Chapter 13
Enhancing Scientific Literacy through the Industry Site Visit

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ABSTRACT

Citizens in contemporary societies are encountering more and more issues that are somehow related to science and technology. Therefore, science and technology education plays an important role in providing students with the knowledge and the competences they need in their life. The research and development project discussed in this chapter focuses specifically on scientific literacy. It is considered as a crucial element of multiple literacies required in modern life. These proficiencies are often referred to in terms such as information literacy, media literacy, environmental literacy, political literacy, computer literacy etc. (see e.g., Lankshear & Knobel, 2003). In order to enhance student scientific literacy the authors introduce a model of industry site visit for lower secondary school science education as a form of out-of-school learning. The potential of the site visit and other learning activities connected to it are discussed in the frameworks of scientific literacy, motivation and interest. The site visit and the activities, such as the use of ICT in reading and writing, are scrutinised with regard to the specified

educational goals. The analysis of the motivational aspects of the site visit is based on self-determination theory. Self-determined learning could occur when an activity at a site is considered by a learner to be interesting, enjoyable, or personally valuable. Furthermore, the site visit offers role models which are critical for students' choice of advanced studies and careers in science. Some empirical results on both cognitive and affective learning outcomes, as well as challenges that were encountered are presented on the basis of first design and evaluation cycle.

INTRODUCTION: ASPECTS OF SCIENTIFIC LITERACY

Recently, an international comparative study on scientific literacy in OECD countries (OECD, 2007) raised interest in promoting scientific literacy in many countries. We begin by discussing the importance of scientific literacy and specifying our perspective on the concept.

Scientific literacy is a worldwide concern, and improving it constitutes a major objective of formal as well as informal science education (McEneaney, 2003). The rough descriptions 'scientific literacy stands for what the general public ought to know about science' (Durant, 1993) or 'commonly implies an appreciation of the nature, aims, and the general limitations of science' (Jenkins, 1994) do not explain a lot about the actual meaning of the concept, but much less how to measure it. Indeed, the concept of scientific literacy has developed into an umbrella term covering virtually everything regarding science education (see e.g., Shamos, 1995; Roberts, 2007). This ambiguity is due to the diversity of underlying reasons for promoting scientific literacy as being beneficial at both societal and personal levels (Jenkins, 1997; Sjøberg, 1997; Laugksch, 2000; McEneaney, 2003). There exists a substantial and diverse literature related to the concept of scientific literacy (for conceptual overviews see e.g. Jenkins, 1997; Laugksch, 2000; Roberts, 2007), which does not lack attempts to *concretise* meaning for the concept. It appears that the only thing in common in these conceptualisations is the (obvious) notion that one has to have some grasp of scientific content knowledge in order to be scientifically literate.

Accordingly, the perspective on scientific literacy employed in this chapter recognises content knowledge as an indispensable part of being scientifically literate. Even so, our focus here is not on the knowledge *of* science, but rather on the knowledge *about* science. By the latter we mean an understanding of science as an enterprise, procedural knowledge, the nature and limitations of science and the use of scientific knowledge in industry, instead of 'pure' scientific knowledge itself (cf. Ryder, 2001). In terms suggested by Roberts (2007) in his recent review of literature on scientific literacy, our viewpoint in this chapter is closer to his definition of Vision II (starting with situations, proceeding to science that is relevant in them) than to Vision I (looking inward to science itself). This kind of functional and contextualised scientific literacy emphasises personal relevance for citizens, enabling them to make informed independent decisions on personal and communal issues that have a scientific or technological base. The chosen conception is in line with the PISA definition of scientific literacy (OECD, 2007), insights of the STS-movement and the Socio-Scientific Issues (SSI) framework (Zeidler *et al*., 2005), and recent recommendations for European science education policies (Osborne & Dillon, 2008).

Our interpretation brings scientific literacy close to other elements of *multiple literacies* that are needed to get along in modern society (see above). Especially, this Vision II -type (Roberts, 2007) conception of scientific literacy is intimately linked with *technological literacy*. Many scholars, e.g., Shamos (1995) and Sjøberg (1997), have argued that the so-called socio-scientific issues

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