

Second grade pupils' understanding of "one half"

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In order to think about, explore and communicate about mathematics we need semiotic representations, as mathematical objects are abstract in their nature (Duval, 2006). Thus it is critical for learning mathematics to be able to interpret semiotic representations and to change flexibly between them. In school mathematics, fractions is a topic that comes with a various number of different semiotic representations, and fractions is a topic that is often challenging for pupils. Providing opportunities for the children to make connections and translate between multiple representations, and to build on children's ideas, is critical (Rau & Matthews, 2017). In this presentation we address the following research question: "How do young pupils give meaning to different semiotic representations of wholes and halves?"

This study is founded in Steinbring's (2005) theoretical framework. He claims that formal sign-systems developed by mathematicians are meaningless to children before they have learnt to interpret them. The pupils' meaning-making happens while working with these signs, in interactive learning processes in the classroom. In this learning process, new mathematical knowledge is to be developed.

The data material in this study is transcribed video recordings from one lesson in a 2nd grade classroom, where the pupils worked on placing cards with fractions represented in different ways on a number line. The cards included geometric figures, numeric symbols and sentences in natural language (like "9 and a half"). This lesson was conducted before the pupils had any other formal fraction instruction. To analyze the data material we used an inductive approach. We partitioned the transcripts into episodes according to what card the pupils were working on. To each episode we asked questions like: "Where are they placing the card?" and "How are they deciding where to place the card?". We then made comparisons, both of the same pupil placing different cards and different pupils placing the same card. This comparison resulted in the identification of three distinct interpretations of "one half".

The three interpretations are 'one half as halving', 'one half as a modifier', and 'one half as an independent quantity'. We use concepts from Steinbring's framework to understand the different categories and how they connect to pupils' informal knowledge. In the presentation we will also discuss the problems that arise in the classroom when pupils using different interpretations are communicating with each other.