

Botany and caatinga biome teaching in the pedagogical projects of bachelor's teaching degrees in biological sciences

ABSTRACT

The integration of botany teaching with local vegetation is fundamental to promoting contextualized learning, requiring a critical analysis of teacher education. This study aimed to investigate how the Caatinga biome and Botany teaching are addressed in relation to the contextualization of local vegetation in Bachelor's Teaching Degrees in Biological Sciences in the state of Bahia, Brazil. A documentary research design was adopted, based on the analysis of four Course's Pedagogical Projects from public higher education institutions located within the Caatinga biome and active during the period of this study. Data were analyzed using Content Analysis with the support of NVivo software. The results highlight the relevance of the investigated programs within their contexts of operation; however, the Caatinga biome and Botany teaching are generally addressed in an implicit and limited manner. Therefore, strengthening these themes in bachelor's teaching degrees is essential to foster the training of teachers who are more engaged with the contextualization of local vegetation in teaching and learning processes.

KEYWORDS: contextualization; curriculum; teaching institutions; teacher training.

Ensino de botânica e do bioma caatinga nos projetos pedagógicos de licenciaturas em ciências biológicas

RESUMO

A integração do ensino de botânica à vegetação local é fundamental para promover aprendizagens contextualizadas, exigindo uma análise crítica da formação de professores. O objetivo deste trabalho foi investigar a abordagem do bioma Caatinga e do ensino de botânica na contextualização com a vegetação local nos cursos de Licenciatura em Ciências Biológicas do estado da Bahia, Brasil. A metodologia adotada foi a pesquisa documental, baseada na análise de quatro Projetos Pedagógicos de Curso de instituições públicas baianas localizadas no bioma Caatinga e em atividade no período de realização desta pesquisa. Os dados foram analisados por meio da Análise do Conteúdo, com auxílio do programa NVivo. Os resultados evidenciaram a relevância dos cursos investigados em seus contextos de atuação; contudo, a abordagem do bioma Caatinga e do ensino de botânica ocorre, em geral, de maneira implícita e limitada. Portanto, considera-se fundamental o fortalecimento dessas temáticas nos cursos de licenciatura, visando contribuir para a formação de professores mais engajados com a contextualização da vegetação local nos processos de ensino e aprendizagem.

PALAVRAS-CHAVE: contextualização; currículo; instituições de ensino; formação docente.

Edeilson Brito de Souza

edeilson.souza@ufrgs.br

orcid.org/0000-0003-2195-245X

Universidade Federal do (UFRGS),

Porto Alegre, Rio Grande do Sul, Brasil

Rosi Maria Prestes

prestes.rosi@yahoo.com.br

orcid.org/0000-0002-7070-6442

Instituto Federal de Educação, Ciência

e Tecnologia de Santa Catarina (IFSC),

Campus Chapecó, Santa Catarina,

Brasil

Maria Cecília de Chiara Moço

mcecilia.moco@ufrgs.br

orcid.org/0000-0001-9478-8713

Universidade Federal do (UFRGS),

Porto Alegre, Rio Grande do Sul, Brasil

INTRODUCTION

At different levels of teaching, botany is often perceived as uninteresting by students and even teachers. Broadening the dissemination of knowledge about plant biodiversity and promoting sustainable practices is of great importance in the face of the climate and environmental emergency (Burke et al., 2022, Stagg & Dillon, 2023). In this context, to make educational practices more contextualized and interdisciplinary, it is necessary to reformulate the fragmented teaching of botany in teacher training (Andriotti Júnior et al., 2025; Santos et al., 2021; Prestes & Moço, 2025). Thus, it is understood that contextualizing implies bringing the student's experience into the classroom, attributing greater meaning to knowledge and expanding its applicability to the students' reality (Kato & Kawasaki, 2011; Vale et al., 2022).

According to Kato and Kawasaki (2011), there are multiple conceptions of contextualization in Science Education. Among the categories identified by the authors, two stand out here: contextualization as "student daily life," in which the content is directly related to the student's lived experiences; and contextualization as "school discipline", in which the content of a course is linked to knowledge from other areas, creating connections that favor the student's identification with what is being studied. The latter concept is closer to school interdisciplinarity, according to Fazenda (1995), which deals with the construction of new knowledge through the connection or integration between disciplines. For the author, this type of interdisciplinarity aims to establish complementary links, convergences, and interconnections between school disciplines.

Interdisciplinarity in the teaching of botany occurs when dialogue is promoted between plant biodiversity and other areas of knowledge, such as Mathematics, Languages, Geography, and History (Barbosa, 2019; Prestes et al., 2023).

In this scenario, it is important that Science and Biology teacher training degrees in the Caatinga biome address plant biodiversity linked to the local reality. Many students in the region where this biome predominates are unaware of its environmental characteristics (Vale et al., 2022), which contributes to the Caatinga remaining one of the least known and scientifically studied Brazilian biomes (Melo et al., 2023).

The Caatinga biome is exclusively Brazilian, classified as a seasonally dry tropical forest, whose phytophysognomy is highly variable and adapted to local climatic conditions, which are predominantly semi-arid (Melo et al., 2023; Tabarelli et al., 2018). Despite its rich plant biodiversity and abundant green landscape, there is still a misguided perception of negative stereotypes of an arid, dry region associated with climatic and social adversities (Tabarelli et al., 2018). Thus, it is necessary to overcome historically constructed myths in order to recognize the environmental threats mainly arising from deforestation and desertification (Melo et al., 2023).

Based on these assumptions, this study seeks to answer the following research question: how is the teaching of botany and the Caatinga biome addressed in the initial training curriculum for Biological Science teachers, considering the context of local vegetation? The hypothesis of this study suggests that the curriculum for

training these teachers addresses the teaching of botany and the Caatinga biome in a sporadic and fragmented manner, with limited contextualized integration.

Thus, this study aimed to investigate the approach to the Caatinga biome and the teaching of botany in the initial training of teachers, considering the contextualization with local vegetation, in the Bachelor's Teaching Degrees (BTDs) in Biological Sciences in the state of Bahia, Brazil.

HIGHER EDUCATION AND BACHELOR'S TEACHING DEGREES IN BIOLOGICAL SCIENCES IN THE STATE OF BAHIA: A BRIEF HISTORICAL CONTEXT

University institutions arrived late in Brazil, in 1920, and in Bahia, in 1946, with the founding of the Federal University of Bahia (UFBA) in the state capital (Salvador), created from the union of pre-existing colleges and schools. Between 1968 and 1970, the state Higher Education (HE) system developed with the creation of Teacher Training Colleges, which would later become the first state universities; until then, HE in the state of Bahia had focused on areas of the primary sector of the economy, but with the creation of these colleges and short degrees, educational objectives were promoted (Boaventura, 2009).

The first state university created was the State University of Feira de Santana (UEFS) in 1970, which grew out of the former Teacher Training College. Subsequently, the State University of Southwest Bahia (UESB) was created in 1980, the State University of Bahia (UNEB) in 1983, and the State University of Santa Cruz (UESC) in 1991, complementing the state HE system in Bahia (Mota & Torres, 2017). Consistent with the goals of decentralization, since the capital concentrated a large part of the institutions, UNEB stood out for extending throughout the state of Bahia with its multi-campus structure: "[...] it was necessary to provide the regional centers of Bahia with higher education, which would strategically train teachers [...]" (Boaventura, 2009, p. 22).

In the federal university scenario, as already mentioned, UFBA, created in 1946 and based in the capital, was for more than 50 years the only federal university in Bahia. In 2002, the Federal University of Vale do São Francisco (UNIVASF) was created, followed in 2005 by the Federal University of Recôncavo da Bahia (UFRB), in 2013 by the Federal University of Western Bahia (UFOB), and in the same year by the Federal University of Southern Bahia (UFSB) (Mota & Torres, 2017). Thus, the HE expanded considerably within the state in order to meet growing demand.

In this context, it is also worth noting the creation, in 2008, of the Federal Institute of Education, Science, and Technology of Bahia (IFBA) and the Bahian Federal Institute of Education, Science, and Technology (IF Baiano), given in the context of territorial policies, the Professional and Technological Education (PTE) policy, and local sociocultural demands (Souza, 2015). These institutes offer basic, professional, and technological education degrees, as well as undergraduate and graduate degrees, including teacher training, also contributing to the decentralization of HE with its multi-campus organization.

The creation of BTDs in Biological Sciences in Bahia dates to the founding of HE institutions, which have undergone curricular reforms over time to comply with current regulations. According to Silva and Macedo (2020), in addition to

promoting the training of biology teachers in various regions of the state, these courses meet the demand for critical-reflective teacher training that considers local social, cultural, political, economic, and environmental diversity, with emphasis on “[...] basic education in the sense of training ethical teachers who can collaborate in a critical-reflective manner on and during their work in view of their social role in the education of citizens.” (Silva & Macedo, 2020, p. 8).

METHODOLOGY

This study is a documentary research, characterized by Gil (2017) as qualitative research that uses the analysis of documents without scientific treatment, such as laws, letters, decrees, and others, aiming at the interpretation of data and information to understand a reality or phenomenon. The stages of this type of research involve: a) formulating the question; b) preparing the work plan; c) identifying and locating sources; d) analyzing and interpreting the data; and e) writing the report (Gil, 2017). These stages were adopted in the development of this study.

Initially, the following research question was formulated: how is the teaching of botany and the Caatinga biome addressed in the initial training curriculum for Biological Science teachers, considering the contextualization of local vegetation? For this investigation, a work plan was developed that aimed to analyze the Course’s Pedagogical Projects (CPPs) of the BTD in Biological Sciences. The following inclusion criteria were established for the selection of participating institutions: a) being a part of the public HE network of the state of Bahia; b) operating in the in-person modality; c) having the document targeted for analysis available; d) being active during the period of the research; and e) being located predominantly in the Caatinga biome (considering the biome of the municipality where the campus is located). This Federative Unit was chosen because Bahia has the largest proportion of the Caatinga biome in its territory, covering approximately 41%, according to data from the Brazilian Institute of Geography and Statistics (IBGE, 2019a).

These criteria were applied through searches in the official database of courses and Higher Education Institutions (HEIs) of the Ministry of Education (MEC), the e-MEC system (Brazil, 2024). The website’s “advanced search” tool was used, and the following search criteria were applied: a) course: “biological sciences,” b) Federative Unit: “Bahia,” c) free course: “yes,” d) modality: “in-person,” e) degree: “bachelor’s teaching degree,” and f) status: “active.” To determine the predominant biomes in the host municipalities of each identified campus, IBGE data available during the research period (2019a; 2019b) were used.

Thus, four BTDs in Biological Sciences met the established criteria, part of the following institutions: Bahian Federal Institute of Education, Science, and Technology (IF Baiano), Guanambi and Serrinha campuses; and State University of Bahia (UNEB), campuses VII (Senhor do Bonfim) and VIII (Paulo Afonso). The information obtained from the e-MEC system was confirmed, and the most recent versions of the CPPs were identified and obtained from the websites of each institution.

After obtaining the documents, the data were analyzed and interpreted according to the Content Analysis (CA) method, which involves the following steps: 1) pre-analysis; 2) exploration of the material; and 3) treatment of results, inference, and interpretation (Bardin, 2016). The first step corresponds to the selection of documents and the formulation of hypotheses and objectives that underpin the analysis; the second consists of the analysis itself, based on the application of previously made decisions and the identification of units of analysis; finally, the last step refers to the compilation and interpretation of results to obtain meaningful data according to the objectives outlined (Bardin, 2016).

The following analysis criteria were established: a) presence of specific content and courses on the teaching of botany and/or the Caatinga biome; b) presence of a proposal for contextualization with the vegetation of the local biome; c) mention of the teaching of botany and/or the Caatinga biome in some part of the document; and d) possibilities for the inclusion of these areas. Details on the categories established, the coding, and their description, which guided the analysis, are provided in Table 1.

Table 1

Categories used to analyze the pedagogical projects of the Bachelor's Teaching Degree courses in Biological Sciences included in the research.

Category 1: Caatinga biome	
Code	Description
Content about Caatinga	Description of content related to teaching about the Caatinga biome in course syllabi.
Course on Caatinga	Identification of courses that specifically address the Caatinga biome.
Possible inclusion of the Caatinga	Excerpts where it is possible to include or improve the approach to the Caatinga, even if they are not currently present.
Caatinga in other parts of the document	References to the Caatinga biome in other sections of the document.
Category 2: Botany teaching	
Botany teaching content	Description of content related to botany teaching in course syllabi.
Course on botany teaching	Identification of specific courses that deal with botany teaching.
Possible inclusion of botany teaching	Excerpts where it is possible to include or improve botany teaching, even if it is not currently present.
Botany teaching in other parts of the document	References to botany teaching in other sections of the document.
Category 3: Contextualization	
Context, Caatinga, and botany	Excerpts where the teaching of botany is specifically contextualized with the Caatinga biome.
Context, Caatinga in other themes	Excerpts where the Caatinga biome is addressed in a way that is contextualized to other topics.
Context, teaching, and other topics	Excerpts where the content discussed (except for the Caatinga biome) is specifically contextualized to teaching.

Source: Authors' own work (2026).

The CPPs were analyzed in their entirety, distinguishing two main characteristics: i) technical-methodological aspects, referring to the structure and implementation of the course; and ii) syllabi (summaries) of the disciplines, relating to the description of the curricular components. For analysis, the Nvivo program was used, which made it possible to read the documents and select the Registration Units (RU), excerpts of text that met the analytical criteria defined in the codes.

It is worth noting that it was not the purpose of this research to assign value judgments to the way in which the pedagogical projects analyzed were constructed, nor to their respective courses and educational institutions. To ensure anonymity, when presenting the results of the data analyzed, the CPPs of the institutions will be identified as CPP1, CPP2, CPP3, and CPP4.

FINDINGS AND DISCUSSION

The following topics present an overview of the BTDs in Biological Sciences offered in the state of Bahia, with an emphasis on the relationship between these courses and the region's biomes and the objectives of each course analyzed. Next, the approach to the Caatinga biome and the teaching of botany in the CPPs analyzed is detailed, highlighting the strategies identified for their inclusion in the curricula.

BACHELOR'S TEACHING DEGREE COURSES IN BIOLOGICAL SCIENCES OF BAHIA AND THEIR CONTEXTS WITH LOCAL BIOMES

With the development of this research, it was possible to obtain a current overview of the BTDs in Biological Sciences offered in the state of Bahia and determine the biomes in which they are located (Table 2). In total, 18 courses are offered in the in-person mode, operating in various regions of the state during the period of this research.

Table 2

Bachelor's Teaching Degrees in Biological Sciences in the state of Bahia and their respective biomes: Caatinga (CA), Mata Atlântica (tr.: Atlantic Rainforest) (MA), and/or Cerrado (CE). The order in which the biomes are mentioned refers to their predominance in the region.

Institution	Campus – City	Year of implementation	Biome
Santa Cruz State University (UESC)	Ilhéus	1980	MA
	II - Alagoinhas	2004	MA
State University of Bahia (UNEB)	VI - Caetité	2006	CE; CA
	VII - Senhor do Bonfim	2004	CA
	VIII - Paulo Afonso	2004	CA
	IX - Barreiras	2006	CE; CA
	X - Teixeira de Freitas	2004	MA

Federal University of Bahia (UFBA)	Ondina - Salvador	1946	MA
State University of Feira de Santana (UEFS)	Feira de Santana	1987	MA; CA
State University of Southwest Bahia (UESB)	Itapetinga	2005	MA
	Jequié	1999	MA; CA
	Vitória da Conquista	1999	MA; CA
Bahian Federal Institute of Education, Science, and Technology (IF Baiano)	Guanambi	2020	CA; CE
	Santa Inês	2010	MA
	Serrinha	2018	CA
	Valença	2019	MA
Federal University of Western Bahia (UFOB)	Barreiras	2006	CE; CA
Federal University of Recôncavo da Bahia (UFRB)	Cruz das Almas	2008	MA

Source: Authors' own work (2026), based on data from the e-MEC portal (Brazil, 2024) and the Brazilian Institute of Geography and Statistics (IBGE, 2019a; 2019b).

Out of the 18 BTDs in Biological Sciences identified, 11 (61.1%) are offered by state universities, with UNEB standing out with six campuses offering the course. Next was IF Baiano with four courses (22.2%) at different campuses, these being the most recent. Finally, federal universities offered three courses (16.7%), one at each different institution. Thus, these data highlight the greater contribution of state universities in Bahia in offering BTB in Biological Sciences, as well as that of Federal Institutes in expanding this offer in recent decades.

Regarding the biomes where the identified courses are located, three of them are based exclusively in the Caatinga biome (16.7%) and eight in the Mata Atlântica (44.4%). Considering the courses located in transition regions between two biomes, four are between Caatinga and Cerrado (22.2%) and three between Caatinga and Mata Atlântica (16.7%). Thus, the territory of Bahia belonging to the Mata Atlântica biome is the most representative, with 11 courses (61.1%). Next comes the Caatinga biome, with 10 courses (55.6%), followed by the Cerrado biome, with 4 courses (22.2%). Thus, the contribution of these courses to the training of Biological Sciences teachers in various regions of the state is evident.

Regarding the general and specific objectives of the BTBs in Biological Sciences analyzed, varied objectives were identified that are consistent with the social, economic, and environmental contexts of the locations where they are located (Table 3).

Table 3

Summary of the training objectives of the Bachelor's Teaching Degree courses in Biological Sciences, based on the Course's Pedagogical Projects (CPP).

CPP	Predominant training axes	Articulation with the context	Interpretative summary
CPP1	Integrated scientific and pedagogical training, teaching	Emphasis on practices related to regional socio-environmental	Proposes contextualized and interdisciplinary training, but without

	autonomy, and problem solving.	development.	making specific topics explicit.
CPP2	Critical teaching practice and integration of scientific and pedagogical knowledge.	Valuing of local knowledge, the territory, and the semi-arid region, with interdisciplinary curricular integration.	Reinforces the relationship between teacher training and the territory, although it addresses environmental issues broadly.
CPP3	Teacher as researcher and agent of social transformation.	Flexible curriculum, linking Natural Sciences and Education, in close relationship with the environment.	Values the investigative, interdisciplinary, and contextualized dimension, but without specific focus on local issues.
CPP4	Study of biodiversity and critical knowledge construction.	Integration between teaching, research, and outreach in a multi- and interdisciplinary approach.	Assumes biodiversity as a central axis, but in a generalist and non-territorialized manner.

Source: Authors' own work (2026).

The CPP1 course aims to train graduates with broad scientific and pedagogical knowledge, centered on valuing diversity and plurality of ideas, aiming to develop an autonomous attitude, capable of solving problems and based on creative, investigative, and interdisciplinary processes.

CPP2, in turn, aims to train professionals to work in different educational contexts, capable of articulating technical, scientific, and pedagogical knowledge, with the purpose of student learning and the social development of the territory in which they teach.

CPP3 provides for the training of graduates capable of consciously acting in the transformation of society through educational practices, emphasizing the development of teachers as researchers, as well as the valuing of environmental issues and contextualized and interdisciplinary education.

Finally, CPP4 points to the study of biodiversity as the central axis of the training process, based on interdisciplinary perspectives and the teaching-research-outreach triad as a strategy to expand students' ability to correlate the knowledge they have built with the various areas of human life. Although local environmental aspects are not explicitly outlined in its general objective, a more comprehensive approach is observed throughout the training proposal.

The analysis of the training objectives of the BTDs in Biological Sciences revealed alignment with an educational proposal committed to valuing environmental, social, political, economic, and cultural diversity, in addition to reaffirming the importance of the teaching-research-outreach triad. There was also a connection with the local socio-environmental context and with principles of contextualization and interdisciplinarity. These findings are in line with the study by Silva and Macedo (2020), which points to the concern of courses in the state of Bahia with critical and reflective training from the beginning of the teaching degree

program, in addition to valuing interdisciplinary work as a way to strengthen teaching.

APPROACH TO THE CAATINGA BIOME

To assess the level of approach to the Caatinga biome in the CPPs of the BTDs in Biological Sciences studied, both the technical-methodological aspects and the course syllabi were analyzed. In the first case, CPP2 was the one that most highlighted the biome, describing that the course proposal is adapted to the context of the semi-arid region of Bahia and the Caatinga, aiming to meet local needs. This document also presented the characteristics of the territory of identity where the course is inserted and emphasized the importance of contextualization in the teaching and learning process. Besides, it emphasized aspects such as non-formal education, environmental education, sociocultural diversity, and the valuing of traditional knowings. The inclusion of aspects related to environmental education is one of the possibilities for interdisciplinary discussion on sustainable development and local biodiversity (Prestes & Moço, 2025; Santos & Kataoka, 2022).

CPP1 pointed out the need for more research on the biodiversity of the Caatinga biome, highlighting elements such as the proper use of natural resources, environmental conservation and sustainability, and the training of professionals who meet the characteristics of the regional context. According to Stagg and Dillion (2023), combining teaching practices with the students' local environment makes learning botany more relevant and meaningful, increasing their appreciation for plants. Thus, bringing environmental issues related to sociocultural and economic aspects is a way of bringing the course proposal closer to the students' reality and improving the study and teaching of botany in various educational contexts.

CPP3 did not delve deeply into the biome, only signaling the possibility of graduate students having contact with curricular components related to the local context. Similarly, CPP4 pointed out that the course was organized in a way that valued local biodiversity in a contextualized manner, without explaining how this could be done. Azevedo and Petrucci-Rosa (2023) state that there is institutional conservatism that permeates teacher training courses, hindering more profound curricular changes, especially regarding overcoming rigid disciplinary organization. Even in the face of educational guidelines and policies that advocate training focused on the reality of students, teaching still remains, in many cases, fragmented and distant from everyday school life.

About the syllabi of the courses analyzed, only CPP4 offered a specific course focused on the Caatinga biome, offered as an elective component. In this course, the content addressed general aspects of the biome and its main plant characteristics, with an emphasis on the botany of the Caatinga. The other CPPs did not include courses with an explicit focus on this biome, which reveals an important gap in the initial training of teachers to work with regional biodiversity.

CPP1 included content on Caatinga conservation in courses on teaching practices and biogeography. CPP2 also proposed this same content, adding aspects of sustainable productive management of local agroecosystems in one of the

mandatory components of the degree. CPP3 did not mention content specifically related to the Caatinga biome.

As for the possibilities of including topics related to the Caatinga biome, in general, the courses in the areas of Ecology, Botany, and Geography were the ones that most closely approached discussions about biomes, bringing content such as biodiversity, agroecology, the environment, adaptive strategies of plants, ethnobotany, and semi-arid landscapes, among others.

The pedagogical curriculum components also present possibilities for addressing topics related to the Caatinga biome. Supervised internships and final course projects, for example, have a high workload, are mandatory, and can foster the development of projects related to the local biome in a contextualized manner.

Thus, both the proposals materialized in specific biological disciplines and those related to education and complementary activities are opportunities for discussions about the Caatinga biome in undergraduate courses. For Melo et al. (2023), educational initiatives are of fundamental importance for the dissemination of knowledge about the Caatinga biome.

Given these data, it is possible to perceive the presence of elements related to the contextualization of knowledge, interdisciplinarity, and appreciation of the biome and the local context in the proposal and justification of the courses. However, these issues do not appear equally in the courses and program content, with the exception of CPP4, which addressed the theme in greater depth than the others.

APPROACH TO THE TEACHING OF BOTANY

To identify the approach to teaching botany—discussions about teaching and learning practices in the area—in the CPPs analyzed, in relation to the syllabi, there was no course directly related to the teaching of botany. In this context, CPP4 stood out, indicating the offer of courses on the botany of the Caatinga biome and on the teaching of other specific areas of knowledge, such as cell biology and chemistry, as optional components.

Discussions related to teaching, in general, in the documents analyzed, were restricted to courses in the area of Education, with a few exceptions in which the syllabus of courses related to the area of Natural Sciences presented content related to teaching. These cases appear mainly in CPP3, in which some botany courses explicitly presented content related to pedagogical practices, such as the discussion of teaching materials and content planning involving playfulness. This same proposal appeared in other specific courses of the degree, such as Zoology, Human Histology, Microbiology, in addition to Botany, as mentioned. In the other CPPs, this proposal also appeared, but less frequently: in CPP1 in the Geology course and in CPP2 in Geology and Biochemistry.

It is worth noting that CPP1 presented courses on teaching practices, each emphasizing topics from the National Common Curriculum Framework (BNCC): Inclusive Education, Digital Information and Communication Technologies (TDICs), Matter and Energy, Life and Evolution, Life, Earth and Cosmos, Environmental Education, and Ecology and the Environment. Although they emphasized the

discussion of teaching strategies for each specific area of elementary and high school education, none of them explicitly mentioned the teaching of botany. Regarding the technical and methodological aspects of the CPPs analyzed, none of them explicitly mentioned the teaching of botany.

Based on the data obtained, it was evident that CPPs 1 and 3, updated in accordance with the National Common Framework for Initial Training of Basic Education Teachers (BNC-Formação), presented a greater amount of content related to teaching compared to the non-updated CPPs. The strategy adopted by CPP1 was to create courses on teaching practices, addressing topics related to the BNCC, and that of CPP3 was to insert content on teaching in some Natural Science courses. Even so, discussions on the teaching of botany appeared explicitly only in CPP3, in some botany courses.

Several factors influence the quality of botany teaching within BTDs in Biological Sciences, such as current legislation, course workload, and institutional infrastructure (Castro et al., 2023). The historical development of botany in Brazil, which emphasized discussions on the more classical subareas, contributed to the devaluation of didactic approaches in the field, whose repercussions in the academic environment are still neglected (Barbosa, 2019).

Teacher training in Brazil is characterized, in most courses, by its technical nature and the fragmentation of teaching into units responsible for specific content in the field and others for pedagogical aspects, hindering an in-depth approach to the teacher's role in teaching botany (Barbosa, 2019). Teaching performance depends on knowledge related to content and pedagogy. However, these dimensions need to be articulated during the training process, and it is not only up to students to correlate them (Barbosa, 2019).

In addition, most of the teachers who teach undergraduate courses are the same ones who teach bachelor's degree courses, promoting the development of studies and discussions focused on the more technical and classical areas of botany, to the detriment of its approach in the educational field (Marchioretto & Moço, 2024).

The common national standards for both basic education and teacher training value the development of skills and competencies connected to contextualized and interdisciplinary teaching (Prestes et al., 2023). In this context, society's appreciation of plants in recent years, related to human well-being, the ecosystemic role of plants in reversing climate change, among other themes, can serve as bridges for the construction and appreciation of botanical knowledge (Burke et al., 2022). This dialogue between current educational guidelines, coupled with the growing appreciation of plants in everyday life, can contribute positively to the teaching of botany, since, regardless of the curricular component being worked on, topics related to plants can be discussed.

The updating of the curriculum for teacher training courses, in accordance with the BNC-Formação, is taking place gradually and will take time to align more closely with the basic education curriculum (Castro et al., 2023). The training of teachers for basic education requires a commitment from those involved in student learning and, in the specific case of the implementation of BNC-Formação and discussions on the teaching of botany in this context, interdisciplinary work emerges as a potential (Prestes & Moço, 2025). Thus, teaching botany in BTDs in

Biological Sciences goes beyond considering what is written in the pedagogical projects; it requires commitment from teachers, students, and institutions to value the course and include it through contextualized and interdisciplinary practices.

ARTICULATION BETWEEN THE TEACHING OF BOTANY, THE CAATINGA BIOME, AND CURRICULAR CONTEXTUALIZATION

The levels of approach between the teaching of botany, the Caatinga biome, and the relationship between the two (Table 4) were defined based on recurrence, conceptual explicitness, and curricular articulation of the themes in the CPPs analyzed.

Table 4

Level of approach to the Caatinga biome, botany teaching, and contextualization in the analyzed Course's Pedagogical Projects (CPP).

CPP	Caatinga biome	Teaching of botany	Contextualization
CPP1	Partial	Not addressed	Partial
CPP2	Extensive	Not addressed	Extensive
CPP3	Little	Partial	Partial
CPP4	Extensive	Little	Partial

Note: Not addressed: the topic does not appear in the CPP; Little: appears sporadically or indirectly; Partial: appears clearly, but not structurally; Extensive: appears repeatedly and articulately.

Source: Authors' own work (2026).

It can be observed that the theme of the Caatinga biome is widely covered in CPPs 2 and 4, albeit in different ways, with greater emphasis on the technical-methodological plan in the former and on the syllabus of the disciplines in the latter. In contrast, CPP1 addresses the biome partially and CPP3 in an insignificant manner. About the teaching of botany, the analysis reveals a weakness common to the documents, with the absence of this discussion as a structured training axis, appearing only partially in CPP3 and in an incipient manner in CPP4.

As for contextualization, although all CPPs present some level of articulation with the local and territorial context, only CPP2 assumes it as an element widely addressed in the training proposal, while the others incorporate it partially. These findings reinforce the existence of a mismatch between the discourse of valuing the socio-environmental context and its effective translation into the curriculum, especially regarding the teaching of botany linked to the Caatinga biome.

A study conducted by Castro et al. (2023), analyzing indicators of botany teaching related to specific content in the area at public universities in Bahia, pointed to operational difficulties in working with botany content, highlighting: the reduction in the number and workload of disciplines, the insufficient number of teachers in the area, the inadequacy of teaching methods, and the scarcity of botany laboratories.

Given the lack of approaches related to the teaching of botany in the context of the Caatinga biome in the CPPs analyzed, some possibilities for the inclusion of this theme were outlined. This is the case for pedagogical practice courses, such as supervised internships, mandatory extension practices, final course projects, and complementary activities, in addition to courses in the field of Botany and Biological Sciences in general. All stages of the BTDs in Biological Sciences are important and appropriate for the inclusion of topics related to the teaching of biology, including botany and the discussion of local biodiversity.

The development of interdisciplinary projects is important in the approach to teaching about Caatinga plants due to the ability of these actions to reach diverse audiences and foster the construction of knowledge in a way that is contextualized to local demands (Vale et al., 2022). Such actions can be carried out within the scope of different curricular components, even if the topic discussed is not explicit in the course's curricular proposal, as they provide direct contact between teacher training students and the object of study and the construction of knowledge through teaching, research, and extension.

The data discussed here regarding the approach to teaching botany also allow us to (re)think the teaching of other areas of knowledge. Despite the constant advances achieved through the updating of the guidelines governing teacher training, there are still adjustments to be made, such as the balanced resizing of pedagogical and specific content, in addition to the improvement of the work developed in the disciplines of methodology for teaching science and biology (Medeiros & Medeiros, 2020). These two dimensions, which are equally important in teacher training, need to be articulated during the course, and it is not only up to the student to do so, but the entire training dynamic needs to be committed to this task.

Finally, it is important to emphasize the importance of a contextualized and interdisciplinary approach in the teaching of botany, intertwining students' prior knowledge with scientific discussions, pedagogical practice, and appreciation of the local context where these processes occur. This promotes more meaningful and motivating teaching and learning practices, resulting in the training of teachers who are skilled not only in the specific content of the area, but also in pedagogical knowledge and the articulation between the two. These aspects are fundamental for the dissemination of knowledge about local flora, in the case of this research, that of the Caatinga biome, to be valued in teacher training courses and, consequently, at various levels of education.

FINAL CONSIDERATIONS

This study analyzed the CPPs of BTDs in Biological Sciences located in the Caatinga biome, in the state of Bahia, Brazil, aiming to understand how the Caatinga biome and the teaching of botany are addressed. The findings indicate that, although the CPPs recognize the local territorial context as a justification for implementing the courses, the explicit approach to the Caatinga biome is not consolidated as a formative axis. Similarly, the teaching of botany has low curricular insertion, with discussions on pedagogical practices identified on an ad hoc basis. Furthermore, the articulation between the teaching of botany and the Caatinga biome proved to be limited.

The hypothesis suggested in this study that the curriculum for teacher training in Biological Sciences addresses the teaching of botany and the Caatinga biome in a sporadic and fragmented manner, with limited contextualized integration, was confirmed, since, although contextualization and interdisciplinarity are themes present in the objectives of the courses analyzed, such proposals do not appear in the same way in the syllabi of the disciplines, which guide the work of teachers.

Several possibilities were identified as proposals for improving the inclusion of the Caatinga biome and the teaching of botany in teaching and learning practices: specific courses in the areas of Botany, Ecology, and Geography, curricular components of pedagogical practices, supervised internships, and course completion work, as well as extracurricular activities. It is important to emphasize the need for teacher trainers to be active agents in this process, committed to issues that do not always appear explicitly in the curriculum, in addition to students and institutional initiatives to propose actions consistent with local needs.

Considering that not all the elements described in the CPPs are, in fact, implemented in practice, and that not all the activities developed therein are present in the documents analyzed, this research did not cover the analysis of the concrete practices developed in the courses in relation to the themes investigated. Thus, we highlight the need for studies that investigate the practices of teachers and teacher trainees linked to the approach to botany in the Caatinga biome. In addition, we also highlight the relevance of conducting studies in other biomes, whose comparative analyses can broaden the understanding of the investigated theme.

Bahia's public higher education institutions play a fundamental role in the production of knowledge, as well as in teacher training. The institutions surveyed stand out for their excellence in performing the above-mentioned roles, contributing to the internalization of higher education and the provision of free, quality public education in historically neglected regions. In addition, these institutions also contribute to the production of knowledge about the Caatinga and to social, cultural, environmental, and economic development.

It is hoped that the data and reflections presented here will contribute to the construction and/or revision of more contextualized initial teacher training curricula, in order to value local plant biodiversity, especially that of the Caatinga biome, the focus of this study, with a view to popularizing botanical knowledge. In addition, it is also hoped that this work will inspire the design of strategies for teaching botany based on local flora and assist in the development of new studies on the discipline.

ACKNOWLEDGEMENTS

We would like to thank the Postgraduate Program in Botany at the Federal University of Rio Grande do Sul (UFRGS), as well as the Research Group on Interdisciplinarity in Science Education (GPIEC). This work was carried out with the support of the Coordination for the Improvement of Higher Education Personnel - Brazil (CAPES) - Funding Code 001.

NOTES

1. This paper was translated by Igor dos Santos Mota (E-mail: i.dossantosmota@derby.ac.uk).

REFERENCES

- Andriotti Junior, M. A. A., Marchioretto, R. M., Prestes, R. M., & Moço, M. C. C. (2025). Percepção de licenciandos de ciências biológicas sobre a formação botânica. *ACTIO: Docência em Ciências*, 10(1), 1-18. <https://doi.org/10.3895/actio.v10n1.18981>
- Azevedo, L. M., & Petrucci-Rosa, M. I. (2023). Uma revisão de literatura sobre interdisciplinaridade, currículo e formação docente em física. *Investigações em Ensino de Ciências*, 28(2), 193-217. <https://doi.org/10.22600/1518-8795.ienci2023v28n2p193>
- Barbosa, P. P. (2019). *Licenciatura EAD em ciências e biodiversidade vegetal: Bases de conhecimento docente, crenças de formadores, percepções e produções de estudantes*. [Tese de doutorado]. Universidade de São Paulo.
- Bardin, L. (2016). *Análise de conteúdo* (Edição revista e ampliada). Edições 70.
- Boaventura, E. M. (2009). *A construção da universidade baiana: Origens, missões e afrodescendência*. EDUFBA. <https://doi.org/10.7476/9788523208936>
- Brasil. Ministério da Educação. (2024). *Instituições de educação superior e cursos cadastrados: Sistema e-MEC*. <https://emec.mec.gov.br/emec/nova>
- Burke, R., Sherwood, O. L., Clune, S., Carroll, R., McCabe, P. F., Kane, A., & Kacprzyk, J. (2022). Botanical boom: A new opportunity to promote the public appreciation of botany. *Plants, People, Planet*, 4(4), 326–334. <https://doi.org/10.1002/ppp3.10257>
- Castro, D. R., Santos, F. A. R., Caetano, R., Santana, R. C., & El-Hani, C. N. (2023). Indicadores do ensino de botânica nos cursos de ciências biológicas das universidades públicas baianas: Implicações para a formação inicial docente. *Investigações em Ensino de Ciências*, 28(2), 402–420. <http://dx.doi.org/10.22600/1518-8795.ienci2023v28n2p402>
- Fazenda, I. C. A. (1995). *Interdisciplinaridade: História, teoria e pesquisa* (2ª ed.). Papirus.
- Gil, A. C. (2017). *Como elaborar projetos de pesquisa*. 6. ed. Atlas.

- Instituto Brasileiro de Geografia e Estatística (IBGE). (2019b). *Cidades e estados do Brasil*. IBGE. <https://cidades.ibge.gov.br/>
- Instituto Brasileiro de Geografia e Estatística (IBGE). (2019a). *Biomass e sistema costeiro-marinho do Brasil: Compatível com a escala 1:250 000*. IBGE. <https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=2101676>
- Kato, D. S., & Kawasaki, C. S. (2011). As concepções de contextualização do ensino em documentos curriculares oficiais e de professores de ciências. *Ciência & Educação (Bauru)*, 17, 35–50. <https://doi.org/10.1590/S1516-73132011000100003>
- Marchioretto, R. M., & Moço, M. C. C. (2024). A prática de docentes universitários no ensino de botânica para a formação inicial de professores de ciências da natureza. *Revista Brasileira de Pesquisa em Educação em Ciências*, 24(1), 1-26. <https://doi.org/10.28976/1984-2686rbpec2024u126>
- Medeiros, E. A., & Medeiros, M. L. S. (2020). Licenciaturas em ciências biológicas: Análise de currículos de formação de professores para o ensino de ciências e biologia. *Revista Ibero-Americana de Estudos em Educação*, 15(4), 1967–1990. <https://doi.org/10.21723/riaee.v15i4.13642>
- Melo, J. O., Medeiros-Dantas, R., Moreira, L. G. L., Giordani, R. B. & Zucolotto, S. M. A. (2023). Caatinga: um bioma exclusivamente brasileiro. *Cienc. Cult.* 75(4). <http://dx.doi.org/10.5935/2317-6660.20230048>
- Mota, A. M. Jr., & Torres, H. C. (2017). Educação superior no estado da Bahia: Contexto histórico e expansão da oferta. *Plurais – Revista Multidisciplinar*, 2(2), 83–106. <https://doi.org/10.29378/plurais.2447-9373.2017.v2.n2.83-106>
- Prestes, R. M., & Moço, M. C. C. (2025). O ensino de botânica em uma perspectiva da Base Nacional Comum Curricular e da formação inicial de professores. *Educação*, 50(1), 1–24. <https://doi.org/10.5902/1984644470607>
- Prestes, R. M., Severo, I. W., & Moço, M. C. C. (2023). Ensino de botânica interdisciplinar: Possibilidades e desafios frente aos anos finais do ensino fundamental. *Revista Insignare Scientia – RIS*, 6(6), 77–101. <https://doi.org/10.36661/2595-4520.2023v6n6.13338>
- Santos, C. R., Moreira, L. S., Lauriano, M. P., Silva, L. B., & Corte, V. B. (2021). O ensino de botânica na formação de professores de biologia: Por que é urgente reformular teoria e prática? *ACTIO: Docência em Ciências*, 6(1), 1-22. <https://doi.org/10.3895/actio.v6n1.11490>
- Santos, D. A., & Kataoka. (2022). Uma investigação sobre a incorporação da educação ambiental nos currículos do curso de ciências biológicas. *ACTIO: Docência em Ciências*, 7(3), 1-17. <https://doi.org/10.3895/actio.v7n3.14716>

- Silva, W. J., & Macedo, G. E. (2020). Os cursos de licenciatura em ciências biológicas nas universidades estaduais da Bahia: Histórico e o perfil do egresso que se deseja formar. In *Anais do V° CONAPESQ*, Campina Grande. Realize Editora. <https://editorarealize.com.br/artigo/visualizar/73038>
- Souza, H. F. (2015). *Política de educação profissional e tecnológica e desenvolvimento territorial: Análise do Instituto Federal Baiano no contexto do semiárido da Bahia, Brasil* [Tese de Doutorado]. Universidade Estadual de Campinas.
- Stagg, B. C., & Dillon, J. (2023). Plants, education and sustainability: Rethinking the teaching of botany in school science. *Journal of Biological Education*, 57(5), 941–943. <https://doi.org/10.1080/00219266.2023.2264617>
- Tabarelli, M., Leal, I. R., Scarano, F. R., & Silva, J. M. C. (2018). Caatinga: Legado, trajetória e desafios rumo à sustentabilidade. *Ciência & Cultura*, 70(4), 25–29. <http://dx.doi.org/10.21800/2317-66602018000400009>
- Vale, J., Sudério, F. B., Paiva, A. B., & Sousa, A. F. (2022). Plantas da Caatinga: Contextualizando os conteúdos de botânica. *ForScience*, 10(1). <https://doi.org/10.29069/forscience.2022v10n1.e1012>

Received: Jun. 27, 2025
Approved: Feb. 14, 2026
DOI: <https://doi.org/10.3895/actio.v11n1.20458>

How to cite:

Souza, E. B. de; Prestes, R. M.; & Moço, M. C. de C. (2026). Botany and caatinga biome teaching in the pedagogical projects of bachelor's teaching degrees in biological sciences. *ACTIO*, 11(1), 1-18. <https://doi.org/10.3895/actio.v11n1.20458>

Copyright: This article is licensed under the terms of the Creative Commons Attribution 4.0 International Licence.



Recebido: 27 jun. 2025

Aprovado: 14 fev. 2026

DOI: <https://doi.org/10.3895/actio.v11n1.20458>

Como citar:

Souza, E. B. de; Prestes, R. M.; & Moço, M. C. de C. (2026). Ensino de botânica e do bioma caatinga nos projetos pedagógicos de licenciaturas em ciências biológicas. **ACTIO**, 11(1), 1-18.

<https://doi.org/10.3895/actio.v11n1.20458>

Direito autoral: Este artigo está licenciado sob os termos da Licença Creative Commons-Atribuição 4.0 Internacional.

