ABSTRACTS

SZALAY, LUCA – BORBÁS, RÉKA – FÜZESI, ISTVÁN – TÓTH, ZOLTÁN: The impact of inquiry-based chemistry education on the development of experimental design skills and acceptance of experimental design

In the MTA-ELTE Research Group on Inquiry-Based Chemistry Education, established within the framework of the Content Pedagogy Research Program of the Hungarian Academy of Sciences, we came to the conclusion at the end of our first five-year project that students need more support and motivation to learn how to design chemistry experiments and not to reject this activity. Therefore, our new empirical research project, named Inquiry-Based Chemistry Education and Systems Thinking and supported by the Research Programme for Public Education Development of the Hungarian Academy of Sciences, started in September 2021 and planned for four academic years, aims to do exactly this. The worksheets for the experimental groups consistently make students practice the use of a scheme teaching experimental design. One experimental group fills in this scheme after performing the same step-by-step experiments as the control group. However, the other experimental group is not given instructions on how to carry out the experiments, but the students have to design the experiments themselves with the help of the scheme. And to motivate students, all the worksheets in each group include questions that put the knowledge they have just acquired into a context that is supposed to be relevant to them, while at the same time encouraging them to practice the elements of systems thinking. In the first school year of the present project, 931 seventh-grade students from 38 classes/student groups in 25 schools, taught by 31 teachers, were involved in the research. We aim to influence their four-year compulsory chemistry education with six lessons in each school year when they perform experiments, based on the student worksheets and teacher's guides written by our research team. The impact of the teaching methods used are assessed by the means of tests conducted at the beginning of the first year and at the end of each school year, measuring recall, understanding and application of the current disciplinary content knowledge and the development of the experimental design skills. There is a questionnaire in the end of each test, which includes questions on subject grades, enjoyment of the subject, the importance of experiments in science and the acceptance of the experimental design.

Statistical analysis of data from two tests completed by 890 students in the first school year of the project showed that the experimental group using the scheme on the worksheets to design the experiments performed significantly better on the tasks measuring the experimental design skills than the other two groups. The same group was less likely to reject the experimental design at the end of the seventh grade than at the beginning of the school year.

Keywords: *inquiry-based learning, systems thinking, science experiments, chemistry education, attitude research*