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The perception of higher education students about the importance of exsiccates for plant taxonomic identification

A percepção dos estudantes do ensino superior sobre a importância das exsicatas para a identificação taxonômica vegetal

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A B S T R A C T

The teaching of Botany, in turn, takes place in a disjointed and deterred form of contextualization, in an approach that hinders adequate learning of its concepts. In this sense, thinking and structuring strategies to face such difficulties is indispensable in the production of a learning relationship within the Sciences and Biology that can foster learning of Botany. Thus, the present work aimed to recognize the importance of botanical collections in the teaching of plant taxonomy to undergraduate students in Sciences: Biology and Chemistry of the Federal University of Amazonas (*Universidade Federal do Amazonas* - UFAM). The research was conducted at the Institute of Nature and Culture (*Instituto de Natureza e Cultura* - INC/UFAM) in the county of Benjamin Constant - AM, and a questionnaire was developed and applied to 20 students of the 6th period of the courses addressing popular knowledge with scientific knowledge and the importance of identifying plant species. Through the results obtained, it was found that the questionnaires presented a positive feedback in the students' knowledge about the techniques of exsiccates, since all the students knew how to answer the concept and the necessary scientific methodological procedures. However, only 75% of the students have knowledge about the storage of exsiccates present in the educational institution, showing that there are still students who are unaware of this scope of paramount importance in the specific area of Botany. It´s worth mentioning that the students mentioned that the exsiccates or samples of plants are of great importance, since this serves as identification of plants or species and from the exsiccates it´s possible to carry out scientific works or even compare them with other plant species. Thus, this research of fundamental importance for a better understanding of the exsiccates and botanical identification in the current context that the university of study is located, in the triple border Brazil x Peru x Colombia, made us rethink the way of approaching the content of botany, so that the student is interested in it and does not perpetuate the "botanical blindness", as well as enable the perception of the importance of plants in their daily lives.

R E S U M O

O ensino de Botânica, por sua vez, se dá de forma desarticulada e despromovido de contextualização, em uma abordagem que dificulta adequada aprendizagem dos seus conceitos. Nesse sentido, pensar e estruturar estratégias de enfretamento de tais dificuldades, é indispensável na produção de uma relação de aprendizagem dentro das Ciências e Biologia que consiga fomentar aprendizagem de Botânica. Com isso, o presente trabalho objetivou-se reconhecer a importância das coleções botânicas no ensino de Taxonomia vegetal para alunos de graduação em Ciências: Biologia e Química da Universidade Federal do Amazonas – UFAM. A pesquisa foi realizada no Instituto de Natureza e Cultura – INC/UFAM no município de Benjamin Constant - AM, sendo elaborados e aplicados um questionário para 20 alunos do 6º período dos cursos abordando o conhecimento popular com o conhecimento científico e a importância da identificação de espécies vegetais. Por meio dos resultados obtidos, constatou-se que os questionários apresentaram um retorno positivo no conhecimento dos discentes sobre as técnicas de exsicatas, uma vez que todos os alunos souberam responder o conceito e os procedimentos metodológicos científicos necessários. Porém, apenas 75% dos alunos tem conhecimento sobre o armazenamento de exsicatas presente na instituição de ensino, mostrando que ainda há alunos que desconhecem este âmbito de suma importância na área específica da Botânica. Vale ressaltar que os alunos citaram que as exsicatas ou amostras de plantas são de grande importância, já que isso serve como identificação de plantas ou espécies e a partir das exsicatas é possível realizar trabalhos científicos ou até mesmo compará-las com outras espécies vegetais. Sendo assim, essa pesquisa de fundamental importância para melhor entendimento das exsicatas e identificação botânica no atual contexto que a universidade de estudo se encontra, na tríplice fronteira Brasil x Peru x Colômbia, nos fez repensar a forma de abordagem do conteúdo de botânica, para que o aluno se interesse pelo mesmo e não perpetue a "cegueira botânica", bem como possibilitar a percepção da importância das plantas no seu cotidiano.

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Introduction

In Brazil, the teaching of Botany has been characterized as the traditional way related to the daily life of society, and without the contextualization of the scientific concepts that should be addressed. With this scenario, the teacher/educator is challenged to adopt pedagogical alternatives that contribute to the construction of effective botanical knowledge, highlighting new proposals and didactics for quality teaching to students (LIMA *et al.,* 2020).

The construction of knowledge about botany is efficient through the adoption of educational and dynamic strategies, especially when referring to the classroom, allowing students to relate the content to their own daily lives, thus seeking to exploit to the maximum their previous knowledge already acquired both outside and within the school environment, so that the construction of a logical and coherent thought occurs (SOUZA; LIMA, 2021).

For this, it´s necessary that students have direct contact with the object to be studied not only in field practices, but in the classroom, because practice is fundamental for students to be able to understand, interpret and draw their own conclusions from certain experiments. Faced with Brazilian Biodiversity, plant species are being used in practical classes to facilitate the understanding of the content in a contextualized way (CAVALCANTE *et al.,* 2018).

Silva (2015), states that teaching Botany requires a lot of creativity and time to achieve quality teaching, transforming information into knowledge, where the ability to transform information into knowledge for the student is something that must be put into practice every day, during the teaching career. In the study of the Plant Kingdom, transforming monotonous classes into classes that students participate in directly is a proposal that can end the taboo that plants are boring, and that they do not interact with us (SILVA, 2015).

It´s worth remembering that the study of Botany is often carried out without references to the life of the student, and it´s a discipline that presents many technical terms and, in most cases, are outdated in the research. According to Moura *et al.* (2021) the scientific studies and proposals published to contribute to the improvement of the teaching of Botany are still in their initial phase of development for an improvement in the classroom.

In this way, the Amazonian scenario becomes a dazzling stage when it comes to efficient and easy to understand classes when it comes to botany, being able to work on the human-nature relations, in addition to presenting several practical approaches in natural ecosystems. However, most schools still choose to use textbooks and technical texts, which most often because they are limited, do not reflect the identities of regional plants (LUCAS *et al.,* 2017).

The term “botanical blindness” was initially proposed by Wandersee; Schussler (1999) apud Neves *et al.* (2019) when portraying the inability to recognize the importance of plants in everyday life, as well as the difficulty in paying attention to aesthetic and biological aspects characteristic of plants, giving the idea that these living beings are inferior to animals, therefore, not deserving attention.

Thus, botany ends up teaching in a format of reproduction along with fragmentation of content, which makes it an obstacle when trying to carry out research activities or elaboration of didactic materials in Biological Sciences courses (FAGUNDES; GONZALEZ, 2006). And according to Paes *et al.* (2015), learning botany in a region as rich as the Amazon adds cultural, environmental and even socioeconomic aspects, providing natural resources in the midst of forests, which are essential, giving subsidy to a significant learning.

Lima *et al.* (2022) highlights in their study that teaching botany is a challenging role and medicinal plants, for example, can be used as a research tool to arouse students' attention during classes. In view of this, the teacher can establish relationships with the production of practice using the raw material, strengthening the idea that the didactics used can contribute to the teaching and learning process of students.

Thus, this work aimed to recognize the importance of botanical collections in the teaching of plant taxonomy to undergraduate students in Sciences: Biology and Chemistry of the Federal University of Amazonas (*Universidade Federal do Amazonas* – UFAM), in the county of Benjamin Constant - AM.

Material and methods

This research was carried out in the county of Benjamin Constant - AM, located in the region of Alto Solimões, 1118 km from the state capital Manaus, Brazil, having as one of the poles of the Federal University of Amazonas (*Universidade Federal do Amazonas* - UFAM), Institute of Nature and Culture (*Instituto de Natureza e Cultura* - INC/UFAM).

The study counted as target audience the students of the 6th period of the course Degree in Sciences: Biology and Chemistry with an age range of 17 to 22 years, which had already attended the disciplines of Botany I and Botany II in the previous periods, and thus, already obtained the knowledge base of this area.

As a form of data collection, a semi-structured questionnaire was developed and applied to 20 students, the importance of the questionnaire is to direct the research to generate data necessary to verify the objectives of a project, in addition to giving more solid results of a research. The questions were related to the knowledge of plant identification, popular name of plants and scientific names and whether the participating student had already seen any herbarium (Chart 1).

Chart 1.

Questions of the questionnaire applied to the students of the Degree in Science: Biology and Chemistry

1)	Do you know any plants? Yes. Which?
2)	What is the scientific name of the plant species you know?
3)	Do you think plant identification is important in graduation?
4)	By your time in graduation, have you ever met any herbarium?
5)	In your practical botany classes, did you ever assemble vegetable exsiccates?

6)	Are plant identifications important for future researches at the educational institution?
7)	Does the institution you study have any herbarium for the storage of exsiccates?
8)	In your opinion, are practical botany classes important in your academic training? Justify.

Source: The author

The data were analyzed in a quantitative-qualitative way, seeking a broader result of the answers, which according to Flick (2009) apud Lucas *et al.,* (2017), this approach employed in this type of study aims at an evaluative character that reaches different contexts for the theme in question.

Results and discussion

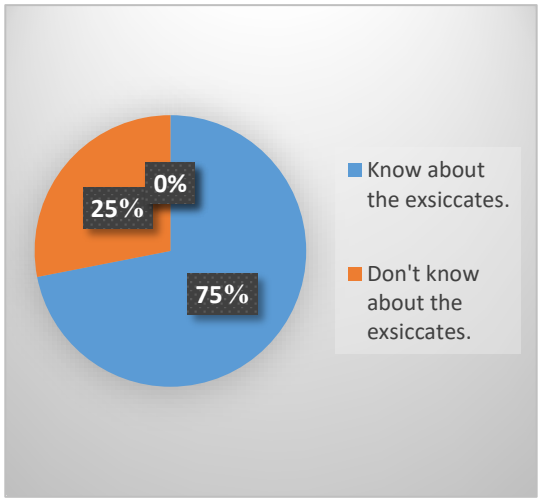
By performing the analysis of the questionnaires at first, it can be seen that the students have knowledge of several species of plants, especially the native ones of the region where they live, but without knowing their scientific names. Despite all the empirical knowledge, it was possible to perceive in their answers that these students can be "diagnosed" with botanical blindness, because they did not know the scientific names of the species.

Like Salantino; Buckeridge (2016) address in his work, people are currently accustomed to seeing some plants only in their final product from industrialization, and leave aside the vegetable as it really is. For example, guarana in soda or barley and hops in beer. This plays a key role in the process of establishing botanical blindness.

The students mentioned that the exsiccates or plant samples are of great importance, since this serves as identification of plants or species, and from the exsiccates it´s possible to carry out scientific works or even compare them with other plant species. However, only 75% of the students have knowledge about the storage of exsiccates present in the educational institution, showing that there are still students who are unaware of this area of paramount importance in the specific area of Botany (Graph 1).

Graph 1:

Students' perception of exsiccates in plant identification.

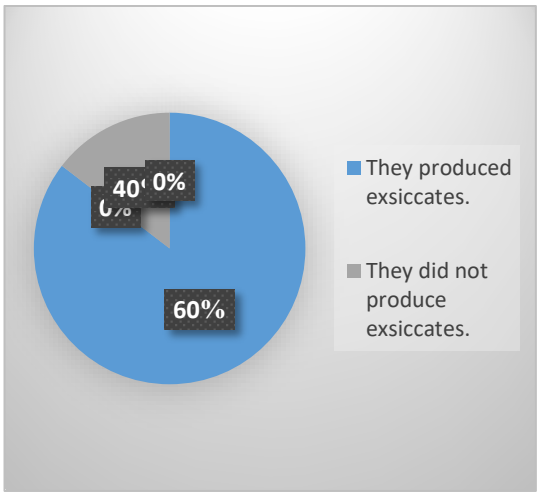


Source: The author

On the other hand, 60% of the students even performed the assembly of exsiccates plants so far in the course (Graph 2).

Graph 2:

Graph showing the number of students who made the exsiccates in the institute.



Source: The author

Krasilchik (2004) proposes that higher education courses should include several didactic modalities, because each situation requires its own solution, in addition to the fact that a variation of activities can attract the interest of students, taking into account the individual differences of each student. In such a way that it can contribute to the overcoming of obstacles in the learning of scientific concepts, not only by providing interpretations, discussions and confrontations of ideas among students, but also by the investigative nature.

Among the conditions for meaningful learning to occur, practical and experimental activities, focused on the daily life of the student, on the situations experienced by him, appear as a strategy capable of motivating the student to want to learn, to perceive the importance of learning and if used appropriately, becomes a potentially significant material for effective learning (MERAZZI; OAIGEN, 2008).

Through the results obtained, it was found that the questionnaires presented a positive feedback in the students' knowledge about the techniques of exsiccates, since all the students knew how to answer the concept and the necessary scientific methodological procedures.

In this context, the application of the questionnaire came with the main guide to evaluate the previous knowledge of the students in the undergraduate program and to seek to identify if the majority managed to assimilate in the botany classes that occurred in the period they went through the discipline.

It´s known that the use of recreational activities as a complementary resource in Biology classes becomes a great ally to the learning of students in the classroom. For this, the applications of games and others allows students to experience new environments, which offer significant support for the teaching and learning of the discipline of Biology and especially when involving curiosities in the area of botany. The playful ones were characterized as a

didactic tool that provides students with a greater understanding of the content addressed and taught to teachers in the school environment.

The traditional methods in the area of Biology have been widely criticized, the lack of innovative methodologies that interconnect the contents in the classroom with the daily life of the student implies the lack of interest of the same. In this context, the teaching of Botany is implemented, which as well as the other areas within Biology is quite complex, with several scientific names that end up influencing the students' lack of interest in the discipline (MELO *et al.,* 2012).

In the teaching of Botany, the challenge faced by teachers is the difficulty of students in assimilating the contents, because the scientific terms are the most listed point in relation to the difficulties faced by both. Therefore, the implementation of differentiated methodologies that escape from traditionalism is indispensable, and with this, teachers can make classes more interesting and thought-provoking (FARIA; VILHALVA, 2016).

Pelizzari *et al.* (2002), states that for there to be a meaningful learning two conditions are necessary. One is that the student needs to have a willingness to learn: if the individual/student wants to memorize the content arbitrarily and literally, then his learning will be totally mechanical. The other is that the school content proposed to be learned has to be potentially significant, that is, it has to be logically and psychologically significant to the students: the logical meaning depends only on the nature of the content passed on, once it´s well explained, and the psychological meaning is an experience that each individual has in himself. Each learner filters the contents that have meaning or not for themselves and that can be passed on in the future.

Meaningful learning is related to the ideas that the learner already knows, and not that literary, taken literally, focusing on some cognitive knowledge of the learner, being relevant to teaching in the school environment (MOREIRA, 2012).

It´s worth mentioning that learning depends on many factors and starting from the idea that the teacher is no longer a transmitter of content, but rather, a collaborator to ensure the meaningful learning of students, it´s necessary to develop motivation and seek creative and stimulating ways mediated by the teacher-student dialogue in the classroom. We cannot give everything ready, because to learn is to research, to get involved, to produce discoveries within the teaching environment, even more so when it comes to academic training. Moraes (2007), states that “the most important isolated factor that influences learning is what the learner already knows. Watch it and teach it accordingly”.

The study of botany itself is still in the process of growth, so it´s necessary to seek new research focused on botanical collections, as they have a fundamental role in the knowledge and conservation of biodiversity. According to Mantovani *et al.* (2005) with the evolution of technology and constant pressure from environmental agencies, inventories have become much more complex and informative.

However, it´s essential to study the herbarium collections, as they act as true databases of information about the Brazilian flora. Piccini *et al.* (2016) points out that one of the main reasons why herbaria are fundamental for researchers is their storage function is the storage function of the material is testimony, so that these institutions function as a bank of scientific evidence in which monographic intellectual productions such as dissertations, theses and articles are based, in addition to ensuring principles of reproducibility in the area of taxonomy (PICCINI *et al.,* 2016).

According to Moura *et al.* (2021), to certify the diversity and richness of the flora of a given region, samples are deposited in botanical collections. These collections are banks of living or preserved materials. Herbariums are examples of preserved botanical collections organized in a systematic way (PEIXOTO; MORIM, 2003). Therefore, a herbarium and other collections associated with them (carpotecs, xylothecas) represent a foundation for research institutions, being indispensable for the work of taxonomists also providing support to other areas of knowledge (MONTEIRO; SIANI, 2013).

In addition to playing a key role in global efforts to mitigate biodiversity loss, herbaria are also teaching tools. Herbariums are an excellent alternative to approach the content of botany through practical knowledge, in order to allow the experience of the theory in a contextualized way, which provides a significant learning (KRASILCHIK, 2008).

With this, Garcia (2006) points out that the botanical collections have specimens with different morphological, anatomical and physiological characteristics, present in different environments. Due to their present characteristics, they can be a didactic instrument for the learning of students of higher education or basic education, configuring themselves as non-formal spaces of scientific education.

Thus, it´s worth mentioning that Brazil has had the presence of herbaria since 1831 and today has about 260 herbaria registered in the Brazilian Network of Herbariums (PEIXOTO *et al.,* 2007). The botanical collections present importance in teaching, research and extension, assisting the teaching-learning process of large groups of plants. In addition, the collection can also attract the attention of students of basic education to encourage collections of plant material from that locality, thus increasing the potential and recognizing its rich biodiversity (MOURA *et al.,* 2021).

Another possibility of teaching botany in a playful way is to make students get to know their own plants in their backyards, an activity known as the “Botanical Tour”, this activity brought a very significant approach to the classroom, developing knowledge and sharing knowledge with this it was possible to perceive that the knowledge about botany exists and that it is not left aside, because the popular knowledge covers in such a way that it was possible to develop this activity and to know the culture, popular knowledge passed from generation to generation, ethnobotany is present in everyday life (SOUZA *et al.,* 2020).

Finally, botanical collections can be strategic tools for the local conservation of plant species, as students can learn about the flora in their backyards, for example, based on their everyday experiences. This process is of fundamental importance in the teaching-learning process of Botany and even of Ecology.

Final considerations

This research was of fundamental importance for a better understanding of the exsiccates and botanical identification in the current context that the university is in rethinking the way of approaching the content of botany, so that the student is interested in it and does not perpetuate the "botanical blindness", enabling the perception of the importance of plants in their daily lives.

The knowledge of the learner's world should be considered relevant, so that the educational practice is concretized and elevated beyond the school context in which he is, making it necessary to understand and establish a dialogical, significant and committed relationship with the construction of knowledge.

In addition to highlighting the qualities of the Amazon rainforest to promote the significant learning of Botany, the resources present in this region are relevant to motivate students to learn, not only because of the aesthetic appeal of some species of plants that influence the curiosity of the student, but also because he understands that in the environment in which he is inserted there is this immense wealth.

There is a great importance of working with the plants of the Amazon region, because individuals are in constant contact with nature and thus take into account their traditional knowledge about a given plant, so that it becomes a meaningful and more dynamic class among them. However, the varied species of plants existing in the North Region, has stood out a lot in the lives of the residents, both in the rural area and in the urban area, where there are the various confections of raw materials, medicines and even food.

Therefore, it´s necessary to encourage students to do new research focused on the region, in view of the diversity of existing plants and for the identification of them to be remarkable to future researchers, so that based on the data of the present work is an aid to identify them.

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