PRÁTICAS EDUCATIVAS, MEMÓRIAS E ORALIDADES

Rev.Pemo – Revista do PEMO

Tutoring lessons in plant anatomy and botany: challenges in in-person and remote mediation

PEDAGOGICAL PRODUCT

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Abstract
This work aimed to report and reflect on the contribution of academic tutoring in the subjects of Plant Anatomy and Botany to the training of student-tutors in the Agronomy course at IFPA – Castanhal, developed in both in-person and remote formats. For this purpose, the monitor's notes on the planning and execution of activities were used as a basis, along with his observations and perceptions of the experiences during the tutoring, including his interactions with students, the subject's professor, and student-professor interactions. Difficulties related to content, infrastructure, and technologies in remote teaching were identified. In in-person teaching, the challenges were also linked to the content, as well as to the structure, materials, and skills necessary for practical classes. The tutoring sessions provided a comprehensive pedagogical experience and different ways of interacting with students, which significantly influenced the tutor's perspective on the role of the teacher in Higher Education, in the addressed formats.
Keywords: Plant Biology. Agronomy. Experience Report. Pedagogical Practices.

Lições da monitoria em anatomia vegetal e botânica: desafios na mediação presencial e remota

Resumo
Este trabalho objetivou relatar e refletir sobre a contribuição da monitoria acadêmica nas disciplinas Anatomia Vegetal e Botânica, para a formação do aluno-monitor no curso de Agronomia, do IFPA – Castanhal, desenvolvidas nas modalidades presencial e remota. Para isso, tomou-se como base as anotações realizadas pelo monitor sobre o planejamento e a execução das atividades, bem como as suas observações e percepções sobre as experiências vivenciadas no transcurso da monitoria, no seu contato com os alunos, com a professora das disciplinas ou ainda no contato aluno-professora. Foram identificadas dificuldades relacionadas ao conteúdo, à infraestrutura e às tecnologias no ensino remoto. No ensino presencial, os desafios também se atrelaram aos conteúdos, além de estrutura, materiais e habilidades suficientemente necessários às aulas práticas. As monitorias possibilitaram uma vivência pedagógica global e diferentes formas de interagir com os estudantes, que impactaram, significativamente, no olhar do

monitor em relação ao papel do docente no Ensino Superior, nas modalidades abordadas.
Palavras-chave: Biologia Vegetal. Agronomia. Relato de Experiência. Práticas Pedagógicas.

1 Introduction

The teaching-learning modality based on pedagogical support, in which student participation is the key element, is called academic monitoring. This practice enables the development of technical skills and theoretical depth, which result in academic improvement, a closer relationship with the content taught and with the supervising teacher (Schneider, 2006).

The student-monitor acts as an intermediary agent in the educational process, in order to help reduce the distance between teacher and student, providing greater interaction and sharing of knowledge (Fernandes *et al*., 2020). According to Barbosa, Azevedo and Oliveira (2014), mentoring encourages students to develop skills that are pertinent to a teaching career, since it acts as a space for daily interaction with teaching and for sharing pedagogical experiences, which favor the construction of their personal and professional identity linked to teaching.

Within the scope of the Ciências Agrárias, Biológicas e Florestais, the subject of Botany is a mandatory component in various undergraduate courses, either individually or combined with related components. Botany is a Science whose focus is centered on the plant kingdom, but in a comprehensive way that can be understood through taxonomy, external morphology (systematics) and internal morphology (anatomy), physiology, the use and distribution of plants, among other fields of knowledge. Plants are of considerable importance because of the multifunctional roles they play in different habitats (Evert; Eichhorn, 2014a). This justifies the need to deepen knowledge in this area, especially at Higher Education level.

The various contents on the plant kingdom, with a wide range of scientific terms, are seen as highly complex and difficult to assimilate (Silva, 2013; Bizotto; Lopes; Santos,

DOI: https://doi.org/10.47149/pemo.v6.e13736
https://revistas.uece.br/index.php/revpemo
ISSN: 2675-519X

2016). This condition makes the subjects merely memorization of concepts, without any critical deepening of the topics studied (Ursi *et al*., 2018). In addition, Machado, Souza and Alves (2019) affirmed the need to update recent scientific knowledge of Botany in teaching strategies, since this content is often transmitted to students in an outdated and decontextualized way.

The problems intrinsic to plant biology can be even more pronounced in remote teaching, since the disadvantages of this type of teaching, according to Salvagni, Wojcichoski and Guerin (2020), are the lack of structure and preparation of teachers. In addition, during the pandemic, in the remote format, teaching proved to be uncertain in terms of content, methods, teacher dedication and student attendance (Ali, 2020). In contrast, in-person teaching is the traditional modality in which students and teachers meet in the same space and at the same time, in a way that enables direct interaction between them (Bruscato; Baptista, 2021). Thus, many difficulties experienced in remote teaching are non-existent in in-person teaching.

In both teaching modalities, knowledge needs to be shared and understood. In this context, the student-monitor actively participates as a facilitator of this process, since he knows the expectations of his peers (students) and seeks didactic transposition from this place. This mediation is favored through directional support, according to the individual difficulties of the students. In addition, the monitor shares the responsibilities of the teacher by performing similar functions in the teaching-learning process.

The aim of this study was to report and reflect on the contribution of academic monitoring in the disciplines of Plant Anatomy and Botany to the training of the student-monitor in the agronomy course, IFPA – Campus Castanhal, developed in the in-person and remote modalities.

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DOI: https://doi.org/10.47149/pemo.v6.e13736
https://revistas.uece.br/index.php/revpemo
ISSN: 2675-519X

2 Methodology

Delimitation of the study and location

This text presents a descriptive study, of the experience report type, carried out from the student experience in the monitoring of the subjects Plant Anatomy and Botany, which are offered in the second and first semester, respectively, of the undergraduate course in Agronomy at IFPA – Campus Castanhal. The experiments took place in 2019 and 2020, corresponding to the 2019.2 and 2020.1 semesters.

The IFPA – Campus Castanhal is a centenary institution focused mainly on teaching Agricultural Sciences. It is located on the BR-316 highway, Km 63, in the northeastern mesoregion of Pará. In 2010, undergraduate courses began to be offered, including a bachelor's degree in Agronomy, which aims to train professionals who are aware of the political, economic, social, environmental and cultural aspects involved in sustainable food production, especially in the Amazon region.

The establishment of the Agronomy course at the aforementioned institution was one of the institute's training policies for the Amazon region, which is of vital importance to Brazil and the world. Another important feature to note is that the course also takes on the responsibility of fostering educational actions for local development and engaging the academic community to this end.

The course curriculum was built on the basis of the Diretrizes Curriculares Nacionais for undergraduate courses in Agronomic Engineering or Agronomy, in accordance with CNE/CES Resolution No. 01/2006. Based on this resolution, it was proposed to structure it on the basis of a set of subjects that aim to give the student their professional identity as an agronomist and enable them to acquire a regionalized identity, since their reference, as well as the application of their knowledge, is built endogenously, based on the local reality of the course.

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ISSN: 2675-519X

Characterization of monitoring

Based on the aforementioned, the Agronomy course at IFPA – Campus Castanhal was divided into three thematic axes: 1) Amazonian biophysical environment and man; 2) Amazonian agroecosystems and work; and 3) Socioeconomic environment and sustainable agricultural development. The disciplines Plant Anatomy (DAV) and Botany (DBot) are basic curricular components in the first thematic axis of the course, as they provide the basis for some disciplines, such as Plant Physiology, Seeds, Plant Science, Ecology, Forage, Ornamental Plants, Medicinal Plants, among others. Plant Anatomy and Botany have a total teaching load of 60 hours and 80 hours, respectively.

The IFPA Programa de Monitoria de Ensino is regulated by Normative Instruction No. 04/2019 of the IFPA Pró-Reitoria de Ensino (PROEN) and provides for actions to assist classes or activities to help the teacher, with the aim of improving the teaching-learning process, articulating theory and practice, in undergraduate courses. The monitoring of Botany was made official by an internal notice (no. 01/2020), while the collaboration in Plant Anatomy was voluntary. In both cases, there was a need to dedicate a specific teaching load, in the first case of 12 hours, provided for in the notice, and in the second case, according to the demand of the subject, but with an average of 4 hours a week dedicated to the activities. This period was set aside for reviewing the literature, preparing activities and/or answering questions from students.

This experience report was based on the monitor's notes on the planning and execution of the activities, as well as his observations and perceptions of the experiences he had during the monitoring period, in his contact with the students, with the teacher of the subjects or even in the student-teacher contact.

Characterization of the subject Plant Anatomy

Plant Anatomy is a branch of Botany dedicated to the study of the internal organization of the plant body. The approach to this subject was based on the theoretical

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https://revistas.uece.br/index.php/revpemo
ISSN: 2675-519X

exposition of the contents based on the syllabus contained in the pedagogical project of the Agronomy course at IFPA – Campus Castanhal, 2017. In this case, the contents covered were: plant cell; plant systems: formation, covering, filling, support, conduction and secretion; primary and secondary structure of the root and stem and functional adaptations; basic structure of the leaf and variations; structure and variations of the flower, fruit and seed; anatomy of organs, natural environment and their interrelationships.

The course was offered entirely in the classroom. In addition to the theory, there were practical classes on basic techniques applied to plant histology. Due to the size of the laboratory and the amount of equipment in contrast to the number of students, it was necessary to divide the class into two groups.

The student acted as a collaborator, participating passively in the theoretical classes, which corresponded to 65% of the total teaching load, and actively in the practical classes, which required 35%. In addition, he was responsible for preparing and presenting a topic from the syllabus, under the supervision of the supervisor; preparing and correcting a questionnaire on the topic previously taught; and organizing the notes obtained. It is important to emphasize that these activities were aimed at 40 students from the 2019 class.

The resources used to prepare and present the topic were PowerPoint, a projector and a marker brush, while Excel was used to organize the activity notes. The laboratory practices required materials such as: dyes (safranin and astra blue), the plant samples, razors, styrofoam, wooden sticks and plastic trays to add the substances (alcohol, hypochlorite, distilled water, solutions with dyes) that made up the series for clarifying, coloring and dehydrating the plant samples, as well as slides and coverslips for microscopy, and a light microscope.

As for the procedure, the samples, previously chosen by the students, were cut freehand (Kraus; Arduin, 1997) under a styrofoam support. The cuts were then transferred to the hypochlorite (bleach) and left to clarify. After this stage, the fragments were double-washed and transferred to astra blue dye. Afterwards, the excess dye from the cuts was removed in water and they were subjected to the initial dehydration process with 30% and 50% alcohol, in this sequence (figure 1). Finally, they

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ISSN: 2675-519X

were transferred to safranin dye, followed by dehydration in alcohol at concentrations of 50%, 70% and 100%, sequentially. After staining, the sections were mounted on a microscope slide and 2 to 3 drops of glycerin were applied to them before the coverslip was applied and then viewed under a light microscope.

The procedures for preparing histological slides are important for good observation of plant structures. The need for clarification and staining of the sections depends relatively on the physical and chemical characteristics of the plant and the section or structure (cell/tissue) to be observed (Rocha *et al*., 2024a).

Figure 1 – Sequence of the staining procedure for plant material sections. (1) Hypochlorite; (2, 3 and 5) Water; (4) Astra blue dye; (6) 30% alcohol; (7) 50% alcohol; (8) Safranin dye; (9) 50% alcohol; (10) 70% alcohol and (11) 100% alcohol

Source: Authors (2019).

After the practical classes, the students were required to write a report and present the information obtained in the form of a seminar. In addition to the seminar, other active methodologies were used, such as dialogued exposition and socialization (Paiva *et al*., 2016).

Characterization of the subject Botany

Botany is the Science that focuses on the plant kingdom in a comprehensive way, looking at taxonomy, external and internal morphology, physiology and the use and distribution of plants (Evert; Eichhorn, 2014b). The approach taken in the Agronomy course at IFPA – Campus Castanhal deals with the study of external morphology. In this case, the course syllabus included the following content: Introduction to Botany with a focus on the external morphology of plants. Organography of the root, stem, leaf, flower, fruit and seed. Plant collection and herborization. Taxonomy and plant systematics. Particular study of species belonging to the main mono and dicotyledonous families found in the Amazon.

The course was offered in hybrid form, so that all the theoretical content was recorded and made available on Google Classroom. The practices were designed based on the situation experienced, so they took place individually and preferably in areas close to the students' homes.

The auxiliary activities carried out by the monitor consisted of producing videos to illustrate the proposed activities and mind maps to review the content studied in a didactic way. These resources were especially necessary since the theoretical content was taught entirely asynchronously and made available via recording to students unable to participate in real time. Only the practical activities took place in person, under the supervision of the monitor and/or teacher.

The resources used in the course were: WhatsApp group for announcements and questions; Google Classroom for posting bibliographic materials, recorded classes and student activities; Canva to prepare the presentation and mind maps; a cell phone and the InShot application to record and edit the videos, respectively; the Sorteador de Nomes website to draw the cultures that would be researched for the taxonomy activity on the Jamboard.

In line with the acquisition of theoretical knowledge, which accounted for 55% of the total teaching load, practical lessons were prepared in chronological order, which required the complementary 45%. To do this, the students were encouraged to look for

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ISSN: 2675-519X

different plant species that were mostly or preferably in their fertile period, within the spatial limits of the IFPA – Campus Castanhal, to identify them by noting their morphological characteristics and then herborizing, cataloguing and depositing them in an herbarium. In this subject, these activities were aimed at 40 students in the 2020 class.

Botanical identification was carried out using dichotomous keys or multiple access keys, which had been made available beforehand. Then, using the characters analyzed and noted during the collection of the species, comparative analyses were made with various morphological characteristics present in the keys, which lead to a specific species, identifying it. This procedure is recommended for materials that are still fresh or fixed.

The herborization process requires pressing the collected specimen using cardboard and string or ropes. The material is then labeled on the outside and dried in an oven at a temperature between 45 °C and 65 °C. The plant is then sent to the herbarium for cataloging and storage.

The resources used to make the exsiccate were cardboard, string and newspapers for pressing the material, ordinary or pruning scissors for removing the plant sample, as well as a pen, cell phone and notebook for taking notes on the characteristics of the specimen and the collection environment. After collecting the plants and making the exsiccates, the students presented their results in the form of a seminar.

3 Results and Discussion

Report on experiences in Plant Anatomy and Botany

The subject of Plant Anatomy (DAV)

Plant Anatomy, as a sub-area of Botany, aims to understand and relate the various internal structures of plants to their functions, through the study of cell types, tissues and vegetative and reproductive organs. (Esau, 1977; Fahn, 1990). Due to the focus provided by Plant Anatomy, it is possible to correlate it with different areas, such as Cytology,

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Molecular Biology, Chemistry, Physiology (Cutler; Botha; Stevenson, 2011), Plant Production (Silva; Alquini; Cavallet, 2005), Phytopathology (Lima; Lopes; Café-Filho, 2010), Plant Biotechnology (Rodrigues; Oliveira; Mariath, 2004), among others.

The DAV's theoretical basis gave the students a general idea of the characteristics of the cell and the different types of plant systems, while the practical classes helped to materialize the knowledge acquired in the classroom, integrating theory and practice. Practical classes in Plant Anatomy are of great importance because the theoretical approach is based on structures that are generally not observed with the human eye, which makes this subject dependent on the imagination.

The practical lessons challenged the students' ability to make freehand cuts, which is a practice still widely used in many laboratories, and to handle the light microscope. After observing the histological structures, generally the transverse section of the stem (figure 2) and the leaf mesophyll, the students were more interested in understanding the sections obtained. According to Nascimento *et al*. (2017), the increase in didactic resources in Plant Anatomy classes, such as the use of histological slides, can stimulate involvement between teachers and students, as it expands teaching practices and results in more dynamic classes, as well as captivating students.

Figure 2 – Cross-sections of stems, made freehand by the students, observed under a light microscope

Source: Authors (2019).

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The content taught at DAV by the monitor was about the filling system, which encompassed the different types of parenchyma, especially chlorophyll/chlorenchyma, filling and reserve parenchyma. In the latter case, it was further subdivided into amyliferous, aeriferous and aquiferous. The experience of teaching the content, together with planning an activity and correcting it, allowed us to truly experience teaching practice, including the challenges inherent in this professional activity. Also, because the exchange of knowledge was student-student, this apparently made it easier for the students to ask questions, compared to when the content was taught by the teacher.

According to Lima (2010), Anatomy, among the areas of Botany, has its importance linked to the possibility of correlating the various internal plant structures to different environments, having a direct influence on the physiological mechanisms of plants. By studying it, it is possible to reflect on the applicability of its knowledge in the various human activities related to plants. In addition, the work by Silva *et al*. (2023) on the perspective of Higher Education students in the Biological Sciences course, in relation to DAV, showed that these individuals consider that the knowledge provided by this subject helps in the understanding of other areas, mainly Plant Morphology, Plant Physiology and Reproductive Aspects.

However, even though Ceccantini (2006) is aware of the importance of Plant Anatomy for various areas, he points out that the emphasis given to DAV is mainly on memorizing the names of structures in an attempt to understand them spatially, the results of which are frustration on the part of the students and a minimal contribution to the acquisition of knowledge.

In order to help reduce this issue, the practical classes at DAV encourage the individuals to come into contact with plant materials and thus bring them closer to biology and nature. These experiences with plants reinforce the idea that they are significantly present in people's daily lives, creating internal images that are constantly mobilized in the educational process (Machado; Amaral, 2015). In addition, Mancuso (2019) emphasizes the importance of using plants not only for what they produce, but also for what they can teach. The architecture expressed in the cellular arrangements of a plant is concrete proof

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ISSN: 2675-519X

that nothing is out of place and, furthermore, there is a plasticity that allows us to understand what they are capable of in order to survive.

The subject of Botany (DBot)

In the Botany subject, the theoretical exposition of the content provided a general idea of the different classifications of the different plant organs (root, stem, leaves, flowers and fruit) necessary for plant identification. The practical activities made it possible to learn various terms intrinsic to plant systematics and apply them to the evaluation of dichotomous keys. In addition, it was possible to bring the students into closer contact with the plants, with a more in-depth look at the multiple nuances they present.

According to Kusumawardani, Muzzazinah and Ramli (2019), the morphological characteristics of plants were the main evidence for the general taxonomy often used for identification, which served as information for the determination/dichotomous key. This key refers to a series of questions related to the characteristics of systematized plants which, when answered correctly, lead to the name or identity of the “objects”.

The correct identification of plants is especially important and necessary for research in different areas of study, as they have particularities in various aspects, such as growth habit, nutritional requirements, production of metabolites under varying conditions, among others.

The first subject covered in DBot was root morphology, which resulted in the students making a mind map for later revision (figure 3). Mind maps are representations using words or images that refer to specific memories and stimulate ideas and reflections for decision-making. In addition, they are considered a strategy for creating active learning environments in the classroom in order to clarify and deepen concepts and ideas (Blumson, 2011; Kaplan; Schuck; Doeller, 2017).

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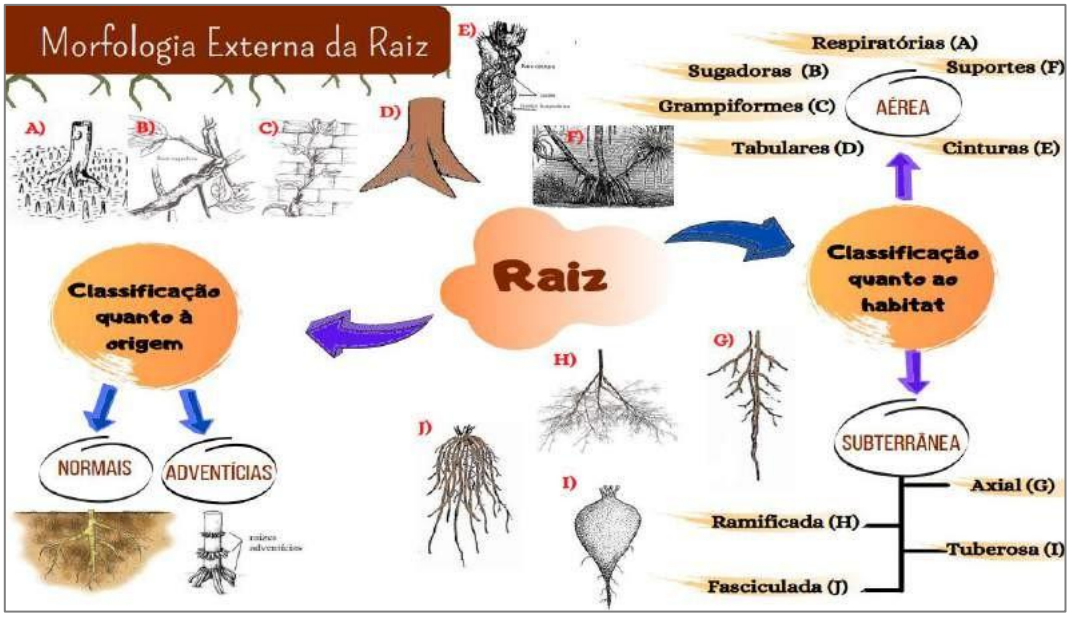
ISSN: 2675-519X

Figure 3 – Mind map on the morphological classification of the root in terms of origin and habitat, with the illustrations and equivalent classifications according to the letters[1]



Source: Authors (2020).

A morphological classification activity was carried out on the leaf morphology content. To do this, the monitor drew up a list of 100 vernacular plant names, preferably regional ones, which were divided into four species for each student. With this, they had to make the classification taking into account aspects such as leaf nomenclature, study of the limb (shape, edge, apex, base and its division), the type of division in compound leaves, phyllotaxis and, if applicable, modifications. To help them, the monitor produced an example video, using mango leaves (*Mangifera indica* L.) glued to A4 paper as a model (figure 4).

[1] The images in figure 3 were obtained from Google and from the book *Botânica – organografia; quadros sinóticos ilustrados de fanerógamas* (Nunes Vidal; Rodrigues Vidal, 2007).

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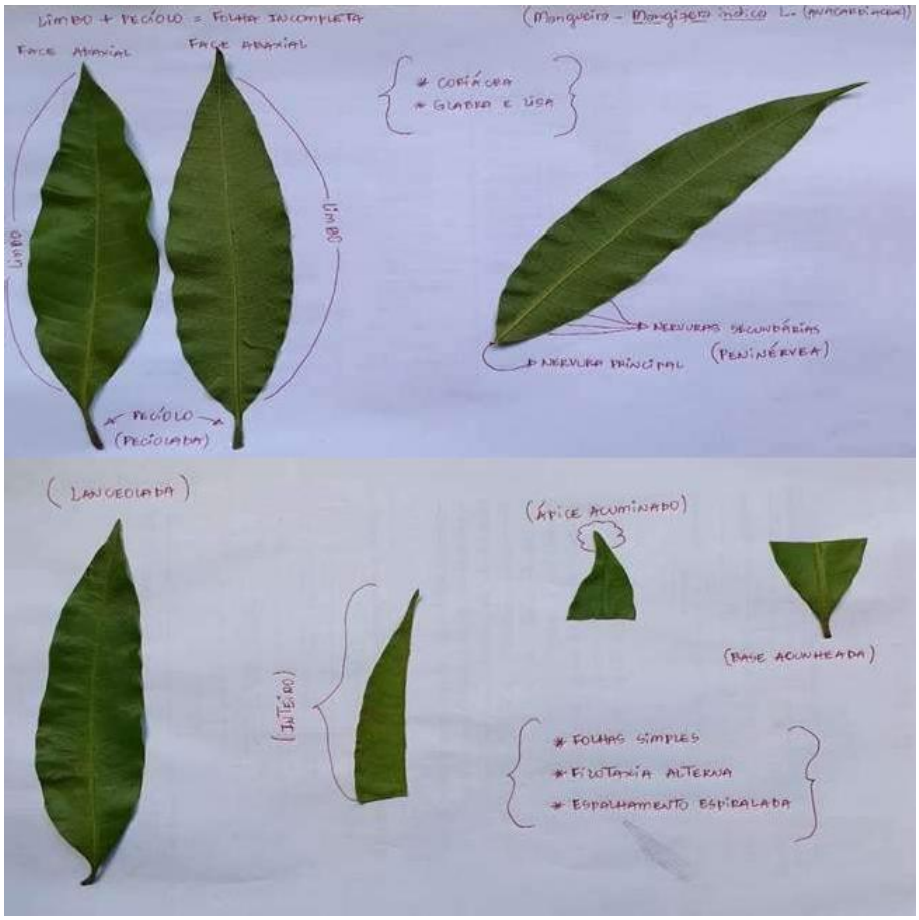
Figure 4 – Illustration of the material used to exemplify the leaf classification activity using mango samples (*Mangifera indica* L.)



Source: Authors (2020).

In addition to these resources, two more videos were produced, one on “Plant organography in everyday life” and the other on making exsiccates. The first highlighted the great diversity of types of roots, stems, leaves and fruit that are present in everyday life in a local supermarket. The second explained the importance of making exsiccates, the materials needed and the procedures.

Matos *et al*. (2015), when testing and evaluating the contribution of didactic resources for teaching botany based on student productions at a university in Sergipe, showed that these resources aligned with practical activities contribute significantly to

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students' learning, because contact with the materials displayed during the activities encouraged them to perceive plants in everyday life, as well as their importance and diversity.

The contrast between monitoring in remote and in-person teaching: challenges and readaptations

Monitoring in remote education (RE)

The severe acute respiratory syndrome coronavirus 2 (Sars-CoV-2) pandemic, confirmed in January 2020 by the World Health Organization (WHO) (Lana *et al*., 2020), has had a global impact on the population, the economy and, especially, health services. In response to this, social distancing and the tightening of hygiene measures and mask use were crucial in slowing the rapid spread of the disease and reducing the consequent burden on the health system (Samaraee, 2020; Ferentz *et al*., 2020).

In remote education (RE), designed for the subject of Botany, the main difficulties observed by the students were the use of or access to technological resources and interaction during synchronous meetings. Given the difficulty in accessing the internet and, consequently, the synchronous meetings, students' attendance was made more flexible. If they were unable to attend the meetings, the students had access to the content resulting from the recording of the meeting. This condition directly influenced the number of students available for interaction in the classes and their dynamism.

The work of Appenzeller *et al*. (2020) highlighted a similar scenario to this work in terms of the difficulty of accessing the internet, which led to problems for students in attending web conferences and virtual meetings. Possollli and Fleury (2021) pointed out that the lack of access or instability of the internet and the electronic equipment available are directly related to the difficulty of student interaction, since this problem has an impact on the pedagogical mediation space.

In addition, in this condition, the classroom space and the teacher-student context changed significantly after the effective establishment of remote teaching. According to

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Goulão (2012), the role of the teacher, under these conditions, takes on a different perspective, since, in addition to transmitting knowledge, they are now responsible for guiding the students' learning process in order to develop their skills, namely learning how to learn, in addition to accompanying, motivating, dialoguing, leading and mediating experiences. Dias (2008) added that teachers need to permeate interpersonal and intrapersonal relationships in order to support and stimulate students, regulating and guiding their emotions, affections and attitudes. However, in a contradictory way to the reflection made on the multiple competencies required of teachers in RE, Masetto (2003) stated that these same characteristics are demanded of this professional in physical spaces.

It is clear that, in addition to teaching, teachers take on different roles, regardless of the type of education. However, it is well known that, in in-person teaching conditions, some of the functions assumed by the teacher in RE are the responsibility of other professionals, such as psychologists, pedagogues, among others. This overload of functions has considerably influenced the dynamics of remote teaching.

Remote education, according to Faustino and Silva (2020), is not something simple to consolidate. The change from a physical teaching space to a virtual one requires greater exploitation of technological resources, which, until then, were little used in the learning environment. RE requires new methodologies, with a differentiated approach, given that even for students with access to technological means, there are limits to retaining content. In contrast, in-person teaching differs in that it offers greater support and direct contact with the teacher. It should also be noted that not all content, given its specific characteristics, is satisfactorily suited to remote education.

As far as the monitor and teacher are concerned, the main challenges experienced were adapting to the use of new sites and programs, especially when envisioning more dynamic teaching, and managing students in this teaching space, which often merged with personal space.

Teachers, immersed in this new teaching dynamic, have had to give new meaning to their pedagogical practice in an attempt to promote active education in the face of the

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challenge of remote classes. In this sense, they sought to maintain the bond and affection through interaction and dialog with the students, who were far from the physical structure of the classroom (Fetterman; Tamariz, 2020).

According to Freitas, Almeida and Fontenele (2021), when taking the opinion of different Higher Education teachers on remote teaching as a basis, they highlighted that they consider it to be a challenging modality, which has brought insecurity, discomfort and difficulties in assimilating the new demands and daily classroom practices. However, they agree that remote education, even though it is a temporary form of teaching, was necessary for the dynamism of pedagogical learning practices.

In this sense, a positive feature in relation to the advantage provided by RE in this experience was the possibility of accessing the lessons, which were recorded, from anywhere, at any time and as many times as necessary.

Godoi *et al*. (2020) highlight challenges similar to those mentioned above and add others, such as work overload, the lack of motivation and engagement of students in the virtual environment, the difficulties faced by students that also impact on the pedagogical relationship and institutional demands and requirements. The various problems related to RE are not solely the result of the model itself. For example, Silva, Sousa and Menezes (2020) state that the problem does not lie in the use of remote education, but in the way it has been implemented, without planning, training and a minimum structure that is viable for students and teachers to learn.

It's also important to note that not all the teachers were unprepared for using the technologies needed for RE. Maciel *et al*. (2020), when monitoring a higher education nursing course offered in the ER, during the pandemic, found that teachers already had previous and daily contact with digital technologies, both related to operational issues, such as recording grades and institutional e-mail, and directed towards education, through the virtual learning environment. This leaves room for reflection that the more resources teachers have, the better prepared they will be for adverse situations, such as the one experienced during the pandemic.

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ISSN: 2675-519X

Monitoring in in-person teaching

Higher Education is focused on the traditional model, which is based on the role of the teacher, who is responsible for verbally explaining the content and, after that, students are expected to passively absorb and reproduce this knowledge in the evaluations (Stofflett, 1999). According to Longo (2012), this methodology promotes the distancing and dissociation of content from everyday life, causing disinterest on the part of students and hindering the learning process.

In in-person teaching (IT), where the subject monitored was Plant Anatomy, the main difficulty observed by the monitor in relation to the students during the doubt sessions was in fixing the content due to the large number of technical terms and the visual nature of the subject.

In this section of the work, the term Botany, discussed by the authors referenced, refers to the broad nature of this Science, which, in a certain part, addresses some element related to the internal organization of plant tissues (content or material for practical classes).

According to Sano (2004), textbooks have a complex approach to the theoretical content of Botany, which is taught in a mechanical, decontextualized and fragmented way by teachers. As a result, students experience an ideological process of distancing themselves from the plant kingdom, which impacts on their inability to perceive plants as living beings and their relevance to humanity's healthy stay on Earth, which Salantino and Buckeridge (2016) have called “botanical blindness”. In this sense, there is a need to contextualize Botany content, taking into account students' previous knowledge and integrating it into what is being taught, in an attempt to promote self-perception of plants (Gonçalves; Moraes, 2011).

According to Santos and Almeida (2008), higher education has traditionally been based on a simplistic and technicist curriculum that has promoted the fragmentation of knowledge, and this condition still persists today. The individualization of content means that it is difficult to correlate it with other areas of knowledge, especially those in which the

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DOI: https://doi.org/10.47149/pemo.v6.e13736
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ISSN: 2675-519X

majority of hours are spent on theory. In response to this, several authors have advocated the need for interaction between subjects, known as interdisciplinarity, in order to overcome this problem (Favarão; Araújo, 2004; Thiesen, 2008; Couto, 2011; Pereira Júnior; Bispo; Pontes, 2020).

The main advantage of IT refers to the physical condition of this experience, the visually interactive space, which allows for the exchange of experiences as students are encouraged to participate, making the environment favorable for correlation with other related areas of knowledge.

With regard to the practical classes on Plant Anatomy, the biggest challenge was to make sufficiently thin sections for detailed observation of the anatomical structures. In line with Rocha *et al*. (2024), the freehand cutting technique requires manual skills that tend to be acquired with practice. Cancian and Frenedozo (2010), based on their experiences in the classroom, also stated that just describing content is not enough for students to learn effectively. For this reason, especially in Biology teaching, practical lessons can be considered a very useful modality, as they provide an opportunity to stimulate learning.

In addition to the challenge related to the student and the content, another issue to be highlighted concerns the size of the laboratory used for Plant Biology activities, as well as the number of pieces of equipment and materials available for practice. The more limited these resources are, the less technical support is provided to students, which results in their academic and professional training being compromised. In these situations, it is not uncommon for teachers to have to use their own financial resources to provide their students with the minimum contact with the basic techniques required in some subjects.

According to Vasconcelos (2019), certain factors jeopardize the system of public basic education schools, based on the deficit in different aspects, such as: infrastructure, teaching aids, school safety, student and teacher motivation, all of which have a direct impact on the training, remuneration and updating of professionals in the field. Beyond basic education, it is clear that these are problems that can be extrapolated to Higher

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ISSN: 2675-519X

Education, which, in the end, have the same negative repercussions on the training process.

The work carried out by Alves, Dias and Gil (2021), on Botany in Higher Education, highlighted the perception of students from Amapá (AM) from different aspects, such as the main difficulties in understanding the subjects and the content considered least attractive to them. The research concluded that the difficulty in understanding the subjects is mainly related to the teaching methodology and the lack of practical lessons. In addition, the students pointed to plant systematics as the content with which they had the least affinity.

Despite the difficulties, the students pointed to the practical classes as an enriching experience and of fundamental importance for clarifying subjects that would once have been in that world of subjectivity. According to Araújo and Leal (2012), one of the ways in which students can motivate and apply the knowledge they have acquired in basic areas is through practical classes, especially from the beginning of their undergraduate course.

Silva (2011) reiterated that the use of innovative teaching strategies, tools and resources is essential in the educational process. Previously, Krapas *et al*. (1997) stated that didactic models are effective tools in the articulation of method and content, since they help visualize and understand complex or abstract content through images, sculptures or models, in a way that favors the learning process.

Therefore, according to Almeida (2015), it is up to the teacher to implement the right tools to attract the student's attention, arousing their interest in the constant search for knowledge. In this sense, audiovisual equipment helps considerably in this process, but it is not enough. For classes to be successful, planning, methodology and dialog are essential. Another way to attract students is to involve them in the lesson by asking them questions about previous topics, facts that happened in the previous lesson, emphasized statements and convincing or unconvincing arguments. Stimulating the students' desire to attend the next classes by anticipating something curious is fundamental, as it serves as an appetizer, awakening in them the desire to take part in the next discussion.

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ISSN: 2675-519X

Costa *et al*. (2019), from a study carried out with teachers on the subject of General Botany in Higher Education in Alagoas, concluded that, even with the lack of resources and practical classes, there is no negative influence on student performance and learning. This particularity has been defended by the adoption of alternative methods (educational games and plant resources from the campus itself) that encourage the students' creativity and dynamism, which captivate them. In fact, this is an example of the fact that it is possible to do what is essential using available, low-cost resources.

The use of active/participatory methodologies can be an alternative to the challenging condition of this Science, in an attempt to diversify teaching methodologies and attract students' attention. Active methodologies consist of a set of methods in which the student is the central protagonist of the teaching-learning process, while teachers act as mediators or facilitators in this process. Through them, students are encouraged to interact in class, by working together or discussing problems. In this way, they are removed from a position of purely receiving information to a context in which they can develop new skills, becoming the center of the teaching-learning process (Borges; Alencar, 2014; Oliveira; Sampaio, 2021).

4 Conclusions

The theoretical basis of the DAV, offered in the IT, gave the students a general idea of the characteristics of the cell and the different types of plant systems, while the practical classes encouraged the materialization of the knowledge acquired in the classroom, providing integration between theory and practice. The practical classes in Plant Anatomy were especially relevant, as the theoretical approach is based on structures that are not usually observed with the human eye, which makes this subject dependent on the imagination.

In the subject of Botany, offered in the IT, the theoretical exposition of the contents provided a general idea of the different classifications of the different plant organs necessary for plant identification. The practical activities allowed the establishment of

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ISSN: 2675-519X

various terms intrinsic to plant systematics and their application in the evaluation of dichotomous keys. It was also possible to bring the students into closer contact with plants, with a more in-depth look at the multiple nuances they present.

The main difficulties observed by students in the RE were the use of or access to technological resources and low interaction during synchronous meetings. The main challenges faced by the monitor and teacher were adapting to the use of the new sites and programs and managing the students in this teaching space. A positive feature in relation to the advantage provided by RE in this experience was the possibility of accessing the recorded lessons from anywhere, at any time and as many times as necessary.

At IT, the students' main difficulty was in retaining the content of the Plant Anatomy subject. In practical classes, the biggest challenge was to make cuts thin enough for detailed observation of anatomical structures. In addition, the size of the laboratory used for Plant Biology activities, as well as the number of equipment and materials available for practicals, influenced the organizational dynamics of the classes and the number of practicals. The outstanding advantage of IT is the physical condition of this experience, the visually interactive space, which allows for the exchange of experiences as students are encouraged to participate, making the environment favorable for correlation with other related areas of knowledge.

The tutoring provided an overall pedagogical experience, as well as different ways of interacting with the students assisted during the process. In addition, these experiences had a significant impact on the monitor's view of the role of teachers in Higher Education, in completely different modalities. Thus, monitoring is affirmed as a space for interaction between teachers, students and monitors, the results of which leave reflections and lessons for all those involved, which give rise to the encouragement of pedagogical practices with this essence.

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DOI: https://doi.org/10.47149/pemo.v6.e13736
https://revistas.uece.br/index.php/revpemo
ISSN: 2675-519X

References

ALI, W. Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. **Higher education studies,** v. 10, n. 3, p. 16-25, 2020.

ALMEIDA, H. M. de. A didática no ensino superior: práticas e desafios. **Estação Científica**, Juiz de Fora, n. 14, p. 1-8, 2015.

ALVES, R. M.; AGUIAR, A. C. A. D. de; GIL, A. dos S. B. Botânica no Ensino Superior: o que pensam os discentes do Amapá (Amazônia, Brasil). **Research, Society and Development,** v. 10, n. 5, e55210515250-e55210515250, p. 1-6, 2021.

APPENZELLER, S.; MENEZES, F. H.; SANTOS, G. G. dos; PADILHA, R. F.; GRAÇA, H. S.; BRAGANÇA, J. F. Novos tempos, novos desafios: estratégias para equidade de acesso ao ensino remoto emergencial. **Revista Brasileira de Educação Médica**, v. 44, e155, p. 1-6, 2020.

ARAÚJO, F. S.; LEAL, R. E. G. Wiki: docência universitária: papéis e desafios. **Revista Docência do Ensino Superior**, v. 2, p. 97-116, 2012.

BARBOSA, M. G; AZEVEDO, M. E. O; OLIVEIRA, M. C. A. Contribuições da monitoria acadêmica para o processo de formação inicial docente de licenciandas do curso de Ciências Biológicas da FACEDI/UECE. **Revista da SBEnBio**, n. 7, p. 5471-5479, out. 2014.

BIZOTTO, F. M.; LOPES, N. P. G.; SANTOS, C. M. D. A vida desconhecida das plantas: concepções de alunos do Ensino Superior sobre evolução e diversidade das plantas. **Revista Electrónica de Enseñanza de las Ciencias**, v. 15, n. 3, p. 394-411, 2016.

BLUMSON, B. Mental Maps. **Philosophy and Phenomenological Research**, v. 85, n. 2, p. 413-434, 2012.

BORGES, T. S.; ALENCAR, G. Metodologias ativas na promoção da formação crítica do estudante: o uso das metodologias ativas como recurso didático na formação crítica do estudante do ensino superior. **Cairu em revista,** v. 3, n. 4, p. 119-143, 2014.

BRUSCATO, A. M.; BAPTISTA, J. Modalidades de ensino nas universidades brasileiras e portuguesas: um estudo de caso sobre a percepção de alunos e professores em tempos de Covid-19. **Revista Brasileira de Educação,** v. 26, e260035, p. 1-25, 2021.

CANCIAN, M. A. E.; FRENEDOZO, R. C. Cultivo de Briófitas em laboratório para utilização como recurso didático no Ensino Médio. **Revista de Ensino de Ciências e Matemática**, São Paulo, v. 1, n. 1, p. 1-8, 2010.

DOI: https://doi.org/10.47149/pemo.v6.e13736
https://revistas.uece.br/index.php/revpemo
ISSN: 2675-519X

CECCANTINI, G. Os tecidos vegetais têm três dimensões. **Brazilian Journal of Botany**, v. 29, n. 2, p. 335-337, 2006.

COSTA, E. A. da; OLIVEIRA, I. V. G. de; SANTOS, A. C. G.; FREITAS-PINTO, A. V.; MATOS, E. C. do A.; PRATA, A. P. do N.; CUNHA, M. M. da S. Percepção de professores sobre a disciplina Botânica geral no ensino superior alagoano. **Revista Insignare Scientia-RIS,** v. 2, n. 4, p. 278-296, 2019.

COUTO, R. M. de S. Fragmentação do conhecimento ou interdisciplinaridade: ainda um dilema contemporâneo? **Revista faac**, v. 1, n. 1, p. 11-19, 2011.

CUTLER, D. F.; BOTHA, T; STEVENSON, D W. Introdução. *In:* CUTLER, D. F.; BOTHA, T; STEVENSON, D. W. **Anatomia vegetal**: uma abordagem aplicada. São Paulo: Artmed Editora, 2009. p. 5-7.

DIAS, P. Da e-moderação à mediação colaborativa nas comunidades de aprendizagem. **Educação, Formação e Tecnologias**, v. 1, n. 1, p. 4-10, 2008.

ESAU, K. **Anatomy of seed plants**. 2. ed. New York: John Wiley, 1991. 576 p.

EVERT, R. F.; EICHHORN, S. E. Botânica: Introdução. *In:* EVERT, R. F.; EICHHORN, S. E. **Raven** – Biologia vegetal. 8. ed. Rio de Janeiro: Guanabara Koogan, 2014. cap. 1, p. 37a.

FAHN, A. **Plant anatomy**. 4. ed. Oxford: Pergamon Press, 1990. 600 p.

FAUSTINO, L. S. e S.; SILVA, T. F. R. S. e. Educadores frente à pandemia: dilemas e intervenções alternativas para coordenadores e docentes. **Boletim de Conjuntura (BOCA)**, Boa Vista, v. 3, n. 7, 2020.

FAVARÃO, N. R. L.; ARAÚJO, C. S. A. Importância da Interdisciplinaridade no Ensino Superior. **EDUCERE** – Revista da Educação, Umuarama, v. 4, n. 2, p. 103-115, jul./dez., 2004.

FERENTZ, L.; FONSECA, M. N. da; ACCIOLY, N. C.; GARCIAS, C. M. Comportamento em tempos de Coronavírus no Brasil: utilização de hashtags no início do isolamento social. **Comunicação em Ciências da Saúde**, v. 31, n. 1, p. 131-143, 2020.

FERNANDES, D. C. A.; FERNANDES, H. M. A.; BARBOSA, E. da S.; CHAVES, M. J. C.; NÓBREGA-THERRIEN, S. M. Contribuições da monitoria acadêmica na formação do aluno-monitor do curso de Enfermagem: relato de experiência. **Debates em Educação**, v. 12, n. 27, p. 316-329, 2020.

Rev. Pemo, Fortaleza, v. 6, e13736, 2024
DOI: https://doi.org/10.47149/pemo.v6.e13736
https://revistas.uece.br/index.php/revpemo
ISSN: 2675-519X

FETTERMANN, J.; TAMARIZ, A. D. R. Ensino remoto e ressignificação de práticas e papéis na educação. **Texto Livre**, v. 14, n. 1, e24941, p. 1-10, 2022.

FREITAS, A. C. S.; ALMEIDA, N. R. O. de; FONTENELE, I. S. Fazer docente em tempos de ensino remoto. **Ensino em Perspectivas**, v. 2, n. 3, p. 1-11, 2021.

GODOI, M.; KAWASHIMA, L. B.; GOMES, L. de A.; CANEVA, C. O ensino remoto durante a pandemia de covid-19: desafios, aprendizagens e expectativas dos professores universitários de Educação Física. **Research, Society and Development**, v. 9, n. 10, e4309108734, p. 1-19, 2020.

GONÇALVES, H.; MORAES, M. Atlas de anatomia vegetal como recurso didático para dinamizar o ensino de botânica. **Enciclopédia biosfera**, v. 7, n. 13, p. 1608-1619, 2011.

GOULÃO, M. F. Ensinar e aprender em ambientes online: Alterações e continuidades na(s) prática(s) docente(s). *In:* MOREIRA, J. A.; MONTEIRO, A. **Ensinar e aprender online com tecnologias digitais**. Porto: Porto Editora, p.15-30, 2012.

KAPLAN, R.; SCHUCK, N. W.; DOELLER, C. F. The Role of Mental Maps in Decision-Making. **Trends in Neurosciences**, v. 40, n. 5, p. 256-259, 2017.

KRAPAS, S.; QUEIROZ, G.; COLINVAUX, D.; FRANCO, C. Modelos: uma análise de sentidos na literatura de pesquisa em Ensino de Ciências. **Investigações em Ensino de Ciências**, Porto Alegre, v. 2, n. 3, p.185-205, 1997.

KRAUS, J. E.; ARDUIN, M. **Manual básico de métodos em morfologia vegetal**. 1. ed. São Paulo: Seropédia – EDUR, 1997. p. 198.

KUSUMAWARDANI, W.; MUZZAZINAH, M.; RAMLI, M. Plant taxonomy learning and research: A systematics review. **AIP Publishing,** The 2nd International Conference on Science, Mathematics, Environment and Education, n. 020051, p. 1-12, 2019.

LANA, R. M.; COELHO, F. C.; GOMES, M. F. da C.; CRUZ, O. G.; BASTOS, L. S.; VILLELA, D. A. M.; CADEÇO, C. T. Emergência do novo coronavírus (SARS-CoV-2) e o papel de uma vigilância nacional em saúde oportuna e efetiva. **Cadernos de Saúde Pública,** v. 36, n. 3, e00019620, p. 1-5, 2020.

LIMA, M. L. P.; LOPES, C. A.; CAFÉ FILHO, A. C. Padrão estomático de *Capsicum* spp. ao Oídio em Telado e Casa-de-Vegetação. **Fitopatologia Brasileira**, v. 29, p. 519-525, 2004.

LIMA, R. S. **Anatomia Vegetal**: Material Didático para EAD. 1 ed. João Pessoa: Editora Universitária, 2010. p. 410.

DOI: https://doi.org/10.47149/pemo.v6.e13736
https://revistas.uece.br/index.php/revpemo
ISSN: 2675-519X

LIMA, R. T. A. de; MEDEIROS, P. D. S. de L.; VASCONCELOS, N. R. D.; OLIVEIRA, R. A. de; ARAÚJO, Z. M. de.; SILVA, J. L. V. da; SOUZA, V. S.; LUCENA, B. K. P. A CEGUEIRA BOTÂNICA: QUAL A SUA RELAÇÃO AO ENSINO DA BIOLOGIA VEGETAL? **RECIMA21** – Revista Científica Multidisciplinar, v. 4, n. 2, e422750-e422750, p. 1-9, 2023.

LONGO, V. C. C. **Vamos jogar?** – jogos como recursos didáticos no ensino de ciências e biologia. Prêmio Professor Rubens Murillo Marques 2012: incentivo a quem ensina a ensinar. São Paulo: FCC/SEP. p. 129-157. 2012.

MACHADO, C. de C.; AMARAL, M. B. Memórias ilustradas: aproximações entre formação docente, imagens e personagens botânicos. **Alexandria**: Revista de Educação em Ciência e Tecnologia, v. 8, n. 2, p. 7-20, 2015.

MACHADO, T. A.; SOUZA, R. P. de; SILVA, D. A. da. Ensino de botânica e atualização de conhecimentos científicos para o ensino superior: uma revisão sistemática da literatura. **Revista ENCITEC**, v. 9, n. 2, p. 82-92, 2019.

MACIEL, M. de A. C.; ANDRETO, L. M.; FERREIRA, T. C. M.; MONGIOVI, V. G.; FIGUEIRA, M. C. dos S. Os desafios do uso de metodologias ativas no ensino remoto durante a pandemia do Covid-19 em um curso superior de enfermagem: um relato de experiência. **Brazilian Journal of Development**, Curitiba, v. 6, n. 12, 98489-98504, p. 98489-98504, 2020.

MANCUSO, S. **Revolução das plantas**: um novo modelo para o futuro. Traduzido por Regina Silva. São Paulo: Ubu Editora, 2019. 192 p.

MASETTO, M. T. **Competência pedagógica do professor universitário.** 2. ed. São Paulo: Summus Editoral, 2003. 212 p.

MATOS, G. M. A.; MAKNAMARA, M.; MATOS, E. C. A.; PRATA, A. P. N. Recursos didáticos para o ensino de botânica: uma avaliação das produções de estudantes em universidade sergipana. **HOLOS**, ano 31, v. 5, p. 213-230, 2015.

NASCIMENTO, B. M.; DONATO, A. M.; SIQUEIRA, A. E. de.; BARROSO, C. B.; SOUZA, A. C. T. de.; LACERDA, S. M. de.; BORIM, D. C. D. E. Propostas pedagógicas para o ensino de Botânica nas aulas de ciências: diminuindo entraves. **Revista Electrónica de Enseñanza de Las Ciencias**, v. 16, n. 2, p. 298-315, 2017.

OLIVEIRA, G. G. de; SAMPAIO, M. C. Metodologias participativas no ensino superior: uma nova proposta de ensinar e aprender. *In:* WENCESLAU, E. C.; PONTE, M. L. da. **Práticas em ensino, conservação e turismo no Brasil [livro eletrônico**. 1. ed. São José do Rio Preto, SP: Reconecta – Soluções Educacionais, 2021. p. 78-90.

DOI: https://doi.org/10.47149/pemo.v6.e13736
https://revistas.uece.br/index.php/revpemo
ISSN: 2675-519X

PAIVA, M. R. F.; PARENTE, J. R. F.; BRANDÃO, I. R.; QUEIROZ, A. H. B. Metodologias ativas de ensino-aprendizagem: revisão integrativa. **SANARE** – Revista de Políticas Públicas, Sobral, v. 15, n. 2, p. 145-153, 2016.

PEREIRA JÚNIOR, A. P.; BISPO, C. J. C.; PONTES, A. N. Interdisciplinaridade no âmbito do ensino superior: Da graduação à pós-graduação. **Revista Ibero-americana de estudos em educação**, Araraquara, v. 17, n. esp. 1, p. 0751-0767, 2022.

POSSOLLI, G. E.; FLEURY, P. F. F. Desafios e mudanças na prática docente no ensino remoto emergencial na Educação Superior em Saúde e Humanidades. **Research, Society and Development,** v. 10, n. 13, p. e146101320655, p. 1-20, 2021.

ROCHA, R. D. C. da; EDSON-CHAVES, B.; RODRIGUES, A. C.; OLIVEIRA, F. M. C. de. Construindo protocolos para o ensino de anatomia vegetal através de práticas laboratoriais acessíveis. **Revista Ciências & Ideias**, v. 15, p. e24152440, 2024a.

ROCHA, R. D. C. da; EDSON-CHAVES, B.; RODRIGUES, A. C.; OLIVEIRA, F. M. C. de. Construindo protocolos para o ensino de anatomia vegetal através de práticas laboratoriais acessíveis. **Revista Ciências & Ideias**, v. 15, p. e24152440, 2024a.

RODRIGUES, L. R.; OLIVEIRA, J. M. S. de; ARAUJO, J. E. de M. Anatomia vegetal aplicada ao estudo de sistemas androgênicos in vitro. **Revista Brasileira de Biociências**, v. 2, n. 3-4, p. 159-166, 2004.
SALANTINO, A.; BUCKERIDGE, M. Mas de que te serve saber botânica? **Estudos Avançados**, v. 30, n. 87, p. 177-196, 2016.

SALVAGNI, J.; WOJCICHOSKI, N.; GUERIN, M. Desafios à implementação do ensino remoto no ensino superior brasileiro em um contexto de pandemia. **Educação por escrito**, v. 11, n. 2, e38898, p. 1-12, 2020.

SAMARAEE, A. A. The impact of the COVID-19 pandemic on medical education. **British Journal of Hospital Medicine**, v. 81, n. 7, p. 1-4, 2020.

SANO, P. T. P16 – Livros Didáticos. *In:* SANTOS, D. Y. A. C. dos; CECCANTINI, G. C. T. **Propostas para o ensino de botânica**: manual do curso para atualização de professores dos ensinos fundamental e médio. São Paulo: Universidade de São Paulo, Fundo de Cultura e Extensão/Instituto de Biociências da Universidade de São Paulo. 2004. p. 43.

SANTOS, B. S.; ALMEIDA FILHO, N. **A Universidade do Século XXI**: para uma nova universidade. Coimbra: Almedina, ICES, 2008. 260 p.
SCHNEIDER, M. S. P. S. Monitoria: instrumento para trabalhar com a diversidade de conhecimento em sala de aula. **Revista Eletrônica Espaço Acadêmico**, Maringá, v. 6, n. 65, 2006.

SILVA, A. C. O.; SOUSA, S. A. de; MENEZES, J. B. F. de. O ensino remoto na percepção discente: desafios e benefícios. **Dialogia**, n. 36, p. 298-315, 2020.

SILVA, J. M.; MATOS, R. F. de; FRANÇA, T. M. de S.; CORTEZ, P. A.; EDSON-CHAVES, B. Anatomia Vegetal na perspectiva dos alunos de ensino superior do curso de Ciências Biológicas. **Revista Docência do Ensino Superior**, Belo Horizonte, v. 13, e045706, p. 1- 24, 2023.

SILVA, J. R. S. **Concepções dos professores de Botânica sobre o ensino e a formação de professores**. 2013. 208 f. Tese (Doutorado em Ciências) – Universidade de São Paulo, São Paulo, 2013.

SILVA, L. G. S. Estratégias de ensino utilizadas, também, com um aluno cego, em classe regular. *In:* MARTINS, L. A. R.; PIRES, J. PIRES LUZ, G. N.; MELO, F. R. L. V. de. **Inclusão:** compartilhando saberes. 5. ed. Petrópolis, RJ: Vozes, 2011. 232 p.

SILVA, L. M.; ALQUINI, Y.; CAVALLET, V. J. Inter-relações entre a anatomia vegetal e a produção vegetal. **Acta Botanica Brasilica**, v. 19, n. 1, p. 183-194, 2005.

STOFFLET, R. T. Putting Constructivist Teaching into Practice in Undergraduate Introductory Science. **The Eletronic Journal for Research in Science & Education**, v. 3, n. 2, p. 1-13, 1999.
THIESEN, J. da S. A interdisciplinaridade como um movimento articulador no processo ensino-aprendizagem. **Revista brasileira de educação**, v. 13, n. 39, p. 545-554, 2008.

URSI, S.; BARBOSA, P. P.; SANO, P. T.; BERCHEZ, F. A. de S. Ensino de Botânica: conhecimento e encantamento na educação científica. **Estudos avançados**, v. 32, n. 94, p. 07-24, 2018.

VASCONCELOS, C. do S. **Coordenação do Trabalho Pedagógico**: do projeto político-pedagógico ao cotidiano da sala de aula. 16. ed., ed. revi. e ampl. São Paulo: Cortez, 2019. 320 p.

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Rev. Pemo, Fortaleza, v. 6, e13736, 2024
DOI: https://doi.org/10.47149/pemo.v6.e13736
https://revistas.uece.br/index.php/revpemo
ISSN: 2675-519X

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Responsible publisher: Genifer Andrade.

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How to cite this article (ABNT):
GUIMARÃES, Jandson José do Vale; ROSAL, Louise Ferreira. Lições da monitoria em anatomia vegetal e botânica: desafios na mediação presencial e remota. **Rev. Pemo**, Fortaleza, v. 6, e13736, 2024. Available at: https://revistas.uece.br/index.php/revpemo/article/view/13736

Received on August 13, 2024.
Accepted on October 11, 2024.
Published on December 19, 2024.