author developed a research project with his group in which activities were carried out in which the students fulfilled all the stages of a statistical research. As an instrument for analyzing his research, Souza (2008) used audio recordings, photographs and writings from the field diary.

The publication by Cibele Elisângela dos Santos (2017), investigated the pedagogical routine of a classroom with a group of 20 children aged between three and six years. The author and teacher of this class carried out 16 activities involving graphics. Her research was characterized as qualitative and was defined as a single group experimental research. The author used various materials, such as video recordings, photographic records and reports and drawings of the children participating in the research. With these records, she carried out a content analysis with the transcripts of the proposed and documented activities, through video recordings, photographic records and field diaries.

Flávia Luíza de Lira (2018), through an excerpt from her dissertation, investigated, in five stages, documents with guidelines regarding the teaching of Statistics, identifying how these contents were exposed in the proposals in the textbook. She conducted a semi-structured interview with four Early Childhood teachers to portray how these

professionals approached Statistics in their classes, including the activities proposed in the textbook.

Lira (2018) carried out a documentary research and a field research. In the first two stages, she analyzed a Municipal Curriculum Proposal and the Class Diary. In the second stage, she investigated statistical content covered in the Mathematics textbook in Early Childhood Education. She exposed stages of the research from the perspective of field research, the third stage being a semi-structured interview with four teachers of Early Childhood Education. For the fourth stage, the researcher held meetings with these professionals in order to promote studies and reflections for the planning of activities that would contribute to Statistical Literacy. The last step was the analysis of the teachers' oral and written productions, based on the proposed planning, in which we sought to link the textbook proposals to the aforementioned productions, as well as to share the experiences in the classroom.

Finally, the paper by Klinger Teodoro Ciríaco and Cristiane Afonso de Lima dos Santos (2020). The authors were based on two central axes, the first with the aim of seeking, in editions of scientific events in the area of Mathematics Education, research that introduced Statistical Education in Early Childhood Education, between the period of 2013 and 2017. The research took place through a questionnaire developed for professor Celi Espasandin Lopes, in order to consider this researcher's perception of the investigated theme. As a database for this mapping, Ciríaco and Santos (2020) resorted to two Brazilian Mathematics Education events: National Meeting of Mathematics Education - ENEM, from 2013 and 2016, in addition to the National Seminar on Histories and Investigations of/in Mathematics Classes - SHIAM, 2015 and 2017. The authors created a script comprising 11 questions, in order to articulate the investigated theme through their perception.

Souza (2008) contemplated in his final remarks that the didactic-pedagogical proposal for the approach of Statistics in Early Childhood

Education carried out in his research was a possible work to be carried out with the age group of the preschool phase. Also, an approach to other aspects, in addition to Mathematics, was also provided. Souza (2008) also analyzed the need to make certain adjustments in the development of the proposal, as he observed that the amount and way of tabulating could be less complex, so that the activity does not become exhaustive.

One of the results pointed out by Souza (2008) highlighted that, although it was not possible to assess with certainty the level of development of statistical reasoning developed by the children, it was observed that some of them introduced the process of development of some aspects of statistical reasoning defended by Garfield and Gal (1999). Therefore, they concluded that in order to approach statistical concepts it was necessary to have a significant contextualization in which children were inserted, overcoming the conception that statistical teaching is unfeasible in childhood.

In Santos (2017), it was observed the feasibility of work involving graphics in the Early Childhood Education stage and concluded that the proposed activities, during their research, allowed children to begin understanding, with regard to the function and structure of a chart. Some activities presented different levels of understanding. As in the research by Souza (2008), the author reflected on the importance of contextualization in the learning process at this stage, highlighting the importance of planning the activity according to the profile and maturity of the class, reflections already mentioned in this paper. Santos (2017) also pointed out that some children were dissatisfied with performing activities with bar graphs, but built collective decisions, sharing different opinions and providing democratic experiences.

Lira (2018) reported that, when performing the document analysis, she observed a lack and only the development of a competence addressed concerning Statistics, in the Curriculum Proposal of the municipality of Jaboatão. Regarding the class diary, the author mentioned that the

Statistical research in Early Childhood Education had not been mentioned as an essential step. She identified few Statistics activities in the textbook, containing only five activities for four-year-olds and three activities in the book for five-year-olds. It also highlights her criticisms about the lack of curricular guidelines that allow experiences with Statistical Literacy for Early Childhood teachers.

Ciríaco and Santos (2020), when presenting the results of their searches during the mapping, showed only one paper referring to the theme Statistical Education in Early Childhood Education. The only paper selected was found in the proceedings of the event and it is a research carried out by Keli Cristina Conti, in 2015, entitled Collaborative contexts in statistical literacy practices: professional development of teachers. They observed that, despite Conti (2015) covering the same theme, it did not expose the reports of experiences and the knowledge developed by the participants of the "Estatisticando" group.

It is understood that both Souza (2008) and Santos (2017) highlighted the feasibility of working and developing statistical teaching for children in Early Childhood Education. The first explored the requirements of statistical reasoning, which was anchored in Garfield and Gal, while the second emphasized working with bar graphs and the child's understanding of its functionality and structure. Both authors reflected on the need for adjustments in their proposed activities, leading to an understanding of how necessary reflection is on our practice. We understand that this happened because it is about Early Childhood Education.

Souza (2008) brought a reflection in which he exemplified that the number of activities could have been reduced for a better development on the part of the children, thus making a research process less exhaustive. On the other hand, Santos (2017) pointed out that, at a certain point in the research, there was a lack of contextualization aimed at the younger children in their group, with a more delimited direction to assist in the process of understanding statistical notions. As one of the intentions of

this study points out, Santos (2017) sought to make children expand their understanding of the function of the graph as an instrument to organize and treat information.

TABLE 04 - 4th Category of analysis: Publications on probability in Early Childhood Education

Source/Document	Title	Authors	Main goals
EBRAPEM annals XX (Research project)	Schemes used by early childhood education students when solving situations involving the concept of chance	Almeida, Irlene Silva de, 2016	To analyze the schemes of Early Childhood Education students when solving situations that involve the concept of chance present in the Teaching Sequence of the Jefferson and 3 friends Random Walks (SE PAJ 3), in the context of the tactile model
EBRAPEM annals XX (Research project)	Analysis of relationships in the resolution of tasks involving the concept of chance by preschool students mediated by a tactile model	Santos, Joaldo Silva, 2016	To analyze the relationships that arise when kindergarten students solve tasks involving the concept of chance using a tactile model.

Source: Authors' collection (2021)

In the last category, the equivalence between the objectives of the selected works can be seen, since both have the purpose of working with the concept of chance from a tactile model, so that children in Early Childhood Education can solve problem situations. That said, two publications found in the annals of the EBRAPEM event, from 2016, were compiled. The first publication, by Irlene Silva de Almeida (2016) addressed the concept of chance present in the Teaching Sequence, "Jefferson and 3 friends Random Walks" (SE PAJ 3), in the context of the tactile model, with children from Early Childhood Education. This

research was defined through a qualitative research approach. The research subjects were 14 children from Early Childhood Education. The second publication was by Joaldo Silva dos Santos (2016) brought a clipping of a master's dissertation. The papers by Almeida (2016) and Santos (2016) refer to the same research. Almeida (2016) pointed out that it was necessary to adapt the Teaching Sequence "The Random Walks of Jefferson", prepared by Vita et al. (2012), from five to three friends.

Santos (2016) reveals that the use of audio-recording, photos and filming were used. Almeida (2016) exposed that the children actively participated during the research proposal and, in addition, they appropriated the pieces of the model in a progressive way. in the most varied contexts, emphasizing that such a study was capable of contributing to the scientific field, specifically related to the concept of chance. In the paper by Santos (2016), the results pointed to the tactile model as a teaching material to be appropriated by children and as a useful mediating instrument in Early Childhood Education. We understand that the two works selected in the annals of EBRAPEM (2016), within the discussion group Teaching Probability and Statistics, had brought the concept of Statistics in an interconnected way with the concept of chance and probability with Early Childhood Education students. A search for the words Statistical Education and Statistics was carried out in the body of the text, but no direct mention was found.

It is understood that Statistics is integrated in the same thematic unit as the teaching of probability, within the specific competences of Mathematics, according to BNCC (2018). Although this unit is proposed for the Elementary School stage, we understand, through the studies and results elucidated in the papers that were presented in this category, the feasibility of starting in Early Childhood Education the construction of both statistical and probabilistic knowledge, with an intradisciplinary work in Mathematics.

Conclusion

This study gave rise to a survey of academic research in Postgraduate programs that discussed Statistical Education in the context of Early Childhood Education. The number of publications presented pointed to the need for an expansion of research in the area, fundamental to promote Statistical Literacy since Early Childhood Education.

Each category presented here presented potential for the insertion of Statistics in the first years of children's school life, even before they enter Elementary School. In particular, starting with the choice of the researched theme, in the collection and organization of data, through the construction of bar graphs, and/or sectors, as well as through activities of classification of a given criterion or not, in addition to other ways of learning, not mentioned here.

Thus, it is also worth pointing out some limitations that were observed in the research presented here. In other words, there is a lack of training spaces that support Early Childhood Education teachers for the development of Statistics in the school environment, in addition to the scarcity of research on the teaching of this science in the context of Early Childhood Education.

It is worth mentioning that such categories can collaborate in different aspects, as in the master's research, for which this paper was developed. Therefore, it is pointed out that, in addition to this State of Knowledge, the theoretical frameworks that supported the studies of research that deal with contexts of formation and collaboration, Tardif (2002), Hargreaves (1998), Fiorentini (2004), among others , will also be able to contribute to our studies on training groups with a collaborative perspective.

Furthermore, the importance of working with statistical approaches in the first stage of Basic Education is highlighted, because since the implementation of the BNCC, in private and public schools throughout Brazil, the work with statistical principles in Early Childhood Education is

evident in its documentary structure. Furthermore, these works are considered essential knowledge to be developed and expanded from different situations and with the promotion of multiple experiences.

In short, it is considered that the studies presented in this State of Knowledge can contribute with other investigations that are related to the teaching and learning of Statistics for children in the Early Childhood Education stage. Adding more and more to this scientific field.

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