17. COULD SCIENTIFIC CONTROVERSIES BE USED AS A TOOL FOR TEACHING SCIENCE IN THE COMPULSORY EDUCATION?

The Results of a Pilot Research Based on the Galileo – Del Monte Controversy about the Motion of the Pendulum

1. INTRODUCTION

In most countries it is generally accepted that science has a legitimate place in the secondary school curriculum. In contemporary aims of science education, there is an increasing interest in the “nature of science” (NOS). A scientifically literate person should also develop a functional understanding of the nature of science (Abd-El Khalick et al., 1997). It is commonly accepted that scientific literacy includes not only scientific knowledge but knowledge about science, its history, philosophy, social and cultural aspects of science. However research has shown that this aim has not been fulfilled (Lederman, 1992).

2. THEORETICAL FRAMEWORK

2.1 The Contribution of History and Philosophy of Science to Scientific Literacy of the Adolescent

The crisis in contemporary science education, as it is demonstrated by the escape of teachers and students from science classes, as well as by scientific illiteracy, reveals a need to make concise efforts at two levels: through curricula modification and at personal level, for every teacher. In the last few years the necessity to introduce elements from the history and philosophy of science has been recognized. The history and philosophy of science is certainly not enough to solve every kind of problem appearing in science education; however it can help a lot in dealing with several of them. An extensive amount of research has been carried out on the importance of history of science in teaching science.


Interesting teaching suggestions based on the history of science have been made by Kipnis (1992), Conant (1957), Klopfer (1969b), Seroglou & Koumaras (2001), Malamitsa, Kokkotas, and Stamoulis (2005), Binnie (2001).

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There has been a developing interest in incorporating history of science into curricula, in several countries around the world. Some of the above writers’ arguments in support of this view are presented by Matthews (Matthews, 2007). Matthews (2007) summarizes the main findings of these researches:

- The history of science encourages understanding of scientific concepts and methods.
- Historical approaches combine the development of personal thinking with the development of scientific ideas.
- The history of science carries very important data. Everyone should be aware of scientific historical events, such as scientific revolution, Darwinism, the discovery of penicillin, …
- History of science is important in order to understand the nature of science.
- History of science counteracts scientism and dogmatism which appear in scientific writings.
- History of science, through scientists’ life and work makes human dimension appear, making sciences more attractive for the students.
- History of science displays the unity and continuity of the scientific enterprise.

According to Malamitsa, Kokkotas, and Stamoulis (2005), the use of history of science in teaching science:

- Helps creating teaching tools, which can improve the teaching of sciences adopting a pluralistic methodology.
- Contributes to the development of students’ critical reasoning abilities.

Not only history of science but philosophy of science may help in science education as well. Even if teachers do not realize that, philosophy of science is usually incorporated in their teaching. For example, all science teachers use concepts such as method, explanation, experiment, theory, law, hypothesis, truth, idealization, etc. These terms are philosophical ones, and especially belong to the field of epistemology. As Matthews (2000) points out:

in Germany, at the end of 19th century, Ernst Mach argued that both history and philosophy of science should be a part of all school and university science instruction.

Nowadays, there is a developing interest in epistemological subjects. Aims and objectives referred to epistemology are included in Science Curricula depicting science teachers’ concern about the issue.

The nature of science has long been of concern to science teachers and curriculum developers. Since the early 19th century, when science first won its place in the curriculum of some schools, it has been hoped that science teaching would have a beneficial impact on the quality of culture and personal life in virtue of students not only knowing science, but also internalizing something of the scientific spirit. Clearly these longstanding aspirations for science education depend upon some understanding by teachers and curriculum developers of the methodological and epistemological aspects of science. That is, they depend on some knowledge of the nature of science (Matthews, 2000).

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