INTRODUCTION TO EQUATIONS: THREE CASES AS PART OF A VIDEO STUDY

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In the comparative video study to which this poster connects, the VIDEOMAT project, the scope has been to document mathematics lessons in Finland, Norway, Sweden and the USA on the introduction to algebra. A more specific teaching content, introduction of letters as variables, was determined through textbook analyses in each country. Series of five consecutive lessons have been video recorded in two to five schools in each country with the primary aim to make comparative analyses concerning algebra teaching and learning. A more comprehensive presentation of VIDEOMAT is found in the poster proposal for WG3 by Wathne, Reinhardtsen and Cestari, and in Kilhamn and Röj-Lindberg (2012).

For this poster, video recordings of three mathematics lessons in primary schools in the Swedish speaking part of Finland have been analyzed. The aim is to present classroom-specific approaches to the introduction of equations.

THEORETICAL BACKGROUND

The introduction of algebra is well known as a problematic area for large groups of students, particularly when the numerical system is expanded to the use of letters to represent variables or unknowns. Concerning the introduction of equations, a distinction can be made between an arithmetic type of equation, such as $ax \pm b = c$, and an algebraic type, such as $ax \pm b = cx \pm d$. In arithmetic equations letters appear as variables or unknowns on just one side of the equal sign, and hence the equal sign might be approached in a dynamic way by the learner. The adjustments from arithmetic to algebraic thinking include a focus on the equal sign as structural (Kieran, 2004) and on the possibilities for participating in public sense-making processes in the mathematics classroom (Schoenfeld, 2008). Furthermore, the nature of those processes needs attention. The problems connected with the introduction of equations in the mathematics classroom may be related to limitations in the teaching approaches. Thus, an exploration of how the content of equations is introduced in classrooms becomes an interesting focus for research.

RESEARCH QUESTIONS

The following general question will be addressed in the poster:

> What kinds of approaches to the introduction of equations are used in the three grade 6 classrooms, and how is each approach socially constituted?

METHODOLOGICAL FRAME AND RESULTS

The poster presents case studies of three mathematics lessons with no intention to generalize the findings to wider populations of schools and classrooms. The teachers were enrolled through personal contacts or through the school authorities. All of them were teaching mathematics in grade 6 (12 to 13 years old students) and in different schools. Five consecutive lessons with each teacher were recorded with three stationary video cameras. One camera was positioned in front of the classroom and recorded the students' interactions with each other and with the teacher. One camera recorded the interactions of a small group of students. The third camera was positioned in the back of the classroom and recorded the actions and voice of the teacher. All the video-recordings have been imported to Transana, software for analyzing digital video or audio data (see www.transana.org). Interviews with the teachers were conducted after the fifth lesson, and comments given by them after each recorded lesson have been collected. Written work by the students and lesson files produced by the teachers (plans, tasks etc.) has been collected as well. The starting point for the analysis is the coding procedure developed from the first video data collected in the VIDEOMAT-project (Swedish data) (see Kilhamn & Röj-Lindberg, 2012). In this procedure the flow of each lesson is structured with mutually exclusive coverage codes to capture what the researcher perceives as the major activities and interactions. For the purpose of this poster, a more fine-grained analysis of activities and interactions in the three first lessons is done. The analyses show that the introduction of equations was highly focused on procedures for solving arithmetic equations, along with visible intentions to focus on a structural meaning of the equal sign as structural. There were, however, remarkable differences in the social spaces that afford mathematical actions by the students.

PLAN FOR PRESENTATION

We plan to present pictures from the classrooms and transcriptions of episodes to illuminate the different approaches used in the three classrooms. References to relevant literature, excerpts from the textbook, examples of tasks used and of student work will be included.

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