

INVESTIGATING TEACHING METHODS FOR MATHEMATICAL MODELLING – DISUM AND ITS FOLLOW-UP PROJECTS

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An important goal of research in mathematical modelling is to develop methods for teaching modelling problems and to examine their effects on students' performance and attitudes (Schukajlow & Blum 2023). A research project dedicated to this goal, with students at the lower secondary school level, is the DISUM project which was carried out from 2002 to 2013 (Schukajlow et al. 2012). The teaching methods developed in DISUM were further developed and examined in a series of follow-up research projects which focused on specific aspects of teaching modelling, also at the lower secondary level, such as formative assessment (Co²CA project, 2007-2013), multiple solutions (MultiMa project, 2011-2017), visualisations (ViMo project, 2015-2019), or dealing with openness (OModA project, since 2020). In addition, the DISUM methods were extended to the tertiary level and the effects were investigated with university students (CoSTAMM project, since 2019).

In the first and main part of the lecture, the research questions, the theoretical background and the various sub-studies of the DISUM project are presented. The first series of DISUM studies was qualitative in nature and aimed at developing appropriate modelling tasks, identifying students' difficulties, and analysing methods used by expert teachers. The second series of DISUM studies was quantitative in nature and aimed at comparing different teaching designs which vary in the degree of guidance given by the teacher and in the extent of self-regulation experienced by the students. An independence-oriented design proved more effective in a ten-lesson teaching unit than a teacher-directive design for the advancement of students' modelling competency. Considering also the results of two follow-up sub-studies, a "method-integrative" design was developed as a blend of the two aforementioned designs and proved even more effective in the same ten-lesson unit.

In the second part, the conception and the results of the follow-up projects CoCA, MultiMa, ViMo, OModA and CoSTAMM are briefly presented. In CoSTAMM, the method-integrative design also worked for tertiary students and proved to be more effective than the teacher-directive design in a five-lesson modelling unit. Altogether, the results of DISUM and various subsequent studies show that it is promising for advancing students' modelling competency to consider basic criteria of quality teaching and, in particular, to find an appropriate balance between instructionist and constructivist aspects of teaching. More research is needed to extend existing findings for the learning and teaching of mathematical modelling to other mathematical topics, other age groups, other types of modelling tasks, and other teaching methods.

References

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