STUDENT PERCEPTIONS OF INDUSTRIAL CHEMISTRY CLASSROOM LEARNING ENVIRONMENTS

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ABSTRACT. This article describes a study conducted in Israel which focused on how learning industrial chemistry case studies affects students’ perceptions of their classroom learning environment and their interest in chemistry studies. The goal of the study was to determine the effects of industrial case studies on students’ perceptions of chemistry in general, and industrial chemistry in particular. Information on students’ perceptions was gathered from a learning environment inventory specifically developed for this study. It was observed that industrial chemistry case studies helped in providing students with a relevant picture of chemistry in general and their chemistry studies in particular. It was also found that teachers who had attended an intensive training workshop were the most successful in presenting the relevance of chemistry in the case studies. These teachers also were more successful in raising students’ awareness of the social implications of chemistry studies. Furthermore, their students had a better awareness of the contribution made by chemistry studies to their preparation as future citizens and for a possible career in chemistry. These findings have important implications for any decisions about whether to make industrial chemistry case studies obligatory for students who major in chemistry. There are further implications regarding the content and learning strategies to be used for the professional development of science teachers in general and chemistry teachers in particular.

KEY WORDS: classroom environment, industrial chemistry case studies, interest in chemistry studies, relevance of chemistry studies, students’ perceptions

In recent years, science educators and curriculum developers have realised that science is taught not only to prepare students for university studies and careers in science, but also to become citizens in a society that is highly dependent upon scientific and technological advances. Therefore, it is suggested that more emphasis should be placed on the relevance of science to everyday life and the integral role that it plays in industry, technology and society. Kempa (1983), for example, has suggested that future educational materials developed for chemistry should include the following six dimensions:

• the conceptual structure of chemistry;
• the process of chemistry;
• the technological manifestations of chemistry;
• chemistry as a personally relevant subject;

• the cultural aspects of chemistry;
• the societal role and implications of chemistry.

Hofstein and Kempa (1985) suggested that case studies and learning units in industrial chemistry can partially serve as the basis for the implementation of these six dimensions in the chemistry classroom.

Since the early 1970s, it has been recognised that the affective outcomes of science studies are as important as cognitive measures (Shulman & Tamir, 1973). Therefore, an increasing emphasis has been placed on the necessity to match the design of science curricula to both cognitive and affective goals. Not only are cognitive abilities such as developmental readiness, learning difficulties, level of knowledge and cognitive style important, but also affective characteristics such as students’ interest in the topic taught and their perceptions of the classroom learning environment deserve attention.

Byrne and Johnstone (1988) showed that students find chemistry studies more appealing when they perceive the subject matter as useful and relevant. Student motivation to study science in general, and chemistry in particular, could be increased if students are presented with relevant scientific topics, such as health issues, the environment and industry-related issues.

Yager (1993) showed that students who were exposed to learning units that combine aspects of science, technology and society (STS) performed better than students subjected to traditional type science education with regard to their perceptions of the nature of science, attitudes towards science and scientists, interest in science and career awareness. Furthermore, STS-type issues and case studies provided teachers with a variety of instructional techniques which helped create an effective and varied science classroom environment (Hofstein & Walberg, 1995).

These trends have also had an impact on research in science teaching, and several studies have been published regarding affective outcomes from learning science. For example, studies using learning environment instruments in the classroom have shown that these instruments are sensitive to different curricula and instructional methods (Fraser, 1998; Hofstein et al., 1996). One widely used research tool in these studies is the Learning Environment Inventory (LEI; Fraser, 1998), which has been used in different forms in order to suit different subject classrooms, such as chemistry, biology and laboratory classrooms (Hofstein & Lazarowitz, 1986; Hofstein et al., 1996). The results of these learning environment studies can help teachers improve their instruction and, as a consequence, increase their students’ motivation to learn science. Measures of classroom