

## Zoology teaching in Brazil from early childhood education to high school: a categorical conceptual analysis of the Base Nacional Comum Curricular

O ensino de zoologia no Brasil da educação infantil ao ensino médio: uma análise categórica conceitual da base nacional comum curricular

La enseñanza de zoología en Brasil desde la educación infantil hasta la escuela secundaria: un análisis conceptual categórico de la Base Nacional Comum Curricular

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### ABSTRACT

The current Base Nacional Comum Curricular (BNCC) was approved to comprise a guiding document for the curricular construction of Brazilian elementary schools. Through a discursive textual analysis, this article analyzes the Zoology content of the BNCC from early childhood education to high school. The results indicate discourses from archaic 19<sup>th</sup> century zoology, of a morphophysiological and classificatory nature, the absence of this bioscience aimed at early childhood education and the lack of updated proposals for its teaching-learning process. We conclude that Zoology teaching as presented by the BNCC proposes strictly conceptual and linear content approaches, and does not promote quality scientific education because it works with concepts that derive from the 19<sup>th</sup> century, not interacting with the other Biosciences.

**Keywords:** Base Nacional Comum Curricular. Curriculum. Teaching Zoology. Zoology.

### RESUMO

A atual Base Nacional Comum Curricular (BNCC) foi aprovada para constituir um documento norteador para a construção curricular do ensino básico brasileiro. Por meio de uma análise textual discursiva, este artigo analisa o conteúdo de Zoologia da BNCC desde a educação infantil até o

ensino médio. Os resultados indicam discursos de uma Zoologia arcaica do século XIX, de cunho morfofisiológico e classificatório, a ausência dessa biociência voltada para a educação infantil e a carência de propostas atualizadas para seu processo de ensino-aprendizagem. Concluímos que o ensino de Zoologia apresentado pela BNCC propõe abordagens de conteúdo estritamente conceituais e lineares, não promove uma educação científica de qualidade pois trabalha conceitos que derivam do século XIX não interagindo com as demais Biociências.

**Palavras-Chave:** Base Nacional Comum Curricular. Currículo. Ensino de Zoologia. Zoologia.

## RESUMEN

La Base Nacional Comum Curricular (BNCC) actual fue aprobada para constituir un documento orientador para la construcción curricular de la educación básica brasileña. A través de un análisis textual discursivo, este artículo analiza el contenido de Zoología en la BNCC desde el jardín de infancia hasta la enseñanza media. Los resultados señalan los discursos morfofisiológicos y clasificatorios de la Zoología arcaica del siglo XIX, la ausencia de esta biociencia enfocada a la educación infantil y la falta de propuestas actualizadas para su proceso de enseñanza-aprendizaje. Concluimos que la enseñanza de Zoología presentada por la BNCC propone enfoques de contenido estrictamente conceptuales y lineales, y no promueve una educación científica de calidad porque trabaja con conceptos que derivan del siglo XIX, no interactuando con las demás Biociencias.

**Palabras clave:** Base Curricular Común Nacional. Currículo Enseñanza de Zoología. Zoología.

## INTRODUCTION

### The Formal Curriculum and its Social Relationship

A curriculum can be characterized as a territory representing a relationship of power, comprising what is allowed to be taught as socially valid knowledge (Apple, 2006). Curriculum construction is the result of a social process that has undergone changes over the decades in both Brazil and in society (Borges, 2018). It is worth noting that, as a social product, the curriculum is at the mercy of political, economic, historical and even epistemic pressures and determinants regarding the construction of its knowledge. The curricular territory, thus, is a space that generates many conflicts, presenting clashes of ideas, cultures, and sociological relations (Costa & Lopes, 2022).

Therefore, the identity process of a formal curriculum is defined by multivariable concerning surrounding social values and, as a cultural production, curriculum knowledge reflects ideological characters (Apple, 2006). Within a historical trajectory, the curriculum temporally aggregates trends and is established and executed by public policies of a reformist nature (Apple, 2006). However, the distinction between the formal and lived curricula, where the former is presented in a documental manner by the current legislation, while the latter comprises an entire movement about what takes place and is performed in classrooms, presenting particular characteristics.

Nilda Alves has influenced the association between the school curriculum and everyday life considering knowledge networks since the 1990s. This network refers to the idea of multiple and different paths in knowledge construction, instead of a single and mandatory approach (Alves, 2003). When discussing new curricula trends, Apple (2006) reports a reductionist movement concerning current curricula knowledge, based on power relations and labor market mechanics and reflecting a neoliberal capitalist relationship.

The Science curriculum is no different and has also undergone proposals and changes in its curricular scope over the years (Santos & Bessa, 2021). This article intends, therefore, to conceptually analyze the current Brazilian curriculum, the Base Nacional Comum Curricular (BNCC)

## The History of Zoology in the Brazilian Curriculum

The first mention of the term Zoology in Brazilian curricula dates back to 1838, at the Dom Pedro II School for Secondary Education, with a unique identity and not as a theme within Biology as it is today (Lorenz, 2010). According to Lorenz (2010), the 19<sup>th</sup> century zoological curriculum followed Botany content, comprising a series in a linear progression model.

In the mid-1850s, still in the 19<sup>th</sup> century, the basic Zoology education curriculum was categorized into four zoological sub-areas: Descriptive Zoology (also termed Zoography), which focused on student animal observation and description, General Zoology, comprising animal anatomy and physiology, Zoological Paleontology, regarding the study of past animal diversity present in the fossil record, and Philosophical Zoology, which sought to discuss studies carried out in Europe.

The Zoological curriculum, in general, sought to encompass discussions on diverse animal aspects, from their anatomy and physiology to their classification and behavioral actions, following epistemological assumptions developed from studies associated to Georges Cuvier (1769-1832). Cuvier was a prestigious zoologist and head of the Anatomy and Comparative Physiology chair at the Muséum d'Histoire Naturelle, in Paris, influencing and dictating 19<sup>th</sup> century curriculum guidelines on Zoology research and teaching, also associated to paleontology in the pre-Darwinian era (Milne-Edwards, 1858; Caponi, 2008).

Over the course of the 19<sup>th</sup> century, several zoologists made small modifications to the zoology teaching and researching system proposed by Cuvier. Its core curriculum, however, focusing on animal classification, alongside anatomy and physiology, remained stable throughout the century (Lorenz, 2010). Meanwhile, two of the previous Zoology areas, Philosophical Zoology and Zoological Paleontology, were lost.

During the first half of the 20<sup>th</sup> century, Zoology as a specific subject was still present in textbooks (Lorenz, 2010; Krasilchik, 2019). With the rise of post-modernism in Sciences, however, Zoology became part of the “Biology” field, alongside other Biosciences, remaining as such until today (Azevedo, 2019).

## The Base Nacional Comum Curricular: Pathways in Brazil

In Brazil, curricula are developed within government proposals under the responsibility of the Brazilian Ministry of Education and Culture. National curricular positions, however, are criticized, given the immense Brazilian territory and multiculturalism (Santos, 2020). The various reforms have taken place in recent decades, aiming at aligning school education with the neoliberal society project, have directly and intensely interfered in the current public school curriculum. Curricula were, thus, hegemonized by private business community devices, with a single purpose of emptying the curriculum of traditional content to incorporate the immediate demands of the working class (Branco *et al.*, 2018).

The BNCC is a curriculum document that aims to present essential knowledge to be developed in the formal teaching environment (Brasil, 2017), while also aiming to guide State and Municipal curricula throughout Brazil, following the provisions established in the ninth article of the Brazilian Law of Guidelines and Bases (LDB/96) (BRASIL, 1996). The most recent BNCC curriculum proposal was presented by the Ministry of Education (MEC) in September 2015, defended as a project anchored in the National Education Plan (PNE, 2014-2024). The movement in favor of the BNCC states that the adoption of a unified curriculum can promote the opposite of the current culture, where the curriculum defines assessment methods and textbooks, and not the other way around (Rocha & Pereira, 2016).

At the time, the National Association of Graduate Studies and Research in Education (ANPED, 2020) listed reasons why the BNCC, as a curricular document would represent a setback if approved, including risks to democracy due to the homogenizing nature of the proposal, and the fact that it

would comprise a standardizing device for large-scale assessments, disqualifying teaching work (Rocha & Pereira, 2016). Groups such as the National Association for Education Policy and Administration (ANPAE, 2015) and the National Confederation of Education Workers (CNTE, 2015) were also outright against the BNCC. For the ANPAE, the BNCC should be a reflection of the established basic education National Curriculum Guidelines (DCNs), as well as an enlightening path for the development of critical and citizen education. The CNTE (2015), on the other hand, is concerned about the descriptive bias of the document in the form of prescriptions, in a logic not permeable to adaptations by pedagogical school projects, while also highlighting that the contents do not match capitalist society reality, imposing several obstacles to school performance and presenting vagueness regarding social issues, such as those related to diversity.

The sociopolitical context of the time was a necessary driving force for the BNCC to become, in fact, what it has become today. The first practical moves for its preparation emerged during the Dilma government, who was impeached in a coup based on political and strategic motivations. With the presidency transition to Michel Temer, the groups responsible for BNCC studies, coordination and structuring were dissolved, and educators, teachers and pedagogues were removed from the project, substituted by professionals linked to the business and economic sectors (Branco *et al.*, 2018).

Even with all the red flags raised by the educational sectors, the BNCC was approved for both Elementary and Early Childhood Education on December 17, 2017, in a public session held by the National Education Council (CNE). It was then subsequently approved for high schools on December 4, 2018 (Aguar & Dourado, 2018).

It is important to highlight that the BNCC is not a ready-made curriculum, but a guiding document for teaching practices regarding their knowledge and processes (Da Silva, 2018), while also presenting a structural reformist character. Picinini and Andrade (2018) warn:

We understand the BNCC as a national educational policy, which interferes with curricular guidelines and, which, therefore, displays in the curriculum reform one of its multiple dimensions, and its implementation will interfere in daily school life, in addition to being added to the set of reforms, from evaluations and teacher formation to the acquisition of teaching materials, moving towards the consolidation/expansion of the abundant and disputed educational market (Picinini & Andrade, 2018, p. 38).

Considering the importance of Zoology teaching for the construction of zoological student knowledge concerning the planet's animals and biodiversity, the aim of this article is, in addition to an important curricular criticality as an explicit trend in the 21<sup>st</sup> century (FRANCO & Munford, 2018), to carry out a categorical conceptual analysis concerning Zoology as a school knowledge of a curricular nature within the BNCC.

Previous Zoology BNCC content analyses have been carried out by Bessa *et al.*, (2018), who discuss structural Zoology relations for Elementary and High Schools along with content chronology. Therefore, conceptual analyses on curricular components are required.

## METHODOLOGY

The latest BNCC version available at the Brazilian Ministry of Education's website (<http://basenacionalcomum.mec.gov.br/>) was used as the basis for this study, comprising the kindergarten, elementary school, middle school, and high school stage versions.

The Discursive Textual Analysis method was employed for the categorical conceptual analysis of the selected documents. This method is applied to discuss, reference, and categorize information obtained from qualitative research (Torres *et al.*, 2008). These authors mention that the Discursive Textual Analysis method can be understood as conceptual understanding

construction process concerning inserted information that emerges following a reading sequence. This method is categorized as three processes, namely Unitarization, Categorization and Metatext.

The unitarization process is based on the selection of the contents to be analyzed, termed “analysis units”, which in the present study comprise zoological content. Zoological content, however, is not presented separately from other contents. Because of this, the unitarization process was carried out for the entire “Science” subtopic present in the analyzed BNCC versions.

The categorization step is classified as a textual entropy phase (Torres et al., 2008) that applies conceptual contributions from bibliographies and other sources to categorize the analyzed content, articulating the analysis units and the referential content, expanding total and partial understanding of analytical investigations. Textual elements with similar characteristics and meanings are, thus, brought together and become a category.

Finally, in the metatextual (or metatext) stage, descriptive and interpretive texts are built based on the proposed categorizations, with the primary purpose of systematizing the knowledge obtained from the analytical processes (Torres et al., 2008).

## **RESULTS AND DISCUSSION**

### **Unitarization of the collected data**

As mentioned previously, Zoology in the BNCC is presented within the “Science” subtopic for Elementary School and “Natural Sciences” subtopic for High School. The unitarization process was, thus, carried out throughout the entire document, seeking Zoology as reference. This topic does not exist in the learning objectives of the Early Childhood Education segment, and there is also no mention of animal themes for the kindergarten segment. Only one suggestion was found in this regard, to use images displaying animal and plant representations to develop calculus notions, approaching mathematical symbolism and not Zoological content.

Pietrobon et al., (2016) discuss the importance of science for early childhood education, arguing that contact with scientific knowledge during this school period can provide opportunities for knowledge development and that children are encouraged from an early age to observe nature. Barbosa, Silveira and Soares (2019) point out that the Early Childhood Education BNCC privileges certain groups of specialists in early childhood education over others, neglecting the theoretical and practical knowledge produced by academia and researchers.

Concerning the Elementary Education, I and II segments, Zoology BNCC skills, proposed mostly alongside botany content, refer to a 19<sup>th</sup> century curriculum, where Zoology and Botany were taught alongside each other. Table 1 summarizes where the thematic unit was detected in the corresponding BNCC, subdivided into analyzed component (herein, Science), the school year that the Zoological theme was found, the inserted thematic unit, the curricular knowledge object and, finally, proposed skills.

**Table 1:** Unitarization of the Zoological content present in the BNCC document concerning the Elementary Education I and II segments.

Component	School year	Thematic unit	Knowledge objects	Skills
<b>S C I E N C E S</b>	2 <sup>nd</sup> year	Life and evolution	Living beings in the environment	(EF02CI04) Describe plant and animal characteristics (size, shape, color, stage of life and where they develop, among others) that are part of their daily lives and relate them to the environment in which they live.
	3 <sup>rd</sup> year	Life and evolution	Animal Characteristics and Development	(EF03CI04) Identify the lifestyle characteristics (what they eat, how they reproduce and how they move, among others) of the most common animals in the nearby environment.
	3 <sup>rd</sup> year	Life and evolution	Animal Characteristics and Development	(EF03CI05) Describe and communicate the changes that occur since birth in animals from different terrestrial or aquatic environments, including humans.
	3 <sup>rd</sup> year	Life and evolution	Animal Characteristics and Development	(EF03CI06) Compare some animals and organize groups based on common external characteristics (presence of feathers, fur, scales, beak, claws, antennae, feet, etc.).
	8 <sup>th</sup> year	Life and evolution	Reproductive Mechanisms Sexuality	(EF08CI07) Compare different reproductive processes in plants and animals in relation to adaptive and evolutionary mechanisms.

Source: Base Nacional Comum Curricular - Document: Elementary School I and II

Concerning the high school segment, the BNCC presents the same skill development proposals for all three years. It is important to note that the term "Zoology" or even "Animal" is not present at all in the curriculum described in the publicly available document, nor is any other biological mention of any other living being lineage (*e.g.*, Fungi, Plants, etc.). Thus, it is understood that the entire biota, including animals, would be located within the concept of "life manifestation", which is mentioned only once (Table 2).



**Table 2:** Unitarization of the Zoological content present in the BNCC for the high school segment.

Component	School year	Skill
Natural Sciences and its Technologies.	1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> years of high school	(EM13CNT202) Interpret forms of life manifestation, considering different levels of organization.

Source: Base Nacional Comum Curricular

### Categorization

The performed categorization aims to attribute meanings to the unitarized skills determined in the previous step of this methodological path.

The conceptual textual reference contribution was associated to basic Zoology literature as a bioscience, as formal Zoology teaching emerged from the formative bases of 19<sup>th</sup> century Zoology research (Lorenz, 2010; Azevedo, 2019).

No kindergarten data was obtained in the first methodological stage, so no subsequent analyses were performed for this segment. Two categories were found at this stage: Morphophysiological Zoology and Classificatory Zoology.

Morphophysiological Zoology comprised a total of three skills, all in the Elementary School BNCC proposal. This instruction on morphology and physiology in Zoology teaching originates from Cuvier and Duméril (1838), who proposed relationships between animals using strictly morphological characters. Lorenz (2010) reports that Morphophysiological Zoology is old as a Zoology teaching aspect, already at the core of the first non-Jesuit formal education curricula in Brazil. This author also attributes a strong association to this Zoology Education area due to early 19<sup>th</sup> century publications, mainly in France, remaining a reference for Brazilian curricula until the mid-twentieth century.

Classification Zoology comprised a total of three proposed skills, two in the Elementary School I and one in the High School BNCC proposals, absent from the Elementary School II segment. The history of classifying animals and other living beings is old and complex, beginning with Aristotle (Lorenz, 2010). Linnaeus (1758), however, proposed the binomial classification method still in force today, while also reworking previous productions, therefore established as the scientific reference concerning animal and plant classification. Table 3 systematizes the proposed categories (Table 3) regarding Morphophysiological Zoology and Classification Zoology observed herein.

**Table 3:** Systematization of the proposed categories regarding Morphophysiological Zoology and Classification Zoology.

Category	Skills	Referential-Textual Conceptual Contribution
Morphophysiological Zoology	EF03CI04 EF03CI05 EF08CI07	Cuvier and Duméril (1838)
Classificatory Zoology	EF02CI04 EF03CI06 EM13CNT202	Linnaeus (1758)

Source: The authors.

## Metatext

At this point, it becomes important to discuss how the observed categorizations are linked with teaching discussions. Morphophysiological Zoology, in addition to linking a purely physical animals relationship, attributes a “biological machine” sense to animals, a relationship also proposed in the 17<sup>th</sup> to 19<sup>th</sup> centuries through Biosciences. Therefore, the proposed skills in the BNCC lead to the notion of animals only as living beings equipped only with biologically pre-programmed relationships, thus neglecting environmental, behavioral and ethical relationships.

The Classification Zoology curricula is also old, denoting the 19<sup>th</sup> century as a pioneer concerning formal teaching in this sub-area. Lorenz (2010) argues that, although Classification Zoology was proposed in all Zoology class plans at the Dom Pedro II School from 1838 to 1900, today, even though it is also required, Classification Zoology cannot be overestimated (Azevedo, 2019). Classification Zoology for teaching should be employed only with the purpose of indicating the structuring bases of this bioscience to students, and no more, as it may lead to an event called Banking Zoology (Da Rocha & Maestrelli, 2015), explained as a highly passive and uncritical conceptual student deposition. According to these authors, other zoological relationships can be explored to better benefit diversity and contemporaneity than memorizing Latin names.

The term "contemporaneity is cited several times in the BNCC, structuring the Natural Sciences as a citizen training area, as noted below:

(...) the area must, therefore, commit itself, as well as others, with the formation of young people to face the challenges of contemporaneity, in the direction of integral education and citizen formation. Students exhibiting greater experience and maturity are able to deepen the exercise of critical thinking, carry out new readings of the world based on abstract models, and make responsible, ethical and consistent decisions in identifying and solving problem situations. (Brasil, 2018 p.112).

As it is a base document, future interpretations for the construction of secondary curricula based on the BNCC can be of concern. It is important to note the absence of zoological content intended for Brazilian childhood education, as human-animal relationships occur throughout the course of life (Gonçalves & Sessa, 2017; Azevedo, 2019), and it is up to all teaching segments to address their relationships as school knowledge. In kindergarten, playfulness can be applied, but in no way can Zoology or other sciences be neglected (Piropô & Boccardo, 2017; Avis et al., 2020).

It is important to note that it is a child's right to access scientific knowledge, updated by Law 9,394 of 2015ART 16, which provides for:

1. Conceptual and procedural science understanding;
2. Sociocultural, political and economic understanding of science processes and products;
3. Understanding the relationships between science, society, technology and the environment (Brasil, 2015, p. 34).

Regarding the sociocultural relations provided for in the aforementioned law, Zoology teaching proposed by the BNCC would not fulfill any of requirements, since it proposes strictly conceptual and linear content approaches. We understand that the scientific knowledge construction and validation process is marked by social and economic relations. Piccinini and Andrade (2018) point out the linear and disorganized structure of the BNCC concerning Natural Sciences Teaching, linked to entrepreneurs holding the economic concept of Education and the bourgeoisie holding the economic capital of the State, which historically select what the population should or should not have access to as formal systematized knowledge. These authors also indicate that conservative ideals are being proposed, denoting a solely technical labor purpose (labor market) for the education of non-critical students:



A scientific education that makes it possible, for example, to question the capitalist mode of production and the domain – albeit basic – of the most different production processes and the most diverse technologies, necessarily permeates economic, political and social transformations. As long as the pursuit of profit, supported by worker expropriation is the pillar of the society we live in, educational policies will continue to be directed towards minimal, fragmented and disconnected content, but sufficient for the exercise of simple work, consistent with market requirements and with a capitalist society. Natural Sciences are no exception to this rule (Piccinini & Andrade, 2018. p.47).

Bernardi, Uczak and Rossi (2018) denounce the influence of the private sector in BNCC development since its inception, pointing out the power needs of the private industry vis-à-vis the public sector and its educational policies. In other words, his comprised an educational reform for the training of a working-class workforce in the face of business interests and monopolies. Therefore, quality scientific education is not encouraged for this purpose. Branco et al., (2019) in a reflective scope, discusses this BNCC theme as follows:

The recent changes in national education, referring to the Secondary Education Reform and the BNCC, emerged with an undisguised urgency and emergency, signaling an educational trajectory directed towards professionalization, fragmentation, and work flexibilization (material and immaterial). The guidelines and determinations provided for in these documents make the profile of the desirable graduate for the interests of capital clear: the docile individual, the multipurpose and proactive worker, who never tires of learning and serving the market interests. Within the scope of the speeches, the option of choice is highlighted. However, it would be naive not to notice that the choice is bankruptcy to capital demands (Branco *et al.*, 2019. p.359).

Therefore, the politicization of Biosciences, with regard to government interests, begins with curricular proposals aiming at promoting a potentially scientifically “illiterate” worker. Therefore, we go from a null Zoology Teaching in early childhood education to classificatory and morphophysiological zoology in Elementary School (I and II), to in High School, whose curricular reference in Zoology is also based on the classification of living beings.

## CONCLUSION

Unlike other abstract Biosciences, Zoology does not comprise knowledge far from the student's reality. Events that involve animal behavior relationships, such as reproduction and birth, are visible at all times, encompassing understanding animals as part of the environment within ecological webs and chains. The questioning concerning Zoology teaching in the current curricula is based on the discussion of what makes it as a curricular component, that is, what is expected of Zoology teaching as a school content, present in a curriculum.

The analysis developed herein indicates that the BNCC proposes the understanding of an archaic zoology from the 19<sup>th</sup> century. Therefore, secondary curricula based on this curricular guide may be based on an incomplete zoology teaching incompatible with the potential social demands that encompass this Bioscience, for example, Behavioral Zoology teaching, which has been previously suggested as a curricular component by the academy (De Moura, Silva & Silva, 2015) or Cultural Zoology (Da Silva, 2018; Azevedo, 2019), which proposes the study of cultural animal society manifestations, such as cartoons and pictures, or even Ethnozoological education (Santos-Fita & Costa-Neto, 2007), concerning ethnographic animal and human society studies.

Total zoological understanding goes far beyond scientific names attributed to animals. It also involves sensitization, awareness, diversity knowledge, the recognition of humans as living animals that also establish ecological relationships with the environment. Brazil presents a significant animal

diversity, in addition to a historical wealth of natural resources. It is, therefore, paramount to bring the animal context into the Environment and Awareness scenario, to structure the most impactful social training processes in Brazilian society. However, the curriculum as a propositional and political document must encompass current concepts underlying zoology, associated to environmental, evolutionary and cultural issues. Formal Biosciences teaching and teachers must be aware of their action and classroom praxis. Thus, on the one hand, the BNCC is available as an archaic textual model, exploring technical-scientific content without links with other biological structures (e.g., Evolution and the environment). On the other, professorships are tied to real relationships and demands, such as government tests that demand quantitative student results, aiming to match international classification standards. Thus, teachers and the curriculum, in this historical moment, are simply the gears or part of the entire educational process in the country, whose demands have been suffocated by progressive fund decreases and a significant devaluation of the teaching practice and student roles.

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