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The role of algebra in Swedish curricula during the last 40 years

Abstract

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, these assumptions have been challenged by several mathematics educators and recent research studies reveal 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 as well and many countries have revised their curricula in order to incorporate algebra in primary school.

In Sweden, which is the focus of the present study, algebra is a part of mathematics that causes school students major difficulties. In international evaluations (such as TIMSS and PISA) Swedish students have performed below the international average in algebra, at least since the 1960s (Murray &Liljefors, 1983). Although Sweden has revised its curriculum by implementing algebra already in primary school 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 school mathematics by investigating the Swedish case. More specifically, this study examines how algebra is traditionally treated in the last three Swedish curricula for grades 1–9 from 1980, 1994, and 2011.These three curricula are of great interest since the Swedish school system has undertaken major reforms during these years; the decentralization in year 1991, the free school reform in 1992 and the implementation of mathematical competencies in the two most recent curricula. The implementation of "New Math" in the national Swedish curriculum from 1969 has been analyzed by Prytz (2018) and will therefore not be included in this study.

In order to characterize the algebraic content as well as to investigate which role algebra plays in school mathematics, Bednarz et al.'s (1996) five perspectives on algebraic content has been applied as a basis for an analytical tool. These perspectives are generalization, problem solving, modelling, function and history. In addition to this we will also consider an everyday mathematics perspective.

The results show both similarities and differences between the three curricula. In the 1980 curriculum algebra represents a very small part of the mathematical content, especially compared with the 2011 curriculum where algebra is emphasized already from earlier grades. All three curricula 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 curriculum states that algebra is less important in everyday life and that students only need a "certain orientation" of the algebra content, which is probably a reaction to the great focus on abstract mathematics in connection with the "New math" during the 70s (see Prytz, 2018). In the 2011 curriculum everyday life appears frequently in connection with the algebraic content. Moreover, the results reveal that there are differences regarding how mathematics knowledge is characterized in the three curricula.

The present study is part of a broader ongoing research project aiming at characterizing Swedish school algebra. Both diachronic and synchronic studies are being conducted focusing on both formulation and realization arenas. The overall aim of the project is to find reasons for the failure to raise the quality of algebra teaching in Sweden, but also to find possible ways to improve the situation.

References:

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