Progress report 2016

LaUDiM is an intervention project developed in close collaboration between researchers, teachers and leaders at two schools. The main goal is to develop deeper knowledge of the learning environment's significance for developing young learners' mathematical thinking and understanding, as well as to develop their ability to express mathematical concepts and ideas, orally and in writing. This also entails learners' ability to discuss mathematics and to argue for and justify why something is right or not. Using a video-based design, it is also a goal to develop knowledge of video as a tool for teachers' learning. We also explore use of video in student teaching as part of strengthening future teachers' competence to lead productive mathematics conversations with pupils. Through this, and as the researchers are teacher educators, knowledge developed in the project will strengthen a research based teacher education. The first year of the project (14/15) a cycle of three phases was developed. In the first phase teachers and researchers in collaboration planned tasks and activities with the aim of stimulating communication, reasoning and justification. The teaching was performed in the second phase. Discussions between teachers and pupils, and between pupils were video-recorded. In the third phase, the recordings and written student work were discussed and analyzed by teachers and researchers using set criteria for the goals of the teaching session. The cycle was performed three times in each of the participating schools. The mathematical content was the term "one half", geometry and subtraction. Based on our own experiences and discussions with the international reference group we made two changes in the cycle in the second year (15/16). A pre-analysis prior to planning of teaching where introduced. Here teachers and researchers jointly do a thorough analysis of the mathematical target knowledge. Phase two of the cycle was extended to two sessions in the classroom. Between the two, teachers and researchers reflect on the need for any adjustments. The extended cycle was conducted three times on one school and two times on the other. Theme was subtraction as difference and multiplicative structures. In the second year (15/16) the project is made visible and presented at seminars and conferences directed at different target groups (see www.laudim.no). For teachers, findings from a cycle on geometry was presented and discussed in seminars at the two schools and presentation at a summer course for teachers in Norway (LAMIS). One of the teachers shows how the analysis of the teaching made her see the importance of pupils starting to classify, name and describe characteristics of varied geometric shapes. Being able to recognize shapes is seen as the easiest approach, but findings from LaUDiM suggests that this may give students perceptions about polygons that are difficult "to unlearn". This finding is also presented for teacher educators at UiT The Arctic University of Norway. A different analysis of the cycle on geometry is presented and discussed at an international scientific symposium, in a session devoted to Brousseau's theory of didactic situations, the project's theoretical foundation. Central to this theory is the concept of "milieu", which models the physical and intellectual reality that pupils act on when solving a task. An adequate milieu (for a particular target knowledge) has an adidactical potential, meaning that the milieu provides sufficient feedback to pupils in order to solve the task without teacher intervention. The analysis shows how the milieu (including the task) undergoes a development from lacking an adidactical potential, to be equipped with such. The first phases of implementation in the classroom proves to be valuable to obtain pupils' existing concepts. Pupils' everyday language is only apparently a sufficient basis for introducing precise mathematical concepts. This finding is consistent with an analysis of pupils' understanding of semiotic representations of mixed numbers. Here we see that mixed numbers represented by phrases in everyday language cause the most problems. This finding is presented at ECER and NTNU.

Video-recordings of student teachers' mathematical discussions with pupils were analysed and discussed in post-lesson sessions where both the mentor and the lecturer in mathematics were

present. The analysis shows that student teachers find it challenging to understand and interpret what pupils say, and represent it in a proper mathematical language. The teacher's role as interpreter and translator of pupils' thinking is crucial for mathematical discussions to be instructive for all pupils in the classroom. This is presented at three international conferences: ECER, Bringing Teacher Education Forward (UiO) and Nordic Teacher Education Congress. In the presentations, we have also shown how the use of video can benefit the development of such a teacher competence.