Comparative education in Zoology Teaching: a historical-curricular analysis

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Abstract: This paper presents a historical analysis of Zoology curricula in Brazil, based on comparative education. Data were collected in six documents that illustrate the historical context from the curricular structure of Colégio Imperial de Pedro II to the Base Nacional Comum Curricular. The following criteria for comparison and analysis were used: zoological curriculum discourse, scientific content, method used and historical context. The results showed that the teaching of Zoology has historically passed 4 curricular phases, namely through: 19th century from the 19th century and the Brazilian Empire, Positivist from the Cold War and technological dispute, Technicists from the military dictatorship and the progressive discourse and Skills and passed Competencies that arise at the time of discussion of post-critical theories of curriculum in Brazil.

Keywords: Zoology. Teaching Zoology. History Curriculum. Comparative Education.
científico, método empregado e contexto histórico. Os resultados mostraram que o ensino de Zoologia passou, historicamente, por quatro fases curriculares, sendo elas: Oitocentista, provinda do século XIX e do Brasil Império; Positivista de redescoberta, provinda da Guerra fria e disputa tecnológica; Tecnocrática, provinda da ditadura militar e do discurso progressista e Habilidades e Competências, que surgiu no momento de discussão das teorias pós críticas de currículo no Brasil. Conclui-se que o Ensino de Zoologia sofreu determinantes políticos e sociais que influenciaram suas perspectivas conceituais e de discurso curricular zoológico no decorrer do recorte utilizado.

**Palavras-chave:** Zoologia, Ensino de Zoologia, História Currículo, Educação Comparada.

1 **The curriculum and its relationships**

Curricula are strongly marked by social, historical, colonialist, economic and structural impositions (APPLE, 2006; CONCEIÇÃO, 2017; MULLER and YOUNG, 2019). The curriculum itself is demarcated as a space for ideological struggles and conquests and for hierarchical maintenance on the selection and execution of socially valid knowledge. Access to these is a channel through which the social macrostructure is installed in the school microstructure (LOPES, 2004). For Apple (2006), the structuring of curricular knowledge and institutional symbols is linked to the social and cultural domination of society, and its conscious manipulation occurs by the ruling class.

The word Curriculum, following the etymological relationship of the word, coming from the Latin curriculum, means a path to be followed and given the pedagogical appropriation of the vocabulary, can be characterized as educational plans and programs linked to school knowledge and the learning experience (APPLE, 2006; LOPES and BORGES, 2017; SCHMIDT, 2003; YOUNG, 2014). Thus, the curriculum is much more than a set of disciplines and concepts structured in other terms, being characterized as a prediction of the formative process of an entire society that will make use of it.

The historical relationship of formal curricula, that is, those planned and implemented by public policies, is a social historical remount on the concepts and their power relations (SCHMIDT, 2003). Research on the subject gained strength in postmodernism, a period in which studies on its pedagogical framework, strictly linked to citizen education, dialogued without metanarratives, although there was a polysemy of visions. Post-structuralism in curricula is also a vector that helped in the documental change and its formative path. Post-structuralism is defined as anti-positivist currents,
which delegate to the curriculum an instruction, in addition to the linguistic concept for its understanding and action (COSTA and LOPES, 2022; LOPES, 2013). In this way, it can be understood that the formal curriculum is not a single and immutable artifact (APPLE, 2006).

The Teaching of Zoology, as an area of knowledge, is brought by Lorenz (2010) as a Bioscience that studies animals and their relationships with the environment. Brought from France, it was present throughout Brazilian history, being taught primarily in the formal education we know at Colégio Imperial de Pedro II, located in Rio de Janeiro.

2 Curricular comparison in the history of education and teaching studies

The studies that make up the curricular comparison aim to promote not only the historical remount of documents, but also to develop within a sociological perspective the study of the successive discourses of society, which influence curricular policies (SILVA, 2016). Correa (2011) exemplifies this purpose of comparative education by analyzing the various political, historical, social, cultural purposes, among others, of educational documents, the curriculum, for example.

In this way, the critical perspective of the curricula is important at this time, as the comparative orientation is based and oriented on investigative procedures, between differences and similarities, for the complete remount of a curricular history (MORGADO, 2019; SILVA, 2016).

Mallet (2004) points out the 20th century as important for comparative studies and describes that this type of research arose to the detriment of some processes that were on the rise, namely:

- The objective and closed conditions of the educational and cultural phenomena that functionalism tends to promote;
- The perspectives of social evolutionism that, blinded by a continuous conception of history and a pragmatic approach to educational facts, tend to neglect the processes of social change;
- Consensualism, which prevents the scientific enterprise from questioning its ends, which is the best way to elude them, especially when the spaces of intervention go beyond national borders. (MALLET, 2004 p. 1311).

The need for comparative studies comes from the premise of being able to recognize the field of singularities and pluralities of different perspectives and approaches present during the studied curricula. Popkewitz (1998) already understood
that we would be starting from a material epistemological premise, for the development of studies of symbolic materials, especially regarding curricula, which are recognized as source objects and legitimize socially valid knowledge (APPLE, 2006; SILVA, 2016).

Comparative education is also supported by globalization, which influences the educational process and curriculum policies. Marcondes (2005) argues that there is a unification of education systems around the world, substantiating the same proposals in different countries.

3 Methodology on curriculum comparison

To qualitatively compare the historical and current curricula on the Teaching of Zoology, exploratory theoretical research was established. Ribeiro (2016) defines this as a survey of first investigations, whose purpose is to explore the documents in search of data that complement each other for future interpretations.

In this article, we list the following Zoology Teaching curricula: Colégio Imperial de Pedro II (CDP), Biological Science Curriculum Study (BSCS), Subsisídios da proposta da Implementação Curricular- Biologia (SPIC-BIO), Currículo de Estudos de Biologia (CEB), Parâmetros Curriculares Nacionais (PCN) and the Base Nacional Comum Curricular (BNCC). The selection of certain curricula is linked to the fact that they are the most complete and documented documents of the historical periods that express the Teaching of Zoology.

In order to guide the investigative process, we started with categories to be investigated and compared, namely: Zoological curricular discourse, scientific content, method used and historical context (Chart 1).

<table>
<thead>
<tr>
<th>Guide to the methodological investigative process</th>
<th>Zoological Curriculum Discourse</th>
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<tbody>
<tr>
<td></td>
<td>Scientific Content</td>
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<tr>
<td></td>
<td>Employee Model</td>
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<tr>
<td></td>
<td>Historical context</td>
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</table>

Source: The Authors

The curricular discourse is based on the purpose defended by the Zoology curricular document for Basic Education, such as objectives, goals and possible explanations of the need for the subject to be taught. Scientific content is the material covered, promoting the disciplinary description of the topics exposed in the curriculum, such as lineages of studies and theories. The method used is based on the proposal
of execution and development of the content for the pedagogical purpose, as approaches and practices. Finally, the historical context appropriates the moment of social history to better understand the curricular aspects analyzed.

4 Results and discussion

According to the methodology applied, four categories were raised on the curricula for the Teaching of Zoology in Brazil, namely: 19th century, Positivist, Technocratic and Skills and Competencies, which will be presented below.

4.1 Traditional 19th Century Category

The first category is based on the curricula of Colégio Imperial de Pedro II, and there is no documentary discourse for Zoology. However, the scientific content was quite vast and specific to the strict zoological content. The method employed was that of repetition, which can be analyzed by the documentary excerpt from 1857:

5th year Latin: version of more difficult authors, themes; English: composition, conversation, improving the study of the lingo; rectilinear trigonometry; continuation and repetition of chorographia and history of Brazil; physics, and repetition of botany, and zoology; Greek; German, comprising only grammar, easy version. (Reform nº 2006, 1857, p.1 emphasis added)

The repetition method was quite common in the 19th century, as it was believed that learning would occur through the simple exhaustive reiteration of a scientific content, that is, repetition would be the means for understanding the material studied and, consequently, for the formation of knowledge (ALMEIDA, 2018).

The historical context is based on the Brazilian Empire, a period in which education would be under the responsibility of the imperial crown. It is worth remembering that the educational process was not public, being only for the upper classes of Rio de Janeiro (VECHIA, 2005). In this way, a breadth of scientific content is observed, although totally socially restricted.

Thus, the term 19th century was used as a categorical title given to the 19th century. This traditional term, aimed, until the mid-twentieth century, to educate and update the elite on scientific concepts debated in academic social spheres, through the accumulation of information. Azevedo and Meirelles (2022) attribute the 19th century Zoology curriculum to academic research from previous centuries, along with Portuguese, Dutch and Austrian influences.
4.2 Positivist Category of Rediscovery

The second category is based on the Biological Science Curriculum Study (BSCS), whose curricular discourse was: Good operational vision of the scientific process. The scientist-centered narrative allows us to observe that the process of teaching Zoology and other Sciences would be linked to laboratory and rediscovery processes (AZEVEDO, SELLES and LIMA-TAVARES, 2016). In turn, the scientific content was presented in three modules, one of these being practical classes, called Investigation of comparative studies, whose curricular scope consists of proposals for the use of animals for experimentation (frogs, shrimps, planarians, hydras, among others).

The historical context, present in the BSCS, dates back to the Cold War, a non-arms dispute that promoted the technological race in the mid-twentieth century between the United States of America and the Soviet Socialist Union (AZEVEDO, SELLES and LIMA-TAVARES, 2016). The technological contexts and the positivist scientific basis in this period are observed. Positivism is understood as a philosophical current that promoted scientific knowledge as the only form of true knowledge, and that veracity could only be proven by the execution of a valid method, preferably quantitative (TRINDADE, 2007). For this reason, the Positivist category of Rediscovery was used, given to the philosophical school, as cited by Azevedo, Selles and Lima-Tavares (2016).

It is worth remembering that the BSCS are curricula imported from the United States of America (KRASILCHIK, 2019) and, thus, the experimental script becomes the key to this described model, since experimentation using the rediscovery method is a classic of positivist curricula (FERNANDES and NETO, 2016).

4.3 Technocratic Category

The next established category is present in the SPIC-BIO and CEB curricula, called Technocratic. The curricular discourse presented in its scope is based on: Conditions for the acquisition of basic notions (...) Assistance in professionalization (...) university life, for SIPIC-BIO, while for CEB it was guided by: providing the student a text that broadly covered the major branches of biology, with greater emphasis on conceptual aspects. Such narratives, according to Ferreira and Bittar (2008), are based on the formation of human capital, which is propagated in training aimed at low-
cost labor, using the term technocratic.

The scientific content was presented in a reduced form, which is classic in technocratic policies, which aim at technical improvement to the detriment of academic and social ones (FERNANDES and NETO, 2016; KRASILCHIK, 2019). Questions of completion and memorization are observed in the Zoology curricula of SIPIC-BIO, while, in CEB, there are also technocratic characteristics, however, with a greater scope of zoological content, such as studies of fauna, cultural zoology and previous knowledge of the student. However, there is still an overestimation of technical concepts. In this way, the technocratic model is stipulated for both Zoology curricula, but with a decline of this model for the CEB.

The historical context presented for this category is the military dictatorship. The dictatorial technocratic model stimulated the technical knowledge of the basic school, as it would form the new working class in the country. For Ferreira and Bittar (2008), technocratic education stimulated proposals to increase the Brazilian GDP, since the employment opportunity of technical training would be stipulated for the economic growth of the nation, using the progressive discourse, subordinating education to economic logic.

4.4 Skills and Competencies Category

In this category are the PCN curricula and the BNCC (current Brazilian curriculum), which articulate the entire curricular document in terms of Skills and Competencies. In this curriculum model, there are basic themes, from which discussions are articulated to then develop specific content (GARCIA, 2005; KRASILCHIK, 2019).

The curricular discourse is based on the development of competences, understanding of the world and citizen education. Regarding the scientific content, it is not detailed and instructive like the old curricula analyzed, but rather presents itself in thematic axes, with Zoology being inserted in the Life and Evolution axis. The PCN are the first curricula of this analysis to question Classificatory and Morphophysiological Zoology in Zoology Teaching, citing on page 35: zoological (or botanical) studies, to cite another example, privilege comparative classification, anatomy and physiology.

However, there is a difference in the approach between the PCN and the BNCC. In the PCN content, Zoology is linked to evolutionary and ecological purposes, while
in the BNCC there is a prevalence of classification and morphophysiological comparison of living beings, dictating a Linelian (Animal Classification) and Cuverian (Morphophysiological) zoological context, respectively.

The moment, according to the literature, would be post-critical movements of the curriculum. The post-critical curriculum theory presents the deconstruction of unilateral knowledge and metanarratives, attributing multicultural values to school knowledge (LOPES, 2013). However, for the historical context, we need to differentiate the PCN from the BNCC, because, having the same model and being in the same category, the historical context contributed to the curricular differentiation between the two documents. PCN appear at the height of post-critical theories of curriculum, which defended multiculturalism and fields of curriculum debates (MACEDO, 2013). The BNCC, which is more recent, presents the historical context of the rise of neoliberal policies, which are linked to cheap labor and technical work (BRANCO et al, 2018; BRANCO and ZANATTA, 2021; COSTA and LOPES, 2018; GONÇALVES, MACHADO and CORREIA, 2020). Below is the systematization of the categories found (Chart 2).

Chart 2: Systematization of the categories found on the Teaching of Zoology in the selected curricula

<table>
<thead>
<tr>
<th>CVs</th>
<th>Curriculum Discourse for Science/Zoology.</th>
<th>Scientific Content</th>
<th>Employee Model</th>
<th>Historical context</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDP (1837-1888)</td>
<td>does not presente</td>
<td>Descriptive Zoology, Zoological Paleontology, General Zoology, Teratology, Philosophical Zoology* (cut in 1854) *</td>
<td>Repetition Method</td>
<td>Brazil Empire</td>
</tr>
<tr>
<td>BSCS (1962)</td>
<td>Good Operational Vision of the scientific process p.5</td>
<td>Animal classification and groups Characteristics of animals Comparative study investigation (practice)</td>
<td>Scientific Model of Rediscovery (Positivism)</td>
<td>Cold War</td>
</tr>
<tr>
<td>SPIC-BIO (1971)</td>
<td>Conditions for acquiring basic notions (...) Assistance in professionalization (...) university life p1</td>
<td>Characteristics of animals and groups Classification</td>
<td>Technocratic Model</td>
<td>Military dictatorship</td>
</tr>
<tr>
<td>CEB (1982)</td>
<td>provide the student with a text that broadly covers the major branches of biology, with a greater emphasis on</td>
<td>Animal phylogeny and taxonomy compared animal physiology phyla study</td>
<td>Technocratic Model with the beginning of changes</td>
<td>End of the military dictatorship (1985)</td>
</tr>
</tbody>
</table>
It is necessary to clarify that there are formal curricula which, categorically, are complex to list. In the case of CEB, categorized as technocratic, it has contents that are not technical, such as the aforementioned Cultural Zoology. However, the curriculum has strong links with memorization, so it could appear as a transition between the technicist model of its predecessor (SPIC-BIO) and its successor (PCN). The same is true for the BNCC, which presents the Zoology content aimed solely at classification and morphophysiology, unlike its predecessor PCN, which used more proposals to approach the content. However, both are in the same category as the use of Skills and Competencies. So,

The fact that the BNCC is linked to technical content in the Skills and Competencies model is nothing new. Niz, Tezani and Persicheto (2020) developed research on literacy and scientific literacy, and concluded that even using Skills and Competencies, the emergence of a technicist proposal emerges. Biondo et al. (2019)
point out historical relevance, social contextualization and the Science, Technology, Society and Environment (STSE) approach, which were excluded from the curricular scope for the area of Natural Sciences. Therefore, for the Curriculum Teaching of Zoology, in a country with high levels of faunal diversity, zoological knowledge would become purely technical and uncritical. Thus, a curricular cycle for the Teaching of Zoology would be returning to become technicist.

The BNCC’s technicist discourse is a neoliberal characteristic, since, in this model, the subject is responsible for his or her school success or failure through the meritocratic model, in which the best receives more public funds and awards (LAVAL, 2019; RORIZ, 2022).

5 Final considerations

Comparing the process of curriculum construction and its paths, it was observed that there have been mutabilities over the centuries, and that changes in the models employed may be directly linked to the sending historical period.

It is possible to understand that zoological knowledge started from the very rich and complex 19th century, and that it was being re-signified during most of the 20th century. However, we cannot forget that the high conceptual deposition of the technical-scientific content of Zoology was not qualitative. However, there is a core linking zoological knowledge to a very technical or positivist knowledge as demonstrated by the BSCS, SPIC-BIO and with the beginning of prerogative in the CEB.

The PCN had a paradigmatic peak when they dissolved the zoological content with the other disciplinary fronts, considering that, until then, there was a separation of Zoology, Botany, Genetics and the others in chapters in the curricula. In the PCN, the division of biological contents is broken and thematic axes are proposed instead. It is worth mentioning that, also in the PCN, the questioning of Linelian and Cuverian Zoology is exposed.

In turn, the BNCC has a scope similar to its predecessor PCN. However, there is a limitation of the curricular discourse and proposals, returning to a strictly physiological, morphological and classificatory approach. Thus, when understanding that neoliberal policies influenced the curricular proposals included in the BNCC, it is expected that the technicist model will return.
That said, it can be inferred that the curricular Zoology Teaching went through four phases. The 19th century phase was characterized by the high deposition of zoological content in natural history, while the positivist phase has as a determining factor the focus on technical-scientific content and on laboratory experiments present in the curricular scope. In turn, the technicist was based on the moment of reduction of zoological content, serving as a pillar of technical courses, such as, for example, agronomy, zootechnics, etc. In the Skills and Competencies phase, zoology content is presented as suggestions, in contexts and topics of approach, and not just zoological content, as occurred in all other curricular phases.

However, it should be noted that the PCN and the BNCC (Skills and Competencies Phase) are curricular proposals that support the construction of curricula in schools, unlike the others that already had, in their scope, the content to be taught with texts, exercises and practical classes. Thus, the BNCC, which is the current curricular document, suggests that the interpretation and school insertion will depend on Brazilian school institutions, in addition to their political impositions of implementation.

Finally, we must also consider that the formal curriculum is just the regimental document. In the school environment, there are other determinants that influence curricular execution, such as national assessment exams, government choices, the hidden curriculum, on which ideologies and the construction of school culture are based and even the conception that the teacher carries with him about the organization and validation of knowledge.

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