EDUCAÇÃO EM FOCO
PROGRAMA DE PÓS-GRADUAÇÃO EM EDUCAÇÃO | UNIVERSIDADE DO ESTADO DE MINAS GERAIS

O ensino de ciências na educação infantil entre os anos de 2005 a 2021

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Resumo
O ensino de Ciências na Educação Infantil deve ser realizado por temáticas que apresentam significados para as crianças, despertando nelas o interesse e a curiosidade. Nesta perspectiva, o presente estudo buscou compreender o ensino de ciências na Educação Infantil através da identificação das temáticas e materiais de apoio utilizados em sala de aula. Buscou-se aporte teórico em documentos oficiais e artigos científicos. A presente pesquisa utilizou a metodologia de revisão bibliográfica com a análise de conteúdo. Foram selecionados 14 artigos para a análise os quais foram categorizados de acordo com as temáticas e materiais utilizados para o ensino de Ciências na Educação Infantil. O estudo mostrou que há uma diversidade de temas para serem desenvolvidos na Educação Infantil, além de identificar a predominância pela temática meio ambiente e a importância da utilização de diversos materiais de apoio para o ensino de ciências.

Palavras-chave: Ensino de Ciências. Educação Infantil. Meio ambiente.

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Science teaching in early childhood education from 2005 to 2021

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Abstract
Science teaching in Early Childhood Education should be carried out by meaningfull themes for children, increasing their interest and curiosity. In this perspective, the present study aim to understand the teaching of science in Early Childhood Education through the identification of the themes and support materials used in the classroom. Official documents and scientific articles were used as theoretical support. Methodology of bibliographic review with content analysis was used. Fourteen articles were selected for analysis and categorized according to the themes and materials used for teaching Science in Early Childhood Education. The study showed that there is a diversity of themes to be developed in Early Childhood Education, and identified the predominance of the environment theme and the importance of using various support materials for science teaching.

Keywords: Science Teaching. Early Childhood Education. Enviroment.

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La enseñanza de las ciencias en la educación infantil entre los años 2005 y 2021

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Resumen
La enseñanza de las Ciencias en Educación Infantil debe realizarse por temas que tengan significados para los niños, despertando su interés y curiosidad. En esa perspectiva, el presente estudio ha buscado comprender la enseñanza de las ciencias en la Educación Infantil a través de la identificación de los temas y materiales de apoyo utilizados en el aula. Se buscó apoyo teórico en documentos oficiales y artículos científicos. Esta investigación ha utilizado la metodología de revisión bibliográfica con análisis de contenido. Han sido seleccionados para el análisis catorce artículos, que fueron categorizados según los temas y materiales utilizados para la enseñanza de las Ciencias en Educación Infantil. El estudio evidenció que existe diversidad de temas que deben ser desarrollados en la Educación Infantil, además de identificar el predominio del tema medio ambiente y la importancia de la utilización de diversos materiales de apoyo para la enseñanza de las ciencias

Palabras clave: Enseñanza de Ciencias. Educación infantil. Medio ambiente.

Introduction

Teaching science in Early Childhood Education (EI) is something that sparks the interest and curiosity of children, given their unique profile related to questioning and inquiring about the world around them, as well as their enthusiasm when challenged to make new discoveries. To teach science at the EI level, the National Curriculum Reference for Early Childhood Education (RCNEI) (1998) indicates that there are many themes that children show interest in, such as:

> Small animals, garden creatures, dinosaurs, storms, sharks, castles, heroes, city festivals, TV programs, current news, stories from the past, etc. Social experiences, stories, ways of life, places, and the natural world are, for children, part of an integrated whole. (BRASIL,1998, p. 163).

Some school practices and proposals have restrictions for developing science education activities with students aged 0 to 5 years. According to the National Curriculum Reference for Early Childhood Education (RCNEI, 1998):

> In working with content related to Natural Sciences, some institutions limit themselves to conveying certain notions related to living beings and the human body. They disregard the knowledge and ideas that children already possess, emphasizing the use of technical terminology, which can lead to a formalization of content that is not meaningful for the children. (BRASIL,1998, p. 166).

Limitations on topics and content deprive children of opportunities to formulate problems, raise hypotheses, and make future discoveries. Additionally, they undermine the potential of early childhood students, adhering to the idea that science cannot be learned at this age. According to the National Curriculum Guidelines for Early Childhood Education (DCNEI) (2009), curricular planning should place the child at the center of the entire learning process.

The teaching of science is presented by the RCNEI (1998) with a perspective of developing work on themes related to the world and its natural and social phenomena. Children are embedded in the world and display curiosity and questions about their environment from a very early age, consistently demonstrating investigative profiles by asking questions and seeking answers.

> Work with knowledge derived from the Human and Natural Sciences should focus on expanding children's experiences and building diverse understandings of the social and natural environment. In this sense, it refers to the plurality of phenomena and events physical, biological, geographical, historical, and cultural knowledge of the diversity of ways to explain and represent the world, exposure to scientific explanations, and the opportunity to understand and develop new ways of thinking about the events that surround them. (BRASIL,1998, p. 166).

"It is important that children have contact with different elements, phenomena, and events from the world, be stimulated by significant questions to observe and represent them, and have access to various ways of understanding and representing them." (BRASIL, 1998, p. 166). In this context, contact with science-related content for young children, according to the RCNEI (1998), is recommended to occur primarily through projects, with selections made based on the criteria of:

> Social relevance and connection with significant social practices, degree of meaning for the child, possibility of building an integrated and relational worldview, and opportunity to expand knowledge repertoire about the social and natural world. (BRASIL,1998, p.177).

Thus, all work developed in Early Childhood Education involves the significance and interest of the children. 'When teaching Science from early childhood, it is not only about forming future citizens, but also about creating individuals responsible for the well-being of society' (FUMAGALLI, 1998, p. 18 *apud* SILVA, 1998, p. 44). In this sense, teaching Science from a very young age will contribute both to the development of critical and responsible individuals and to the progress of the community in which they are situated.

In this perspective, the present research aims to understand the development of Science education in Early Childhood Education by identifying the themes and support materials used for teaching Science at this stage, seeking theoretical support in official documents and scientific articles.

The Evolution of Early Childhood Education in Brasil

Education for young children has undergone significant transformations throughout history, evolving over time, along with concepts and understandings of childhood. The first early childhood institutions in Brazil appeared at the end of the 19th century.

> The first proposals for preschool institutions for children from lower-income families in Brazil appeared in 1899 with the inauguration of the daycare center of the Companhia de Fiação e Tecidos Corcovado in Rio de Janeiro. This was the first recorded Brazilian daycare for workers' children. In the same year, the Instituto de Proteção e Assistência à Infância do Rio de Janeiro was also founded. (KUHLMANN JR, (1998), apud SOUZA, 2007 p.14)[1]

[1]KUHLMANN Jr., M. **Infância e educação Infantil: uma abordagem histórica**. Porto Alegre: Mediação, 1998

The early childhood education institutions of that time provided schooling with an assistentialist approach. Access to and retention in these schools were limited, as outlined in the National Curriculum Reference for Early Childhood Education (RCNEI) (1998):

> Institutional care for young children, both in Brazil and globally, has historically reflected diverse social purposes. Many of these institutions were originally established to serve exclusively low-income children. For many years, the use of daycares and preschool programs as a strategy to combat poverty and address children's survival issues justified the existence of low-cost services, characterized by inadequate budget allocations, limited material resources, poor facilities, insufficient professional training, and a high ratio of children to adults. (BRASIL, 1998, p.17).

As exposed above, early childhood education (ECE) institutions initially aimed to combat poverty, serving children in social vulnerability. These institutions often operated under precarious conditions. In this perspective of ECE with welfare-oriented goals, childhood was viewed as consisting of children who did not belong to the social and cultural world, and whose recognition as rights-holders and cultural contributors was disregarded.

For a significant shift from this welfare-oriented approach to ECE, the RCNEI (1998) calls for a reevaluation of the concept of childhood and an examination of how care and education practices are developed in institutions for children aged 0 to 5 years. Thus, the practices, experiences, and offerings in daycares and preschools are linked to how professionals perceive their young audience: whether they view children as entirely dependent on adults or as historical and cultural subjects capable of experiences that foster their autonomy.

At the end of the 19th century, when early education for young children in Brazil began to be documented, the concept of childhood was often perceived in contradictory terms: sometimes as incapable or as an abstract child, overlooking their potential and possibilities, and shaping an institutional education model based mainly on welfare projects legitimized by state policies (SOUZA, 2007, p. 25).

Concepts of childhood and development, including how children learn and their societal roles, began to be studied and researched, moving away from the earlier view of children as "tabula rasa" (FREIRE, 1996), or empty vessels without content. According to Kramer (1999), "the notion of childhood as it is today is a relatively new concept, a product of the evolution of societal history[2]"

[2]KRAMER, Sônia; LEITE, Maria Isabel. **Infância: fios e desafios da pesquisa**. 6. ed. Campinas: Papirus, 1996.

(KRAMER, 1999 p. 244 *apud* MAIA, 2012 p.13), this means that society has come to understand children from a new perspective. In Brazil, the evolution of early childhood education and concepts about children can be traced through public policies and official documents. According to the RCNEI (1998), the child is conceived as:

> A social and historical subject who is part of a family organization embedded in a society, with a specific culture and in a specific historical moment. The child is deeply influenced by the social environment in which they develop, but they also shape it. The child has the family, whether biological or not, as a fundamental reference point, despite the multitude of social interactions they establish with other social institutions. (BRASIL, 1998, p.21)

Regarding the place of children and their role in society, Souza (2007) determines that:

> The place of the child is a social place, and they have a political role to play in school, in daycare, and in life a place that legitimizes them as a developing subject. Regardless of their economic class, their rights must be guaranteed. (SOUZA, 2007, p.29)

Based on what is presented by the RCNEI (1998) and Souza (2007) regarding how the child is conceived, it is possible to identify the evolution of the recognition of the child as a historical subject who produces culture and has rights.

From this perspective, one can trace the evolution and contributions of public policies that have collaborated and ensured children's rights, historically marked by, initially, the promulgation of the Federal Constitution (1988), which establishes education as a right for all and a duty of the State and the family. In 1996, the Law of Guidelines and Bases of National Education (LDBEN) was established, which defines Early Childhood Education as the first stage of Basic Education, aiming for the comprehensive development of the child in physical, psychological, intellectual, and social aspects (BRAZIL, 1996). This guarantees the right to access and permanence, as well as the assurance of the child's development in school from early childhood. In 1988, the RCNEI was established with the purpose of guiding actions and objectives to be developed within the Early Childhood Education curriculum.

> This document is the result of an extensive national debate involving teachers and various professionals who work directly with children, contributing diverse knowledge from both the extensive practical experience of some and the academic, scientific, or administrative reflections of others. It represents an advancement in early childhood education by seeking educational solutions to overcome, on one hand, the traditional assistentialist approach of daycare centers and, on the other, the early schooling approach of preschools. The Reference was conceived to serve as a guide for educational reflection on objectives, content, and didactic guidelines for

> professionals working directly with children from zero to six years old, respecting their pedagogical styles and the cultural diversity of Brazil. (BRASIL, 1998, p.7)

In light of this, early childhood institutions have undergone significant transformations in their offerings, aiming for education directed towards contributing to the holistic development of the child, rather than merely providing assistentialist care.

In 2009, with the promulgation of the resolution establishing the National Curriculum Guidelines for Early Childhood Education (DCNEI), the child is conceived as a historical subject with rights, embedded in a society through which, via interactions, they produce culture. Furthermore, the DCNEI (2009) conceptualize the curriculum for Early Childhood Education as a:

> A set of practices aimed at integrating children's experiences and knowledge with the cultural, artistic, environmental, scientific, and technological heritage, in order to promote the holistic development of children from 0 to 5 years old. (BRASIL, 2010, p.12).

All pedagogical practices in Early Childhood Education are guided by two essential axes: interactions and play (BRASIL, 2009). It is through lived experiences that students will be able to build their knowledge.

In 2013, the LDBEN/1996 underwent a revision, making Basic Education compulsory from the age of four. This means that, starting in 2013, there is a guarantee of the right, access, and continuation of children in Early Childhood Education (EI). Previously, children attended daycare and preschools based on need or parental choice, without it being mandatory. Thus, the revision of the LDBEN (1996) ensures the child's right to attend EI and establishes the parents' duty to enroll their children at the age of four. Early Childhood Education institutions in Brazil are provided according to the structure outlined in the LDBEN (1996), with daycare centers for children aged 0 to 3 years and preschools for children aged 4 and 5 years, which constitute the EI audience.

The Base Nacional Comum Curricular (BNCC) of 2017 views the child as someone who observes, questions, makes judgments, concludes, and acquires knowledge through interaction with the world in which they are inserted. From this perspective, it ensures children's learning and development through six learning rights: to live together, to play, to explore, to participate, to express themselves, and to know themselves. The BNCC (2017) organizes the curriculum for Early Childhood Education into five fields of experience:

- The Self, the Other, and Us
- Body, Gestures, and Movements
- Traces, Sounds, Colors, and Shapes
- Listening, Speaking, Thinking, and Imagination
- Spaces, Times, Quantities, Relationships, and Transformations

Within each field of experience, learning objectives are established according to the age range of the students. In the field of Spaces, Times, Quantities, Relationships, and Changes, it is proposed that students should be able to explore, identify, manipulate, and make discoveries about the world they live in. This ensures the possibility of developing pedagogical practices directed towards Science content. Regarding the construction of knowledge, children need to have opportunities to:

> Formulate their own questions, seek answers, imagine solutions, formulate explanations, express their opinions, interpretations, and worldviews, compare their thinking with that of other children and adults, and relate their knowledge and ideals to broader contexts. Through these processes, children can build increasingly sophisticated knowledge. However, this knowledge is not directly provided to the children. It results from a process of internal construction shared with others, in which they think and reflect on what they wish to learn (BRASIL,1998, p.172).

In this way, knowledge will result from the entire interaction of the children's process with others and with the relevant situations studied. Furthermore, the teacher needs to be clear that this knowledge is built gradually, as children "develop attitudes of curiosity, criticism, refutation, and reformulation of explanations in response to the plurality and diversity of phenomena and events in the social and natural world." (BRASIL,1998, p.173).

The Nature and Society axis of the RCNEI (1998) guides that the topics to be developed in preschool should be relevant to the children and their social group.

> Children should, from a young age, be encouraged to observe phenomena, report events, formulate hypotheses, predict outcomes for experiments, learn about different historical and social contexts, and try to place them in space and time. They can also exchange ideas and information, debate them, confront them, distinguish them, and represent them, gradually learning how new knowledge is produced or why ideas change or remain. (BRASIL,1998, p. 172).

In this way, all knowledge to be studied in Early Childhood Education should be associated with themes that have social relevance, meaning topics that are meaningful to the children.

Ways to Identify Science Education in Early Childhood

The present research is exploratory in nature and takes the form of a literature review, proposing a qualitative data analysis methodology known as content analysis. According to Moraes (1999), content analysis presents both theoretical and practical investigations with its own distinct characteristics. From this perspective, the raw material for content analysis can come from various sources of communication, such as books, posters, reports, interviews, among others. For the author, all data and information reach the researcher in a raw state and therefore need to be processed in order to contribute to understanding, interpretation, and inference, which underpins content analysis. Additionally, Moraes (1999) approaches this study as a personal interpretation, as the researcher needs to reconstruct the context with clear objectives.

In this context, the present research follows the method presented by Moraes (1999), divided into five stages: preparation of information, during which searches were conducted to select the articles to be analyzed; a complete reading of the selected articles; followed by the next stage proposed by the author, known as unitization, which is the transformation of content into units. The present research used scientific articles as the unit of analysis, adopting selection aspects such as the age range of early childhood education (0 to 5 years) and proposals, pedagogical practices, and support materials used for Science Education. It also involved creating identification codes with the letter A for articles and numbering them according to the articles that met the study's proposed objective, as requested by Moraes (1999), to facilitate locating the units of analysis during the research.

Regarding the categorization or classification stage of the units into categories, two tables were constructed to structure the selected articles, which were organized according to their themes and the support materials used for developing Science in Early Childhood Education. Next, the research described each unit of analysis, presenting what each article contributed in terms of topics for teaching Science in Early Childhood Education. Finally, the study interpreted and evaluated the contribution of each selected article to Science Education in Early Childhood Education.

To obtain the data, searches were conducted in the Scielo Brasil database using the descriptors in Portuguese and English: *Educação Infantil* (Child Education) and *Ciências* (Science). To broaden the study, searches were also performed using the terms *educação infantil* (Child Education) and *meio ambiente* (environment) in both Portuguese and English. The focus was exclusively on articles published in journals, excluding theses, dissertations, books, book chapters, and conference papers.

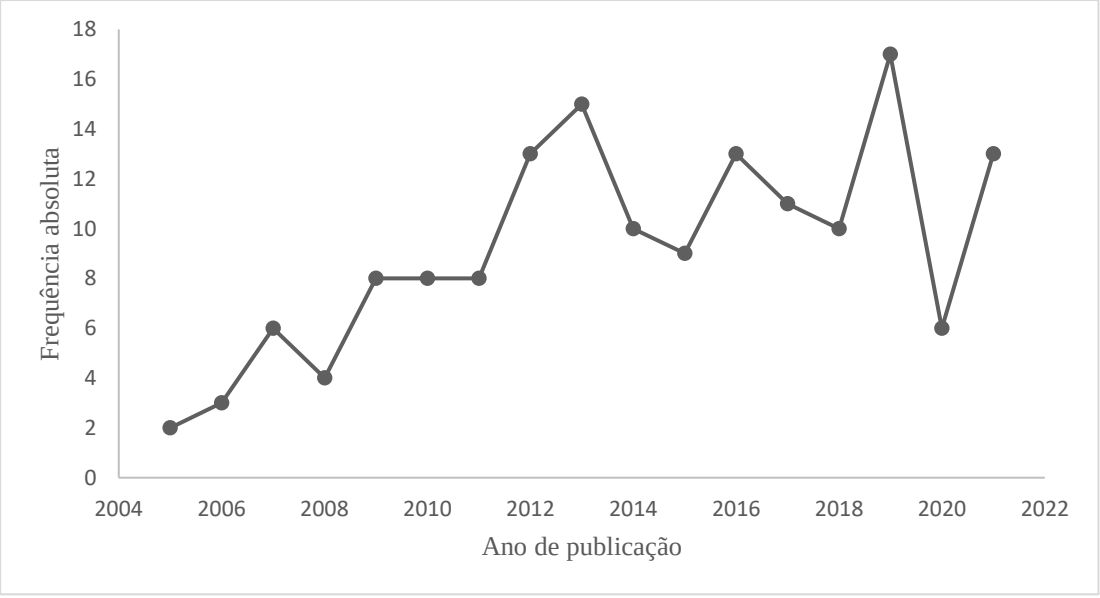
A total of 156 articles were obtained, which were then screened, resulting in 14 articles that fit the study's corpus.

Themes Addressed for the Development of Science Education in Early Childhood

Figure 1 shows that starting from 2005, there is a significant increase in publications. However, in 2008, the number of published articles decreases. From 2009, there is a rise that remains steady until 2011. According to Figure 1, there is another decline in publications in 2014, followed by a rise in the number of articles in 2016, which then declines again until 2018.

The highest number of published articles is identified in 2019, with the descriptors used in this research, totaling 16 publications. Starting from 2020, publications experience a significant decline, attributed to the global pandemic related to Covid-19. From 2021, publications begin to grow again.

FIGURE 1- Number of works registered by year



Source: prepared by the authors (2022).

To analyze the articles that met the selection criteria, readings of the keywords that included Early Childhood Education (EI) and Science were conducted, resulting in twenty-three articles. After identifying the articles, a thorough reading of the research was performed, and the relevant data were collected and organized in an analysis that considered the following selection aspects: age range of

early childhood education (0 to 5 years), proposals, pedagogical practices, and support materials used for Science Education.

In the first stage of preparing the information, all selected materials were read according to the objectives established in the research. As a result, only 14 articles met the selection criteria, with articles selected from 2005 to 2021. The unit of analysis used in the research was scientific articles addressing topics related to Science Education in Early Childhood. After selecting the articles that met the research criteria, they were organized according to the publications by regions, as shown in Figure 2.

FIGURE 2 - Number of Articles Published by Brazilian States**.**

Source: prepared by the authors (2022).

The highest concentration of publications is found in the South and Southeast regions, especially in the state of São Paulo, totaling seven articles, which represents half of the analyzed articles on Science Education in Early Childhood concentrated in that state (Figure 2). It is possible to identify the absence of scientific articles in the North, Northeast, and Central-West regions, with only one publication in a scientific journal from the Federal District.

Additionally, this research sought theoretical support in official documents to outline the evolution of public policies in Brazil in the educational context. The laws and documents used in this study were listed in ascending order by the year of their publication, as shown in the table below

:

TABLE 1 – List of Official Documents Used in the Research

Official Documents Used in the Research	Year of Publication	Links to Access Official Documents
National Education Guidelines and Framework Law (LDBEN)	1996	http://www.planalto.gov.br/ccivil_03/leis/l9394.htm
National Curriculum Reference for Early Childhood Education (RCNEI)	1998	http://portal.mec.gov.br/seb/arquivos/pdf/volume3.pdf http://portal.mec.gov.br/seb/arquivos/pdf/rcnei_vol1.pdf
National Curriculum Guidelines for Early Childhood Education (DCNEI)	2009	http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=2298-rceb005-09&category_slug=dezembro-2009-pdf&Itemid=30192
National Common Curricular Base (BNCC)	2017	http://basenacionalcomum.mec.gov.br/images/BNCC_EI_EF_110518_versaofinal_site.pdf

Source: prepared by the authors (2022).

The articles were coded with the letter A – for article – and numbered from 1 to 14 for identification of each unit of analysis (Table 1). Subsequently, the articles were categorized, and the data were grouped by analogy or similarity. This study grouped the data according to the themes present in the articles, that is, topics proposed for Science Education in Early Childhood. Table 1 presents the list of the works with their publication years in ascending order, as well as the authors and the themes used.

TABLE 2 – List of Articles and Categorization by Recorded Themes

Identification Code	Authors	Titles	Year of Publication	Theme
A1	MELLO, F.T. M; L.H. C; TORELLO; M. B. FREITAS.	Paleontology in Early Childhood Education: Literacy and Knowledge Building.	2005	Paleontology

A2	TOMAZI, A. L; A. J, PEREIRA; C. M. SCHÜLER; K. PISKE; D. TOMIO.	What Is Science and Who Does Science? Images of Scientific Activity Depicted in Children's Animated Films.	2009	Science Communication for Children – What Are Scientists Like?
A3	LAROCCA, L. M; V. R. B MARQUES	Hygiene and Childhood in Paraná: The Mission to Form Healthy Habits (1931-1949	2010	Hygiene
A4	PEREIRA, A. G; E. G; TERRAZAN.	Multimodality in Science Popularization Texts: Contributions to Science Education for Children	2011	Ecology and the Environment
A5	GIRARDELLO, Gilka.	Imagination: Art and Science in Childhood	2011	Art and Imagination
A6	LINHEIRA, C. Z.; S. CASSIANI; A. MOHR.	Challenges in Teaching Science in Hospital Classrooms: A Report on an Experience with Research and Teaching in Teacher Training.	2013	Human Body
A7	DOMINGUEZ, C. R. C; TRIVELATO, S. L. FRATESCHI.	Young Children in the Meaning-Making Process About Butterflies: How They Use Languages?	2014	Small Animals
A8	SILVA, F.D. A; A. M. O. CUNHA.	Social Representations of Early Childhood Education Teachers on the Development of Pedagogical Practices in the Environment	2016	Environment
A9	SCHWARZ, M. L. T.M. HERRMANN; M.C. TORRI; L. GOLDBERG	Rain, How We Want You! Social Representations of Water Through Drawings by Children from a	2016	Social Relevance

		Semi-Arid Rural Region in Mexico		
A10	COUTINHO, F. A, GOULART, M. I.M.P; A. FAGUNDES.	Learning to Be Affected: Contributions to Science Education in Early Childhood	2017	Rock Art
A11	ALMEIDA, C. S; M. FREIRE. L. BENTO; G. JARDIM. M. RAMALHO; M. DAHMOUCHE.	Science and Theater: A Study on Performing Arts as a Strategy for Science Education and Communication in Museums	2018	Science Communication
A12	RODRIGUES, D. G; D. SAHEB	Environmental Education in Early Childhood According to Morin's Knowledge	2018	Environmental Education
A13	LOPES, T; C. CARVALHO	Early Childhood Education in Art, Science, and History Museums	2021	Performing Arts
A14	VOLTARELLI, M. A; E. A.M. LOPES	Childhood and Scientific Education: Perspectives for Teacher Learning.	2021	Teacher Training

Source: prepared by the authors (2022).

The theme of Paleontology addressed in the article A1 Enables Science education through the study of fossils, dinosaurs, and the origin of life. In article A1, it is evident that considering the enthusiasm and perspectives of students regarding the topics presented is important for what they wish to learn. In Early Childhood Education (EI) classrooms, it is essential to formulate hypotheses, engage with the objects of study, and show interest in what is intended to be investigated, thereby practicing actions aimed at scientific knowledge.

Articles A2, A5, and A11 conducted studies based on science communication, adopting a teaching methodology focused on the use of films, theater, and museum visits for the appropriation and dissemination of scientific knowledge.

Regarding the theme of hygiene addressed in article A3, no established pedagogical practice was found; instead, the study focuses on the importance of addressing it in Early Childhood Education

(EI). It emphasizes that body care and personal hygiene are practices that should be incorporated into the routines of daycare centers.

Articles A4, A6, A7, and A8 focused their research on themes related to the environment, including the study of Science in Early Childhood Education (EI) through the investigation of small animals, Brazilian biomes, and rain. This aligns with the RCNEI (1998), which restricts proposed content to themes related to living beings and the human body. According to the survey and analysis of the categories, there is a clear predominance of themes related to the environment.

Article A9 also addresses an environmental theme but uses the social reality of students from a rural region in Mexico, which faces drought and water scarcity, as the object of study. In this context, article A9 developed an activity with students to record their knowledge about water through drawings, revealing that water and rain are seen as signs of joy due to their scarcity in this regional community. Consistent with what is discussed in article A9, it is evident that teaching Science through themes with social relevance is important, considering the students' reality, in line with what is presented in RCNEI (1998). Science knowledge should be mediated by the social and cultural world, and it is crucial to choose topics that are most relevant to the children. Thus, it is essential to take into account the students' prior knowledge and address situations that are part of their social reality.

Article A10 initially addressed rock art as a study topic, but the children's interests shifted towards learning about how cave dwellers lived and their lifestyle. As this shift in interest emerged, the theme was adjusted to match what the children genuinely wanted to investigate. Article A10 demonstrates the principle outlined in the National Curriculum Guidelines for Early Childhood Education (DCNEI) (2009), which states that pedagogical practices should place the child at the center of the curricular planning. This means that projects developed in EI should start from the children's perspectives, reflecting their thoughts, imaginations, and interests.

The use of Environmental Education as a teaching proposal in Early Childhood Education (EI) presented in article A12, in parallel with what is presented in the DCNEI, RCNEI, and LDBEN, shows that even though the term Environmental Education is not explicitly mentioned in these documents, they reflect aspects aligned with what is established in the official documents, such as ethics, care, cooperation, and solidarity.

Article A13 addressed the use of performing arts as a teaching proposal for Science, where imagination is beneficial for acquiring new knowledge related to time and nature, facilitated by adult mediation.

Article A14 discussed the teaching of Science involving pedagogical analysis through pedagogy students in the Science and Technology course, where undergraduates carried out field activities in educational environments to observe scientific education in EI and Elementary School. The analysis of article A14 highlighted the importance of addressing Science education from early childhood, focusing on how children learn, and promoting the connection between theory and teaching practice.

From the groupings carried out by this research regarding the themes used for teaching Science in EI, it is possible to identify different learning proposals through the themes presented in Table 1, which align with the experience field of spaces, times, quantities, relationships, and transformations established by the BNCC (2017). This allows children to explore and make discoveries about the world they are in, understanding its physical, social, and natural aspects.

The articles were categorized and structured according to the support materials used for teaching Science in EI, and were divided into 11 subcategories: articles from the magazine *Ciência Hoje Criança* (CHC), booklets, projects, games, theater, diverse languages, museums, images, drawings, music, dances, poems, films, experiments, observations, and theoretical approaches (Table 2). The articles were arranged in the table below following the same initial identification codes.

TABLE 3 – Classification of Analyzed Articles According to Support Materials Used

Category	**Subcategories**	**Identification Codes**
Support Materials Recorded in the Analyzed Articles	Articles from the Magazine Ciência Hoje Criança (CHC)	A4
	Booklets	A1
	Projects	A1
	Games	A1
	Theater	A11
	Diverse Languages	A7
	Museum	A11, A13
	Images	A7, A4

	Drawings, Music, Dances, and Poems	A7, A9
	Films	A2
	Experiments and Observations	A6, A10
	Theoretical References	A3, A5, A8 e A14

Source: prepared by the authors (2022).

Article A4 used multimodal texts as support material for teaching science. These texts employ more than one linguistic modality and enable students to identify scientific knowledge. The texts are provided by *Ciência Hoje Criança* (CHC), a scientific dissemination magazine with language appropriate for children, which serves as a study resource and is freely accessible to the school community. Even though preschool children are not yet literate, they are able to associate images with written text, thus acquiring scientific knowledge with the teacher's mediation.

Article A1 used booklets from the Sistema Anglo de Ensino as a reference to initiate a project on Paleontology. In this scientific article, the researchers addressed the limitation of focusing solely on dinosaurs within this theme, as occasionally information about the origin of life or types of fossils was included. The methodology developed by the authors of Article A1 involved a project on Paleontology, which included the following stages: a timeline related to the history of life on Earth; a mini paleobotanical garden; a permanent exhibition room for paleontological themes; a course for teachers; a query channel allowing teachers to contact paleontologists; ongoing integration activities between paleontologists and students; and during vacation periods, activities related to the theme through games, another resource used as support material. Article A1 presents a variety of materials and strategies used to explore the same theme, highlighting significant possibilities for teaching science to preschool children. This aligns with the RCNEI (1998) proposal to teach science primarily through projects.

Article A11 used theater as a strategy for science education and dissemination in museums. It is evident that there are significant challenges to be overcome in using this resource as an alternative for teaching science, as people generally show more interest in comedic theater. Thus, the researchers proposed using comedic theatrical activities as an innovative strategy for scientific dissemination. Additionally, Article A11 presents two different strategies for investigating science education for

children: museum visits and theatrical performances. It also highlights the difficulties encountered in accessing museums and attending performances, such as lack of publicity for the shows, absence of museums and theaters near the respondents' homes, transportation issues, financial constraints, and lack of public policies to address these problems, which hinders access to and appropriation of scientific knowledge. The challenges pointed out in Article A11 reveal non-compliance with what is proposed in the DCNEI (2009) regarding the guarantee of experiences that promote children's interaction with various forms of artistic expression, including visual arts, theater, and cinema, among others.

Diverse languages were applied in Article A7, related to the study of butterflies, where children expressed themselves through oral language and drawing. The importance of offering learning situations where children can present their acquired knowledge in different forms is evident, due to each child's uniqueness. This approach proposes various representations of the same subject. Besides diverse languages, Articles A7, A9, and A4 also used images, drawings, music, and dances to present the topic under study, employing different support materials to develop activities related to the same pedagogical approach. In alignment with the DCNEI (2009), which states that pedagogical practices should facilitate children's immersion in different languages promoting learning situations where students can express themselves in various ways and engage with different domains of expression, including verbal, gestural, dramatic, and others this approach is supported by the findings in these articles.

Article A6 addressed science teaching in hospital classrooms for children aged 0 to 14 years, highlighting the lack of resources available for teaching within hospitals. The support materials used in these classrooms included: expository lessons, maps, reading activities, internet searches, outings for soil and plant observations, and video projections. In contrast, Article A10, which falls under the same subcategory of using experiments and observations, adopted an observational methodology where children conducted investigations using gloves, magnifying glasses, cameras, and a plastic bag to collect clues in the school’s wooded area, actively participating in the investigative process. Thus, Article A10 ensures compliance with the BNCC (2017) framework spaces, time, quantity, relationships, and transformations where children need to experience situations in which they can make observations, investigate, and explore their surroundings, raising hypotheses and seeking answers to their curiosities. By promoting these experiences through observation and

experimentation, the BNCC (2017) establishes that children expand their knowledge about the physical and sociocultural world, enabling them to apply it in their daily lives.

Article A2 investigated the use of animated scientific films for teaching science, revealing the stereotypical image of the scientist. Films aimed at children often portray scientists as old, crazy, disheveled, male figures who possess absolute truth and work exclusively in laboratories. Consequently, Article A2 suggests that when screening films in early childhood classrooms, teachers must pre-analyze how scientific knowledge is presented due to its influence on the child's development and learning.

The use of films in classrooms as support material or teaching strategy became mandatory following the revision of the LDBEN (1996) in 2014, which mandated the screening of national films in basic education schools as a curricular component integrated into pedagogical practices, establishing a minimum of two hours per month. Thus, ensuring the provision of various pedagogical resources for children is essential and legally established, given that Early Childhood Education is part of Basic Education, alongside Elementary and Secondary Education, as set out in the LDBEN (1996).

Regarding Articles A3, A5, A8, and A14, it was not possible to identify a specific pedagogical practice applied in the classroom, as they discuss the concepts of science teaching based on theoretical frameworks derived from an analysis of the researched descriptors.

Through the collected data, it was possible to identify the diversity of resources that can be applied in classrooms with early childhood students according to the proposed themes. From a teaching perspective, the methodology using various support materials and strategies for science teaching allows for the observation of information acquired during the teaching-learning process. In early childhood education, evaluation is conducted through observations and records, without the aim of promotion; that is, the teacher, based on the evaluative procedures mentioned, must monitor the comprehensive development of the children as established in the DCNE (2009).

Final considerations

The analysis of this research revealed a diversity of themes and support materials that can be used in classrooms for early childhood education. As important as the content, themes, and teaching strategies for science education is the way the classes are conducted, since children's interests align with how activities are presented, so they can feel enthusiastic about new discoveries.

Thus, it is necessary to analyze relevant and pertinent themes related to the social world, so that children feel motivated to investigate the natural and social factors and phenomena that are part of their community, allowing the social reality to become the object of study. For social reality to become the subject of studies and research, it is essential to provide access to various modes of representation and learning using diverse materials and pedagogical strategies. Moreover, all strategies need to involve interaction among children with their peers to internalize the knowledge, considering the guiding axes presented by the BNCC (2017), such as interactions and play. Therefore, it is hoped that this study will lead to the investigation and analysis of new themes for the educational evolution of scientific knowledge in early childhood education.

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Recebido em: 26/10/2022
Aprovado em: 10/05/2023