

# Experimental Activities from the Inquiry based Learning and from the reflections about of the Nature of Science

**Abstract.** This work aims to discuss the importance of reflecting on the role of experimental activities in the teaching of Physics. Fundamentally, we discuss the use of experimental teaching activities from two dimensions: the first refers to the possibility of developing activities based on teaching by investigation, in which students are placed as agents in the construction of knowledge; the second dimension refers to the possibility of incorporating discussions about the nature of science in these activities. In this proposal we present two activities developed with basic education students, as well as some preliminary results.

## 1 Introduction

There are many works that point to the use of experimental didactic activities (EDA) as a fundamental teaching resource for the teaching of natural sciences, particularly Physics. In Brazil official documents, such as: the National Curriculum Parameters for high school (PCN) and the Curriculum Guidelines for High School (OCM), emphasize the use of experiments as a strategy to address various themes as they are part of life, school and the everyone's daily life. These documents recommend that the experimental activities should not be carried out exclusively in a laboratory with scripts followed in the smallest details, but should start from a problem or question to be answered (BRASIL, 2002; BRASIL 2006). Galiazzi et al. (2001) present some of the justifications, pointed out by teachers, who highlight the importance of using experimental activities as a didactic resource: a) to stimulate accurate observation and careful data recording; b) promote scientific thinking methods; c) develop manipulative skills; d) train in problem solving; e) clarify the theory and promote its understanding; f) experiencing the process of finding facts through research, reaching its principles and g) motivating students. Although there is some consensus regarding the importance of experimental teaching activities, we emphasize that such activities do not in themselves guarantee compliance with the aforementioned items. Contrary to a certain common sense, we point out that the EDA must be planned so that they achieve specific objectives.

## 2 Theoretical framework

The present proposal reinforces the importance of using experimental teaching activities as a fundamental resource for teaching natural sciences, in particular Physics, from the perspective of training critical thinking. Our approach is fundamentally based on two aspects: the first refers to the development of activities that place students as agents in the construction of knowledge. For this, we base ourselves on teaching by investigation as a theoretical framework; the second refers to the incorporation of reflections on the nature of science from the ADE. We point out the use of History, Philosophy and Sociology of Science in science teaching as a potential possibility for such incorporation (LEDERMAN, 2002; BRAGA et al., 2012).

### 3 Activity Proposals

We present two experimental teaching activities aimed at basic education students as practical elements of the proposed discussions.

The two activities presented in this work deal with themes related to electromagnetism. The first deals with the relationship between electric field and electric potential from field lines. In this activity, we discuss ontological issues – from the problematization of the concept of reality (materiality of field lines), as well as epistemological issues – from the discussion of the relationship between empiricism and rationalism in the construction of scientific knowledge. For this, we use a fragment of the text by Francis Bacon that composes the EDA . The second activity deals with the relationship between direct current (DC) and alternating current (AC), and approaches concepts of electromagnetism present in electrical voltage transformers and rectifier bridges. For the activity in question, we start from a historical episode that took place in the 19th century, which is presented through an edited video (based on the BBC documentary - The War of the Currents), from which we emphasize the social, economic, and subjective, present in the development and production of science and technology.

### 4 Some Results

The analysis of the data constructed from the dialogues between the students, as well as from the students' textual production, allowed us, in a preliminary phase, to build categories of arguments that raise dimensions that include elements that go beyond conceptual issues, favoring the construction of more complex representations of science.

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