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Pre-service mathematics teachers' view of mathematics in the light of mathematical tasks

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Mathematical tasks play a crucial role in mathematics education in the school context, in higher education and therefore also in the professional development of pre-service mathematics teachers. Pre-service teachers' views of mathematics are reconstructed in relation to experiences with mathematical tasks in those contexts.

Keywords: Pre-service mathematics teachers, mathematical tasks, view of mathematics.

INTRODUCTION

The findings presented in this paper are part of an ongoing qualitative study addressing learning experiences of pre-service mathematics teachers at university. Ten semi-structured interviews with pre-service mathematics teachers are analyzed using a combination of grounded methods (Strauss & Corbin, 1990) and objective hermeneutics (Wernet, 2009). The topic of mathematical tasks emerged to be worthwhile taking a closer look at in relation to the institutional dimension. Interestingly the topic of mathematical tasks is addressed in the interviews in relation to insecurities concerning the view of mathematics.

In her analysis of word problem tasks, Jean Lave (1993) has pointed out that the institutional dimension is an important aspect leading to a deeper understanding of meanings ascribed to mathematical tasks. She described that mathematical tasks fulfil a variety of different roles in the school context, which can be contradictory (e.g., “realistic” word problems being motivating to all students vs. the complication of tasks due to backward translation into mathematical language). Taking a closer look at teacher education, at least three institutional dimensions have to be considered; the pre-service teachers' experiences (I) at school level, (II) in subject matter courses at university and (III) in pedagogical content knowledge courses

at university. These three dimensions do not stand alone, but are all embedded in the societal discourse.

One aspect of pre-service mathematics teacher's professional development is reflection on mathematical tasks. Taking a closer look at the influence of mathematical tasks on views of mathematics in relation to the different institutional contexts, the following question arises:

What meanings do pre-service mathematics teachers ascribe to mathematical tasks that they are confronted with throughout their university education?

The findings are discussed through the cases of Anna and Georg; both addressed modelling tasks in the interview as being a new aspect of mathematics for them.

THE ROLE OF MATHEMATICAL TASKS IN TEACHER EDUCATION

Bearing in mind the central role of mathematical tasks in mathematics education it is reasonable that they are an important topic for pre-service teachers. Experiences with mathematical tasks in school have already shaped students' views of mathematics (Hannula et al., 2005) and their perception of the teacher's role before they start their studies to become teachers. According to their view of mathematics, different meanings are ascribed to mathematical tasks in university courses: Anna's experiences with mathematical tasks in school led her to the stable view that doing mathematics will lead to definite solutions. In university courses she relies on sample solutions for learning mathematics. She perceives mathematical tasks provided by her subject matter courses to be guidelines of what she is supposed to learn. She plans on providing step-by-step instructions to her future pupils. Georg sees mathematics as a logic game. To

him, mathematical tasks in university courses provide opportunities to learn a way of thinking.

Throughout their studies, pre-service mathematics teachers' views of mathematics are challenged by the different nature of mathematical tasks compared to those in the school context. For Anna and Georg, modelling tasks seem contradictory to their view of mathematics. Anna recognizes that modelling tasks differ from her view of mathematics and has difficulties integrating this new type of task into her mathematical practices and perceives teaching modelling in school as a burden. Georg recognizes, due to modelling tasks, the application facet of mathematics but even so he cannot imagine presenting the abstractness and application of mathematics in a coherent manner in a school context. At the time of the interview he favours promoting the application facet in school.

Different aspects of mathematics that seem contradictory to pre-service teachers need to be explicitly addressed and reflected on in university courses in order to help future teachers broaden their view of mathematics and integrate those aspects into their practice.

REFERENCES

- Lave, J. (1993). Textaufgaben im Mathematikunterricht: Mikrokosmos der Widersprüche zwischen schulischem Lernen und außerschulischer Lebenspraxis. *Forum Kritische Psychologie*, 31, 5–28.
- Hannula, M. S., Kaasila, R., Laine, A., & Pehkonen, E. (2005). The structure of students teachers' views of mathematics at the beginning of their studies. In M. Bosch (Ed.), *CERME 4 – Proceedings of the Fourth Congress of the European Society for Research in Mathematics Education* (pp. 205–214). Sant Feliu, Spain: ERME.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.
- Wernet, A. (2009). *Einführung in die Interpretationstechnik der Objektiven Hermeneutik*. Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.