

Pedagogical Residency in Biology: a study in high school in a public school in Picuí-PB

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Abstract

The Pedagogical Residency Program was launched with the aim of integrating students from teaching degree programs into basic education, providing initial training. The objective of this study was to describe the experiences of the program to a group of residents from the Biology teaching degree course. To this end, we present here a descriptive study. The activities described were carried out at a public high school in the city of Picuí-PB, from August 2023 to December of the same year. The residents were involved in a wide range of activities, such as conducting theoretical and practical lessons, creating and grading exercises, participating in technical-scientific events, and assisting in field classes. In this sense, we believe that these activities provided a series of experiences and the development of competencies and technical skills specific to teaching and Biology, fostering qualified human resources for the teaching profession.

Keywords: Basic education teaching. Teaching. Initial formation.

Residência Pedagógica em Biologia: um estudo no ensino médio em uma escola pública de Picuí-PB

Resumo

O Programa Residência Pedagógica foi lançado com a finalidade de inserir estudantes de cursos de licenciatura no ensino básico, oportunizando formação inicial. O objetivo deste estudo foi descrever as experiências vivenciadas por um grupo de residentes do curso de licenciatura em Biologia. Para tal, apresentamos aqui um estudo de caráter descritivo. As atividades descritas foram realizadas em uma escola pública de ensino médio da cidade de Picuí-PB, no período de agosto a dezembro de 2023. Os residentes foram inseridos em uma ampla diversidade de atividades, como regência de aulas teóricas e práticas, elaboração e correção

de exercícios, participação em eventos técnico-científicos e acompanhamento em aulas de campo. Nesse sentido, consideramos que essas atividades oportunizaram uma série de vivências, além do desenvolvimento de competências e habilidades técnicas próprias da licenciatura e da Biologia, fomentando recursos humanos capacitados para a profissão docente.

Palavras-chave: Magistério de ensino básico. Docência. Formação inicial.

1 Introduction

The Pedagogical Residency Program (PRP) was recently launched by the Ministry of Education (MEC), as described in Notice 6/2018 of the Coordination for the Improvement of Higher Education Personnel (CAPES), and is on the agenda of the National Basic Education Teacher Training Policy. This notice had, among other objectives, the selection of public, private non-profit or private for-profit Higher Education Institutions (HEIs) that have degree courses participating in the University for All Program, for the implementation of innovative projects that stimulate articulation between theory and practice in degree courses (Brasil, 2018).

The PRP, in general, has some similarities or analogies to the medical residency in the complementary training (post-graduation) of medical courses. In Brazil, the idea of Pedagogical Residency can also be found in the use of terms such as educational residency, teaching residency and teaching immersion, referring to the initial training of undergraduate students (Faria; Pereira, 2019) and the continuing training of preceptors in basic education institutions (Ferreira; Siqueira, 2020).

Through CAPES, the program offers a scholarship to students enrolled in undergraduate courses at HEIs. This grant also extends to the school preceptor, the supervising teacher and the program coordinator at the HEI. One of the criteria for undergraduates to take part in the program is that they have taken at least 50% of their course subjects (Oliveira-Neto; Pereira; Pinheiro, 2020). As one of the objectives of the program is to introduce students to teaching, it is important that they already have a good grasp of their field.

In Brazil, basic education faces numerous challenges, including a lack of adequate investment in education, social and economic inequality that directly affects access to and quality of education, a lack of adequate teacher training, curriculum gaps and a lack of student motivation. In addition, there are other challenges related to each specific level, such as insufficient literacy in elementary school and school dropout in secondary school (Tartuce *et al.*, 2018).

While 95% of children of parents with complete higher education complete secondary school, only 25.9% of children of parents with no schooling achieve the same level (Ferreira; Ribeiro; Tafner, 2023). The National Education Plan (PNE) seeks to change this situation, but its actions have been insufficient, with many targets not being met. Considering the aforementioned factors, in order to improve public primary education, it is necessary to invest more in public policies that increase the quality of schools (Coutinho; Oliveira; Borges, 2017).

Following this line of thought, how could the PRP help to improve basic education? We agree that the residency is a “two-way street”, because while the undergraduate students participating in the program are enriched in terms of their initial training, the preceptor teacher is enriched in their continuing training, given that they will be involved in the academic environment, a research environment. This results in better methodological, pedagogical, didactic and professional development, fostering the training of highly trained human resources and, consequently, improving the quality of basic education (Ferreira; Sequeira, 2020).

As the research by Freitas; Freitas; Almeida (2021) describes, the field school that receives the PRP gains energy from the new professionals. Furthermore, the PRP can contribute to understanding how teaching praxis is carried out, integrated and how, on a daily basis, it transforms the collective and its practices (Silva, 2020).

The aim of this study was to investigate the experiences of students participating in the PRP program of the Biological Sciences degree course at the Federal University of Campina Grande (UFCG) - Center for Education and Health (CES), in a public high school.

Here we report on a variety of experiences and how important they were for the development of skills and competencies for the training of a Biology graduate.

2 Methodology

2.1 Characterization of the study

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This is a descriptive study with a qualitative approach, based on the experiences of a group of students who took part in the PRP during its lifetime.

The study is presented as an important scientific narrative, which demonstrates unique experiences, and is understood as a study whose objective is not to propose a definitive concept, and is therefore open to analysis and the production of new and transversal knowledge (Daltro; Faria, 2019).

This study was organized according to the assumptions of Mussi; Flores and Almeida (2021), shown in Table 1.

Table 1: Stages adopted for the study.

Stages	Description
Introduction	Key concepts, relevance and purpose of the report.
Methodology	Time period, location, characterization of the activities and intervention carried out.
Results	Main experiences.
Discussion	Dialogue with the literature and critical reflection.
Final considerations	Analysis of the scope of the report.

Source: Adapted from Mussi; Flores and Almeida (2021).

2.2 Formation of the Biology center

Initially, the students selected through public notice 33/2022 formed a nucleus of the UFCG-CES Biology Residency, bringing together around 28 students, including scholarship holders and volunteers, from that institution's Biological Sciences degree course. They were divided into four groups to work in different schools in the region of Paraíba's 4th regional education department, in the cities of Picuí, Nova Floresta and Cuité.

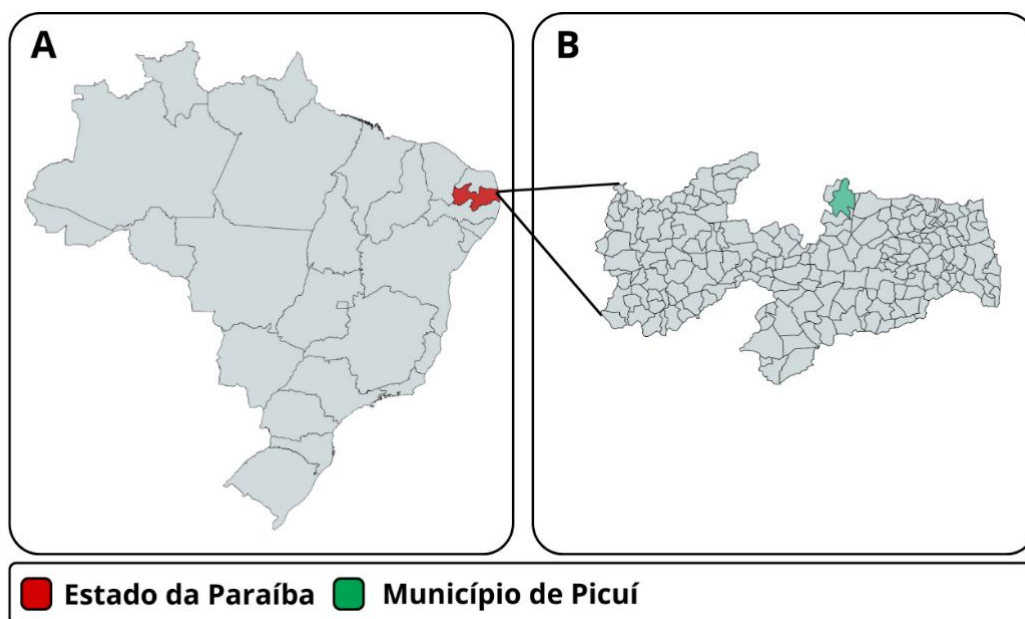
Each group of residents in the schools had a preceptor, as provided for in the public notices (Brasil, 2018). Regarding the characterization of this group of residents, the authors of this work, it was composed of 6 scholarship students, but only four participated in this study.

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2.3 School and activities

The PRP activities were carried out from August 2023 to December of the same year at a public high school in the municipality of Picuí (Figure 1). The school offers the final years of elementary school and complete high school. In the last school census, the school had 262 enrolments, serving students from both the urban and rural areas of the city. The teaching staff is made up of 32 teachers distributed between secondary education and the technical base, since the institution also has a technical course integrated with secondary education.

Figure 1: Location of the field school where the PRP activities were carried out. **A:** Brazil and the state of Paraíba in red. **B:** Paraíba with the municipality of Picuí in green.



Source: Prepared from MapChart, 2024.

The institution has a good infrastructure, including facilities with accessibility, toilets with accessibility, food and filtered water, as well as a library, kitchen, science laboratory with various equipment, library, sports court and teachers' room.

Before starting the regency, the group of residents met with the preceptor of the field school for initial planning and a study of the institution's Political Pedagogical Project (PPP). At this meeting, a period of study of the school context was planned, during which the residents attended the preceptor's Biology classes to observe, adapt and study the profiles of the classes and students. Only after this period did the residents start teaching.

During their time there, the residents taught classes for all the years of high school, distributed between theoretical and practical classes. However, it should be noted that the residents only taught “Experimental Practices” to the first-year classes, as will be detailed below. The average number of students per class was 27. However, this average only considers individual classes. As the classes are stratified into subgroups, such as 1st year class “A”, “B” and “C”, the total number of students, taking these stratifications into account, would be higher (Table 2).

Table 2: High school years in which the classes were taught and other related information.

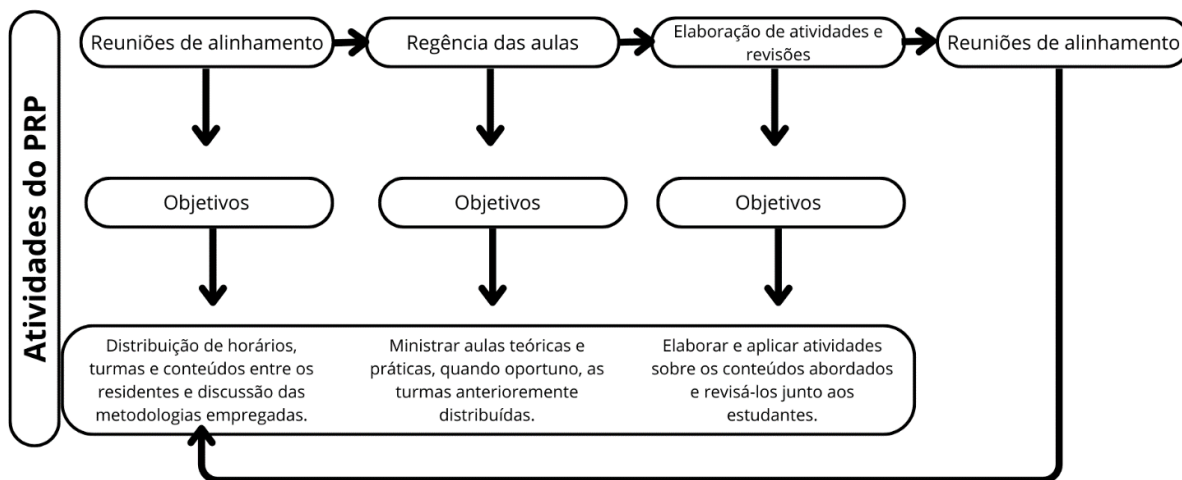
Classes	Type of lesson	Main topics	Average number of students
1st grade A, B and C	Practical class	Various topics	30
2nd grade A and B	Theoretical class	Ecology	27
3rd grade A and B	Theoretical class	Genetics	25

Source: Authors, 2024.

The organizational process between the residents and the preceptor was based on a simple flowchart (Figure 2). In a nutshell, it consisted of periodic alignment meetings, in which teaching methodologies and techniques were discussed, as well as general group planning. The meetings were followed by the teaching of theoretical or practical classes, with the practical classes usually complementing the theoretical ones, as well as the

preparation of activities and reviews. Teaching resources and materials were also produced during these activities, and were generally conceived in the planning and personal preparation of each resident.

Figure 2: Flowchart showing how the main activities of the pedagogical residency took place.



Source: Authors, 2024.

3 Results

The group of PRP students was involved in a variety of teaching activities, especially teaching classes, since this is the main objective of the program. They also took part in preparing and correcting activities, creating teaching resources and materials, and taking part in technical and scientific events (Table 3). These activities were distributed around 12 hours a week.

In general, the main methodology used for teaching classes was the lecture-dialog. However, due to the implementation of the subject “Experimental Practice” as a curricular component of the new high school, the residents prepared and applied practical lessons, which could be laboratory, field or incorporate methodologies and other playful strategies in the teaching of Biology.

Table 3: Main activities carried out by residents during their time.

Activities	Description
Teaching theory classes	The residents taught classes, especially for the second and third year of secondary school at the aforementioned institution, so that each resident was in charge of a class at a specific level, while for the first years, the classes taught were “Experimental Practices”, since the preceptor was only responsible for this subject in the first year classes. Therefore, the lessons were practical and usually in suitable spaces, such as the field around the school or in the laboratory. For the second and third years, lessons included theoretical activities in the classroom, as well as “Experimental Practices”.
Teaching practical classes	In the new high school curriculum in Paraíba, the above-mentioned “Experimental Practices” subject was implemented. The residents prepared and taught practical classes that were related to the theoretical content covered in their respective classes.
Preparing teaching resources and materials	When appropriate and necessary, the residents developed teaching resources and materials, such as guides and digital presentations for pedagogical support, in order to facilitate the students' teaching-learning process.
Preparing electives	Among other activities that the residents were also able to carry out were the preparation of electives, from the preparation of the syllabus containing the objective, justification and subjects and areas involved, based on the Common National Curriculum Base (BNCC), the general and specific competencies as well as the skills to be developed and the definition of the



entire elective program. The elective called “Fantastic Beings and Where They Live” was created and conducted by the residents and preceptor.

Preparing and correcting exercises

One of the residents' tasks was to prepare and correct exercises and activities that were applied to students in different classes in order to promote greater fixation and revision of the content.

Participation in technical and scientific events

When the time came, the residents took part in scientific events to share and publicize the activities carried out in the PRP. Interesting products were generated, such as book chapters and a mini-course at a local event at the Federal Institute of Paraíba (IFPB), as well as this manuscript.

Participation in field classes

Among the practical classes conducted, when appropriate, residents, students and preceptors went out into the field to collect data, make observations and the like. In addition, the “Fantastic Beings and Where They Live” elective class, accompanied by the preceptor and residents, took a field trip to the Arruda Câmara Zoo and Botanical Park in João Pessoa - PB.

Source: Authors, 2024.

4 Discussion

The PRP is based on the principle of immersing students in all the activities carried out at the field school, in which the preceptor teacher is actively involved. In this immersion process, the resident takes part in the school's routine, including out-of-class activities promoted by the institution (Freitas; Freitas; Almeida, 2020).

In this study, we report a diversity of activities to which the residents were subjected, and thus stimulated to experience a heterogeneity of experiences. According to Monteiro *et al.* (2020, p. 10), these experiences provide future teachers with real knowledge of the educational environment, offering rich experimentation in the teacher training process.

In a similar study, Benjamin-Neto; Pereira and Pinheiro (2020, p. 10) report that:

The supervision and experiences gained during the PRP produced excellent results, in which it was possible to work on content, information and everyday issues in a broad and productive way, which provided a context for observation, participation and interaction with the class. Furthermore, the program provided contact with the teaching-learning relationship, planning and theoretical-practical knowledge.

The PRP is based on the premise of valuing the teaching profession through quality initial training. The program proposes an education professional qualified by the teaching-learning practice process developed during the undergraduate course (Costa; Gonçalves, 2020). We would like to highlight that the various experiences offered by the PRP have proved invaluable to the training of undergraduates.

The interaction between preceptor-resident, resident-resident and resident-student offered a valuable exchange of knowledge, contributing to the development of different skills and knowledge. The group shared their individual skills and specific knowledge of their field of work in Biological Sciences, enriching the residents' experiences in different areas such as zoology, botany, ecology and genetics. This also included the addition and use of new technologies and methodologies, and so, in agreement with Costa and

Gonçalves (2020, p. 316), residency is also a way of expanding practical knowledge and modernizing basic education.

The actions of training programs for education and teaching professionals have gained prominence through their actions, forming links between higher education institutions and basic education institutions (Lima *et al.*, 2020). For Soares *et al.* (2020, p. 13):

The PRP promotes, directly or indirectly, a very strong interaction between university and school and vice versa, since what emerged for the discussion of this is the relationship that the academic perceives when he enters the school universe, throughout the discussion being this relationship characterized as teaching practice, as well as the relationship of the public school teacher who is inserted in the scientific production of materials from the various activities carried out with the academics and the teachers of the HEI.

Rocha; Ferreira and Pires (2020) researched the perception of chemistry residents at a public school about the PRP. According to the results, the majority of residents believed that the PRP can improve the quality of initial teacher training, as in-depth contact with the school environment not only provides better performance, but also gives them the opportunity to exercise teaching actively and independently. Previous reports and studies have also discussed the contributions of the PRP to the training of participating undergraduates (Souza; Gomes; Costa, 2023; Lima *et al.*, 2023; Sousa; Barroso, 2019).

We believe that our study also contributes to increasing understanding of the residency's contributions to the training process, not only initial, but also continuing, especially with regard to Biology, since the program's experiences have offered numerous contacts with different fields of action in the Biological Sciences through regency, fostering highly qualified human resources.

In addition to the teaching and other activities reported here, the program also provided a very significant glimpse of the challenges and problems faced in basic education. We would like to point out that, although the field school has facilities recently built by the state government and has a lot of equipment and a large science laboratory, there were some setbacks, probably common to other institutions, such as the lack of some reagents or dyes. However, this was not an impediment to the classes being held, since,

through the link established between the school and the university by the PRP, resources such as semi-permanent slides of angiosperms, for example, were provided for use by the residents.

Some classes, such as the first and second year classes, had a relatively high number of students, which often meant that the attention of the residents and the preceptor was divided, especially in practical classes, which required more monitoring. What's more, for a single teacher, this could mean a huge amount of work, with many classes to plan, content to revise and a sum of activities to correct.

In this sense, we stress how the program also offered timely assistance to the preceptor. When revisiting Table 1 (available in the results), we noticed the plurality and large number of activities that the residents carried out. In a context without the residents, all these tasks would have been conceived and carried out solely by the teacher, resulting in an accumulation of responsibilities and duties which, when distributed among the residents, were much less burdensome.

Among the considerable number of activities carried out by the residents, we would emphasize that the practices conducted were not limited to lectures or laboratory classes. With the implementation of the “Experimental Practices” course, it was possible to offer high school students, as well as the residents themselves and the preceptor, an abundance of experience in different biology practices. In addition, the creation of the elective entitled “Fantastic Beings and Where They Live” enhanced these experiences, synthesizing scientific practices in the school environment. We list some of these activities:

1) Water collection and analysis: some students were selected to collect water from a small eutrophied body of water near the school. Later, together with the whole class, they analyzed the sample under a common optical microscope in search of phytoplankton and zooplankton.

2) Photosynthesis and leaf anatomy: In this practical, the students macerated *Tradescantia sp.* leaves in order to visualize the pigments related to photosynthesis, as well as making paradermal cuts to visualize stomata, structures also related to photosynthesis.

3) Plant morphology: In this practical, the residents and the preceptor collected plants and took the students to the laboratory for morphological analysis using stereomicroscopes, with the aim of learning about the main morphological variations of flowering plants.

4) Creating an entomological box: This practice was carried out in the elective “Fantastic beasts and where to find them”, where the students collected arthropods to be fixed in a box that was kept in the school's science laboratory.

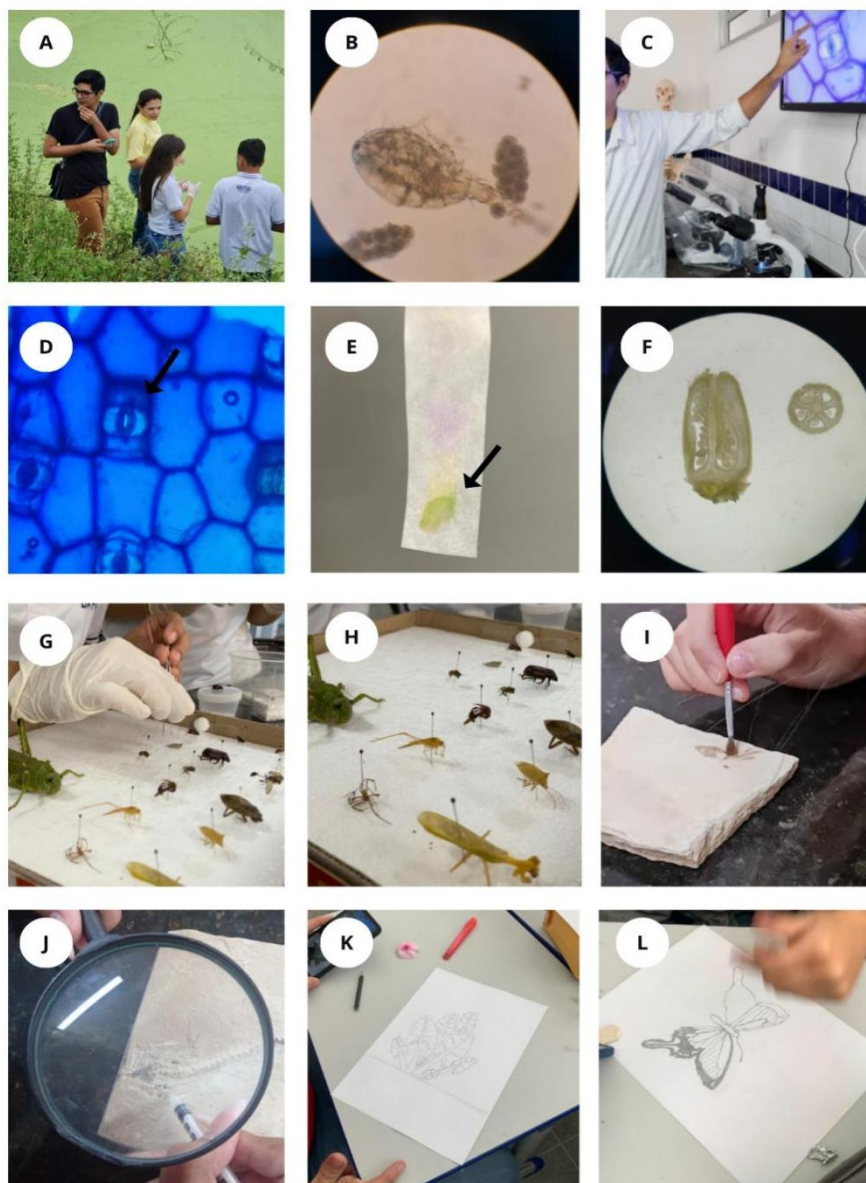
5) Ancient beings and paleontology: Fossils of various organisms, provided by the UFCG-CES paleontology laboratory, were presented to the students for analysis and cleaning using magnifying glasses in the institution's science laboratory.

6) Scientific illustration workshop: In this activity, students were introduced to the techniques and basics of scientific illustration and were then encouraged to create their own illustrations. All these activities can be seen in Figure 3.

In these activities, active student participation was advocated. Accompanied by the residents and the preceptor, they carried out the collections, sections or other necessary procedures. It is also worth noting that among the facets of active methodologies are practical classes and activities (Braga *et al.*, 2019).

It is known that these activities play an important role in the teaching-learning process, as they provide the experience of problematized situations, facilitating the understanding of conceptualized classroom theory and arousing greater interest in the subject in question. Furthermore, practical classes allow for a diversity of content and skills to be explored (Edigio *et al.*, 2021; Interaminense, 2019).

Figure 3: Diversity of classes and practical activities carried out during the PRP period. **A:** Resident, preceptor and students collecting water from a eutrophied lake. **B:** Copepod found when analyzing water using an optical microscope. **C:** Resident exposing the stomata of *Tradescantia* sp. **D:** Paradermal section of *Tradescantia* sp. leaf showing stomata, the arrow points to the stomata. **E:** Extraction of photosynthetic pigments showing chlorophyll, the arrow points to chlorophyll. **F:** Practicing plant morphology, sectioning an angiosperm ovary and showing the ovules. **G** and **H:** Students fixing arthropods in an entomological box. **I** and **J:** Observing and cleaning fossils in Paleontology practice. **K** and **L:** Students illustrating in the scientific illustration workshop.



Source: Authors, 2024.

From these diverse and plural practical and active experiences, high school students gained a range of experiences in the subject of Biology and, as Interaminense (2019) mentions, had the opportunity to develop and explore new skills. In addition, residents and preceptors benefited from exchanging experiences and knowledge based on their personal skills, as mentioned above.

Finally, we can see that some of the authors of this study, who were still residents at the time of writing this article, have completed their undergraduate degrees and gone on to pursue careers in their respective fields in Biology, as well as continuing their education through postgraduate studies. In this sense, we agree with Cardoso; Kimura and Nascimento (2021, p. 13), who describe the PRP as a possibility for qualification, promoting investigative and reflective attitudes. This is expressed in our context by the encouragement that the PRP has given residents to pursue a teaching career.

5 Conclusions

The aim of this study was to investigate the experiences of Biological Sciences undergraduate students during their participation as PRP residents in a public high school. The PRP emerged as a way of meeting the demands of improving the training of elementary school teachers. In this study, we point out how the program can provide initial and continuing training for those involved, as well as developing the skills and techniques required for teaching.

Notoriously, undergraduate students need to develop a series of skills to better deal with the reality of the elementary school classroom, which can often be challenging due to many variables, such as very large classes and a lack of materials. We note that the PRP enables prior contact with the classroom. Residents are inserted into the school context and develop their autonomy through teaching and planning, resulting in better preparation to deal with the adversities that may arise.

Furthermore, with regard to specific knowledge in Biology, the exchanges between preceptor-residents and residents-residents were a means of optimizing concepts and

techniques in the Biological Sciences. During this process, new concepts could be learned, new techniques in practical classes were retained, and new skills, such as scientific writing, were acquired, as expressed by the design of this study.

In conclusion, in view of the harsh reality that Brazil is experiencing with regard to the teaching profession, which is often undervalued and less and less desired by young people, the PRP appears to be a stimulus to the career of educator, since it gives people a taste for the profession and, with incentives such as scholarships, attracts students from all degree courses, fostering trained human resources for basic education.

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