Learning models enhancing Number sense

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Taking in account that mathematical knowledge can partly be explained as theoretical knowledge, students have to take part in theoretical work to enhance mathematical knowing. Further, taking in account that theoretical work depends on mediated actions, questions in relation to the youngest students use of mediated tools can be raised. In this presentation I will discuss students work in grade 1, 2, and 3 in Sweden in relation to research in the perspectives of learning activity and early algebraization. I will discuss learning models and algebra as tools to enhance mathematical knowledge even together with the very young students.

From a project; "Education in Mathematics together with young students using problem solving and algebra", I am interested in what mathematical knowledge students in grade one, two and three are experiencing in relation to learning models. A task, used by students in the project (project students) and in three different reference schools (reference students), shows that the project students handled problem solving in quite another way than the reference students (Eriksson, 2016). The project students used algebraic symbols and a length model to solve the task. Earlier research shows similar results (see e.g. Zuckerman, 2004; Schmittau, 2003).

In the project we used the theoretical framework of Early Mathematical Education developed by El´konin and Davydov (see Davydov, 2008/1986). The framework developed by these researchers are often used as reference in the field of early algebraization (Cai & Knuth, 2011). In this field algebra is used even together with the youngest students, for example; to develop learning models for numbers. Learning models suggested in this theoretical framework are always constructed together with the students; the aim with the models is to make it possible to discuss and develop theoretical knowledge (compare Gorbov & Chudinova, 2000). A leaning model descried by these researchers can be constructed of symbols, but also of schemas, models, pictures and physical artefacts (see even Kozulin & Kinard, 2008). Also, younger students need these learning models to take part of theoretical work (Davydov, 2008/1986). Drawing on the problem solving ability the project students' show, and results from earlier research, I want to discuss the following research question; What mathematical

knowledge are the students experience, while working with a learning model? To answer this question, I will discuss the theoretical framework used in the project with help of data from the project "Education in Mathematics together with young students using problem solving and algebra".

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