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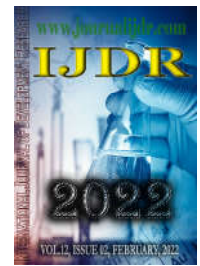
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RESEARCH ARTICLE

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EDUCATIONAL STRATEGIES TO OVERCOME “BOTANICAL BLINDNESS” IN BASIC EDUCATION

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ABSTRACT

The term “botanical blindness” refers to people’s inability to perceive plants in the environment, which may be related to the existence of students who show little interest in the subjects of Botany in Basic Education. Thus, this research aims to understand the conceptions of Basic Education teachers about teaching Botany, as well as to create practical class guide in order to reduce “botanical blindness” in Elementary and High Schools. The online questionnaire was used as a method for data collection, it was answered by Science and Biology teachers from the State of Maranhão, Brazil. In view of their experiences, the teachers mentioned as the most complex contents of Botany for their students to learn were: physiology (23.61%); morphology (15.79%) and taxonomy (13.16%). Teaching Botany requires methodological strategies capable of promoting the relationship between humans and plants, seeking ways and means to facilitate the teaching-learning process and make it meaningful for the student. Therefore, the most feasible strategies were: practical class in the field, practical class in the laboratory, didactic games and didactic models.

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INTRODUCTION

Plants are important for the maintenance of life on Earth: they have a wide variety of forms and diverse functions directly linked to the survival of many species. Plants can have functions for medicine, for environmental and ecological balance. Furthermore, the economic values of plants such as wheat, rice and corn are very high, as they are the most important agricultural crops on the planet (SALATINO; BUCKERIDGE, 2016). Botany is an area of biological Sciences that studies plant and algae life. Researchers on teaching Botany agree that there are students who show dismay to expand their knowledge about plants, which justifies works on this theme (BATISTA; ARAÚJO, 2015). In Brazil, the concern with teaching Science is old and researchers have already highlighted the challenge of teaching this discipline since 1937 (KATON; TOWATA; SAITO, 2012). The authors Wandersee and Schussler (2001) used the term “botanical blindness” to refer to people’s lack of interest in plants. Although they are in our daily lives, many people lack the ability to perceive and notice the plants in our surroundings, which results in a certain inability to identify the importance of Botany for human beings and perceive plants in their daily lives (KATON; TOWATA; SAITO, 2012). Baptista (2010) reports that the teaching Science became mandatory after the enactment of the “Law of Directives and Bases”

(Law number 4.024/1961) in Brazil, in the 1960s. This is the legislation that regulates the educational system (public or private) in Brazil (BRASIL, 1996). In this context, the teaching Science and Biology is systematized in order to prioritize the study of concepts, languages and methodologies in these areas of knowledge. Therefore, the teaching-learning process must take into account the interpretation of everyday life. The National Common Curriculum Base is a Brazilian educational document that presents changes for Brazilian education by strengthening the idea of the students as protagonists of knowledge. In addition, this document promotes the insertion of technologies and emphasizes the importance of using up-to-date materials that are in line with the students’ reality (BRASIL, 2018). Teaching strategies based on content that is difficult to understand, with scientific names and words that are out of the student’s daily life implies difficulties for students to build knowledge related to Botany for culture, economy and ecology. According to the Brazilian Curriculum Parameters (BRASIL, 2001), the teaching Science must collaborate to the construction of critical, reflective and investigative skills, which are important for the formation of citizens. Students may consider Botany complex, especially if the content is taught mainly in an expository way. Teaching based on shallow explanations results in students’ lack of interest, so the search for innovative pedagogical strategies has helped to arouse students’ curiosity and interest (SILVA *et al.*, 2015; ARAÚJO *et al.*, 2021). Therefore, it is necessary

to innovate and seek alternatives for each learning situation, for example: practical classes, projects, games, elaboration of didactic models, etc. In parallel, preparing classes and practical guide as a methodology are crucial in the construction of Botanical knowledge, resulting in the reduction of “botanical blindness”, as it contributes to scientific training, in addition to stimulating observation, manipulation and construction of models (SILVA *et al.*, 2015). The proper use of innovative strategies for teaching Botany can break the vicious circle in which future teachers have insufficient training in Botany and therefore cannot motivate students to learn the subject, aggravating “botanical blindness” (SALATINO; BUCKERIDGE, 2016). Breaking this vicious circle is fundamental for valuing the discipline in Brazil and may have implications for the formation of conscious citizens about the importance of biodiversity (KINOSHITA *et al.*, 2006). The present work aims to verify the conceptions of Basic Education teachers about teaching Botany, as well as to develop a guide to contribute to the understanding of the importance of Botany, in order to reduce “botanical blindness” in school environments.

MATERIALS AND METHODS

This research has a qualitative approach, that attributes value to the statements of the research participants, the expressions and meanings presented by them (VIEIRA; ZOUAIN, 2005). This type of analysis is based on theoretical-empirical knowledge that allows assigning scientificity. A bibliographical review was elaborated based on the systematic survey of theoretical references and published by written and electronic means (FONSECA, 2002; GIL, 2002). Scientific papers, articles, textbooks and books were surveyed based on the following descriptors: “botanical blindness”, “educational strategies”, “teaching strategies to overcome botanical blindness”, accessed in the “Google Academic” (scholar.google.com.br) database, between 2001 and 2021.

Verification of teachers’ conceptions about “Botanical Blindness”: Data collection was carried out by sending an online questionnaire, on the “Google Forms” (docs.google.com) platform to Science and Biology teachers from schools in municipalities in the State of Maranhão, Brazil, containing 15 questions. The questionnaire contained open and closed questions. The period for collecting responses was from March to April 2021. Teachers who participated in the survey were able to rate each educational strategy on a scale from 1 to 5, with level 5 meaning greater feasibility of the strategy. The various methodologies that teachers use in order to help students in the process of knowledge construction were considered feasible teaching strategies, being essential to improve the students’ performance, allowing them to visualize the content and see them in their daily lives. All participants in this research affirmed their participation through the Informed Consent Form.

Preparation of a practice guide in Botany: teaching strategy to overcome “Botanical Blindness”: In order to increase the interest of students in Botany, a practical class guide was created, for use in both Elementary and High Schools, according to the educational strategies indicated by the teachers interviewed in the research. The practical class guide includes practical lessons in the laboratory. After analyzing the responses to the questionnaires, the themes considered complex by the teachers were selected for the practical class guide. The guide will collaborate with teachers to expand their ways of exposing contents related to Botany. The selected themes were: scientific terms, visualization/ identification of plant structures and the importance of plants in everyday life.

RESULTS

Teachers’ conceptions about the Teaching Botany: Thirty-five Science and Biology teachers from 9 (nine) municipalities in the Maranhão State, Brazil (Figure 1) participated in the research. Most of the survey participants were women (60%) and more than half

aged between 20 and 30 years (54,3%). Regarding professional performance, 82.86% had worked at public schools, 2.86% at private schools and 14.29% at both. Most teachers responded that they worked at Elementary School in the final years (6th to 9th grade) (77.1%) (Figure 2).

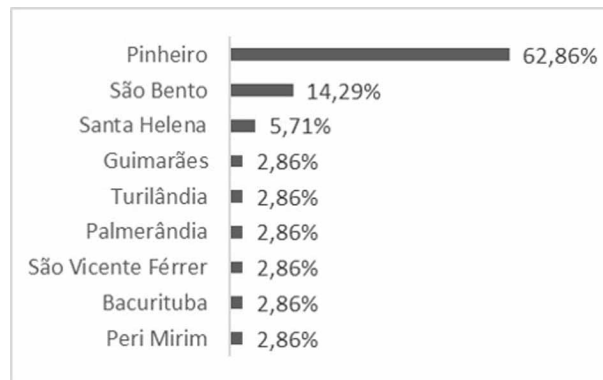


Figure 1. Percentages of citations regarding the cities of origin of the teachers from Maranhão

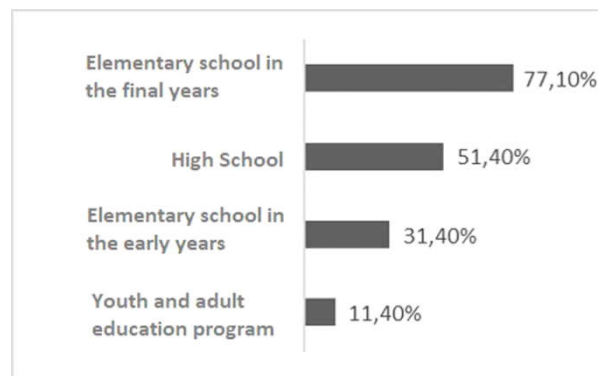


Figure 2. Percentages of citations regarding teacher professional performance

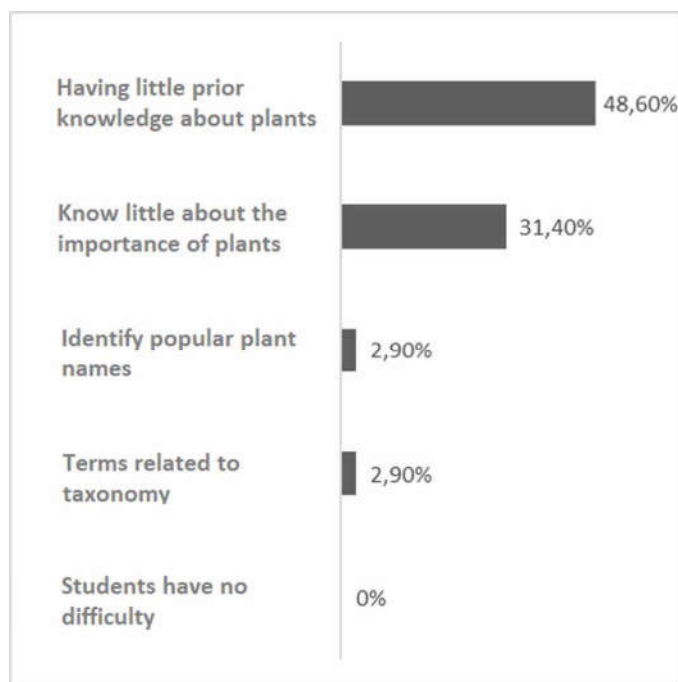


Figure 3. Percentages of citations regarding the difficulties presented by the students in contents related to Botany

The first question was about student participation in classes with contents related to Botany, Zoology or whether participation was the same for these subjects.

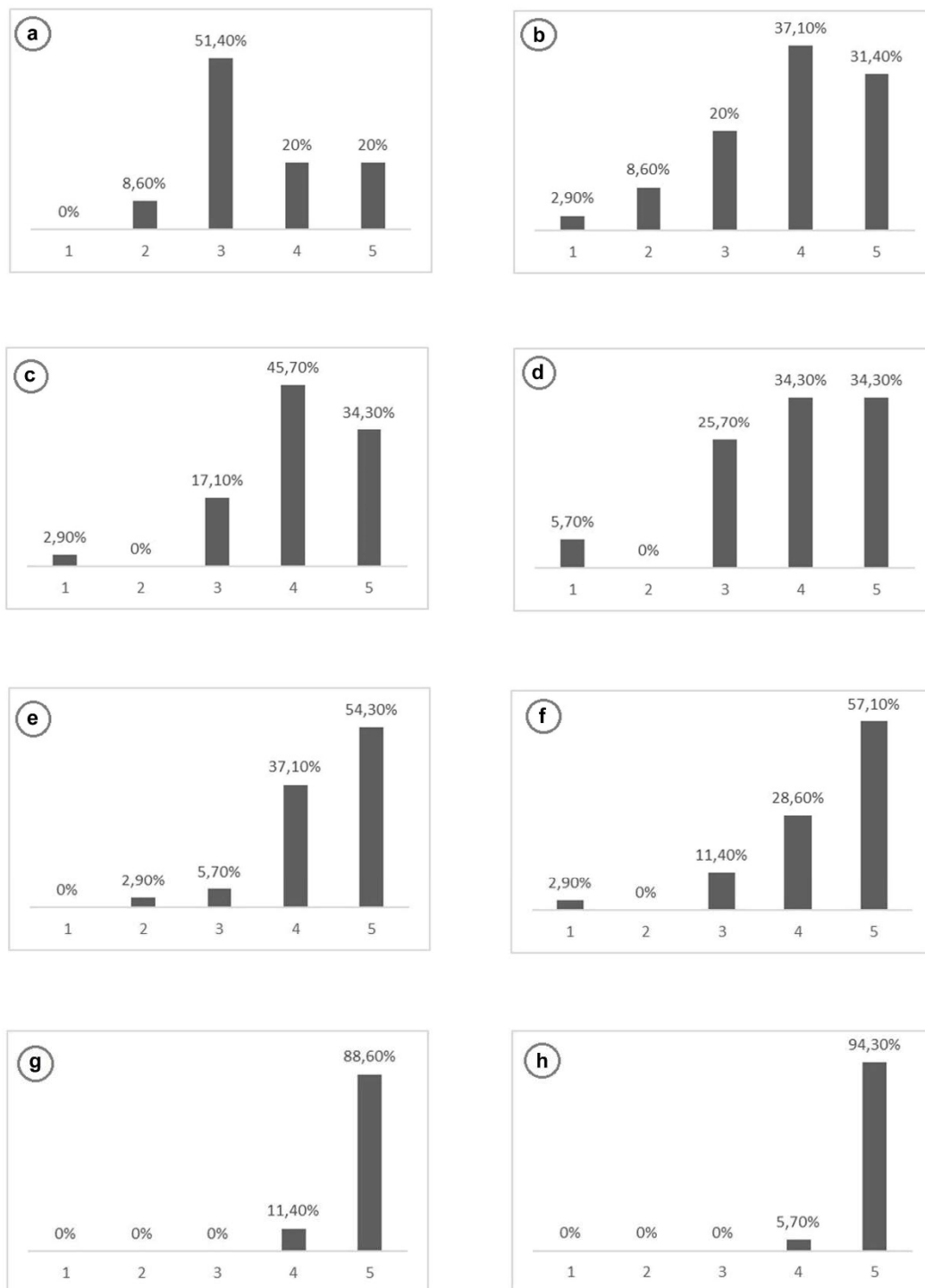


Figure 4. Percentages of citations regarding didactic strategies (X axis – scale from 1 to 5 in which teachers used to evaluate educational strategies, level 5 represents better evaluation). A: didactic textbook; B: reading specialized magazines; C: watch videos/documentaries; D: reading scientific content on blogs and social networks; E: use didactic model; F: use educational games; G: practical class in the laboratory; H: practical class in the field

It was found that students tend to have the same participation in both contents (62.86%). Contents related to Zoology had a higher percentage of student participation (28.57%) than Botany (8.57%). According to the interviewed teachers, one of the main difficulties for students to understand Botany themes is the use of scientific terms (from Latin or Greek) (Figure 3). In view of their experiences, the teachers mentioned as the most complex contents of Botany for their students to learn: physiology (23.61%) and morphology (15.79%), they also pointed out taxonomy (13.16%), photosynthesis (13.16%), histology (13.16%), scientific names (10.53%), reproduction (7.89%) and pollination (2.63%).

Strategies for Teaching Botany: Teachers were asked about the uses of educational strategies and their feasibility in teaching Botany. Teachers' conceptions of some popular educational strategies appear in Figure 4. Therefore, the most feasible strategies in this research are identified as those with the highest percentages of feasibility at level 5, in the following order: practical class in the field, practical class in the laboratory, didactic games and didactic models. Based on their experience in the classroom, the teachers stated that Botany can be perceived as part of the students' daily lives through practical classes, using educational strategies, such as the field class, which are ways to

promote this understanding. According to some reports from teachers in their responses to the questionnaire:

"The field class gives us support for better understanding of some Botanical terms". (P09)

"As the student observes the real importance of plants for the survival of living beings the student can then be induced to recognize botany as part of their daily lives. And one of the best ways is through real contact. Field lessons for example." (P25)

Strategies for Teaching Botany: Teachers were asked about the uses of educational strategies and their feasibility in teaching Botany. Teachers' conceptions of some popular educational strategies appear in Figure 4. Therefore, the most feasible strategies in this research are identified as those with the highest percentages of feasibility at level 5, in the following order: practical class in the field, practical class in the laboratory, didactic games and didactic models. Based on their experience in the classroom, the teachers stated that Botany can be perceived as part of the students' daily lives through practical classes, using educational strategies, such as the field class, which are ways to promote this understanding. According to some reports from teachers in their responses to the questionnaire:

Thus, the educational product, a practical class guide, were elaborated with the intention to facilitate the understanding of content which the students have difficulty, such as scientific terms, morphology, identifying plants in daily life and their importance in order to reduce "botanical blindness".

Practical class guide: This class guide was elaborated according to the needs of practical classes in the laboratory, aiming to expose the importance of plants and their variety of species, as well as applying botanical terms. For schools that do not have a laboratory, this guide will help them with alternative materials.

Class guide: Plant exhibition

1. Teachers should introduce plants and their importance for sustaining life.
2. The materials are: Varied plants; Tea leaves; Vegetables; Spices.
3. These materials must be arranged on a bench, or table, where students can visualize their structures and smell possible odors.
4. Next, the teacher should present the structures of plants, demonstrating through the samples how they are present in everyday life and functions/characteristics of vegetative and reproductive organs.
5. At the end, the teacher will ask the students to write a practical class report. With the following structure: Cover; Introduction (two paragraphs); Materials and methods (all material used in practice, how it was used, etc.); Results: making drawings, in which the students would identify the structures presented by the teacher in vegetative and reproductive organs; Conclusion (two paragraphs) and References.

DISCUSSION

According to Souza *et al.* (2017), the contents focused on Botany were and still are an obstacle in the classroom. This happens, *a priori*, because the student does not establish a relationship between plants and their daily lives. This is explained not only by the strategies used, but also by the ways in which some people have difficulties in identifying the importance of plants. Furthermore, human beings tend to perceive and recognize animals in nature more quickly (KATON; TOWATA; SAITO, 2012), such evolutionary facts contribute to Botany being one of the most complex fields of understanding and assimilation of content (COSTA; DUARTE; GAMA, 2019). The vast vocabulary of scientific terms makes it difficult for students to understand and sometimes the classes do not reach the expected

performance (KRASILCHIK, 2004). Other difficulties pointed out were the identification of plant structures and having little prior knowledge about plants, as well as knowing little about their importance. Silva, Cavalcante, Xavier and Gouveia (2019), stressed the importance of knowledge in Botany, the understanding of this area and its relevance for the maintenance of life on Earth, however, the lack of this knowledge causes great damage, encouraging "botanical blindness". Sometimes, Biology teaching, in general, is based on traditional methods, which are based on the memorization of contents. The excess of nomenclatures and concepts used in the classroom without relating them to the student's context, make them believe that Biology is just a grouping of difficult names and concepts (MACEDO *et al.*, 2005). According to Batista and Araújo (2015), it is observed that teaching Botany, due to scientific terms and subjects considered complex, becomes of no interest to students if taught in a boring way, as it focuses on complex concepts and names, for sometimes restricting teaching to theoretical, based on repetitions.

Strategies for Teaching Botany: Teaching Botany requires methodological strategies capable of promoting the relationship between humans and plants, seeking ways and means to facilitate the learning process and make it meaningful for the student (MELO *et al.*, 2012). For Krasilchik (2004), the textbook has a relevant role in classrooms, considering that it establishes the content to be worked on, in addition to being one of the main resources available to teachers and students. It is up to the teacher to analyze and reflect how far the textbook achieves the teaching and learning objectives of students (RODRIGUES; DELLA JUSTINA; MEGLIORATTI, 2011).

According to Freitas *et al.* (2011), the realization of didactic games in classes, allow students to experience different environments, as it presents itself as a didactic resource that offers a better understanding of the subject, relating the content to something pleasant and pleasurable. In addition, didactic models enable visualization and experimentation, allowing students to assimilate and understand the content more easily (SETÚVAL; BEJARANO, 2009). Among the strategies, the use of scientific divulgation on blogs and social networks was mentioned (Figure 7). Scientific divulgation seeks to popularize access to science studies and research, as well as inserting the community in discussions about scientific issues, and blogs and social networks expand this dissemination (VICENTE; CORRÊA; SENA, 2015). Scientific divulgation can also occur through videos and in this case the use of videos as an educational strategy encourages students to understand, in addition to enabling students to build their knowledge (RAMOS; PEREIRA; SILVA, 2019).

According to Borges *et al.* (2020), experimental laboratory practices attract students because it occurs in a different environment from the classroom and because it provides teaching and learning, not only in Botany, as it stimulates students' attention, it develops the ability to observe and store information and understand scientific concepts. The field class in Brazil has been changing over the years due to the sociopolitical and educational scenario. The objectives of this educational strategy were also modified, at a certain point the educators investigated the understanding of flora, fauna and the environment interconnecting the ecosystems around them. On other occasions, they aimed to make the student relate the environment in which they live and the practice of citizenship. Despite the different objectives, there is the same intention to provide students with the possibility of experiencing knowledge (TREVISAN; SILVA-FORSBERG, 2014). The practical class in the field causes assimilation, aesthetic perception and student interest in plants, stimulating the construction of knowledge in the school environment, the search for explanations and more conscious behavior with the environment (SILVA, 2008). There are still students who show little interest in the subjects of Botany in Basic Education. In order to transform this reality, approaches, together with educational strategies, enable understanding, in addition to making the subject more interesting for the student (KATON; TOWATA; SAITO, 2012). Therefore, the most feasible strategies in this research are identified as those with the highest percentages of feasibility at level 5, in the following order: practical class in the field, practical class in the

laboratory, didactic games and didactic model. Seniciato and Cavassan (2004) stated that the various strategies, such as the field class in Science and Biology classes, have positive points, as they lead students to experience what they study, in addition to being a way to innovate in class. Wandersee and Schussler (2001) stated that prior, mutual, well-designed and aware (social and scientific) education about plants, together with countless experiences, is possible to be the most prudent way to overcome “botanical blindness”. It was observed that teachers face challenges regarding the teaching Botany. These challenges, if not overcome, reinforce the expansion of “botanical blindness”. In this way, teachers play a fundamental role in this process of overcoming “botanical blindness”, seeking ways and strategies that allow for innovation in Botany classes. The use of educational strategies in the teaching of Botany gives students the opportunity to develop curiosity, observation, investigation and interest.

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