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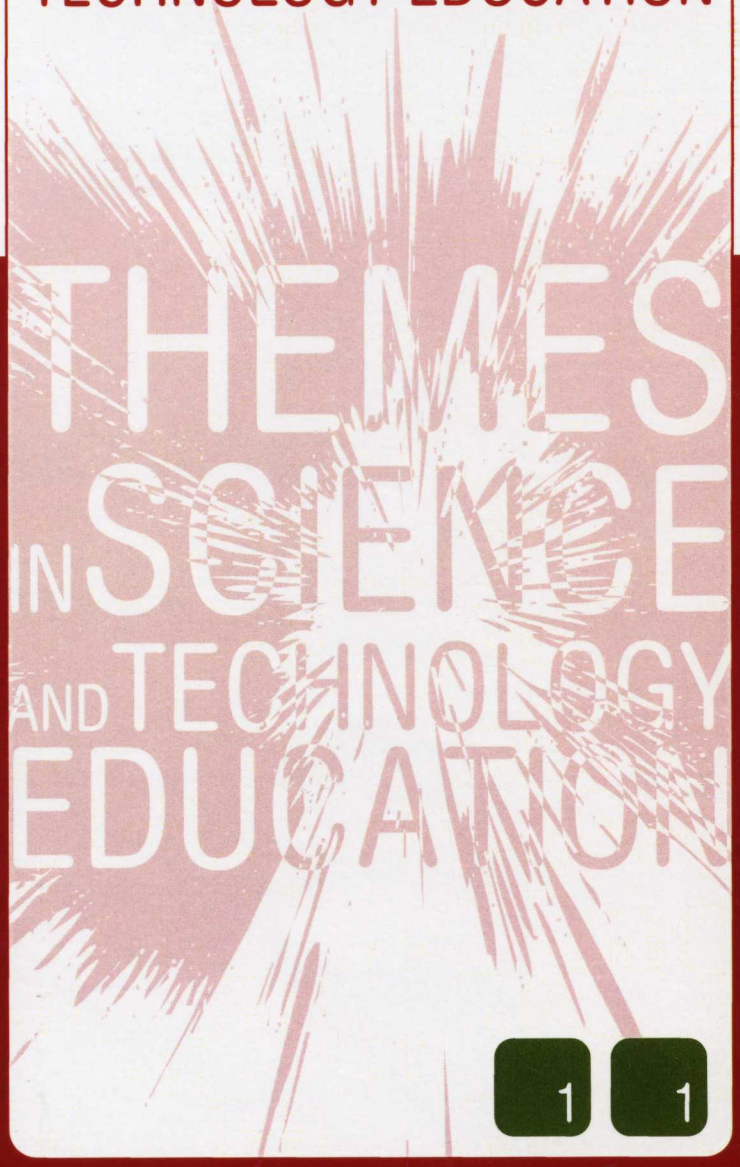

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Students' interest and experiences in physics and chemistry related themes: Reflections based on a ROSE-survey in Finland

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Abstract

Interest in physics and chemistry topics and out-of-school experiences of Finnish secondary school students (n=3626, median age 15) were surveyed using the international ROSE questionnaire. Based on explorative factor analysis the scores of six out-of-school experience factors (indicating how often students had done something outside of school) and eight topic factors (indicating how interested students were in learning about something) were studied. The students had a lot of out-of-school experiences in simple measuring and observing and in ICT use, but they had few science and technology related hobbies and activities or experiences of camping. Several gender differences were found. *Observing natural phenomena and collecting objects* was the most important factor correlating with the topic factors. Factors measuring experiences of ICT use and the use of mechanical tools had the lowest correlations with the topic factors. Based on the results, the implications for science education will be discussed.

Keywords

Physics and chemistry education, students' interest, out-of-school experiences

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Introduction

Several concepts, such as interest, motivation or attitudes are used to describe motivational aspects of science education. We use the concept "interest" and interpret it as a content-specific motivational variable that can be both empirically investigated and theoretically reconstructed (Krapp, 2007). Interest research has shown that students will engage in science learning activities and, moreover, choose science courses in upper secondary school if they are interested in the topics to be learned (for a review, see Osborne, Simon & Collins, 2003; Hidi, Renninger & Krapp, 2004).

In this research we will use the data collected in Finland with the ROSE (The Relevance of Science Education; http://www.ils.uio.no/english/rose/) questionnaire. The ROSE-project aims to shed light on factors of importance to the learning of science and technology for the upper grades of comprehensive school (Schreiner & Sjøberg, 2004). Data collected by the ROSE questionnaire has already been used for different purposes in different countries, such as for international comparisons of the data; for giving information to science teachers, teacher educators, student teachers, and textbook authors; for taking part in local education policy discussions; and for understanding youth culture and sociological and sociocultural points of view of science education. In this article we will use items in the ROSE questionnaire which measured how interested students were in learning certain physics and chemistry related topics or themes and what kind of physics and chemistry related out-of-school experiences students had. We use the term "related" before "topics" and "out-of-school" to describe the nature of ROSE questionnaire items (explained in the Methodology chapter). Students' responses to the items are interpreted to indicate task- or knowledge-based situational interest as will be shown in the next chapter. ROSE-data has thus far not been analysed in the framework of interest or motivation research and, therefore, we aim to shed light on it within this context.

For our analysis we chose only ROSE items which relate to student interest in physics or chemistry. We had three reasons for doing this: firstly, we have already analysed the Finnish ROSE data from the point of view of biology and geology education (Lavonen et al., 2005; Uitto, Juuti, Lavonen, & Meisalo, 2006); secondly, there are 169 items concerned with science related interest issues, thus making it difficult to analyse and discuss the subject in a proper way; thirdly, it is known that science in general and school biology in particular is quite interesting for students, but most students, especially girls, do not find school physics and chemistry and careers and occupations in those fields interesting (Osborne, Simon & Collins, 2003; EU, 2004; EU, 2005).

Consequently, as students' interest is so important to the learning of physics and chemistry and any future involvement in the subjects, it is useful to know what students find interesting about them and what kind of experiences they have had in physics and chemistry related activities. Research has already identified several factors that interrelate with interest in physics and chemistry learning: nationality, gender, the perceived relevance of physics and chemistry from the point of view of further studies or occupation, interest in the contents of physics and chemistry, interest in contexts where physics or chemistry content or topics are met, interest and enjoyment in an activity type or the teaching methods used, perceived achievement, level of difficulty, and appreciation of the topic (Simon, 2000; Stokking, 2000). Also, OECD (2006) has included an affective domain to the PISA framework, giving the reason that "Students' interest in and attitudes toward science play an important role in students' decisions to develop their science knowledge further, pursue careers in science, and use scientific concepts and methods productively throughout their lives" (OECD, 2007, p. 39).

Student interest in physics and chemistry

Since Herbart (1965a, 1965b), modern pedagogy has emphasized the value of interest not only as a mean, but as an educational end in itself. Modern interest research (for a review, see Hidi, Renninger & Krapp, 2004) has confirmed Herbart's conception. Namely, interest-based motivation to learn has positive effects both on the studying processes and on the quantity and quality of learning outcomes. To clarify the concept of interest, we review the literature of interest, especially in the context of school physics and chemistry. Interest is typically approached from two major points of view. One is interest as a characteristic of a person and the other is interest as a psychological state aroused by specific characteristics of the learning environment. Traditionally, the former approach has been termed topic interest or personal interest and the latter has been called situational interest (Krapp, 2003).

Personal interest is topic specific, persists over time, develops slowly and tends to have long-lasting and stable effects on a person's knowledge and values (Hidi, 1990). It refers to the dispositional motivational structure of an individual (Krapp, 2007) or to information that is of enduring personal value, activated internally, and topic-specific (Hidi, Renninger & Krapp, 1992; Krapp, Hidi & Renninger, 1992). Pre-existing knowledge, personal experiences and emotions form the basis of personal interest (Schiefele, 1991). Moreover, Krapp (2003) has assumed that the fulfilment of so-called basic psychological needs for *competence*, *autonomy*, and *social relatedness* are important for the development of personal interest. And personal interest can be subdivided into latent and actualised interest (Schiefele, 1991; 1999).