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The plant and fungi collection of the FFOP Herbarium in the extension activities of the Universidade Federal do Paraná

A coleção de plantas e fungos do Herbário FFOP nas ações de extensão da Universidade Federal do Paraná

REVISTA EXTENSÃO EM FOCO
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ABSTRACT

Herbaria are commonly related to research activities, through the conservation of samples of dried algae, plants and fungi. However, this type of biological collection has great potential for integrating the fields of teaching, research and extension. Therefore, the project entitled "Herbarium of Setor Palotina: integrated into the extension at UFPR" was conceived with the aim of integrating the collection of herborized plants and fungi of UFPR - Setor Palotina, called Herbarium of Flora and Fungi of Western Paraná - FFOP, to schools in the region, seeking to provide materials that would assist in the teaching-learning process of botany, as well as developing approaches that could contribute to minimizing students' lack of interest in this area. Therefore, this text aimed to list and analyze the results obtained over the first year of project implementation. Through dialogic interaction, activities such as workshops and visits by schools in the region were carried out. Plants were collected on the Palotina *campus* to prepare teaching materials as well as materials used in the annual event "Come to UFPR", which provided opportunities for contact with schools. In total, 345 students participated in the actions carried out at the herbarium, and around 2000 visitors passed through the University during the event. 48 teaching materials were also made in the form of exsiccates to be used in schools. In addition to consolidating the herbarium as an extension environment, the project also reaffirms the commitment to the local school community by meeting the demand for teaching materials.

Keywords: Exsiccate. Teaching botany. Fungi.

RESUMO

Os herbários são comumente relacionados à atividade de pesquisa, através da conservação de amostras de algas, plantas e fungos herborizados. Esse tipo de coleção biológica apresenta um grande potencial de integração dos campos de ensino, pesquisa e extensão. Deste modo, o projeto intitulado "Herbário do

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Setor Palotina: integrado à extensão na UFPR" foi concebido com o intuito de integrar a coleção de plantas e fungos herborizados da UFPR - Setor Palotina, denominada Herbário da Flora e dos Fungos do Oeste do Paraná - FFOP, às escolas da região, buscando fornecer materiais que auxiliassem no processo de ensino-aprendizagem da botânica, assim como desenvolver abordagens que pudessem contribuir para minimizar o desinteresse dos estudantes por essa área. Dessa forma, esse texto teve como objetivo elencar e analisar os resultados obtidos ao longo do primeiro ano de implementação do projeto. Através da interação dialógica foram desenvolvidas atividades como oficinas e visitas de escolas da região. Foram coletadas plantas no campus Palotina para o preparo de material didático bem como de materiais usados na feira anual "Vem pra UFPR", evento este que oportunizou o contato com as escolas. Ao todo, 345 alunos participaram das ações desenvolvidas no herbário, e cerca de 2000 visitantes passaram pela Universidade durante a feira. Também foram confeccionados 48 materiais didáticos na forma de exsicatas para serem utilizados no âmbito escolar. Além de consolidar o herbário como um ambiente extensionista, o projeto também reafirma o compromisso com a comunidade escolar local ao suprir a demanda por materiais de ensino.

Palavras-chave: Exsicata. Ensino de botânica. Fungos.

INTRODUCTION

Over the past five years, Brazilian higher education institutions have been undergoing a process of integrating extension activities into the curricula of undergraduate programs, a process that has been referred to as the crediting of extension. This reform stems from a federal requirement established by Resolution MEC/CNE/CES No. 007/2018, of December 18, 2018 (BRAZIL, 2018), which sets forth the Guidelines for Extension in Brazilian Higher Education. In this resolution, extension is defined according to the concept presented by the Forum of Pro-Rectors for Extension of Brazilian Public Higher Education Institutions, as:

> … An activity that is integrated into the curriculum and the organization of research, constituting an interdisciplinary, educational, political, cultural, scientific, and technological process that promotes a transformative interaction between higher education institutions and other sectors of society, through the production and application of knowledge, in permanent articulation with teaching and research (BRAZIL, 2018, Art. 3).

The National Education Plan (PNE), established by Law No. 13,005 of June 25, 2014 (BRAZIL, 2014), had already stipulated, in its Goal 12 and Strategy 7, that institutions should ensure that at least 10% of the total curricular credits required for undergraduate programs be fulfilled through participation in university extension programs and projects. This strategy was later regulated by Resolution MEC/CNE/CES No. 007/2018 (BRAZIL, 2018).

Within the scope of the Federal University of Paraná (UFPR), Resolution No. 86/20 (UFPR, 2020) regulates the accreditation process, internally referred to as the "Integration of Extension", through Normative Instruction No. 001/2024 (UFPR, 2024).

Resolution No. 57/19 (UFPR, 2019) establishes the general guidelines for all extension activities at UFPR. According to this Resolution, university extension must be developed in the form of a Program, Project, Course, Event, or Service Provision, provided that these modalities incorporate, in their actions, the five extension principles: Dialogical Interaction, Interdisciplinarity and Interprofessionality, Indissociability between Teaching, Research, and Extension, impact on Student Education and Social Impact and Transformation (FORPROEX, 2012).

Accordingly, in order to comply with the legislation related to curricular integration, all UFPR undergraduate programs began adapting their pedagogical plans to include the required extension workload, either in full or in part, thus undergoing curriculum reforms. In addition, the number of extension project proposals within the institution increased, aiming to provide students with more opportunities to fulfill their extension credit requirements. One such initiative is the project “Herbarium of the Palotina Sector: integrated with extension at UFPR” (PROEC Registration - PEX00000470).

This project began in 2023 and is expected to last five years. It is linked to the Palotina Sector Herbarium, officially named Herbarium of the Flora and Fungi of Western Paraná - FFOP. The Herbarium currently holds a small scientific collection of vascular plants and fungi, consisting of research specimens and material exchanges with other herbaria. The aim of incorporating the Herbarium into the Palotina Sector’s extension activities was to bring the community closer to this scientific space and, above all, to reduce the unawareness of plants and fungi in nature and in the daily lives of students and teachers from local schools, thereby fostering interest and improving the teaching and learning of botany (URSI; SALATINO, 2022). Moreover, the project also seeks to support Biology and Science teachers from public schools by donating herbarium specimens (exsiccatae), thus helping to mitigate the shortage or difficulty in obtaining fresh biological materials, such as branches with leaves and flowers from various plant groups or fungi, for use in practical classes.

The use of herbaria in teaching has already been reported by other researchers. Nunes et al. (2015), for instance, observed that incorporating the herbarium into school activities facilitated learning and sparked interest in botany. For these authors, the herbarium represents an interesting didactic strategy for teaching. Similarly, Machado and Silva (2022) reported that the production of exsiccatae by students, throughout a project, fostered a closer relationship with the local flora, enhancing contextualized learning and improving the understanding of botanical concepts.

In line with such initiatives, Cordi et al. (2017) also sought to connect the UEC Herbarium of the State University of Campinas (São Paulo) with extension activities. These authors have been promoting educational visits and workshops on various topics

related to plant biology research and teaching, involving undergraduate and graduate students as well as faculty members. According to them, this represents a new way of broadening the dissemination and communication of scientific knowledge. The Nupélia Herbarium - HUNP of the State University of Maringá (Paraná) has likewise developed extension activities alongside research and taxonomic identification work, particularly focusing on riparian flora. These activities include courses, mini-courses, and both in situ and ex situ visits (KAWAKITA et al., 2017).

Beyond the contribution of herbaria to botanical education, these spaces also provide opportunities to practice teaching as part of extension activities. For undergraduate teaching students in particular, such experiences promote the development of public speaking skills, reduce inhibition, and enhance interaction with target audiences. In this sense, the FFOP Herbarium extension project, in addition to its educational dimension, offers students the chance to engage in teaching practice through short lectures and workshops featuring material demonstrations and explanations. Furthermore, the project encourages collaboration among students from different undergraduate programs, fostering the exchange of knowledge across disciplines.

Thus, the objectives of the project in 2023 were: to carry out various extension activities within the FFOP Herbarium, a space traditionally associated with research; to bring the external community, especially students and teachers from local public schools, closer to the university, thereby stimulating curiosity and interest in botanical knowledge; to improve the teaching and learning of plant and fungal topics in schools, thus reducing botanical unawareness; and to contribute to the professional training of undergraduate students in Biological Sciences and Agronomy at UFPR's Palotina Sector.

METHODS

Workshops and guided visits were carried out with elementary and high school students, teachers were trained, herbarium specimens and mini-specimens were prepared for donation, and a project exhibition was held at a local fair. The activities were planned and organized according to the participants' age and profile, as well as in response to specific requests and needs.

1. Workshops, training and guided visits

The workshops were conducted for elementary and high school students in the Plant Systematics Laboratory and in an anteroom adjacent to the FFOP Herbarium collection at UFPR - Palotina Sector. They addressed the themes 'collection and herborization of plants and fungi' and 'the universe of botanical collections and the FFOP Herbarium',

with the language used in the presentations adapted in complexity according to the age group of the participants. During the activities, demonstrations were carried out using fresh plant materials to illustrate the procedures for collecting, pressing, and dehydrating biological specimens, employing field and laboratory equipment such as plant presses, pruning shears, and a forced-air drying oven.

In the same space, and following the same explanatory stages, but using a more technical language, training sessions were held for public school teachers who wished to learn herborization techniques in order to apply them with their own students in the schools where they teach.

For the guided visits, the Medicinal and Aromatic Plants Garden of UFPR - Palotina Sector was used, since, according to Lopes et al. (2011), botanical gardens are suitable environments for educational programs aimed at rescuing and valuing traditional knowledge.

Both the workshops and the guided visits were conducted by the FFOP Herbarium team (undergraduate students - scholarship holders and volunteers, together with the supervising professor and the laboratory technician), scheduled in advance via email, telephone, or in person.

2. Collection and herborization of materials for the preparation of herbarium specimens and mini-specimens

Herbarium specimens were prepared as didactic material for use in practical or theoretical Biology and/or Science classes, to be donated to a public school in the municipality of Palotina. This initiative began with contact with a teacher, a biologist and UFPR student, followed by an interview to identify which biological materials could best support her lessons. Subsequently, the actual preparation of the specimens began.

The collection of materials took place on the UFPR – Palotina Sector campus. After being herborized, the plants were mounted on white cardstock sheets of various sizes, according to the type of botanical material intended for classroom use. Small flowers, both whole and dissected, were mounted on smaller sheets, while larger flowers or leafy branches were mounted on larger ones.

At the time of collecting plants for the specimens to be donated, additional samples of small flowers were also gathered for the preparation of mini-specimens, as well as

other diverse samples for the assembly of specimens to be displayed in an annual exhibition held at the Palotina Sector, entitled “Come to UFPR”.

The mini-specimens were prepared on 7x10 cm white cardstock, containing the name of the herbarium and the common and scientific names of the species. These were distributed to visitors participating in the activities as a memento of their visit and as a way to promote the FFOP Herbarium.

3. Exposition at the local fair “Come to UFPR” and contact with schools

In order to promote the activities carried out within the facilities of the FFOP Herbarium and to foster contact and potential partnerships with educational institutions in the region, the project team organized an exhibition of its activities at an annual fair held at the university, entitled “Come to UFPR” (Extension Project PEX-00019882 - PROEC/UFPR). This event features exhibitions from undergraduate programs and various projects, aiming to attract teenagers and other individuals interested in joining the institution.

Preparations for the event included the planning and production of display material, as well as informational materials to be distributed to visitors. A small collection of herborized plants was assembled, accompanied by potted specimens to demonstrate the before and after stages of the herborization process. Some of the material traditionally used in the herbarium’s daily activities were presented, and small souvenirs were distributed to visitors by the organizing team.

RESULTS AND DISCUSSIONS

1. Workshops, training and guided visits

Throughout the second academic semester of 2023, the FFOP Herbarium welcomed students and teachers from seven primary and secondary schools, both public and private, six from the municipality of Palotina (PR) and one from Toledo (PR).

Workshops were conducted on basic concepts of plant material collection and herborization, as well as workshops on floral morphology (Figure 1). In addition, a special workshop entitled “Exploring the Semideciduous Seasonal Forest and Methods of Plant Collection and Herborization” was held at the São Camilo State Park (Palotina - PR), with the participation of 80 high school students.

Another highlight was the event “Discovering Plant Biodiversity on the UFPR Palotina Sector Campus,” held in two sessions (morning and afternoon) to receive 100 children from a municipal early childhood education center (CMEI) in Palotina. This event also included workshops conducted in the Phanerogam Systematics Laboratory, in the Medicinal Plants Garden, and in the fragment of Semideciduous Seasonal Forest (SSF) located within the Palotina Sector (Figure 1).

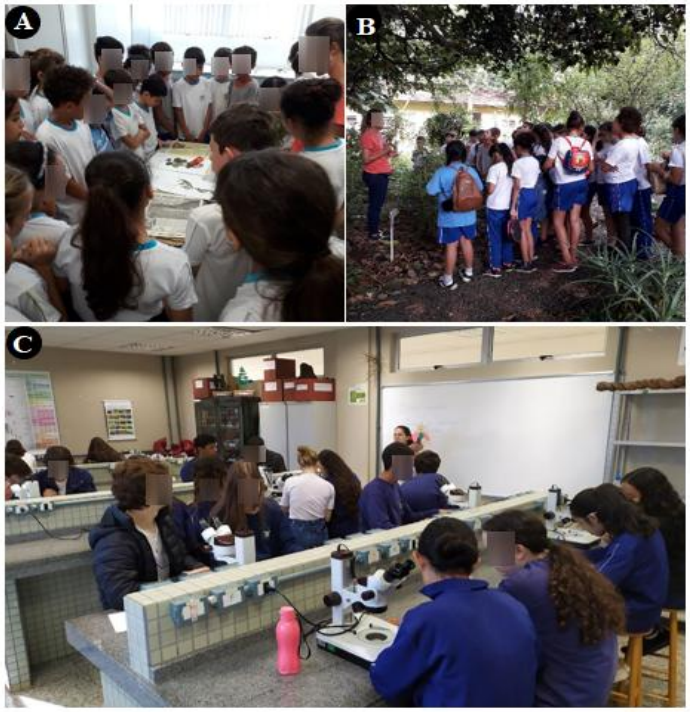
This latter activity, in particular, formed part of the extension component of the course Phanerogam Systematics in the UFPR Biological Sciences program. Undergraduate students were trained to welcome the children and to develop activities related to plants within the context of a natural environment (the SSF remnant on campus). In the Medicinal Plants Garden, they discussed plants used for health and nutrition. In the FFOP Herbarium, they introduced the research space and demonstrated how plants are prepared for scientific study, and in the laboratory, the children had contact with equipment and were able to observe plant cells under the microscope and details of morphology through a magnifying lens.

The positive outcomes of this extension activity became evident by the end of the afternoon, at the moment of farewell. The children were delighted with the mini-specimen they received as a souvenir, an emotion clearly reflected in their spontaneous smiles and the sparkle in their eyes. Some enthusiastically exclaimed, “I want to study here!”, “I want to be a biologist!”, or “I want to be a teacher like you!”, clear evidence of the project’s social impact and transformative reach.

Among the spaces utilized in extension activities, the Medicinal Plant Garden proved to be an environment of great value for guided visits, even enabling integration with other extension projects focused on medicinal plants, thus constituting a prolific space for the appreciation of knowledge (LOPES et al., 2011).

In this environment, walks were conducted among the garden beds with visitors, accompanied by explanations, aiming to guide participants so that they could observe the plants in their natural setting, perceiving the textures and scents of the cultivated species before their collection for dehydration and the preparation of herbarium specimens (Figure 1b). Most of the plants on site are labeled with plaques containing both the common and scientific names of the species, along with their main therapeutic uses, making it possible to learn more about the benefits of using medicinal and aromatic plants in health care.

Figure 1– (a) Workshop on the herborization of botanical material conducted at the FFOP Herbarium; (b) Visit by students to the Medicinal and Aromatic Plants Garden of the Palotina Sector; (c) Workshop on floral morphology held in the Plant Systematics Laboratory.



Source: The authors (2024).

These extension opportunities allow undergraduate students to reflect on their experiences, on what they learn in the classroom and other settings, and gradually facilitate the construction of their personal and professional identity based on the pursuit of knowing how to be, knowing how to do, and knowing how to learn, that is, in the development of their competencies (FERNANDES et al., 2012).

At the end of all activities, the participating public received “mini-herbarium specimens” as souvenirs, with a total of 240 units distributed: 140 of Jacaranda mimosifolia D. Don (jacarandá-mimoso), 25 of Leucophyllum frutescens (Berland.) I. M. Johnst, 50 of Bougainvillea spectabilis Willd. (bougainvillea), and 25 units of Nerium oleander L. (Figure 2d).

In total, 345 students were recorded as having participated in these project activities. These visits represent moments of interaction and learning between the community and the academic environment, allowing visitors to engage with the reality of scientific research while enabling university students to develop their teaching and extension skills (MENEZES et al., 2017).

According to Arantes et al. (2023), these new activity opportunities positively impact students' university trajectories by providing new experiences, promoting personal growth, influencing their social and civic development, and even guiding future professional choices. In this sense, considering multi, inter, and transdisciplinary approaches in extension activities is as important as strengthening their connections with teaching and research (ROVATI; D'OTTAVIANO, 2017).

In addition to the work conducted with students, a training session was provided for a partner teacher from the public school network on plant collection and herbarium preparation methods. This training included practical activities at the FFOP Herbarium. This initiative clearly demonstrates how the production of university knowledge can engage with society through extension activities, addressing demands and offering solutions (SILVA, 2016).

2. Collection and herborization of materials for the preparation of herbarium specimens and mini-specimens

In addition to the previously mentioned activities, the herbarium team also undertook, through a partnership with a high school teacher from Palotina - PR, the preparation of herbarium materials that could be used as teaching tools in the classroom for botany education.

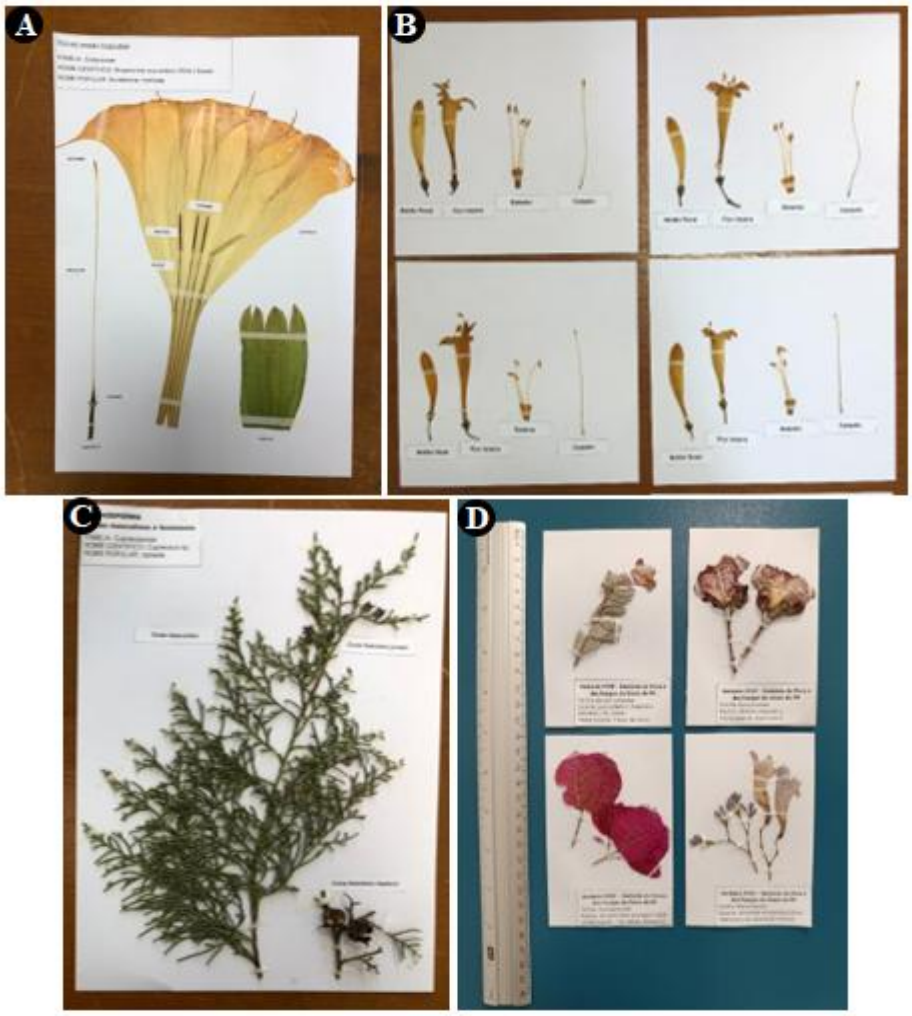
Following the teacher's suggestions, priority was given to producing materials related to the groups of gymnosperms and angiosperms. For this purpose, samples of closed and dissected flowers of Brugmansia suaveolens (Willd.) Sweet (angel's trumpet) and Pyrostegia venusta (Ker Gawl.) Miers (golden trumpet vine), as well as branches of Cupressus sp. (gymnosperm) with male and female cones at different stages of development, were used. Each flower part was labeled with tags indicating the structures that could be observed in the herbarium specimens, such as stamen, anther, carpel, ovary, petal, and sepal. In the gymnosperm samples, the male and female cones were identified (Figure 2).

In total, 14 herbarium sheets measuring 28 × 42 cm of B. suaveolens (Willd.) Sweet were produced and donated, including 6 sheets of whole (closed) flowers and 8 sheets of dissected flowers (for observation of the reproductive organs), 14 medium-sized sheets (10 × 10 cm) of P. venusta (Ker Gawl.) Miers flowers, both whole and dissected, and 20 sheets measuring 25 × 20 cm of Cupressus sp., containing branches with male, young female, and mature female strobili (cones). In return, the teacher who received the

samples agreed to provide feedback once the materials were used in botany lessons, reporting their impact on the teaching/learning process of the content covered.

The teacher's interest and willingness to use the herbarium specimens in her classes is crucial for allowing students to visualize botany in a way that differs from traditional textbook presentations, relating it to their daily lives and thereby encouraging reflection (NUNES et al., 2015) and fostering their interest in learning the content (PEREIRA; FERNANDES, 2018). The use of teaching herbariums, represented through herbarium sheets as educational materials, is an excellent alternative that brings students closer to botany (BRASIL-PEIXOTO et al., 2021).

Figure 2 – (a) Herborized material using dissected flowers of B. suaveolens (Willd.) Sweet for use in the study of floral morphology; (b) Herborized materials produced with flowers of P. venusta (Ker Gawl.) Miers; (c) Example of herborized material of Cupressus sp. for use in the study of gymnosperm reproductive structures; (d) Examples of mini-specimens prepared for distribution to participants in the extension activities.



Source: The authors (2024).

3. Exposition at the local fair “Come to UFPR” and contact with schools

Throughout the first academic semester of 2023, the herbarium team organized and participated in the exhibition of project activities at the “Come to UFPR” event, which took place in June 2023. Preparatory activities began with the collection of botanical material for herbarium preparation and subsequent assembly of mini-specimens, aiming to obtain material for display.

A total of 25 mini-specimens were produced, containing specimens of pteridophytes, gymnosperms, and angiosperms, representing 14 different families. The collection of display materials was designed to be as didactic and visually engaging as possible (Figure 3). Some of the species presented as mini-specimens were also cultivated several months in advance, allowing visitors to observe them both in vivo and in their dehydrated form.

To further increase the outreach of the herbarium, materials were produced for distribution to visiting audiences, including an informational brochure (Figure 4) about the work conducted in a herbarium, detailing the steps involved in preparing a herbarium specimen and information about the FFOP Herbarium collection, along with 150 “mini-specimens” featuring the species Pyrostegia venusta (Ker Gawl.) Miers (golden trumpet vine), Alternanthera sp., and Cuphea gracilis Kunth (false heather), as a way to provide visitors with a souvenir from the exhibition.

Figure 3 – (a); (b), and (c) Student presenters promoting the activities of the FFOP Herbarium to visitors at the project booth during the 2023 “Come to UFPR” event

Source: The authors (2024).

Complementarily, and to stimulate visitors' curiosity, a fresh bryophyte sample was collected and placed for observation under a magnifying glass, accompanied by a poster posing the question: "Do you know what plant this is?". Motivated by the question, visiting students approached and attempted to identify the material by looking through the lenses. This activity provided an opportunity to experience using laboratory equipment, to recall concepts for identifying a plant commonly found in both urban and preserved environments, and to interact with the exhibitors.

According to the event organizers, approximately 2,000 people from 23 municipalities, including students and teachers, visited the university during the fair.

As observed, conducting an extension activity is not about imposing knowledge, prescribing, or dictating, but rather about sharing, dialoguing, and interacting (dialogical interaction) in a way that allows for a connection between scientific culture and the culture of the humanities (PAULA, 2013).

According to Corrêa (2019), viewing extension as part of the educational process and an integral aspect of human development is challenging. Even with the curricular integration of extension activities in Brazilian undergraduate programs, regulated by MEC/CNE/CES Resolution No. 007/2018 of December 18, 2018 (BRAZIL, 2018), there remains some resistance among university faculty to adopt extension practices that bring scientific knowledge closer to the community. Historically, teaching and research activities have always been more highly valued within the university. Arantes et al. (2023) identified a decrease in the availability of extension projects at the Palotina Campus of UFPR from 2017 onward, during the period analyzed in their study, citing possible causes such as limited resources for project development, the low number and short duration of extension scholarships for students, the complexity of administrative procedures and systems for recording extension activities, and limited visibility due to insufficient dissemination of extension initiatives.

Figure 4 – Brochure developed by the FFOP Herbarium team to be printed and distributed to visitors at the project booth during "Come to UFPR". (a) Front side containing the name of the Herbarium, contact information, and a relevant fact related to the field; (b) Inside page containing information about the work carried out in a herbarium and the steps involved in the preparation of herbarium specimens.

Source: The authors (2024).

FINAL CONSIDERATIONS

The development of this work contributed to strengthening the FFOP Herbarium as a venue for extension activities, aided in the dissemination of research conducted on its premises, and highlighted the importance of scientific spaces, such as biological collections, in the educational process beyond the classroom.

For these activities, dialogical interaction was essential, allowing the sharing of knowledge with visitors, as well as the inseparability of teaching-research-extension, which are the three pillars of the university. This principle should be understood as a response to social demands for a socially responsible university that engages more actively with various sectors of society, promoting education and knowledge production aligned with social needs (GONÇALVES, 2015), directly linked to teaching at both undergraduate and graduate levels, and to research (DEL-MASSO et al., 2017).

In this sense, based on the survey and evaluation of results obtained through participatory observation during the implementation of the project with the participating public, it was possible to verify that the project fostered the development of critical thinking among extension students regarding the teaching-learning process of botanical content, by applying new teaching approaches and methodologies.

Furthermore, it provided the opportunity to develop and enhance skills such as teamwork, creativity, proactivity, as well as a sense of responsibility toward the work and all involved. These outcomes reflect the importance of extension in the context of academic training, promoting positive impacts on the professional and civic development of extension students, as well as benefiting the community through the activities carried out.

For teachers and students from the regional education network, interactions with the project offered exposure to new learning perspectives beyond the formal classroom space, incorporating activities conducted in natural areas as well as in spaces traditionally associated with research. Additionally, the partnership with a local public school teacher enabled the identification of gaps in tools for teaching botany in schools, leading to the preparation of materials that could partially address this demand.

Incorporating extension into academic practice is neither simple nor easy. It requires a willingness to engage in dialogue, to break paradigms and entrenched educational habits, as well as to challenge the academic discourse that maintains a compartmentalized view of knowledge, inherited from a tradition that stratifies learning into independent domains (CORRÊA, 2019). The ability to create, think, propose, innovate, take risks, and reflect is necessary when aiming for an education that is plural and open (RIBEIRO et al., 2018).

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