

Chapter 12

Reflections on Inquiry

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ABSTRACT

This chapter provides concluding comments and reflections on the Chain Reaction project as well as inquiry approaches in general. The authors also include three reflective stories based on their involvement in the program. These stories attempt to bring differing roles and aspects of the project to life while identifying successes and barriers within the project. They also discuss implications for the future of science education across Europe and summarize their outcomes from the Chain Reaction project.

INTRODUCTION

In this chapter we reflect on our experiences of Chain Reaction from our roles as managers of this large and complex collaborative project, the main purpose being to provide a more personal account of the project from three key project team members in contrast to the previous chapters which are purely objective in their reporting. We will highlight lessons learned and identify some of the problems and complexities of such a large education project which impacts a diverse group of stakeholders, be it teachers, students, teacher educators or policy makers, and share our experiences of three different roles within the project consortium. Firstly, we set out our position regarding inquiry as an approach to teaching and learning in the science classroom, giving the reasons why we focused on Inquiry Based Science Education (IBSE) and highlighting key literature.

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A BELIEF THAT INQUIRY IS EFFECTIVE

Our belief that inquiry approaches can add significant value to students' learning experiences in the science classroom strongly influenced the design of the Chain Reaction project and this belief has deep roots over many years of experience and scholarship in the field of science education. Historically, the idea of inquiry dates back to the time of Greek philosophers (Shields, 2014), with a more recent attempt to encourage science learning through inquiry originating with Dewey (1938). Since this point, the roots of scientific inquiry have been fertilised over the years by the work of scholars such as Herron (1971), Driver (1986; 1994), Osborne (1998), Harwood (2004), Bybee (2006a) and Crawford (2000). Our belief in inquiry is underpinned by a desire to support an approach that situates the student as an agent within the inquiry process and provides greater opportunities for encouraging a more positive attitude to the study of science and personal growth by encouraging student ownership of their own learning. We are not alone in this, indeed, the effectiveness of inquiry in science teaching and learning is supported by a large pool of scholars whose empirical work reports positive learning outcomes for students in terms of achievement, enthusiasm, ownership and scientific skills development (Minner, Levy, & Century, 2010; Minstrell & van Zee, 2000) as they practice science which mirrors, to some extent, authentic processes outside of the classroom. This work signifies continuing attention on inquiry teaching in science education and suggests a perceived importance placed on inquiry by a good portion of the science education community which we will now reflect upon. The following section will explore literature which expresses specific positive outcomes from engaging in the practice of inquiry.

IMPROVING STUDENT ATTITUDES

Crawford (2000) undertook a yearlong observational activity whereby she reviewed the teaching of a particular teacher who claimed to teach through inquiry. During this time the researcher attempted to understand students' attitudes towards learning science in this manner. She found that the authentic nature of the inquiry projects, which they engaged in throughout the year, motivated the students and made them consider the importance of doing science in this way for future college studies. Additionally, some students revealed the respect they had developed for their teacher because he included them as necessary contributors to the classroom 'research team' (Crawford, 2000). This implies that inquiry practices can help to foster positive relationships between teacher and student, a phenomenon reported by many teachers and students in the Chain Reaction project. Crawford (2000) did note however, that such positive interactions were not always met as some students felt that the teacher's high expectations of them had a negative impact. That said, the majority of students valued the rigor and effort needed from them (Crawford, 2000). Rees, Pardo and Parker (2013) endorsed Crawford's finding by suggesting that when using a supportive framework during an open inquiry activity, participating students can be highly engaged in the task.

INCREASING ACHIEVEMENT LEVELS

Mao and Chang (1998) investigated the effect of inquiry-oriented instruction on the achievement of students through earth science using a comparative study method. The results showed that students

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