Elementary mathematics education in the Netherlands ca. 1800: New challenges, changing goals

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Around 1800 Dutch elementary mathematics education (10 to 15 years old) changed. The textbooks that were used in Dutch education, bear witness of that change. It is revealing to compare, for example, the immensely popular arithmetic textbook by Willem Bartjens (1569-1638), published for the first time in 1604, with a 19th century arithmetic textbook. The textbook by Bartjens [1] was re-issued over a hundred times until it was finally considered old-fashioned in the early 19th century. A comparable arithmetic textbook (comparable in the sense that it was destined to be used in schools for the same age group), was published in 1828 by the Leyden Mathematical Society Mathesis Scientiarum Genitrix [3]. This textbook –as any other 19th century arithmetic– could not compete in popularity with Bartjens, but it was similar to many other arithmetic textbooks printed at the time.

Of course there are obvious differences between the textbooks, as reflected in the introductions. Even some changes between the subjects treated can be noted. In 1828 the Dutch had adapted the metric system, so treatment of decimal fractions had become obvious, whereas Bartjens naturally devotes no attention to the subject. But apart from these, there are three more fundamental differences between the two textbooks, that reflect an entirely new view on education.

First of all there is a difference in the use of sections. For Bartjens (after a few prelimaries, notably the basic rules of arithmetic) sections are mainly used to distinguish rules needed by various professions. His education was aimed at the individual pupil. Until 1800 pupils payed exactly for the education they wanted to have: the merchant's son, who wanted to take over his father's business, would pay for learning French and the rules of trade he needed. The 1828 textbook uses new sections exclusively to distinguish between the various mathematical results and sections. Bartjens uses his sections exclusively to distinguish the various rules, wereas the 1828 textbook also refers to section numbers.

Bull. Belg. Math. Soc. 13 (2006), 937–940

A second difference can be found in the exercises. Partly, this is a result of the function of the sections, but is also a more fundamental choice. With Bartjens, the merchant's son would only come across exercises he would also meet in his future career. The 1828 textbook uses all kind of different contexts, to show the universal applicability of mathematics, but also showing the merchant and the surveyor and the goldsmith that they could use the same kind of mathematics. This implied that the exercises had verbose explanations, whereas Bartjens sometimes has cryptic sentences which could only be read by those who were already familiar with the trade (most pupils were already working as apprentices in their future trade, so they knew what the author meant), this knowledge could no longer be assumed by the author in 1828.

Third, and certainly not last, there is a striking difference in the way subjects are treated. In the 1828 textbook definitions are used and there are several proofs of the correctness of certain arithmetical rules. These are not present in Bartjens. Bartjens did not have any need for definitions or proofs. He advocated rote learning. His pupils came to him to learn a particular set of rules they needed for their future professions. For the 19th century pupil it was deemed necessary to understand the correctness of the rules. Furthermore, the rules became more general. In Bartjens' *Cijfferinghe* the rule of alloys and the rule of changing currency were different rules, wereas in 19th century textbooks these rules would no longer be mentioned, because they were both considered to be applications of the rule of three.

Comparing the algebra textbook by the Groningen mathematics teacher Pieter Venema ([7] first published 1714), the most important Dutch algebra textbook of the 18th century, to the 1826 algebra textbook [4] by Jacob de Gelder (1765-1848) similar differences may be noted. There is hardly any difference in *what* subjects were treated (both do linear equations, sets of linear equations, quadratic equations), but the way these are treated again is different. Certainly in the early sections, where the subject is first introduced to the pupil, the difference in approach is obvious. Whereas the 18th century textbook does not spend much time on the preliminaries, simply summarizing for the pupil the way he should proceed in the various situations he might encounter when reckoning with letters, the 19th century textbook typically devoted numerous pages on explaining the basics. The algebra textbook by De Gelder explicitely regards the letters as "arbitrary numbers" and generalizes (and refers to) results obtained during arithmetic lessons.

These changes are connected with changing goals that Society set to education in general, mathematics education in particular. Developing knowledge and spreading it, by the end of the 18th century, became a part of public (as opposed to a private) culture in Europe. In the Netherlands societies like Felix Meritis were founded to allow the public to participate in lectures on scientific novelty. These lectures could be about physical experiments, medical knowledge, the steam engine, or the new system of chemical elements as devised by Lavoisier. The audience consisted typically of well-to-do Dutch merchants. Education became an issue: whereas the 18th century school had been a place for an individual to learn certain rules of his future trade, this new fashion dictated interest in a far broader field for every well-to-do citizen [5]. The arithmetic by Bartjens no longer fitted that ideal.

During the mathematics lessons that Felix Meritis (and other organisations) staged for its members' children since the late 1770's, the pupils were learning about decimal fractions, logaritms, geometry and algebra: subjects for which most of the attendants –merchant's sons– had no use whatsoever.

Just a few generations back, people had known the enormous wealth, the political and military superiority of the Dutch Republic, but by the end of the 18th century the Dutch were in a rather poor economical situation. The loose federation of states was no match to the newly risen powers of Britain and France. When the French revolutionary armies marched in they found very cooperative Dutch, who were eager to abandon the old political system and started restructuring the state according to the French model [5]. Most notably an educational system was established that would guarantee the education of citizens for a new state. After the French occcupation a kingdom was established (1813) under William I from the house of Orange, and he needed education to reorganize his newly acquired kingdom: to unifiy his kingdom, and also to establish economical prosperity. Due to the impetus of the French Revolution, the school system - now being brought under central governmental guidance - was open for reform. New egalitarian ideas like class room instruction instead of "the old way" of individual instruction won [6].

The new challenges that had to be met by Dutch (mathematics) teachers around 1800 were to develop a curriculum answering the demands of the time. Unity and prosperity, so it was supposed, were achieved, among others, by teaching mathematics. But it was no longer the mathematics as taught by Willem Bartjens or Pieter Venema. From 1800 onwards all pupils in the class had to learn both the exercises that were functional to the merchant, and those that were useful to the surveyor. In the new textbooks these were shown to be similar exercises, turning up in the same section: the merchant and the surveyor both made use of the same mathematical principles. Exercises referring to the Dutch Golden Age or to the house of Orange and its part in the Dutch fight against the Spanish helped to underline this. Societies like Felix Meritis already had some experience with this new kind of mathematics education –and these organisations also harboured the people the new king had to befriend– and they also firmly believed that better (i.e.: their kind of) mathematics education would kindle the fire of technical progress in the Netherlands. Hence, it seemed quite obvious what had to happen.

It was assumed that pupils who actually understood their mathematics were able to keep up with technical literature, and could help introduce technical innovations in the Netherlands. With these hopes even technical drawing in Euclideam style was introduced. It was assumed that people, properly introduced to mathematics, were to develop a clearer style of thinking, and thereby, e.g., also accept the necessity of state structure [2].

Mathematics as a discipline certainly did very well for itself with the changes that took place around 1800. In 1815, legislation made algebra (linear equations, sets of linear equation and quadratic equations) and geometry (similar triangles, calculating areas, the Pythagorean theorem) a part of the Latin school curriculum, where no mathematics had been taught before.

References

[1] Willem Bartjens (1604). *De Cijfferinghe*, Amsterdam.

[2] Danny Beckers (2003). *"Het despotisme der Mathesis"*, Hilversum.

[3] M.I.S. Bevel and P.E. Rijk (1828). *Grondbeginselen der Rekenkunde*, Leiden.

[4] Jacob de Gelder (1826). *Allereerste gronden der stelkunst*, Amsterdam, Den Haag.

[5] Joost Kloek en Wijnand Mijnhardt (2001). *1800: Blauwdrukken voor een samenleving*, Den Haag.

[6] Jan Lenders (1988). *De Burger en de Volksschool*, Nijmegen.

[7] Pieter Venema (1714). *Een korte en klaare Onderwyzing in de beginselen van de Algebra*, Amsterdam.

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