

## The role of Swedish school algebra in a historical perspective

Solid knowledge of algebra is vital to manage mathematics at upper secondary and university level. Traditionally, algebra has been postponed until adolescence because of former assumptions that young children would not be cognitively capable of thinking algebraically. However, recent research reveals that it is possible and even beneficial to start working with algebra already in early grades (Blanton et al., 2015). This has influenced school mathematics where many countries have revised their syllabuses in order to incorporate algebra in primary school.

In Sweden algebra is a part of mathematics that causes pupils major difficulties. In international evaluations, Swedish pupils have performed below the international average in algebra since the 1960s. Although there has been various attempts to improve school algebra teaching the results in algebra have not improved. The overall purpose of the present study is to contribute to the international research field regarding the complex issue of implementing algebra in early school mathematics by investigating the Swedish case. More specifically, we examine how algebra is traditionally treated in the last five Swedish syllabuses for grades 1–9 from 1962, 1969, 1980, 1994, and 2011. The study is part of a broader research project aiming at characterizing Swedish school algebra on both formulation and realization arenas (Hemmi et al., 2018). The project is theoretically embedded in Bernstein's theory about classification and framing of educational knowledge.

In order to characterize the algebraic content as well as to investigate what role algebra plays in school mathematics we have conducted a qualitative content analysis where Blanton et al.'s (2015) five big ideas of algebra have been applied as an analytical tool. The big ideas are: Expressions and equations, Generalized arithmetic, Functional thinking, Variables, and Proportional reasoning.

The results show both similarities and differences between the syllabuses. For instance, in the 1980 syllabus algebra represents a very small part of the mathematical content, especially compared with the 2011 syllabus where algebra is emphasized already from earlier grades. All five syllabuses emphasize the importance of everyday mathematics and the practical use of mathematics in contexts relevant for the students. However, there are differences regarding which role algebra plays in everyday life. The 1980 syllabus states that algebra is less important in everyday life and students only need a "certain orientation" of algebra, which is probably a reaction to the great focus on abstract mathematics of "New math" in the 1969 syllabus. In the 2011 syllabus everyday life appears frequently within the algebraic content. A common feature of all five syllabuses is the weak emphasis on the big idea generalized arithmetic.

### References:

Blanton, et al. (2015). The development of children's algebraic thinking: The impact of a comprehensive early algebra intervention in third grade. *Journal for Research in Mathematics Education*, 46(1), 39–87.

Hemmi, et al. (2018). Characterizing Swedish school algebra – initial findings from analyses of steering documents, textbooks and teachers' discourses. In *Papers of NORMA 17, The Eighth Nordic Conference on Mathematics Education* (pp. 299-308). Stockholm.