Student teachers' reasoning about the mathematical content in pupils' solutions

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Introduction

The focus of this study is to investigate student teachers' interpretation of the mathematical content in first year upper secondary school pupils' solutions of two algebra problem solving tasks. The student teachers were gathered together in six groups with 2-3 students in each group, and were asked to discuss and assess the solutions of two algebra tasks, taken from released PISA 2003 tasks. Altogether around 90 pupils solved the two tasks. Based on a first analysis of the solutions, where different solution strategies were identified, a sample of solutions was chosen and given to the student teachers. Each group of student teachers got four solutions of each task, representing different strategies, to discuss and assess.

My aim of this work is to answer the following research question: *What characterizes student teachers' communication when talking about secondary school pupils' solution of algebra tasks?*

Method

The discussions about the mathematical content in the pupils' solutions were both video and audio recorded. The student teachers made notes about the pupils' solutions and these notes were collected as data. The video and audio material was scrutinized several times and most of the material was transcribed verbatim for further analysis. In addition to oral communication, relevant non-verbal actions and interactions were included in the transcripts.

Theoretical framework

To answer the research question I plan to use the following framework, the epistemological triangle (Steinbring, 2006) and the IC-Model (Alrø & Skovsmose, 2002).

The epistemological triangle

In mathematics a variety of signs are used. The role of a sign is that it stands for something else. Signs are socially constructed and Steinbring quoting Peirce, states that "we have no availability to think without signs" (Steinbring, 2006 p. 133). The mathematical signs are a way for us to for example code, describe,

communicate and generalize mathematical knowledge (Steinbring, 2006) and they have two functions:

(1) A semiotic function: the role of mathematical sign as ″something which stands for something else″.
(2) An epistemological function: the role of the mathematical sign in the frame of the epistemological constitution of mathematical knowledge. (Steinbring, 2006, p. 134)

As a means to represent the way mathematical knowledge mediates between signs and objects or reference contexts Steinbring has constructed *the epistemological triangle* (2006, p. 135).

The IC-Model

To grasp the interaction/communication about the mathematical content I intend to use Alrø and Skovsmose's (2002) *Inquiry Co-operation Model (or the IC-Model)*. Theoretically, "an inquiry-based education is completely dissociated from the idea of transferring knowledge. Knowledge is not to be delivered, it must be developed" (Alrø & Skovsmose, p. 52). The key notions in the IC-Model are: *getting in contact, locating, identifying, advocating, thinking aloud, reformulating, challenging, and evaluating*. These notions have been described as "communicative acts among teachers and students that can support learning in a particular way" (p. 62). The main condition in the IC-Model is active listeners who try to grasp the facts and feelings in what is said.

The methodological issue

To make it possible to study the way the student teachers communicate about the mathematical content of the pupils' answers my idea is to use both the epistemological triangle and the IC-Model. With the epistemological triangle the focus is upon the relations between object, sign and concept in the tasks and in their solutions, and with help of the IC-Model I want to focus on how these relations, the transition between the representations in the tasks, are discussed in the groups.

References

Alrø, H., & Skovsmose, O. (2002). *Dialogue and learning in mathematics education: Intention, reflection, critique*. New York: Springer.

Steinbring, H. (2006). What makes a sign a mathematical sign? – An epistemological perspective on mathematical interaction. *Educational Studies in Mathematics*, 61, 133–162.