Abstract

This diploma thesis focuses on analyzing the conceptual understanding of chemistry among first-year university students in the Czech Republic. It identifies both strengths and weaknesses in students' comprehension of fundamental chemical concepts. For the research, selected tasks from the Chemical Concepts Inventory (CCI) were adapted into a three-tier format to enable deeper insight into students' misconceptions. The theoretical part of the thesis first addresses the theory of conceptual understanding and misconceptions in chemistry, including their definitions, causes, and impact on the educational process. It also describes methodological approaches to identifying students' misconceptions, with a special emphasis on the use of three-tier tasks. This section further includes an overview of previous research in the field of conceptual understanding in chemistry and misconceptions, along with a detailed description of the development of the Chemical Concepts Inventory (CCI). The thesis then defines its research objectives, methodology, and results. The main goal was to determine the level of understanding of chemical concepts, students' ability to explain their answers, and their confidence when answering. The results showed that while students had a relatively good ability to identify correct answers in multiple-choice questions, they struggled with formulating correct and logical justifications. Less than half of the students managed to combine a correct answer with a correct explanation. In terms of metacognitive monitoring, the findings revealed an average level of confidence, with students often overestimating the correctness of their answers. This thesis contributes to a deeper understanding of conceptual chemistry knowledge at the university level and highlights the need to improve students' reasoning skills and their deeper understanding of chemical concepts. The results provide valuable insights for educational practice and may inspire innovations in chemistry instruction to enhance students' comprehension and metacognitive skills.

Keywords

Conceptual understanding, misconceptions, chemical concepts, three-tier tasks, Chemical Concepts Inventory (CCI)