

A NEW MONOGRAPH FOR RELEVANT SCIENCE AND TECHNOLOGY EDUCATION

Ivana Šimonová

University of Hradec Králové, Czech Republic

Martin Bílek et al. *Interaction of Real and Virtual Environment in Early Science Education: Tradition and Challenges*. Hradec Králové: Gaudeamus, 2009, 144 p. ISBN 978-80-7435-019-1.

The monograph "Interaction of Real and Virtual Environment in Early Science Education: Tradition and Challenges" is first outcome of the research project *Challenges and limits of interacting real and virtual environments in early science education*, which is supported by the Czech Science Foundation (GAČR), and it is Volume 5 of the Didactics of Science and Technical Subjects edition published by the Faculty of Education, University of Hradec Králové since 1999.

The monograph, published in English, consists thirteen contributions of authors from four countries (Lithuania, Poland, Slovakia and Czech Republic) and six universities (University of Hradec Králové, Jan Evangelista Purkyně University, Adam Mickiewicz University in Poznań, Jagellonian University in Krakow and Šiauliai University).

The content is structured into six main chapters devoted to the methodology of science cognition, and focusing mainly on general chemical education, real and virtual experiments in early education in this field, their types, possibilities and experience in their practical use in the process of instruction, in research activities of experiment-supported instruction, and it also deals with possible risks which applications of new technologies may cause.

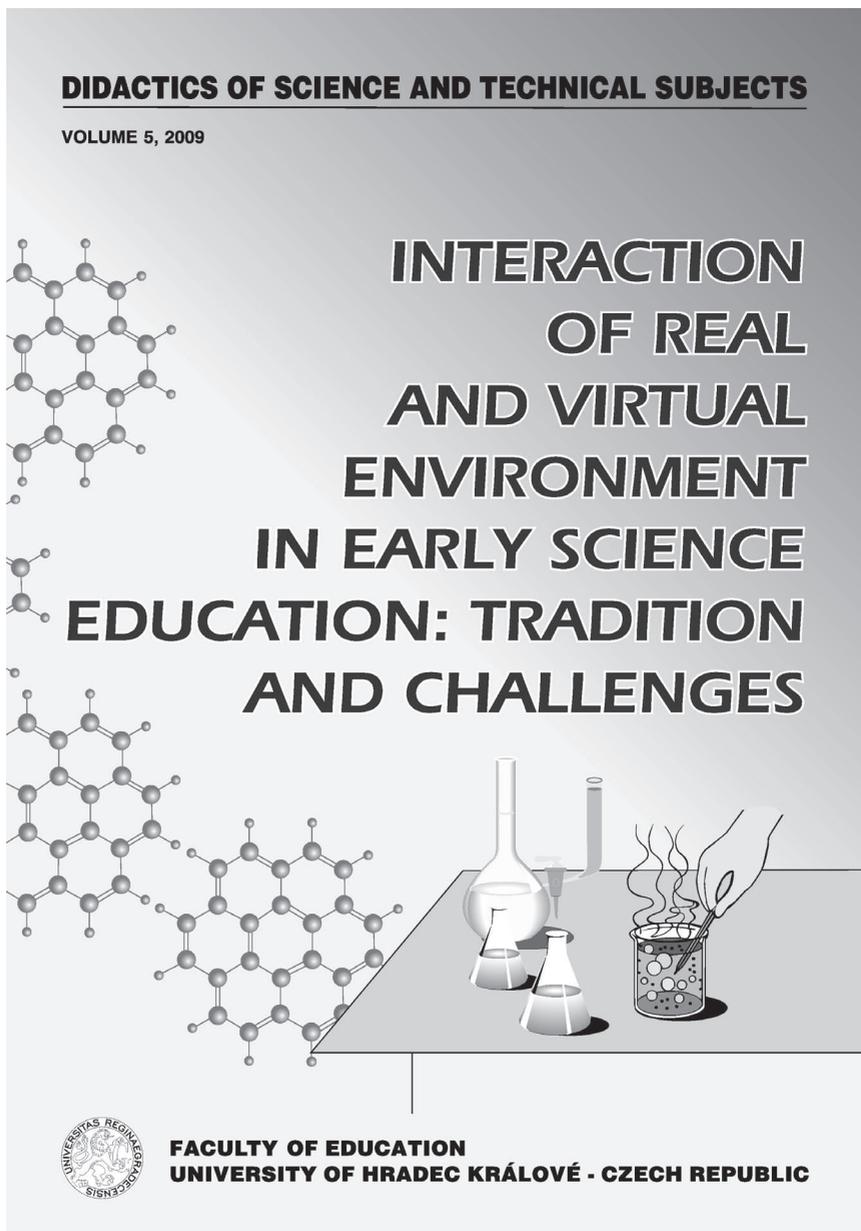
In the *Introductory Chapter* M. Bílek discusses the importance of the Natural Science methodology and its projection into the Science subjects in general education in the times of information and knowledge society.

In *Chapter Two* J. Škoda, P. Doulík, K. Myška and others provide a detailed insight and analysis of the role of school experiments as an important method in the process of cognition; they also emphasize the contribution of modelling and creating modern material didactic means to support the process of Chemistry instruction.

Chapter Three includes four contributions on virtual experiments and their types. The above mentioned computer models and modelling are worked out in the study by K. Myška, K. Kolář and M. Bílek. The last mentioned together with M. Turčáni and P. Skalická deal with remote and virtual laboratories and remote measuring. They emphasize the contribution of F. Lustig, a Czech pioneer in the field of school applications of remote laboratories in Physics, they present examples of putting such activities into effect, and running and managing Web supported real chemical experiments. Foreign authors R. Wolski and P. Jagodziński describe the situation in Poland and provide examples of using the Internet for chemical experiments. They introduce a course tailored to Chemistry students and teachers which aims at developing new skills in this field. They also deal with new electronic teaching aids, e.g. minicomputer, and services which it offers to Chemistry instructions. The article contains photographs showing the use of the presented material didactic means in the real environment. An article by M. Bílek on the role of virtual museums in science and technical instruction as an example of electronic support of so called "museum didactics" closes this part.

Chapter Four focuses on ways in which different types of experiments can be applied in Science education. Authors of five contributions look for ideal rate of using real and virtual environment for running experiments, and the present their own experience. Again R. Wolski and P. Jagodziński summarize the positive influence which experiments have on the process of cognition in Sciences, mainly in the affective field and motivation. J. Rychtera demonstrates the possibility of intentionally directed process of perceiving through experiments supported by video-technology. I. Maciejowska and M.





Bílek set main e-learning objectives in Science education, among which experimental activities cannot be omitted. A specialist in the field of “augmented reality” and “augmented virtuality”, V. Lamanuskas, presented possibilities how this modern tool can be used in early Science and Chemistry instruction, analyzes the advantages and disadvantages, and introduces the ARISE Project as an innovative approach to natural science education. The topic is widened by M. Vilkonienė who presents results of the research supported by this technology.

Research activities focusing on the use of real and virtual experiments in early Science instruction are discussed in *Chapter Five*. It includes two articles by P. Doulík, J. Škoda and M. Bílek. In the former one authors provide a meta-analysis of research studies on didactic application of various types of experiments which were published in renowned foreign journals in the last decade. In the latter contribution selected methods of pedagogical experiments applied in researching efficiency of school experiments in Natural Science instruction are presented and evaluated.



In the *final chapter* the same three authors propose a possible future way based on the curricular reform. This requirement results from social and economic changes running in the current society, and the technical and technological development in all spheres. The curriculum reflecting this situation and perspectives must define adequate educational objectives, content and extent, methods and forms how information is provided to students, deal with relationship between science and technology on one side, and society on the other one, include global and ecological problems, devote to inter-subject relations and ways of thinking in the new situation, propose supportive methods of instruction which are offered by new information and communication technologies. Research projects which provide feedback information about this process form the basis for defining didactic recommendations.

The publication does not aim at covering the whole field which is currently very hot. Author/s of each contribution are trying to provide their experience towards the process of ICT implementation in the science and technical subject instruction, particularly in early Chemistry instruction. Being implemented correctly, the supporting-instruction ICT provide not only educational contribution in the form of visual multimedia presentations of school experiments, but they also eliminate the danger during real experiments, and they save money because new chemical matters and other laboratory aids are not required. The long-term savings appear despite the starting financial expenses in HW and SW equipment.

One of the most important contributions of the monograph is by my opinion the above mentioned meta-analysis which resulted from demanding work of experienced researchers. The cited references will serve the interested as a deep source of literature in this field. The monograph is well-arranged because of unified structure and formatting of single contributions, and adequate technical quality of the text and figures.

The monograph can be recommended to researcher and teachers of all types and school levels. It enables future and graduate teachers to insight in the work of experienced university teachers, didacticians and researches in the field of science and technical subject instruction. It offers an outline of modern technologies which could be applied in experimenting, motivates to follow or be modified according to the level of their own institution.

The work is available at University of Hradec Kralove, Gaudeamus Publishing House, or in the electronic form on the project web page (<http://pdf.uhk.cz/kch/projekty.html>).

Received 28 February 2010; accepted 08 March 2010.

Ivana Šimonová

Ph.D., Lecturer at Faculty of Informatics and Management, University of Hradec Králové, Rokitanského 62, CZ 500 03 Hradec Králové, Czech Republic.

E-mail: ivana.simonova@uhk.cz

Website: <http://www.uhk.cz/>

