Initial participation in a reasoning and proving discourse in elementary teacher education

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Reasoning and proving is difficult to learn and difficult to teach. Research in mathematics education has shed light on different aspects of (pre-service) teachers' work on reasoning and proving, such as their beliefs related to proofs and proving, challenges when carrying out proofs and their knowledge. However, more research is needed on (pre-service) teachers' learning to teach reasoning and proving, as well as how teacher education can support their learning. A part of teachers' learning to teach reasoning and proving is learning to reason and prove in school relevant mathematical areas, which is the focus of this study.

In this study, we examine two elementary teachers´ work on a reasoning and proving task in mathematics during a professional development course. We follow Sfard (2008) and take the position that learning mathematics, including learning the work of reasoning and proving, is learning to participate in a particular discourse. Our research question is: *What characterizes two in-service teachers' initial participation in a mathematical discourse on reasoning and proving in elementary teacher education?*

Within Sfard´s (2008) commognitive framework, discourse is a special type of communication within a particular community that is made mathematical by a community's use of words, visual mediators, narratives and routines. Any spoken words or written text that discusses properties of objects or relationships between objects is called a narrative. Narratives are subject to endorsement or rejection, that is, labelled true of false, based on specific rules defined by the community. Modes of argumentation depend on the routines established in the discourse. Routines are here understood as well-defined practices regularly employed in a discourse by a given community.

In our presentation, we show a preliminary analysis of a data collected through video recordings of two elementary teachers working on a reasoning and proving task on properties of multiplication. Transcripts of the data material were coded and categorized in order to identify what the teachers do as they work on the given task. The results were interpreted by means of the commognition framework. Our preliminary findings show that some aspects of reasoning and proving seem to be more accessible for teachers to take part in than other aspects. The teachers in the study are questioning the validity of arguments provided, searching for patterns and ways to express them, and using various representations in their arguments. However, developing exploration routines within a mathematical discourse requires knowing both *the when* and *the how* of constructing and substantiating mathematical narratives and recognising narratives for further substantiation. Based on our analyses, we argue that a commognitive perspective on learning contribute to gaining insight into the challenging process of learning reasoning and proving in elementary teacher education.