18th CENTURY MATHEMATICS EDUCATION
Effects of Enlightenment in Iceland

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ABSTRACT

Living conditions in Iceland worsened in the period 1600–1800, and the greatest lava flow on earth in historical times in 1783–84 was accompanied with severe earthquakes and famine. Concurrently, the Enlightenment movement, channelled from Germany through Denmark, had considerable influence in Iceland from 1770 onwards. People, interested in progress in Iceland, established a society which advanced the Enlightenment by publishing a journal and books on various practical matters. Among them were philosopher Ó. Olavius and lawyer Ó. Stephensen, later Governor of Iceland, both educated in Copenhagen. The Enlightenment movement produced in the 1780s substantial arithmetic textbooks deliberately intended to raise the educational standards of Icelanders. One of them was by Olavius in 1780, modelled on Danish and German textbooks. The other arithmetic textbook published in 1785 by Stephensen, was accompanied with introduction to algebra, modelled on lectures at the University of Copenhagen. It was immediately sanctioned as a textbook at the two Latin schools, where, however, mathematics education was at its nadir until 1822. These two books, in addition to a book of arithmetic tables, remained the only arithmetics textbooks available in Icelandic until the 1840s. Both were good representatives of the typical European arithmetic textbook of the *practica* type. Their influence in the aftermath of the disastrous events will be explored as well as their roots in German arithmetic education tradition in the Enlightenment period.

1 Introduction

The Enlightenment was an educational movement which had considerable effect in Denmark whence it arrived from Germany. The Enlightenment left a marked impact on many Icelanders who studied in Copenhagen, some of whom subsequently became leading officials in Iceland, both secular and religious, and could thus use their influence (Sigurðsson, 1990, p. 293).Arithmetic textbooks constituted an important part of the efforts of behalf of the members of the Enlightenment movement to raise the educational standards of Icelanders.

We shall study three printed arithmetic textbooks, published in the period 1780–1785. Considering that only one 14 page long arithmetic textbook in the Icelandic language had been printed earlier, these were important enterprises and worth exploring. Several questions come up:

Which political aims led to the publications of the textbooks?

Who funded the publications?

From where did the authors seek their models?

Which didactical aims did the authors have?

We shall elaborate on each of the three books, one by one, and finally draw some conclusions about the above questions. But first we shall set the scene of the Icelandic society in the 18^{th}century.

2 Iceland in the 18^{th}century and the Enlightenment

In the Age of Enlightenment, Iceland was a part of the Danish state and cultural and other influences from abroad reached the country mostly from Denmark. At the end of the 18^{th} century the population numbered only 47,000 and was almost exclusively rural (Sigurðsson, 1990). The 18^{th} century had been marked by periods of famine and misery. Consequently, the state of general education worsened in Iceland while it was rising in Europe.

From the 12^{th} century there had been cathedral schools at the two Episcopal Sees in Skálholt and Hólar where the syllabus was preparation of the clergy and Latin was the main subject. In 1743, an ordinance was issued which required knowledge in the four arithmetical operations in whole numbers and fractions (Janus Jónsson, 1893, pp. 38–41). Geometry was not mentioned. There were no schools for the general public, while regulations on knowledge in reading and Christendom were set in 1743 as requirement for confirmation at the age of 15. The instruction was the responsibility of the families under the supervision of the clergy.

Records are available on population of year 1703: 50,358, and year 1769: 46,271. Repeated period of famine had led to population decrease. The census of 1703 provides information about occupations, see Table 1. As the structure of society did not change markedly during the 18^{th} century one may assume that the division of the population into classes was similar around 1780.

Karlar *Males*	
Lögmenn *Prefects*	3
Landsskrifari *Secretary of the public court of law*	1
Lögréttumenn *Members of the public court of law*	43
Sýslumenn og lögsagnarar *Sheriffs*	21
Hreppstjórar *Municipal administrators*	670
Umboðs- og klausturhaldarar *Administrators of public estates*	5
Biskupar *Bishops*	2
Prestar *Clergymen*	245
Djáknar *Deacons*	4
Skólameistarar og kennarar *Headmasters and teachers*	7
Skólalærðir *School graduates*	26
Skólapiltar *Students*	76
Fyrrverandi embættismenn *Retired officials*	6
Kaupmannsfullmektugir og eftirlegumenn *Commercial managers*	5
Fálkafangarar *Falcon catchers*	6
Smiðir *Carpenters/artisans*	108
Bókbindarar *Bookbinders*	2
vBrytar *Stewards*	4
Total	**1224**

Occupations in 1703 (Hagskinna, 1997).

Public administrators, public employees, academics, lawyers and other professional occupations numbered about 350, among them 245 clergymen many of whom took young boys for learning. Another group of people, who must have had to know some counting, were the municipal administrators who numbered 670. Adding their family members and skilled workers, one can assume that at least

1500 persons in the country could make use of arithmetic textbook. Many skills deteriorated during the misery of the 18th century while the ordinance about reading skills in the 1740s counteracted that.

In spite of many calamities that befell the population of Iceland in the last quarter of the 18th century, it was also a dawn to new era. The policy of the Danish authorities towards Iceland was in many ways influenced by the Enlightenment movement. After a period of famine by the mid-1700s the Danes were shocked to realize that the population in 1767 was less than 50,000 instead of the 80,000 which had earlier been assumed. Various bodies in the Danish state supported efforts to enhance progress in Iceland. Not all of them were well founded, however, but a number of new legislation acts were enacted in 1772–1787 with the aim of modernization (Björnsson, 1990). Research reports were made on the state and trends in the colony, and e.g. in the period 1770–1780 a great number of informative printed texts were distributed free in Iceland (Magnússon, 1990).

The Danish authorities had run monopoly trade from 1602 where the inhabitants were obliged to trade within certain trading districts, each allotted to a particular merchant. A terrible famine following volcanic eruptions and earthquakes in 1783–84 led to sudden abolition of the monopoly trade in 1787. The earthquakes destroyed the Episcopal See of Skálholt and its cathedral school which consequently was moved to the new capital Reykjavík and became one of the seeds to growing urbanisation in the 19th century.

The Icelandic society had stayed intact for centuries, and things were not easily changed, least by external force, however good intentions and resources were put into the effort. The catastrophic eruption and earthquakes of 1783–84 and financial difficulties in Denmark caused by the Napoleonic wars in the early 1800s were finally to reduce to results to next to nothing (Björnsson, 1990).

3 The textbooks

Three books on arithmetic were published in a five year period, 1780–1785. They may be considered as a result of the wide-reaching effort of the Danish authorities and the proponents of the Enlightenment to raise the level of education in the country. All the authors were active members of societies of the movement and agents of the Danish authorities in one way or another.

The textbooks largely adhered to the European tradition of practical arithmetic, *practica*, originating in the late Middle Ages. They began by an explanation of the concepts of a number and of numerical place value, followed by the arithmetic operations in whole numbers and fractions: addition, subtraction, multiplication, division and extracting square roots. The remaining content concerned mathematical techniques for business use: use of the Rule of Three, monetary exchange, problems of partnership and barter (Swetz, 1992). However, the nature of the three textbooks was different and they may have complemented each other.

3.1 Olavius: Clear Guide

One of the most prolific writers of the Icelandic Enlightenment movement was Ó. Olavius (c. 1741–1788), who wrote a number of books about nature science and economic matters. One of his greatest feats, while also his fallacy, was to establish the first print shop in the country to print secular books in 1773. The print shop printed a total of 83 books. Olavius had, however, to leave the enterprise in 1784 for the sake of disagreements on its financial matters. The following years he travelled around

Iceland to write a research report, *Økonomisk Rejse / Economic Travel* on utilization of harbours, drift wood and abandoned farms, to finally move to Denmark in 1779.

In 1780 Olavius published in Copenhagen an arithmetic textbook, called *Greinilig Vegleidsla til Talnalistarinnar / A Clear Guide to the Number Art* (374 pp. + foreword, xxviii pp.). The book seems to have had support from influential Danish parties. The book is dedicated to a Mr. Schach Rathlau who may have funded the publication. In his foreword, Olavius recounts that there no instruction in the indispensable knowledge of mathematics had existed in the county's vernacular. This could have harmful consequences when trade was made with foreign merchants and experienced calculators who sometimes wanted to earn more than they should. He intended the book for use at the Latin Schools which were two at that time but also for "of other children of the country, who might find an urge to exercise in computing." (Olavius, 1780, p. vii–viii).

While one can sense a sincere wish to improve education in Iceland with this book, an expression like the one later in this address: "... who should believe that the country, deprived of this knowledge amongst others, should be able to stand up so long, as it nonetheless has, even if brought into the shape it presently has, and over which one cannot be surprised ..." (ibid), disturbed many a good inhabitant of Iceland.

The writer next addresses the benevolent reader for 20 pages. The author is concerned that no one teaches the general public anything about arithmetic, which he counts as most other arrangements in the non-country and every common person who want to learn something must be his/her own teacher. So he concludes that he must explain with a great number of examples.

Unfortunately for the book and the young author, an influential minister of the church, Gunnar Pálsson, a former schoolmaster, and a member of the group who kept the Hrappsey print shop running, gave the book bad review in a letter to a colleague. He seized the phrase "non-country" and others similar, and deemed the book lacking *dexteritas didactica*, didactical adroitness, which it certainly is not in modern understanding. Further inspection reveals that Pálsson wrote the letter before he had seen any more than the forewords. The disagreements and disappointments in connection with the print shop probably caused Pálsson's expressions, which have coloured the reputation of the book until present (Bjarnadóttir, 2006, p. 76).

The textbook was never used at the Latin Schools, but it survived at least for half a century. Olavius recounts in his *Economic Travel*, published in 1780, the same year as the *Clear Guide*, that the *Clear Guide* was distributed for free in Iceland in 1300 copies. Assuming 7000 homes, leads to the conclusion that the book was available in nearly every fifth home in the country. We shall now look at its model and didactical content.

The author informs the reader that among his models were textbooks by the Dane Chr. Cramer, adherent to the Enlightenment, and the German Christlieb von Clausberg (1732, 1748, 1762), the author of *Der Demonstrative Rechenkunst*, to which the *Clear Guide* bears resemblance. Clausberg's book was published in four volumes, a total of over 1400 pages. The *Clear Guide* contains traditional arithmetic of the *practica* type: The number concept, numeration, the four arithmetic operations in whole numbers, "multiple" numbers (with units) and fractions, monetary and measuring conversions, and the Rule of Three, a method of calculating proportions, which was indispensable in unit conversions and price computations. What is different from many other textbooks, ancient and modern, is that the author stressed that calculation methods are only procedures that may be altered and he gives a number of alternatives (Olavius, 1780, pp. 32–33, 41–42, 65–89).

A great part of the book is devoted to "number tricks", translated from the Clausberg's text, named *Rechungsvorteile*, calculating advantages. The number tricks are based on understanding of compositions of numbers. Some of them are simple aid to mental arithmetic, such as multiplying by 100 and dividing by 4 instead of multiplying by 25, or multiplying by 8 and dividing by 1000, instead of dividing by 125. Others suggest e.g. that when multiplying 96 by 39, one may multiply by 40 and subtract 96 once, see Fig. 1:

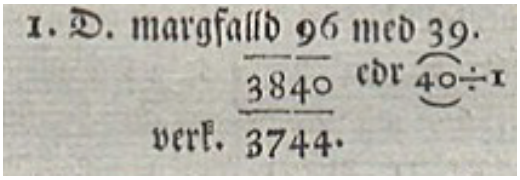


Figure 1

Multiplying by 96 was very useful as 1 rixdollar was 96 shillings. That could be done in various ways, such as multiplying by 6, and then 16; or by 4, 4, and 6, or even 6, 8 and 2, see Fig. 2. The question is: How many shillings are 484 rixdollars?

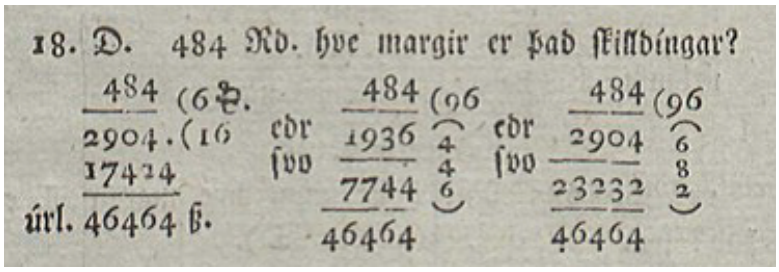


Figure 2

The reverse processes could be applied when converting shillings to rixdollars, see Fig. 3:

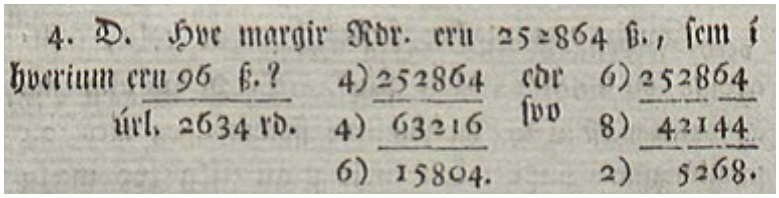


Figure 3

Division was still cumbersome in the 18th century, but number tricks could be good aids. Fig. 4 and 5 demonstrate division by 99 and 97.

678345 : 99 is solved by repeated subtraction:

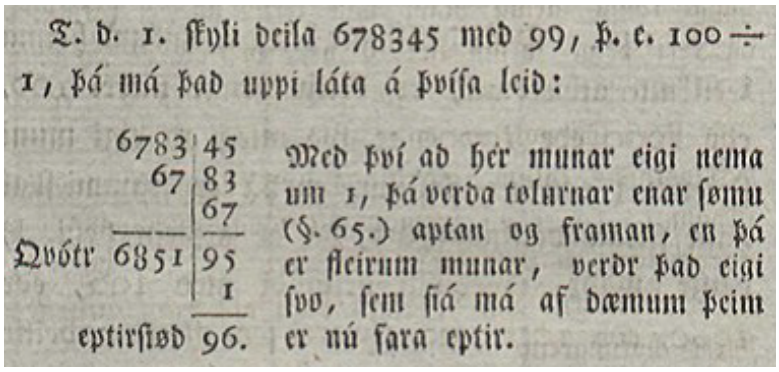
$678345 = \mathbf{6783}(100-1) + 45 + \mathbf{67}(100-1) + 83 + 67$

The quotient is $6783+67 = 6851$ and the remainder is $45+83+67 = 195$, which raises the quotient to 6852 and the remainder to 96.

Dividing by 97 by this method is a little trickier, see Fig. 5:

$379681 = \mathbf{3796}(100-3) + 81 + \mathbf{113}(100-3) + 88 + \mathbf{3}(100-3) + 39 + 9$

The quotient is 3796 + 113 + 3 = 3912, remainder 81 + 88 + 39 + 9 = 217,


T. d. 1. ſkyli deila 678345 med 99, þ. e. 100 ÷ 1, þá má þad uppi láta á þvíſa leid:

6783 | 45
67 | 83
| 67
Qvótr 6851 | 95
| 1
eptirſtöd 96.

Med því ad hér munar eigi nema um 1, þá verda tölurnar enar ſömu (§. 65.) aptan og framan, en þá er ſleirum munar, verdr þad eigi ſvo, ſem ſiá má af dæmum þeim er nú fara eptir.

Figure 4

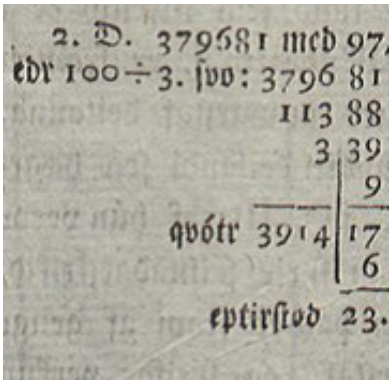

2. D. 379681 med 97, edr 100 ÷ 3. ſvo: 3796 81
113 88
3 39
| 9
qvótr 3914 | 17
| 6
eptirſtöd 23.

Figure 5

raising the quotient to 3914 with remainder 23.

The examples above demonstrate the author's intentions; to enable people to play with the numbers to achieve skills in the art of computing. How fertile the soil was for such methods were in Olavius's "non-country" with no schools for the general public is questionable. However, from the modern point of view, the examples witness a deep understanding of arithmetic and a wish to share it. The model is also clear; a number of the examples in the *Clear Guide* are also found in Clausberg's *Der Demonstrativen Rechenkunst*. The pedagogical aims are declared in the address to the benevolent reader:

> I say of myself, that I learn more from one solved problem than 10 unsolved ones, as there are always some differences, and then more can be learnt from 3 or 4 than from one, how elsewhere shall be done. When beginners will be handed these problems for solving, or they take themselves the same and solve wrongly, then they may see from the doings of the book, wherein their error is hidden, and thus bring their number to the right track, but it must be exercised on a question and an answer. For this reason I call my little work Clear Guidance to the Number Art (Olavius, 1780, p. xv).

The books by Olavius and Clausberg resemble other products of protestant educational efforts (Bjarnadóttir, 2011). They contain examples deduced from the Bible, such as: "The number of years since the creation of the Earth is 5746 years but from the birth of Christ 1779 year. How many years from the creation of the Earth were gone when he came into being?" (Olavius, 1780, p. 39). This

problem is found in Clausberg's textbook where the creation of the Earth was 5678 years and Christ born 1729 years earlier (Clausberg, 1732, p. 66), so the two authors do not quite agree upon the age of the Earth. Other examples count the time since the flood of Noah and the time since the Lutheran Reformation. In his examples Olavius does not refer much to Icelandic environment or occupations but primarily to didactical arithmetic concerns.

There is a section about ratio and proportions, and arithmetic and geometric progressions are mentioned. In the section about fractions, numbering 112 pages, the greatest common divisor is found by Euclid's algorithm in a somewhat advanced version. Number tricks with fractions cover 90 pages. The final chapter on *regula de tri* numbers 84 pages.

On the whole, the book is a good introduction to arithmetic, and much of its content could still be of use today as an aid to mental arithmetic. The good intentions to explain and be of assistance shine from the pages, even if the author may have managed to offend his intended readers.

3.2 Johnsonius: A Pocket Book for Farmers

In 1782, the next arithmetic book was published. A learned man, Jón Jónsson Johnsonius (1749–1826), published a pocket-book with tables, handy for the exchange of goods. It was called *Vasa-qver fyrir bændur og einfalldlínga á Islandi: edr ein audvelld Reiknings-List / A Pocket-Book for Farmers and Simple-minded People or an Easy Computing Art* (249 pages). A further elaboration of the title recounts that it contains all kinds of computations in purchases and sales, both by domestic and foreign price levels, and furthermore an extract of the royal Icelandic ordinance on buying rates and mailings.

Johnsonius studied in Copenhagen and received from 1779 a stipend to serve at the Arnamagnaean Manuscript Collection. A. Magnússon's collection, made in the early 18th century, was cherished by the Danes as a Nordic heritage but only Icelanders could read and edit it. Johnsonius became county magistrate in 1797.

In its foreword the author says that even if farmers and the bourgeoisie in Denmark are much better informed in the computing art than the common people in Iceland, a number-booklet such as this one has been published in Copenhagen long ago, and many times. They are better informed, as there they at least have some experience of it in the primary schools [which did not exist in Iceland]. And even if Iceland has already had printed *Number Art* [*The Clear Guide to the Number Art*], this present booklet might nonetheless be of good use to many, who do not have the opportunity to soak their head in arithmetic studies. The other book, even if good and well composed, might not be of good use for the common people.

The author hoped this present book to be of use for those who were not skilled in arithmetic, for their inspection at home and by the merchant so that they were not depending on the merchant or other customers how to calculate the prices which they could read and find themselves in the booklet. But then they would have to study the booklet thoroughly in beforehand. The book and in particular the interest tables, were, according to the author, modelled after the Danish booklet, which is attributed to Søren Matthisen (1680) (Johnsonius, p. 5–7).

The content of the *Pocket-Book* is mainly tables. Firstly, there are multiplication tables up to 100 times 100 on 25 pages, then multiplication of the present currency on 102 pages, and interest-tables on 25 pages. The remainder of the book contains conversion tables between different currencies and scales, and an extract of the charge-table published as a royal ordinance, dated in 1776, about the Danish trade monopoly. These were basically Danish measures, in addition to the ancient *landaurar*,

the *hundrað*/hundred equivalent to 120 *alin*/ells (an ell was approx. 60 cm of woollen cloth), 240 fishes or one cow.[1]

The *Pocket-Book* can therefore not be considered as a textbook but a collection of tables. Its contents are in most respects similar to the first textbook, published in 1746, *Lijted Agrip*, an extract of Hatton's *Tradesman's Treasury* (1712), translated by the Rev. Halldór Brynjólfsson, later bishop. The "fish" trading unit is related to other units, such as rix-dollars and shillings, as well as the *Cronas* and *Specias*. Also included is a table of the *tíund* or tithe, which was computed as a 1% property tax, 1 sheep of every 100 sheep, and 1 cow of every 100 cows.

Possibly this book had more influence on the mathematics education of the public than the two good textbooks published by the proponents of the Enlightenment in that same decade.

3.3 Stephensen: Short teaching

In 1785 Ó. Stephensen published at his own cost a textbook (Stefánsson, 1785), *Stutt Undirvísun í Reikníngslistinni og Algebra / A Short Teaching on the Computing Art and Algebra* (248 pages), which became a required reading at the two Latin schools (*Lovsamling for Island 5*, 1855: p. 244). In his preface Stephensen recounts that in 1758 he had written down what he learned in Copenhagen in order not to forget it. As many copies of that work were still in distribution he decided to have it printed. In his address to the reader the author feels necessary to safeguard himself against those already knowledgeable:

> ... this booklet is not composed in the understanding that there are not many in this country that well can compute, and can, without it, teach it to others, especially officials of the religious and secular classes; rather it is intended for use to youngsters and adolescents ... (Stefánsson, 1785: To the reader).

Stephensen was a student of the Rev. Brynjólfsson, later bishop, who translated the *Little Compendium*, and knew undoubtedly his arithmetic well. An inspection of Stephensen's manuscript (Lbs. 409, 8vo), originating in 1758, reveals however a concise text, different from the textbook. The autobiography of Stephensen's son, M. Stephensen recounts that he revised his father's manuscript before printing according to a Professor Geuss's lecture notes (Lbs. 408, 8vo) in 1781–82. The textbook is therefore at university level of the times. The son had added chapters on decimal fractions, which were a novelty, ratios, proportions and sequences, algebra and linear and quadratic equations, to the traditional content of his father concise *practica* textbook manuscript (Bjarnadóttir, in print).

The *Short Teaching* was immediately authorized as a textbook for the two Latin schools. The Latin Schools deserved to have an arithmetic textbook to assist the teaching, but the authorization of the book by Stephensen, which may have been linked to his high administrative position, excluded Olavius's book from school use. Earthquakes, which destroyed one of the schools in 1784, may, however, have reduced the educational impact of Stephensen's textbook. In 1802, the two Latin Schools were

[1] *Hagskinna* (1997). Measures, weights and currency: A hundred = 20 *aurar* (pennies) = 120 *álnir* [ells, originally a measure of woollen cloth]. In terms of fish-value, one hundred = 6 *vættir* = 240 (valid) fishes. This Icelandic currency system existed from medieval times up to the 20th century, called *landaurar* (land-pennies). A hundred was the equivalent of a cow, i.e. a middle-aged, faultless cow in spring, or six sheep, woolly and carrying lambs, in spring. The monetary value of *landaurar* was variable, and up to and beyond the 18th century there were differences of opinion on how to compute it. . . . Farms were also measured by hundreds. An average farm was valued at 20 hundreds, and it was supposed to support livestock of 20 cows or 120 sheep.

merged into one where mathematics education was marginal. According to a memoir: "Everyone who reached the upper grade was given Governor Ólafur's Arithmetic, but it was up to the pupils whether they ever opened the book or not." (Helgason, 1907–1915: pp. 85–86). From 1822 onwards, when B. Gunnlaugsson (1788–1876) had become mathematics teacher at the Latin School, it adhered to Danish regulations and Danish textbooks were used.

As the two other textbook authors, Stephensen mentioned the trade, but first he flattered the Danish authorities which he said that if the inhabitants themselves had most graciously been left to choose, they would have wished themselves nothing else in this respect: that the country's trade would be entrusted to such enlightened, so righteous and so much for its affluence and prosperity, meticulous gentlemen's management (Stefánsson, 1785, p. *3). One should recall that Stephensen was the second highest official in the royal Danish administration and had to be loyal to his superiors. It is, however, hard to credit the sincerity of these words, considering the situation of trade monopoly, which was abolished in the following year. It seems that the author was aware of the forthcoming abolition, as he hopes that the book will be of aid to the up-growing youth; either to be able to themselves, in due time, to participate to some degree in the trade, or as servants to further the same. For this purpose he dedicated the book to these honourable Excellencies and good gentlemen (Stefánsson, 1785, p. *4).

The content of the examples in Stephensen's book concerns farming in the general sense. One example reflects class division of society, exercised since medieval times:

> 70 guests were invited to a wedding reception. They are to sit at three tables. Available amount of money is 200 rixdollars. The elite are to have food for 4 rd., guests at the middle table for 3 rd., and at the lowest table for 2 rd. How many could sit at each table? (Stephensen, p. 170).

The problems otherwise tell about fish catch, sheep, horses, mowing fields, credits with the merchant, alms to paupers, cost of food for students and servants, and problems of age, time, distance etc. Generally, the examples reflect the world of farmers, people who run farms and boats and deal with merchants, while they would hardly be considered rich elite in the modern sense.

4 Distribution of the 18th Century Textbooks

Remarkable as it was to have a choice of two good printed arithmetic textbooks in the last decades of the 18th century, no proper textbook was published again until 1841. The two books and the *Pocket-Book* were therefore the basis for mathematical knowledge for over half a century, at least for those who did not attend a learned school.

A survey exists of inventories of books in seven out of nine benefices in the county of Austur–Húnavatnssýsla in northwest Iceland from the first three decades of the 19th century (Jensdóttir, 1969). The sources were on one hand annual church censuses, and on the other hand probate records and records of administration of estates at death, available at the National Archives of Iceland. The inventories were not all compiled in the same year; it differs from place to place in which year the best list was taken. The first one was made in 1809, another in 1823, while the other five were made in 1826–1830. Books were counted on 159 farms, a total of 2,490 religious books; the average number on each farm being 16, not counting four larger libraries. Secular books were not counted on the regular farms, only when the estate of a deceased person was evaluated. For the larger libraries complete, but not all equally accurate, lists exist. From them and from estates of deceased persons one can deduce that

secular books comprised about one-eighth of the total number of books, approximately 350 books, which gives an estimated total of 2,840 in addition to 562 books in private libraries, a grand total of about 3,400 books (Jensdóttir, 1969, p. 164).

In 129 estates of deceased persons in the period 1800–1830, there were a total of 8 arithmetic textbooks out of 189 secular books. In the four private libraries there were 6 arithmetic books out of 562 total books and an estimated 70 secular books.

Out of the approximately 260 secular books found in estates of deceased persons and in private libraries, four copies were found of the *Pocket-Book*, three copies of the *Clear Guide* and seven copies of the *Short Teaching*. All these books were at that time between 25 and 50 years old. The *Short Teaching* was found in three out of the four private collections, all owned by learned persons. Of the three copies of the *Clear Guide* two existed in private collections.

One may estimate approximately 160 secular books not counted at the regular homes and not included in the estates of deceased persons, so one could expect 5–7 arithmetic books not counted.

The population in the region in question may roughly be estimated as 1/30 of the whole population. Assuming 20 arithmetics textbooks in the region, gives 600 arithmetic textbooks in the country. This number for the 25–50 years old book is not so little, taken into consideration that each copy may have had many users and that Icelandic farmhouses were not well suited for conserving book collections for many decades, in the badly heated buildings made of turf and stone, where things quickly moulded and rotted.

5 Conclusions

We have seen that three useful books on arithmetic for the general public, a total of close to 1000 pages were distributed in Iceland in a period of great difficulties, probably all of them more or less for free. What effect did it have?

The textbooks in concern were deliberately aimed at teaching farmers and young people basic elements of arithmetic in their dealing with foreign merchants. The political interests of the textbook authors, Olavius, Johnsonius and Stephensen, all proponents of the Enlightenment movement and all of them employed by the Danish administration, can be read in their forewords to their arithmetic books. They all state clearly that their intentions are to provide individuals with prerequisites to cope with trade and skilled merchants. Their main aim was to contribute to the technological and socio-economic development of Icelandic society.

We do not have many sources of information about their effects. Certainly they were better than nothing. Young people who had the endurance for self-study had access to sources of knowledge, but how accessible were they? Olavius tells us that there were no teachers in 1779, when the *Clear Guide* was written. The Rev. Helgason tells us that everyone was given the book, which reveals that the *Short Teaching* was distributed for free, but no one cared if the pupils studied it or not. As there were no mathematical requirements for students entering the University of Copenhagen, the cathedral Latin schools did not have to take that aspect into consideration until 1822.

What good was it then? Considering that the Clear Guide was published in 1300 copies and the other two hardly in less than 600 copies each leaves 2500 copies in Icelandic homes, and at least 600 copies seem to have existed 25–50 years later. Even if people favoured poetry and stories more, and was obliged to read a certain amount of religious literature, it is not unlikely that a couple of hundred

books were studied thoroughly and another 500 inspected irregularly. Home- and self-study was the only acknowledged way of studying until late 19th century. The only Icelandic mathematician until 20th century, B. Gunnlaugsson, did not attend school until the University of Copenhagen, where he earned a gold medal for solving a mathematical problem before he even enrolled in the university. Gunnlaugsson mentions both books, by Olavius and Stephensen, in his textbook (Gunnlaugsson, 1865). These books were without doubt bases for Gunnlaugsson's early mathematical studies with his father, a poor tenant farmer who had earned several prizes from the King, on the initiative of the proponents of the Enlightenment, for invention of utilities, such as a loom and a harpoon.

The early printing of handbooks for farmers with conversion tables of trading units, the *Lijted Agrip / Little Compendium Intended for Farmers* (Hatton, 1746) and *Pocket-book / A Pocket-Book for Farmers and Simpleminded People or an Easy Computing Art* (Johnsonius, 1782) reveal a need for handbooks as an aid in trade. They may have served more people than the comprehensive arithmetic textbooks, good though they were.

The political aims that led to the publications of the textbooks were to enhance education and subsequent progress in Iceland, the Danish colony, and they were merely funded by Danish actors. The authors were educated Icelanders who were employed by the Danes. They were therefore subjected to suspicion, to impose information and instructions upon the inhabitants which they themselves had not asked for. This is an old and a new story of the relations between the colonial masters and the subordinated. The masters believe that they know what is best for their subjects. Some of it may be ill-founded which awakes suspicions about whatever the masters may have to offer.

Each textbook author had his own didactical aims. From the modern point of view, Olavius's book is an excellent textbook in arithmetic versatility and Stephenson's book brings the latest technique in arithmetic, such as decimal fractions. Both authors modelled their books after acknowledged authors, Olavius on Clausberg's book, which adhered to the fashion structured by the Lutheran Reformation, and Stephensen on the latest university syllabus. They wanted to share the latest and the best with their countrymen and some of their seed may have hit a fertile ground like Gunnlaugsson.

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