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► To cite this version:

Marita Friesen, Sebastian Kuntze. Pre-service teachers learn to analyse classroom situations: How is their development related to the use of technical language?. Proceedings of the IV ERME Topic Conference 'Classroom-based research on mathematics and language' (pp. 147-148), Mar 2018, Dresde, Germany. hal-01856542

HAL Id: hal-01856542

<https://hal.science/hal-01856542>

Submitted on 12 Aug 2018

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Pre-service teachers learn to analyse classroom situations: How is their development related to the use of technical language?

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Introduction

Learning to analyse classroom situations can be considered as an important objective in mathematics teacher education. In this context, the use of technical language is assumed to be an important requirement for pre-service teachers to describe and discuss teaching practice. We conducted a one-semester university course focusing on pre-service teachers' learning to analyse the use of multiple representations in mathematics classroom situations and investigated how their development in analysing was related to the technical language they made use of. At the beginning of the course, key elements of theory related to the use of multiple representations in the mathematics classroom were introduced (e.g., according to the approach in Duval, 2006). Based on these elements of theory, criteria for the analysis of classroom learning situations (e.g., presented as video clips) under the focus of multiple representations were derived. Correspondingly, the pre-service teachers learned to make use of relevant terms in the context of learning with multiple representations, such as *register* and *conversion* (Duval, 2006).

Theoretical background and research question

Due to the essential role representations play for the teaching and learning of mathematics, analysing the use of multiple representations has been described as a key aspect of mathematics teachers' professional competence (e.g., Friesen & Kuntze, 2016). Mathematics teachers must be able, for example, to identify situations where students need support in using representations or in connecting different representations of the same mathematical object to each other (e.g., Mitchell, Charalambous & Hill, 2014). In this context, it is assumed that what teachers identify and interpret when observing classroom situations is not only channelled by their knowledge, but also by *what they can name* (Mesiti et al., 2017). Teachers' analysis of classroom situations and its development in teacher education might consequently be related to the use of a technical language for describing practice and naming its components (Grossman et al., 2009). In our research, we were interested in pre-service teachers' development in identifying and interpreting events relevant for students' learning with representations. This resulted in the following research question: How is pre-service teachers' competence of analysing related to the use of technical language regarding multiple representations before and after a corresponding university course?

Methods, results and discussion

We collected 112 written analysing results from seven pre-service teachers who each evaluated eight classroom situations regarding the use of representations before and after the university course. Each classroom situation was followed by an open-ended question: *How appropriate is the teacher's response in order to help the students? Please evaluate the use of representations and give reasons for your answer.* Although no technical terms as introduced in the course were

found in the answers of the pre-test, 19 results indicated that events relevant for students' learning with multiple representations have been identified and correctly interpreted. However, many of these results were characterised by a rather vague and intuitive argumentation. In the post-test, 35 results indicated a successful analysis regarding the use of multiple representations. Amongst them were nine answers with technical language related to representations as introduced in the university course.

The findings show that the use of technical language as introduced in the university course was not a necessary precondition for identifying and interpreting classroom events relevant for students' learning with multiple representations. It indicates that it was possible for the pre-service teachers to give correct analysing results without the explicit use of relevant technical terms. On the other hand, however, all but one of the answers containing relevant technical language also indicated successful analysing of the corresponding classroom situation. Moreover, the argumentation in these analysing results was characterised by being more pointed and consistent. It might therefore be concluded that the use of technical language could help the pre-service teachers to interpret events they identified regarding the use of multiple representations and to improve their analysing results. The use of technical language for articulating analysing results should consequently be paid particular attention when pre-service teachers learn to analyse classroom situations. Specific support in applying relevant technical terms to classroom events, however, might be necessary. The reported findings encourage further research into the relation between the use of technical language and pre-service teachers' learning to analyse classroom situations. A corresponding study with a bigger sample of pre-service teachers is currently being conducted at Ludwigsburg University of Education.

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