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BIOLOGY TEACHER EDUCATION: AN EXPERIENCE BASED ON SUPERVISED INTERNSHIP INVOLVING EVOLUTIONARY THEORIES

FORMAÇÃO DO PROFESSOR DE BIOLOGIA: UMA EXPERIÊNCIA COM BASE EM ESTÁGIO SUPERVISIONADO ENVOLVENDO TEORIAS DA EVOLUÇÃO

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Abstract
This report aims to present our experiences in the Biology internship carried out at the Colégio da Polícia Militar (CPM) Diva Portela located in the municipality of Feira de Santana, Bahia, Brazil. The internship plays a fundamental role in teacher education, as it is through it that future teachers acquire essential knowledge for the development of their identity. The theme addressed was Evolutionary Theories, a central theme of interest in the training of future Biology teachers, as well as being a topic demanded in entrance exams, especially the Exame Nacional do Ensino Médio (ENEM). During this experience, we accompanied a Biology teacher in the 2nd and 3rd year classes, where we taught lessons, applied activities, and discussed the topic. Overall, the experience of being in front of a classroom teaching was enriching for our formation as future Biology teachers. Based on our observation and teaching experiences, we can form some distinct strategies on how to work with different classes, different people, in different contexts.

Keywords: Supervised Internship; Biology Teaching; Teacher Education.

Resumo
Esse relato tem como principal objetivo apresentar nossas experiências no estágio de Biologia realizado no Colégio da Polícia Militar (CPM) Diva Portela, localizado no município de Feira de Santana, Bahia,

Brasil. O estágio desempenha um papel fundamental na formação de professores, pois é por meio dele que os futuros docentes adquirem conhecimentos essenciais para o desenvolvimento de sua identidade. O tema abordado foi Teorias Evolucionistas, temática de interesse central na formação dos futuros professores de Biologia, além de se tratar de um tema demandado nos vestibulares, principalmente no Exame Nacional do Ensino Médio (ENEM). Durante esta experiência, nós acompanhamos uma professora de Biologia nas turmas de 2º e 3º Ano da disciplina de Biologia, onde ministramos aulas, aplicamos atividades e discutimos sobre o tema abordado. No geral, a experiência de estar à frente de uma sala de aula ministrando aulas foi enriquecedora para nossa formação como futuros docentes em Biologia. Com base nas nossas experiências de observação e regência, podemos formar algumas estratégias distintas sobre como trabalhar com diferentes turmas, com diferentes pessoas, em diferentes contextos.

Palavras-chave: Estágio Supervisionado; Ensino de Biologia; Formação de Professores.

INTRODUCTION

This work aims to report the experiences of the first two authors, guided by the third author and the fourth author, during the second semester of 2023 while undertaking the mandatory supervised internship for the course Supervised Internship in Biology Teaching II (EDU571), as part of the Bachelor's Degree in Biological Sciences at the Universidade Estadual de Feira de Santana (UEFS), located in the interior of the state of Bahia, Brazil. The internship was carried out at the Colégio da Polícia Militar (CPM) Diva Portela, situated in the Campo Limpo neighborhood in the city of Feira de Santana, from August 23 to October 18, 2023, totaling 40 hours. During the internship, we sought to provide readers with a critical reflection and a new perspective on the practice of supervised internship, highlighting its main contributions.

According to Castro et al. (2012, p.2), internships are a mandatory stage in the training of all educators, involving challenges in pedagogical practice and the conceptions of future teachers. Supervised internships offer a stimulating experience for aspiring educators, allowing them to demonstrate fundamental characteristics of teaching, such as creativity, independence, and character. Moreover, this is the moment when student-teachers have the opportunity to assess their choice of career in the field (Bianchi et al., 2005).

According to Carvalho et al. (2005), supervised internships are unique stages in the training of future educators, enabling students to broaden their understanding of the

educational reality by establishing a closer and more direct relationship with students and the school culture.

The fieldwork for this study was conducted at a Military School, where the work methodology and student training differ from traditional schools. Despite these differences, conceptual education is one of the main objectives of CPM teachers, given that it is a technical school. This is also aligned with the new framework of the New High School (NEM), which focuses on scientific literacy. This term refers to the ability to understand and use scientific knowledge critically and reflectively in everyday life (Martins & Nicolli, 2019).

According to the Base Nacional Comum Curricular (BNCC), scientific literacy is fundamental for the comprehensive education of students, contributing to the development of skills such as investigation, argumentation, and problem-solving, which are essential for life in society. Scientific literacy goes beyond the mere acquisition of scientific knowledge, also involving an understanding of scientific processes and methods, as well as the ability to apply them in various situations. Thus, scientific literacy is closely linked to the concept of science education, which aims to train critical and participatory citizens capable of understanding and intervening in the world they live in (Cunha, 2018; Hilário & Souza, 2017; Sasseron & Carvalho, 2008; Vitor & Silva, 2017).

The topic chosen for the lessons was Evolutionary Theories, a subject of significant interest in Biology education and highly demanded in entrance exams, especially in the National High School Exam (Exame Nacional do Ensino Médio – ENEM). This topic was selected because it was the only scheduled content for third-cycle students according to the school's methodological calendar. The supervising teacher had already covered genetics and ecology topics in the earlier cycles.

This work aims to report on the internship experience and highlight the contributions of this experience to the initial training of the first two authors, particularly regarding the use of active methodologies. The intention is to present, in a reflective and analytical manner, how the application of these methodologies contributed to the professional

and personal development of the student-teachers, emphasizing the lessons learned and their impact on their training as educators.

ACTIVE TEACHING METHODOLOGIES: PROMOTING STUDENT ENGAGEMENT AND DEVELOPMENT

Active teaching methodologies are instructional approaches that place students at the center of the learning process, fostering their active participation, development of skills such as autonomy, creativity, and critical thinking, and meaningful knowledge construction—competencies increasingly valued in today's job market (Osborne, 2004). Bonwell and Eison (1991) emphasize that these approaches have the potential to create a more stimulating and engaging learning environment for students, resulting in greater motivation and improved learning outcomes.

These methodologies involve practical, collaborative, and contextualized activities that encourage students to seek, analyze, and apply information rather than passively receiving knowledge. Freeman et al. (2014) highlight that implementing active methodologies can lead to significant improvements in student performance in science, engineering, and mathematics disciplines.

Through practical and collaborative activities, students have the opportunity to apply theoretical knowledge to real-world situations, thereby developing problem-solving and decision-making skills. Hmelo-Silver et al. (2007) point out that this type of problem-based learning can lead to a deeper and longer-lasting understanding of concepts compared to more traditional approaches focused on the mere transmission of decontextualized knowledge.

MATERIALS AND METHODS

To begin our activities, we first held a meeting with the supervising teacher to plan the work strategies for the third-year classes. Our initial interaction at the school was with class 3ºB in the morning shift, during which we administered the II Cycle mock exam alongside the classroom teacher.

Subsequently, we conducted a printed questionnaire with several open-ended questions on the topic "Evolutionary Theories." The questions included:

1. Charles Darwin proposed the Theory of Evolution by Natural Selection. Explain how this mechanism works and provide examples of how it can be observed in nature.
2. What is the importance of fossil discoveries in supporting the Theory of Evolution? Cite examples of fossils that provide evidence for species evolution.
3. Alfred Russel Wallace was another naturalist who developed a theory similar to Darwin's. What was the main similarity and difference between Darwin's and Wallace's theories?
4. Explain the concept of sexual selection and how it contributes to species evolution. Provide examples of traits that can be explained by sexual selection.
5. How does modern genetics support the Theory of Evolution? Explain how genetic mutations and natural selection relate to species diversity.
6. What are homologies and analogies in evolutionary biology? Give examples of each form of evolutionary evidence.
7. How does the Synthetic Theory of Evolution, also known as Neo-Darwinism, combine Darwin's ideas with modern genetics?
8. Explain how species adaptation to their environment is a direct result of evolution by natural selection.
9. What are the main criticisms of the Theory of Evolution, and how do scientists address these criticisms?
10. How does biogeography provide evidence for species evolution? Give examples of how the geographic distribution of species can be explained by evolution.

This diagnostic activity proved useful in assessing the students' level of understanding regarding the subject to be taught, as well as serving as a guide for content delivery during the lessons. According to Ribeiro & Figueiredo (2010), diagnostic evaluation functions to identify the aspects in which students need development and should occur during the teaching and learning process, rather than at the end of the term, as is commonly practiced in schools.

Pinho (2022) argues that Biology should be taught through a pedagogical approach that considers students' prior experiences, particularly by contextualizing the subject matter. Thus, the content was carefully planned and executed to introduce the topic effectively. Aligning with Pinho's (2022) perspective, the approach to this theme sought to break away from the notion of fragmented teaching devoid of historical context, as such methods are often less engaging for students.

RESULTS AND DISCUSSION

The first class with the 3ºBM group began with the word "Evolution" written on the board. Students were then asked to mention terms or words related to the theme. Over

time, the board was filled with words such as "evolve," "changes," "improvements," "elimination," "Darwin," "Lamarck," "development," and "survival" (Figure. 1).

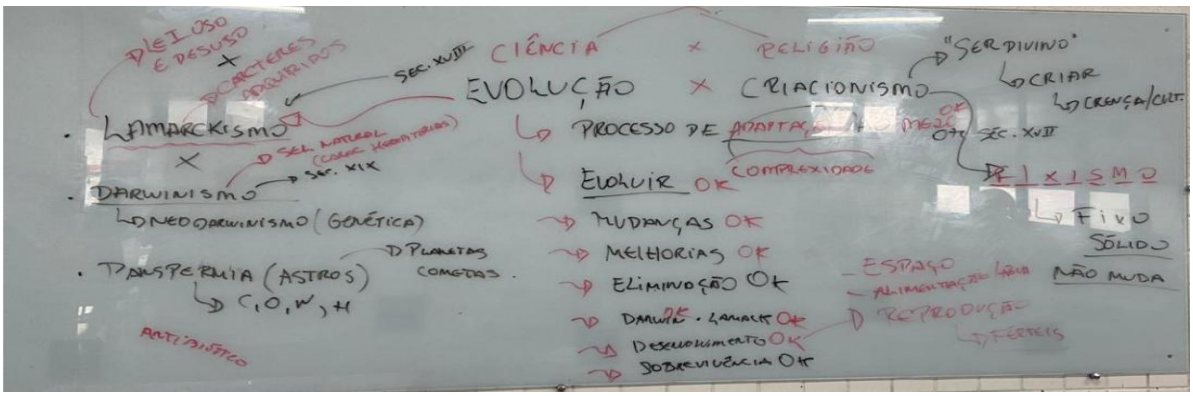

Figure 1 – Board filled with words alluding to the theme "Evolutionary Theories," as mentioned by the students. Examples: "evolve," "changes," "improvements," "elimination," "Darwin," "Lamarck," "development," and "survival."
Source: First author.

Next, a correlation of the mentioned terms was performed, explaining their meanings (Figure. 2). It is noteworthy that, even without knowing the exact concepts of the words, theories, or ideas, the class brought up significant terms (Figure. 1).

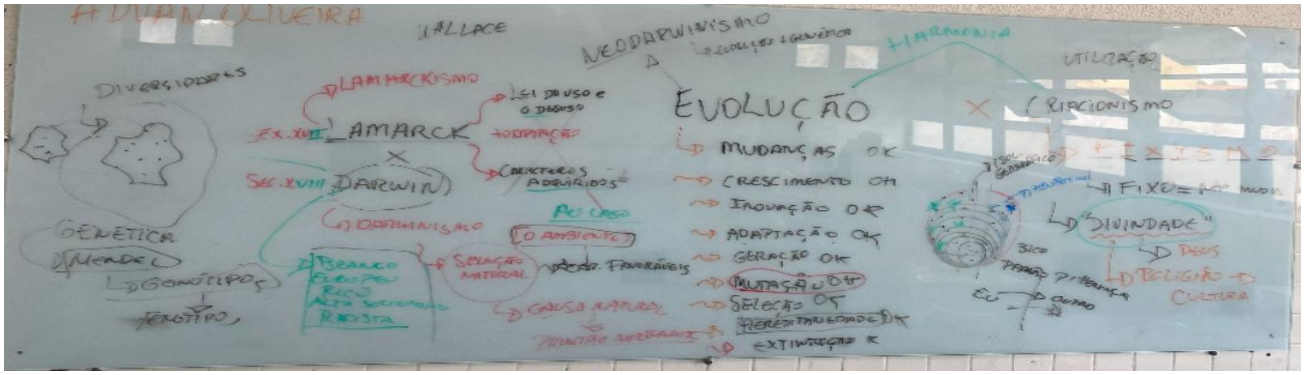

Figure 2 – Correlation of the cited terms, presenting their meanings.
Source: First author.

The same activity was applied to the 3ºCM group, where terms such as "change," "growth," "innovation," "adaptation," "generation," "mutation," "selection," "heredity," and "extinction" were observed. Like the previous class, this group also mentioned terms related to the concept of evolution. However, differences were noted, as the 3ºCM group demonstrated a greater understanding of the subject.

It is important to highlight that the Colégio da Polícia Militar Diva Portela has adopted the New High School Curriculum (NEM). As a result, high school classes are divided into four groups, each governed by a specific area of knowledge. While the 3ºBM group belongs to the area of Languages and its Technologies, the 3ºCM group is focused on Natural Sciences. Consequently, their curriculum includes subjects more directly related to scientific fields.

Both groups actively participated during the lessons, contributing with their insights and observations. A commonly used methodology was employed: the use of slides to present the content. The slide material was designed simply, featuring more images than text (Fig. 3) to capture the students' attention and spark their curiosity.

Figure 3 – Presentation of slides with the following themes: "Evolutionism vs. Creationism," "Evolutionary Theories focusing on Darwinism vs. Lamarckism," "Sexual Natural Selection." Source: First author.

Through the slide presentation, the following topics were addressed: "Evolutionism vs. Creationism," "Evolutionary Theories with a focus on Darwinism vs. Lamarckism," and "Sexual Natural Selection" (Fig. 3).

Subsequently, a biology mock test was prepared, consisting solely of questions related to the topics covered. Questions from previous ENEM exams, following its standard format, were selected and applied to the classes. The following questions were included in the mock test:

1. (ENEM 2020) The fruits of pupunha palm weigh about 1 g in wild populations in Acre, but can reach 70 g in plants domesticated by indigenous populations. Initially, however, domestication was unintentional. Human groups simply identified tastier or more useful plants, and their propagation occurred through the disposal of seeds near inhabited sites.

The change in phenotype (fruit size) in domesticated pupunha populations occurred because there was:

a) the introduction of new genes.

b) a reduction in mutation pressure.

c) a decrease in genetic uniformity.

d) an increase in the frequency of desirable alleles.

e) the expression of pathogen-resistant genes.

2. (ENEM 2016) During his trip to the Galápagos Islands, Darwin observed that finches had differently shaped beaks on each island, depending on the available food types. Lamarck, in explaining that the giraffe's neck stretched to reach higher leaves and fruits, proposed important ideas about the evolution of living beings.

The text suggests that a common idea in the evolutionary theories proposed by Darwin and Lamarck concerns the interaction between organisms and their environments, which is called:

a) mutation.

b) adaptation.

c) natural selection.

d) genetic recombination.

e) genetic variability.

3. (ENEM 2018) It can be expected that, evolving from ancestors that competed for the same resources, species developed traits that ensure less or no competition with members of other species. Coexisting species, with an apparent potential for competition, exhibit differences in behavior, physiology, or morphology.

What evolutionary phenomenon explains the maintenance of the ecological and biological differences mentioned?

a) Mutation.

b) Gene flow.

c) Natural selection.

d) Genetic drift.

e) Hardy-Weinberg equilibrium.

4. (ENEM 2020) It is believed that eyes evolved from light-sensing organs to versions that form images. The human eye acts like a camera, collecting, focusing, and converting light into an electrical signal, which is translated into images by the brain. However, instead of a photographic film, a retina detects and processes signals using specialized cells. Cephalopod mollusks (such as squids) have eyes similar to humans, despite the phylogenetic distance.

The comparison of the eyes mentioned represents what type of evolution?

a) Random.

b) Homologous.

c) Divergent.

d) Progressive.

e) Convergent.

5. (ENEM 2021) In recent decades, several countries, including Brazil, have witnessed a significant proliferation of pathogenic bacteria involved in various diseases and resistant to multiple antibiotics. Recently, superbacteria have become prominent, accumulating several resistance-related genes, making them resistant to practically all antimicrobials.

This resistance has occurred because:

a) pathogenic bacteria multiply rapidly.

b) antibiotics are used indiscriminately by the population.

c) bacteria possess plasmids containing virulence-related genes.

d) bacteria can be transmitted to individuals using various strategies.

e) precarious health services constitute significant reservoirs of pathogenic bacteria.

By correcting the proposed activities, it was possible to assess which aspects of the subjects students were able to absorb and identify which topics required review to help synthesize the content.

FINAL CONSIDERATIONS

The Supervised Internship is an essential stage in the training of future educators. During this period, students have the opportunity to immerse themselves in the school environment, acquiring techniques, strategies, and methodologies crucial for mediating interactions between teachers, students, and content. In this context, future teachers assume the role of knowledge mediators in a humane, sensitive, and coherent manner, encouraging students to develop critical thinking, reflection, and meaningful learning.

The experience of leading classes and teaching lessons is highly enriching for biology teacher trainees as they prepare to become educators. Through observation and teaching practice, they can develop different strategies to work with diverse groups in varied contexts. This learning is invaluable as it enables future teachers to design and implement effective pedagogical practices tailored to the specific needs of each group, fostering more dynamic and inclusive education.

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