

## What to do with algebra? Changes in the Dutch mathematics curriculum for secondary education.

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"Algebra or general Arithmetic is a science that teaches one to contemplate and calculate multitudes in general and all relations between them<sup>1</sup>." (Baudet, 1842, p.1)

"Algebra [at school] is first of all a way of working, where 'working with formulas that contain letters' is important, but is not everything. Algebra at school is strongly associated with verbs such as solve, manipulate, generalize, formalize, structure and abstract." (Drijvers e.a., 2011, p.8).

There are many publications on the history of algebra and even more on the teaching and learning of algebra. However, as da Ponte & Guimares point out, hardly any research has been published on the history of the teaching and learning of algebra (da Ponte & Guamarães, 2014). From the 16th to 18th century the production of textbooks, including books on algebra, increased significantly, facilitating instruction and self-instruction. The development of (public) secondary education, with mathematics as a school discipline and algebra as an autonomous topic within school mathematics, mostly started in the 19th century. Though there is a growing body of research on the educational structures and mathematics education in the 19th and 20th century, publications specifically on algebra in education are few. Examples are Bråting (2021) on teaching traditions in Swedish school algebra; Krüger (2015) with a short overview of algebra teaching in the Netherlands from 1600 onwards; Oller (2017 CERME10) about algebra in a 16th century Spanish text. In treatises on the history of mathematics education algebra is sometimes mentioned, see for example (NCTM, 1970; Krüger, 2014; Schubring, 2010; Price, 1994).

The delimitation of the content of school algebra, the views on what may be considered as algebra, the use of algebra in other subjects and the didactic approach all varied from the late 18th century until the present (Drijvers, 2011; Leung e.a., 2014; da Ponte & Guimarães, 2014).

This paper concerns itself with algebra in Dutch secondary education, starting mid-19th century. At that time algebra already was an art which was relatively wide-spread among Dutch mathematical practitioners and teachers of mathematics. Textbooks in Dutch, but also in English, French and German and journals were available to provide knowledge about algebraic techniques, simple exercises and algebraic problems.

Thus when in 1864, some form of national mathematics curriculum for secondary education in the Netherlands was formulated, ideas about the algebra to be taught were reasonably well established. During the next 150 years there were about seven relatively influential changes in the mathematics curriculum. In this paper the aims of these changes and consequences for school algebra are explored.

The following aspects will guide the exploration:

- images or definitions of algebra, characteristic for the period
- changing aims of the curriculum, of the view on school mathematics
- consequences for algebra in the curriculum, its content and delimitations

The methods and materials used will be analysis of curriculum documents, search through teachers journals, samples from textbooks on school algebra and of problems in final exams.

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1 [Algebra of algemeene rekenkunde is eene wetenschap, die ons de grootheden in het algemeen en in alle derzelve betrekkingen leert beschouwen en berekenen.] All translations by author.

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