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Teachers' Learning about Climate Change Education

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Abstract

Climate change education occupies a major node in school education. It is cross-disciplinary and therefore can be a subject challenge for many teachers; its knowledge claims are based on modelling from uncertain and partial data that challenge traditional views of what a science is; its breadth encompasses subject content knowledge, attitudes to the environment, and commitment to action, a complex set of interactions in comparison with most themes; its strong links to personal and communal action, often political, may make development of climate change education in conventional classrooms controversial; characterization of learning is multi-faceted and often beyond the skills sets of many teachers. The research question was: what are the features of climate change education that promote engaging teaching and learning? It used a mixed-methods approach drawing on a variety of written evidence and observations of teacher education sessions. Validation was provided by using perspectives from two researchers in the analysis. This paper draws on evidence from a European Network (Changing with the Climate) and its activities with schools across nations, an exercise with future science teachers about the place of Climate Change Education in the Curriculum in comparison with a published study in Florida and Puerto Rico, and responses to a Manual for Teachers using innovative pedagogy during trials in French and English Schools, and with their teachers. The outcomes were quite mixed, with much positive engagement by established and future teachers in three of the six countries, but highly successful learning when adopted. Using the data from the research on the nature of climate change education in the UK and Florida, the differences can be accounted for by the participants' views about teaching in general, and about climate science as a science.

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1. Introduction

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Climate change education is a troublesome theme for a number of reasons.

It is cross-curricular which demands negotiation between discipline-based teachers, timetable and syllabus commitments that constrain opportunities for teaching.

The novelty of the topic and absence with degree content means that many teachers lack confidence in their personal subject knowledge.

Many teachers are unprepared for the integration of action and content knowledge that characterises climate change education, especially those in science where subject knowledge tends to be more factual.

For some students, climate change science is seen as controversial, and makes it very distinct from other areas of science. Dealing with this constitutes a new need for teachers.

Underpinning climate science are the issues of uncertainty and risk. While much of science data is uncertain, the level of uncertainty is much greater and more obvious in climate science, as is the widespread use of proxy data. Climate science is not an exact science like physics and chemistry, and it has more in common with the stochastic nature of biology and geology.

The nature of climate systems, ranging from atmospheric understanding to oceanic acidity, requires that much of the research is carried out by modelling. At present, this is a small aspect of other science teaching, and teachers require change and support to provide effective teaching.

The nature of climate change education is such that complexity is at the science core, while teachers are required to simplify. Pedagogies are required to ensure that the simplifications remain faithful to the science while not overwhelming the students. These are new tasks for teachers.

Normally, teachers are highly confident with traditional forms of instruction. In this paper, I identify some novel pedagogies to deal with the troublesome facets of climate change education.

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2. Teaching established teachers of science

Rudolph (2007) (cited in Herman *et al*, 2013) states:

“Too many of our citizens simply don’t understand how it is that researchers figure out what’s going on in the world. It’s this misunderstanding about how science is done that has been and continues to be exploited by various business and political interest groups. The situation with global warming is a telling case in point. Given that the majority of the public holds an oversimplified view of science—as an activity that is capable of producing verifiable knowledge by means of a carefully prescribed experimental method—it’s not surprising that those who seek to undermine public faith in the claims made by climatologists have highlighted the uncertainties in their work.” (pp. 1-2)

Herman (op cit) also states:

Survey efforts revealed that Florida and Puerto Rico secondary science teachers hold many of the same naïve views about the causes of climate change that are pervasive among the American public. For instance, forty-six percent of the Florida science teachers and eighty-two percent of the Puerto Rico science teachers erroneously thought that the depletion of the ozone layer is a primary cause of climate change. Furthermore, ten to sixty-three percent of all surveyed teachers thought insecticides, aerosol sprays, and nuclear power generation were also primary causes of climate change. Surprisingly, between thirty-one to forty-eight percent of the surveyed teachers erroneously thought that vehicle emissions and fossil fuel use by utility companies were at most secondary or minor causes of climate change.

An alarming percentage of the surveyed secondary science teachers possessed naïve views about the validity of climate change science and its methodologies. For instance, approximately one-fourth to one-third of all the surveyed teachers were unsure if or agreed that the data for climate change are ambiguous as to whether it is

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