Open modelling problems in mathematics teaching that is oriented toward self-regulation

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Abstract

Open problems that can be solved by using different solution methods are an important part of the school curriculum in mathematics and science. These types of problems are typically related to the real world, and thus, they can be solved by constructing mathematical models and are known as open modelling problems. One characteristic feature of these problems is that numerical information that is essential for solving the problems is missing. Solving open modelling problems in classes should prepare students to apply their mathematical knowledge in their current and future lives.

On the basis of research on mathematical modelling, on open problems, and on self-regulated teaching methods, in the OModA-projekt, we aim to investigate (1) the effects of instruction that is focused on important barriers in solving modelling problems and (2) how the teaching of open modelling problems affects students' cognitive and motivational learning outcomes. We will carry out an experimental study to investigate how learning how to identify missing numerical information and how to set this information affects students' performance. Further, we will contrast two treatment programs in a quasi-experimental study: In the first teaching program, students will solve open modelling problems, and in the second teaching program, they will solve closed real-world problems.

The current project is grounded in cognitive and motivational theories of learning and should give new insights into the importance of open modelling problems for students' cognitive and motivational development in instructional settings that are oriented toward self-regulation. Further aim of the present project is to investigate which variables influence the quality of teaching with respect to modelling problems. This project focuses on the investigation of modelling problems with open initial state, whereas in the following project, we are going to investigate modelling problems with open goal state.