Young pupils' way of explaining and arguing in the discourse of mathematics

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This is a short report of the background and of methods I plan to use in an on-going study.

In Skolverket (2011, p.59), in the curriculum for primary school, it is said that "…pupils should be given the preconditions to develop their familiarity with basic mathematical concepts…". According to Vygotsky (1999), concepts develop through language, because "concepts is impossible without words…" (Vygotsky 1999, p.186, Authors translation). In the formation of concepts, words are used as functional tools (Vygotsky 1999). This imply, as I see it, that the use of language is an important factor in the learning of mathematics. Skolverket (2011), also relates to the use of language when they say that

> Teaching in mathematics should essentially give pupils the opportunity to develop their ability to
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> - apply and follow mathematical reasoning and
> - use mathematical forms of expression to discuss, reason and to give an account of questions, calculations and conclusions. (page 59-69)

Sfard (2008, p.297) talks about mathematics as a discourse, where she defines a discourse as "…a special type of communication made distinct by its repertoire of admissible actions and the way these actions are paired with re-actions".

According to Sfard (2008), mathematical communication involves ceaseless transition from what she calls signifiers, which are words or symbols that function as nouns in the utterances of the discourse participants, to other entities which Sfard calls realizations of the signifiers. The realizations of the signifiers are perceptually accessible objects that may be operated upon in attempt to produce or substantiate narratives about the signifier.

These examples, among others, have made me think of communication as something important, perhaps the most important tool, in becoming a competent actor in the discourse of mathematics.

I am interested in looking in to the communication in the discourse of mathematics in a Swedish mathematical classroom somewhere in the year 4 – 6 and I will focus on pupils' explanation and argumentation connected to Geometry.

I think of explanation as a lower level of communication compared to argumentation. When you explain something, you just describe a phenomenon so that someone else can "get a picture of it". If your aim is not just to describe, but also to convince someone of something, then you would have to use argumentation. According to van Emeren and Grootendorst (2004), argumentation can be described as

> A verbal, social and rational activity aimed at convincing a reasonable critic of the acceptability of a standpoint by putting forward a constellation of proportions justifying or refuting the propositions expressed in the standpoint. (page 1).

To capture pupils' explanation and argumentation I plan to both audio and video record what happens in two specific settings, performed at two different times.

The first setting is a task which aim is to capture pupils' ability to explain. The pupils will work in small groups or pairs where one of them will receive a drawn picture of a quadrilateral and the task will be to describe the figure so that the others in the group will be able to draw it without having seen the figure.

In the second setting the pupils will work with a task where I want them to argue. The students will once again work in small groups (not pairs this time). They will receive a collection of cut out quadrilaterals and the task will be to sort the quadrilaterals in some way of the groups own choice and to verbally argue for the decisions being made.

I don't know in advance what can be found in the data of the students' communication. I want to investigate what kind of communication that appears and then, how the communication can strengthen students' understanding of the mathematical discourse. According to Charmaz (2006) qualitative researchers can "…add new pieces to the research puzzle or conjure entire new puzzles – *while we gather data* – and that can even occur late in the analysis" (page 14). This is one of the reasons I, at this point, think of my study as qualitative.

References

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