Conventions as Obstacles for Understanding? – Pupils' Reasoning when Making Sense of School Mathematics Language

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This study focuses on a group of pupils when reasoning about a task including the algebraic convention to answer "expressed in n". (In Swedish: "uttryckt i n".) The aim is to investigate what resources the pupils make use of and how they apply and understand the colloquial, inter- and school mathematics language. The study builds on video graphed classroom data. The analysis is currently underway, but preliminary conclusions point to that the generalisation itself is not problematic. The obstacle for understanding is how to interpret the convention to answer "expressed in n" (school mathematics language).

Background

During the last decades it has been an increasing emphasis on reasoning and communication in teaching mathematics (Säfström, 2013). In school mathematics many pupils do not succeed in algebra. If looking at both *Algebra* and *Reasoning* in the 8th grade in TIMSS 2011, Sweden scores below the average in EU/OECD (Skolverket, 2012).

Against this background my interest is to analyse the reasoning in a group of 12-years old pupils when they are working on a task where a key formulation in the question is a typical expression in school algebra discourse that is novel for the group.

Research question

The aim of the study is to investigate what resources the pupils make use of and how the group members use and understand the colloquial, inter- and school-mathematics language (Olander & Ingerman, 2011) when they try to solve a task whose answer will be an algebraic expression. The ambition is that the study will contribute to knowledge which, in later phases, can be fruitful to teachers when noticing pupils language in mathematics and when introducing algebraic expressions.

Method

The study is a part of a project entitled VIDEOMAT, which is a video study about early algebra. The video data dealt with in this paper is from a discussion between pupils about this task, which originates from TIMSS:

Hasse has 3 jackets more than Anna. If *n* is the number of jackets Hasse has, how many jackets does Anna have in *n*? Write an expression which describes how many jackets Anna has expressed in *n*.

Tentative conclusions

The analysis is still underway and conclusions are tentative at this point. The pupils really struggle to understand the text, and their collaboration is intense and creative. Their mathematical reasoning is logical, even if the starting-point is not correct. But the group cannot find out the answer and formulate it "expressed in *n*", because they do not yet have access to the convention of expressing a generalisation in this specific way, or even know what it might mean. This implies that they have to grasp the question at the same time as they try to find the answer. In their reasoning they try to make sense of the convention by looking for pieces of jigsaw puzzles, which possibly can fit in into the empty hole of what "expressed in *n*" is for the group.

Initially the pupils try to make sense of what there is in the *n*, and the first resource they use is the alphabet which leads them to count up to *n*=14. Some of the other resources the group make use of: the other members of the group, the discussion itself, features of the school mathematics discourse and its framings (e. g. expectations that it is possible to find an answer), reading the question several times with different emphasis, the teacher, prior knowledge in mathematics (e g about *x* and *y)* and humour.

The analysis shows that the generalisation required in the task is not problematic, when the pupils use everyday language (colloquial language) or apply counting examples to see the relation between the numbers (inter language). The main obstacle for understanding is how to interpret the convention to answer "expressed in *n*" (school mathematics language).

References

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