Teaching the Philosophical and Worldview Components of Science

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Abstract A common feature of contemporary science education curricula is the expectation that as well as learning science content, students will learn something about science—its nature, its history, how it differs from non-scientific endeavours, and its interactions with culture and society. These curricular pronouncements provide an ‘open cheque’ for the inclusion of history and philosophy of science in science teacher education programmes, and for their utilisation in classrooms. Unfortunately this open cheque is too often not cashed. This paper will discuss an important aspect of the contribution of science to culture, namely its role in the development of worldviews in society. A case study of the adjustments to a central Roman Catholic doctrine occasioned by the metaphysics of Atomism which was embraced at the Scientific Revolution will be presented. Options for the reconciliation of seemingly conflicting scientific and religious worldviews are laid out, and it is claimed that as far as liberal education is concerned, the important thing is to have students first recognise what are the options, and then carefully examine them to come to their own conclusions about reconciliation or otherwise.

1 Introduction

A common feature of contemporary science education curricula is the expectation that as well as learning science content and method, students will learn something about science—its nature, its history, how it differs from non-scientific endeavours, and its interactions with society and culture. Thus as well as disciplinary or technical goals, contemporary science curricula rightly seek to contribute wider educational goals. These have often been called ‘humanistic’, ‘cultural’ or ‘liberal’ goals.

The American Association for the Advancement of Science expressed its commitment to cultural or humanistic outcomes of science education in its Project 2061 publication:

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Becoming aware of the impact of scientific and technological developments on human beliefs and feelings should be part of everyone’s science education. (AAAS 1989, p. 173)

The position was elaborated a year later in The Liberal Art of Science:

The teaching of science must explore the interplay between science and the intellectual and cultural traditions in which it is firmly embedded. Science has a history that can demonstrate the relationship between science and the wider world of ideas and can illuminate contemporary issues. (AAAS 1990, p. xiv)

The AAAS believes that learning about science—its history and methodology—will have a positive impact on the thinking of individuals and will consequently enrich society and culture. Proper science education does this by the cultivation of worthwhile ‘Habits of Mind’.1 In Benchmarks for Science Literacy the AAAS says that education has to:

prepare students to make their way in the real world, a world in which problems abound—in the home, in the workplace, in the community, on the planet. (AAAS 1993, p. 282)

The unique contribution of the science programme to this more general problem-solving educational goal is the cultivation and refinement of specifically scientific habits of mind. These are meant to ‘spill over’ from the laboratory bench to the home, workplace, community and nation. For the AAAS, the wider ‘planetary’ problems are not just scientific and technical, they are also social, cultural, and ideological; and the conviction is that these problems can be, and perhaps only can be, solved by application of a ‘scientific habit of mind’. It is easy to think here of scientific issues such as global warming, extinction of species, forest clearing, rising of ocean levels, uncontrolled carbon emission, etc.; but social problems also include such matters as unjust concentration of wealth and power, exploitative trading, globalisation and attendant unemployment, etc.; and finally there are ideological problems that are so clearly manifest in different aspects of the so-called ‘war on terror’ and the ‘clash of civilizations’. The AAAS are suggesting that this whole spectrum of problems is best, if not only, addressed with a scientific habit of mind and by the application of scientific method.

The expectations of the AAAS have found their way through to the US National Science Education Standards where there is a separate content strand on ‘History and Nature of Science Standards’ (NRC 1996) this strand is to be covered in science programmes from kindergarten to year 12. Of this strand, the document says that:

Students should develop an understanding of what science is, what science is not, what science can and cannot do, and how science contributes to culture. (NRC 1996, p. 2)

And,

The standards for the history and nature of science recommend the use of history in school science programs to clarify different aspects of scientific inquiry, the human aspects of science, and the role that science has played in the development of various cultures. (NRC 1996, p. 107)

Norway has also recognised the benefit of an historical approach to school subject matter, saying in its State Education Framework that:

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1 The basic statement is in AAAS 1989, chap. 12; 1993 chap. 12. Good (2005) amplifies the AAAS position and argues for incompatibility between scientific and religious habits of mind; Gauld (2005) defends the compatibility of the two outlooks.