

15 European Conference on Research in Chemical Education

ECRICE 2020 Webinar

Excellence and Innovation in Chemistry Teaching & Learning

Abstract Book

Please register in advance for this webinar
<http://tiny.cc/ig00pz>

Conference Website

www.weizmann.ac.il/conferences/ECRICE2020



The macroscopic, submicroscopic and symbolic level of physical and chemical changes of substances in the reasoning of thirteen-year-olds

Dragica D. Trivic^{a*}, Vesna D. Milanovic^a

^a *University of Belgrade – Faculty of Chemistry*

* Corresponding author: dtrivic@chem.bg.ac.rs

The aim of this research was to diagnose the students' problems in the process of connecting the macroscopic, submicroscopic and symbolic level of representation of physical and chemical changes of substances and to investigate the potential of demonstration experiments for the purpose of eliminating those problems. A total of 63 students (31 boys and 32 girls) attending the seventh grade of three primary schools in Belgrade participated in this research. The data were collected using a test and an interview which was conducted according to the protocol. The students completed a worksheet with requirements related to the demonstration experiments. The worksheet had been designed in such a way so that it guided the students in the process of considering the changes of substances and the analysis of their answers provided an insight into how that process had gone. The work with each class included: pre-testing, completing the worksheet, post-testing and postponed testing. In order to compare the students' achievements before and after observing demonstration experiments, the same test was used for the purpose of the pre- and post-testing. After the lesson, four students from each class (12 students altogether) were interviewed. Three months later, at the beginning of the following school year, the students were tested again using the same test (postponed testing).

In the post-test, which was administered immediately after observing the demonstration experiments, a larger number of students gave correct answers to eight out of nine tasks compared to the pre-test (for one task the number of correct answers was the same in both tests). For one of the eight tasks which had been done better, the difference in the percentage of correct answers was statistically significant. The analysis of worksheets showed that the percentage of students who had provided a correct answer decreased as the complexity of the mental processes required from the students increased, while the percentage of the ones who did not provide an answer increased. The analysis of the answers in the interviews pointed out the problems in connecting the symbolic, submicroscopic and macroscopic level of representing substances and their changes. In the postponed testing, the students had better achievements in seven tasks compared to the pre-test, and in two tasks compared to the post-test. The statistically significant difference in the percentage of correct answers, which was found by comparing the results of the post-test and the pre-test, was also found for the same task when the results of the postponed test and the pre-test were compared. That task could be related with the observed demonstration experiments.