



RESEARCH ARTICLE

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DOING SCIENCE USING AN INTERPRETATIVE TRAIL: REPORT ON THE EXPERIENCE OF A PUBLIC SCHOOL IN THE MUNICIPALITY OF PETROLINA, PERNAMBUCO STATE, BRAZIL

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ABSTRACT

The lack of investment in public education in Brazil has encouraged the search for alternative mechanisms to achieve quality teaching, especially in the basic sciences. The chronic lack of laboratories underscores the urgent need for alternatives that can improve science teaching. In this respect, the present article is a report of an Interpretive Trail implemented by a biology teacher, third year students at a state high school, and licensed researchers from a federal university affiliated with the Institutional Professor Initiation Scholarship Program. The strategy promoted unprecedented mobilization in the class, even attracting the attention of some of the students' family members. Student participation in the discussion during the Trail, and in the subsequent production of didactic material presented to the academic community at a Science Fair, justifies using this tool to provide dynamic and critical practical classes that truly empower students as social players in their communities.

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INTRODUCTION

Teaching science in Brazil has never been so controversial, especially since commonly accepted scientific theories are being marginalized by a significant portion of society. Doing science in Brazil has become more than ever a political act. We are living in a time when there is an urgent need to broaden science teaching in both academic and non-academic areas, transforming its reductionist dichotomy that sometimes views science merely as a tool for young scientists, and sometimes only as an emancipatory mechanism for the general population. Spaces must be set aside to guarantee future discussions on the different biases involved in doing science, but our current mission is to save science in Brazil.

Teaching/doing science must be viewed as a means of political resistance, within a need to reaffirm the historical advances of Brazilian science.

A participative democracy requires the electorate to have a scientific culture in order to be able to support or not the proposals and decisions of their representatives, and endorse or not their election, based on some understanding of the implications of these proposals or decisions (OLIVEIRA, 2001, p. 204).

Pavão's (2008) provocative vision states that "there is a conservative current of thought that does not give children the right to do science. In fact, it is a prejudiced conception typical of a dominator" (p.15). We must assume the risks of this ideological struggle under threat of retrogressing as a society and irremediably compromising the quality of life of the general population.

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Our historical moment requires an effective scientific dissemination strategy, viewed as a social responsibility tool that demystifies doing science, moving away from the reductionism of scientific and technological “knowledge” and enabling “a scientific culture that empowers citizens to freely discuss science, with some knowledge of its processes and implications in their daily lives” (JACOBUCCI, 2008, p. 65).

The need to go beyond the rigid walls of university centers and institutes has never been greater. It is imperative that we socialize with the different segments of society and that people know and perceive the scope of Brazilian scientific production as the most effective means of increasing militancy in defense of knowledge in Brazil. In the current context, maintaining the elitism of science favors the elimination of relevant institutions and projects developed in different regions of the country. We need to truly popularize science, bringing it to the lives of everyday people, regardless of their socioeconomic situation.

The unprecedented challenge of making scientific knowledge available to students, a population represented for the first time in our history by all segments of society, and increased participation from classes and cultures that hitherto did not attend school, cannot be overcome using the same teaching practices of previous decades or schools for the few (DELIZOICOV, 2009, p. 33).

Science must be taught to future teachers/researchers in order to improve teaching practices that have deteriorated over time and urgently need innovation. It is equally important to energize teaching institutions without relegating them to inferiority. There is an urgent need to take science to the streets, squares, parks and other heavy traffic areas, recognizing it as an emancipating activity that transgresses established precepts and allows the human species to fully evolve.

We need living and questioning schools that favor contradiction and the exchange of ideas, in addition to vibrant and entertaining teaching and learning, where students desire knowledge, which is never imposed institutionally (PAVÃO, 2008). It is essential to teach the history and nature of science and technology, reflecting on the experience of our researchers and their contributions to the quality of life of the population. A possible path is through itinerant events, using poetry, dance, music, painting and new technologies, stimulating people's imagination and reenergizing the professionals involved in these challenging and undervalued endeavors (JACOBUCCI, 2008 & CACHAPUZ, 2005). By moving beyond the walls of our teaching institutions we seek, among other things, to create alternative spaces to revitalize classes, especially in the bleak scenario of the vast majority of Brazilian public schools, where the lack of professional training of a significant portion of science teachers, exacerbated primarily by the inadequate conditions of the teaching laboratories available, limits science teaching methodologies. In this respect, informal science teaching spaces play an important role, provoking and stimulating students' curiosity to seek answers for relevant questions in their daily life that are not typically available in the classroom, and elevating different curricular content to new teaching-learning perspectives (SCHRADER; FRENEDOZO, 2014).

In a proposal that uses investigation (...), students are no longer merely observers in classes, which are frequently

expository lectures, but begin to have considerable influence by arguing, thinking, acting, interfering, and questioning, becoming a part of their knowledge-building process (CARVALHO, 2004. p. 24-25).

In the search for more pleasurable, dynamic and effective alternatives for science classes, it is important to highlight the use of Interpretive Trails as spaces for extramural practical classes, where students can have direct contact with nature and reflect on the need to review relations between humans and the environment. Given the current social crisis that demands drastic changes in teaching practices, environmental education must go beyond promoting respect for nature and expose students to critical and real scenarios of environmental degradation that will cause short-term impacts on their health or community. As such, we must overcome the inflexibility of classroom teaching.

The human need to occupy urban areas has distorted people's understanding and perception of nature. This disconnection from nature has decreased awareness of the need to conserve biodiversity, explaining the current environmental crises (NASCIMENTO; ALMEIDA, 2009, p. 358).

As a pedagogic tool, the Interpretive Trail cannot be reduced to a mere ecological walk. It needs prior planning so that students can be previously instructed on how to develop a critical, reflexive and questioning viewpoint, assuming the active role of environmental researchers. In this respect, the responsibility of teachers increases exponentially, since the objectives of the Trail include allowing students' to develop their own ecological perspectives about the environment, always supported and legitimized by the teacher's scientific precepts. The Trail functions as engaged research, where the actors involved are immersed in the environment, feeling, interacting, and critically reflecting on real concrete issues in a world no longer imaginary, but real, producing knowledge within a truly political perspective.(SOUZA, GONÇALVES and BOMFIM, 2018). The area selected for the Interpretive Trail was a grape producing farm in the municipality of Petrolina, Pernambuco state (PE).The property, selected for its proximity to the Edison Nolasco State School, is a model in pest control, especially fruit flies, an important topic discussed in Biology classes, where most of the students are children of small-scalefarmers who haveno access to pest control technologies.

MATERIALS AND METHODS

Study area: The farm belongs to the JMM Agricola business group, located in the Senator Nilo Coelho Project, N-06, lot no. 681 in the rural zone of Petrolina, Pernambuco state, Brazil, a company that cultivates grapes for the international market. The Edilson Nolasco State School, located in the N-1 community (Maria Tereza Irrigation Project, Petrolina, PE), serves students from the rural zone of the municipality, especially the children of small producers and farm workers that live in the nearby agricultural villages.

Methodology: With a view to operationalizing Interpretive Trail planning, meetings were held between the different actors, students and teachers from the state school, students affiliated with the Institutional Teacher Initiation Scholarship Program (PIBID) and professors in the Nature Sciences Course

of the Federal University of São Francisco Valley (UNIVASF). In the first meetings it was determined that after the trail, the students, supervised by the teachers, would hold a Science Fair to discuss the questions raised during the activity and socialize with the entire academic community. In response to the demands of students and teachers, and with the purpose of promoting a more critical eye in the former while on the Trail, discussions were held on the following subjects: fruit flies, ecology and health, environmental degradation, and the rational use of renewable resources. A prior visit was made to the farm to establish the script and questions that the company representative would raise. Next, the following five thematic groups were created to develop a more discerning eye in the students: waste, fruit fly, fauna and flora, relief and water management. Each group consisted of 3 students from the school and one from PIBID/UNIVASF, who were in charge of taking photographs, statements and obtaining additional information and subsequently organizing the didactic material to be displayed at the Science Fair.

RESULTS AND DISCUSSION

Although the farm where the Interpretive Trail occurred is near the school, close to most of the students' homes, they were amazed at its organization.



Source: Research data.

Image 1. Model of a grape plantation and didactic material produced by the students

The group in charge of collecting trash during the Trail and taking photographs and statements were surprised at the

neatness of the vineyard and the number of trashcans on the property, in stark contrast to where they lived. This demonstrates the need to broaden educational initiatives beyond the school setting and prevent trash produced in the communities from being discarded in streams and rivers and damaging the environment. The group in charge of taking photographs and collecting information on pest control, especially fruit flies, made interesting observations on how producers control this insect and suggested meeting with all the producers' families with a view to improving production quality. Educational material produced by a company in the region was collected to promote gatherings at the school and between families, including scientific information on *ceratitis capitata*, the most common fruit fly in the area, supported by the Trapping and Control Program (PAC), where individuals are taught how to install traps and use pheromone, also a form of control.



Source: Research image.

Image 2. Demonstration of fruit fly control techniques

The group in charge of discussing fauna and flora underscored the absence of animals, both wild and domestic, which generated an interesting discussion when the vineyard representative informed the students that no animal could roam around the property for sanitary reasons, especially cats and dogs, under penalty of losing its certification and export license. This led to an eloquent discussion on the contribution of sanitary measures in controlling food quality, changing the viewpoint of the students, who had assumed these measures existed solely for bureaucratic reasons. With respect to flora, a marked change in the local vegetation was observed, namely, as the irrigation canals advanced, so did fruit production, demonstrating to the students the need to create green spaces with native vegetation, to serve as a refuge for native animals, among other things. Finally, the group in charge of taking photographs and recording information on relief and water management discussed the difficulties experienced by some small producers in accessing the irrigation canals, due to their distance and the relief of the area, or the control of their flow. At the end of the Interpretive Trail, students from the Edison Nolasco State School spent two weeks studying and producing didactic material for the Science Fair that was held for the entire academic community. The students were mobilized in their pursuit of knowledge, which involved planning and executing the event, and included all the science classes of the institution.



Source; Research image.

Image 3. Students during the Interpretive Trail: (a) Production of the model, (b) Presentation during the Science Fair (c,d)

Final Considerations

Teaching Natural Sciences in elementary education has become burdensome for public school teachers, largely due to the lack of didactic material for practical classes and overload of activities. This leads to uninspiring lectures instead of creative and dynamic strategies, which demand both time and energy. In the current appalling state of public teaching institutions in Brazil, especially elementary schools, Interpretive Trails emerge as a possible means of making science classes dynamic, since practical classes usually stimulate students to greater involvement in discussions, as was observed here. The Trail involves a complex scenario of discussions on issues that truly promote critical thinking on the part of students regarding environmental questions, or social and political topics related to the areas visited. It is important to underscore the need for final deliberation on the questions raised during the Trail, in order to increase student involvement, which will encourage socialization within the group and increase their engagement in the research undertaken.

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