



HAL
open science

Written engagement with modelling task situations as a strategy to enhance the comprehension process

Anna Surel

► To cite this version:

Anna Surel. Written engagement with modelling task situations as a strategy to enhance the comprehension process. Twelfth Congress of the European Society for Research in Mathematics Education (CERME12), Feb 2022, Bozen-Bolzano, Italy. hal-03759075

HAL Id: hal-03759075

<https://hal.science/hal-03759075v1>

Submitted on 23 Aug 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Written engagement with modelling task situations as a strategy to enhance the comprehension process

Anna Surel

University of Münster, Germany; anna.surel@uni-muenster.de

Keywords: Modelling task, situation model, comprehension process.

Motivation

When it comes to mathematical modelling tasks, students often have difficulties when working on them (Blum & Leiss, 2007). A high proportion of the occurring errors are errors in the comprehension process (Wijaya et al., 2014). These errors lead to further errors in subsequent modelling steps and to incorrect solutions. Although understanding the context of a modelling task and forming a suitable situation model is so important, it is often not focused on in mathematics lessons (Prediger & Krägeloh, 2015). In order to help students to solve modelling tasks correctly, it would be advisable to focus on the comprehension process. One way to integrate this into regular mathematics lessons could be to guide students to engage with the situation of a modelling task. In more detail one option could be to have students retell the given task situation in writing before solving the task.

Theoretical framework

According to the modelling cycle by Blum and Leiss (2007), the first step in solving a modelling task is to understand the task text and the situation described in it. In this step, a mental model of the given situation, the so-called situation model, is formed. A situation model is a mental representation of the given situation that is built in the mind while understanding a task and is influenced by variables of process-, person- and task-related characteristics (Leiss et al., 2019). Since the context of modelling tasks is not interchangeable, modelling tasks cannot be solved without considering the context (Leiss et al., 2010). The comprehension of the task and the associated formation of a suitable situation model is crucial for the further processing of the task. Nevertheless, when working on modelling tasks in mathematics lessons, the focus quickly shifts to mathematizing or to directly working mathematically (Prediger & Krägeloh, 2015). This makes it difficult for students to form a suitable situation model.

To counteract this, it would be advisable to focus more intensively on the given situation when working on modelling tasks. One possibility would be to encourage students to do this by retelling the given task situation in detail. In order for all students to have the opportunity to engage with the task situation individually by retelling it, this could be done in writing. The argument in favor of a written engagement is that the thinking process is slowed down during the writing process, which allows students to deal with the situation more intensively (Kuntze & Prediger, 2005). Therefore, this strategy could help students to form a suitable situation model. However, text production requires certain writing skills, what might bring new hurdles that need to be overcome (Bossé & Faulconer, 2008). It is therefore unclear to what extent an engagement with the task situation of a modelling task in the form of written retelling is beneficial for the processing of a modelling task.

Research questions and method

With the theoretical background, the following research questions arise:

- 1) To what extent does an engagement with the situation of a modelling task influence the success of solving a modelling task?
- 2) How does the processing of a modelling task differ when students retell the task situation in writing before solving the task?

To investigate the research questions, a quantitative study is planned. Seventh graders are given two modelling tasks to solve. The first task is to be solved by each student without further instructions. For the second task, the students receive further instructions in which they are asked to retell the given task situation in writing. Afterwards, they are asked to solve the task as well. The order of the tasks will be permuted over all students.

The students' written solution paths are then analyzed. For the evaluation of the results, first the number of correct solutions will be compared for the processing with and without applying the presented strategy. Subsequently, some details, such as the number and type of errors made, can be focused on in more detail. For example, it could be analyzed whether certain errors are made less frequently when retelling the task situation before solving the task instead of directly solving the task. These analyses should help to determine whether written retelling of the task situation as a strategy to engage with the task situation is beneficial for solving a modelling task. Data collection will begin in the spring of 2022.

References

- Blum, W., & Leiss, D. (2007). How do Students and Teachers Deal with Modelling Problems? In C. Haines, P. L. Galbraith, W. Blum, & S. Khan (Eds.), *Mathematical Modelling (ICTMA 12): Education, Engineering and Economics* (pp. 222–231). Horwood Publishing. United Kingdom. <https://doi.org/10.1533/9780857099419.5.221>
- Bossé, M. J., & Faulconer, J. (2008). Learning and Assessing Mathematics through Reading and Writing. *School Science and Mathematics*, 108(1), 8–19. <https://doi.org/10.1111/j.1949-8594.2008.tb17935.x>
- Kuntze, S., & Prediger, S. (2005). Ich schreibe, also denk' ich — Über Mathematik schreiben. *PM: Praxis der Mathematik in der Schule*, 47(5), 1–6.
- Leiss, D., Plath, J., & Schwippert, K. (2019). Language and Mathematics — Key Factors influencing the Comprehension Process in reality-based Tasks. *Mathematical Thinking and Learning*, 21(2), 131–153. <https://doi.org/10.1080/10986065.2019.1570835>
- Leiss, D., Schukajlow, S., Blum, W., Messner, R., & Pekrun, R. (2010). The Role of the Situation Model in Mathematical Modelling — Task Analyses, Student Competencies, and Teacher Interventions. *Journal Für Mathematik-Didaktik*, 31(1), 119–141. <https://doi.org/10.1007/s13138-010-0006-y>
- Prediger, S., & Krägeloh, N. (2015). Low achieving eighth graders learn to crack word problems: A design research project for aligning a strategic scaffolding tool to students' mental processes. *ZDM*, 47(6), 947–962. <https://doi.org/10.1007/S11858-015-0702-7>
- Wijaya, A., Heuvel-Panhuizen, M. van den, Doorman, M., & Robitzsch, A. (2014). Difficulties in solving context-based PISA mathematics tasks: An analysis of students' errors. *The Mathematics Enthusiast*, 11(3), 555–584. <https://doi.org/10.54870/1551-3440.1317>