The Historic Approach in Teaching: Analysis of an Experience

RUTH S. DE CASTRO AND ANNA MARIA PESSOA DE CARVALHO

Faculdade de Educação, Universidade de São Paulo, Av. da Universidade 308, 05508-900, São Paulo, Brazil

ABSTRACT. The main purpose of this paper is to report our first attempts to study how and where it is possible to use the history of physics in a high school course. We made four activities based on historical data connected to heat and temperature. Filming was extremely important for the type of study we made since it allowed to draw out the situations we considered most relevant whenever necessary. We selected and analysed all the episodes in which there was any allusion (explicit or not) to history, presented in the form of questions or doubts, or portraying explanations of facts and phenomena built up based on reconstructions provided by the historical approach.

1. INTRODUCTION

The idea that an historical approach can be useful and rewarding in the teaching of science is found in the writings of a great many teachers (Langevin, apud Bensaude-Vincent 1982; Conant 1960; Brush 1969; Gargiulo 1986, 1988; Satiel & Viennot 1985, Lacombe 1987, Resmorduc 1987). However, practical answers that could lead teachers to make use of this approach are rare, although acceptance of the importance of the historical approach in giving a more complete understanding of science is virtually unanimous.

The question is how and where, and what evidence is there that the use of history is really helpful? How and where is it possible to use the history of physics in a high school course?

The main object of this paper is to report our first attempts to answer these questions based on what seems to us most relevant: how can our students actually make use of the history presented to them? The only way we can advance in studies about the use of this approach is by knowing how students really use historical data, what importance and status they attribute to these data, and when they resort to them.

However, prior to beginning the report on our research, we deem it necessary to explain our theoretic position.
2. THEORETIC INSPIRATION

2.1. How we Learned what we Know

A large portion of the research in physics teaching carried out over the last two decades has dealt with students' alternative concepts, showing that their notions are substantially different from current scientific thinking and that formal teaching has done little to change this framework. The great majority of researchers have called on a constructivist view of knowledge to exemplify this fact: knowledge is built up by the person who possesses that knowledge, and is not therefore transmitted or revealed.

'... learning comes about through the learner's active involvement in knowledge construction. Within this broadly 'constructivist' perspective, learners are thought of as building mental representations of the world around them that are used to interpret new situations and to guide action in them.' (Driver 1989, pp. 481-482)

However, one must dig a little deeper into the process of building up new concepts (how is this construction initiated and how does it come about) if we aim to organize a type of teaching committed to effective construction of knowledge.

The theory of piagetian equilibration seems to be a useful theoretic structure with which to face the issue of how knowledge is constructed. Perturbation plays a fundamental role when we adopt this means of explaining knowledge construction: the overcoming of perturbation leads to reequilibration. The succession of reequilibrations marks the person's progress. However, perturbation can take two forms: conflict perturbation, and gap perturbation. Conflict perturbations involve contradictions, go contrary to expectations, and imply correction. Gap perturbations have to do with the lack of information or of the conditions required to carry out an action or solve a problem, and its resolution implies effort (Piaget 1977).

Thus, as teachers, we must constantly seek perturbation-generating situations, activities, and approaches that will lead to advances on the path to scientific knowledge. At the same time, we must analyze how these interventions work as improvement mechanisms and how they can lead to the overcoming of perturbations. In short, we must discover what type of aspects or actions such interventions, chosen by us, bring to the surface in the classroom, and examine how the appearance of these classroom actions and attitudes make the student the legitimate possessor of the knowledge to be produced.

2.2. Methodological Change and Conceptual Change

A great many papers on science teaching criticize the view of scientific-knowledge producing mechanisms. This criticism only serves to reinforce the difficulty of narrowing the gap between the knowledge built up by the