



Investigation of Students' Chemistry Problem Solving Approach with the Use of Eye Tracking-Enhanced Retrospective Think-Aloud

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Abstract

In 2016, national curriculum in the Czech Republic was completed with so called Standards for education. This document contained education objectives completed with indicator tasks for each education field. When the Chemistry tasks were piloted, a satisfactory distribution of successful and unsuccessful solvers was discovered [1]. According to Korenekova [2], however, many of the test results were affected, e.g. students guess the correct answer in a multiple choice. In this research, students' process of solving chemistry problem-tasks was investigated. The same tasks were used to build two sets of tests of comparable difficulty. Altogether 139 first-grade vocational school students solved the tasks. Based on these test results and considering the students' school grade, eight students were chosen for the second round of the research according to their test results and school successfulness. These eight students were then provided a second set of the tasks oriented on the use of the periodic table of elements. To find out more about the process of problem-solving, the retrospective think-aloud method was used. To be able to map the students' problem-solving process, eye-tracking was used too. The record then solved not only as a control of the students' task-solving process, but also as a support for the subsequent retrospective think-aloud interview [3]. The students were quite unsuccessful in solving the tasks. The records from the eye-tracker show many of them did not use the provided periodic table to solve the problem. The students who used it then mostly tried to get all the information needed from the table and did not use their prior knowledge. The combination of eye-tracking and retrospective think-aloud methods allowed the researchers to identify students' limiting strategies mostly in unfinished task reading and identification of guessing the answer. Among field-oriented strategies, confusion of the group and period was discovered or uncertainty regarding the ordering of elements in the table (metals, metalloids, nonmetals). The methods could be used in the future for the task piloting as the description of the strategies needed to solve the tasks given by the authors of the tasks and the strategies the students – successful solvers – use differed in some cases.

Keywords: *Problem-solving skills; chemistry education; eye-tracking; think-aloud;*

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