

Science Education in the 21st Century: Challenges and Concerns

Introduction by Rachel Mamlok-Naaman & Dvora Katchevich (Editors)

Krajcik, Mamlok and Hug (2001) claimed, that during the twenty century, the topics about which scientists and educators were concerned were: «What is worth learning in science», or «How should students learn science»? Science and educators have continually struggled to make science teaching resemble the practice of science, and yet, there are still textbooks and classroom practices persisting in providing cookbook styles and hands-on activities. The release of the National Science Education Standards (National Research Council, 1996) served as a landmark in identifying a comprehensive set of goals for achieving scientific literacy for all American students.

The National Science Education Standards (NSES) define in broad terms the scientific concepts and processes that all students should know and be able to apply. Most importantly, they provide guidelines for assessing the degree to which students have mastered the content of the standards. In addition, the standards detail the teaching strategies and support necessary to deliver high-quality science education to all students, e.g., inquiry skills. «Inquiry» has been a perennial and central term in the rhetoric of past and present science education reforms in the United States. During the second half of the twentieth century, «good science teaching and learning» has come to be distinctly and increasingly associated with the term inquiry (Anderson, 2002).

Students learn to do inquiry in the context of science content and develop epistemological understandings about the nature of science (NOS) and the development of scientific knowledge, as well as relevant inquiry skills (e.g., identifying problems, generating research questions, designing and conducting investigations, and formulating, communicating, and defending hypotheses, models, and explanations).

The issue consists of six papers. In all the six studies there has been done an effort to find out what should be the best ways to motivate students to study science, and to gain inquiry skills. Some studies (e.g. Fraser, 1982) revealed a positive correlation and a causal relationship between achievement in science and attitude constructs, whereas others revealed no clear (or negative) relationship between attitudes towards learning science and achievement (Osborne & Dillon, 2008). International studies have shown that students' attitudes towards scientific disciplines depend on the extent of their active participation in the learning process.

The main topics of the six studies of this issue are: (1) The link between formal and non-formal learning in science education, (2) students' linguistic heterogeneity in science, (3) poster exhibition as an effective means of support for teachers to introduce contemporary chemistry topics to high school students, (4) argumentation in the chemistry laboratory, (5) chemistry, industry, and the environment in the eyes of the individual and society, and (6) the inclusion of students with special needs in science classes teaching them inquiry-based activities. All the papers deal with studies which have the similar objectives: How can we involve as many students as possible in science studies? How can we bridge the gap between formal and non-formal education? How can create a productive and encouraging learning environment?

We hope, that the variety of the topics discussed in this issue, will present a broad picture of studies in science education which have been done in different institutions and countries, aiming at improving and enhancing students' motivation and learning skills. These studies refer to a large population of students and to innovations in science and in science education in the 21st century. The papers address educators as well as to policy makers, in order to improve and to enhance science education as much as possible.

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