

Arithmetic Textbooks of the Colégio N^a S^a da Conceição, São Leopoldo, from 1885 to 1903

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ABSTRACT

The article analyzes the arithmetic textbooks produced by the teachers of Colégio São José, used at Colégio N^a S^a da Conceição, in the city of São Leopoldo, from 1885 to 1903. The textbooks address different themes, starting with basic operations, decimals, fractions, ratios and proportions, rule of three (simple and compound), interest, discount rule, company, mixture and alloy, power, root and geometry. Since the theme is part of the History of Mathematical Education in the Rio Grande do Sul, this qualitative and documentary study is supported by cultural history and historical research to analyze the approached subjects. The target audience was schoolgirls from Colégio São José and in a second moment the schoolboys from Colégio Conceição dos Jesuítas, in their respective courses. The idea defended by the authors consisted of something practical and necessary that aimed to facilitate the schoolgirls of the College the knowledge of a science which was not always attractive to them. Therefore, the aim was to teach Arithmetic in a practical and contextualized way from a continuous relationship of guided theory with practical situations. Most of the activities were developed through problem situations, developed orally and in writing, centred on the process of repetition. It was found that the methodology used by the teachers aimed to contribute to arouse in the students the desire to achieve mathematical knowledge and its applicability.

Keywords: Colégio N^a S^a da Conceição; Arithmetic teaching; Textbooks.

Livros Didáticos de Aritmética do Colégio N^a S^a da Conceição de São Leopoldo de 1885 a 1903

RESUMO

O presente artigo analisa os livros didáticos de aritmética produzidos pelas professoras do Colégio São José, utilizados no Colégio N^a S^a da Conceição, de São Leopoldo, de 1885 a 1903. As obras abordam diferentes temas, iniciando com operações fundamentais, redução de número complexos e incomplexos, frações decimais, frações ordinárias, razões e proporções, regra de três (simples e composta), juros, regra de desconto, companhia, mistura e liga, potência e raiz e geometria. Como o tema se insere na História da Educação Matemática no Rio Grande

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do Sul/Brasil, este estudo qualitativo e documental ampara-se na história cultural e na pesquisa histórica, para análise dos assuntos abordados. O público-alvo, dos livros, eram as alunas do Colégio São José e num segundo momento os alunos do Colégio Conceição dos Jesuítas, em seus respectivos cursos. A ideia defendida pelas autoras consistia em algo prático e necessário que visava facilitar para as alunas do Colégio o conhecimento de uma ciência nem sempre atrativa para elas. Portanto, objetivava-se um ensino de Aritmética prático e contextualizado a partir de uma relação contínua da teoria guiada com situações práticas. As atividades desenvolvidas, em sua maioria, eram através de situações-problema, desenvolvidas de forma oral e por escrito centrado no processo de repetição. Constatou-se que a metodologia utilizada pelas professoras visava contribuir para despertar nas alunas o desejo de alcançar o conhecimento matemático e sua aplicabilidade.

Palavras-chave: Colégio N^a S^a da Conceição; Ensino de Aritmética; Livros Didáticos.

INITIAL CONSIDERATIONS

This article is intended to discuss arithmetic in the books entitled *Elementary Arithmetic Practice: Part II* and *Elementary Arithmetic Practice: Part III*, by the Teachers of the Colégio São José das Irmãs Franciscanas, which discuss the teaching of Arithmetic for the courses taught at the Colégio N^a S^a da Conceição de São Leopoldo, Rio Grande do Sul (RS) from 1885 to 1903, as recorded in the annual reports of the school.

This is a study started during the elaboration of the thesis *The teaching of arithmetic in Catholic parish schools and the Colégio N^a S^a da Conceição de São Leopoldo in the nineteenth and twentieth centuries from the perspective of the Jesuits and deepened during the Postdoctoral internship to the Postgraduate Program in Science and Mathematics Teaching (PPGECIM) of the Universidade Luterana do Brazil (ULBRA)*. It presents as a guiding question the analysis of the arithmetic books edited by the teachers of the Colégio São José with regard to the methodologies used to approach the mathematical contents worked on their pages.

The Franciscan Sisters of Penance and Charity arrived in São Leopoldo in 1872. They worked closely with the Jesuits, and as soon as they arrived, they began classes in a building bordering the Colégio N^a S^a da Conceição, with two classes for German-speaking girls from and around São Leopoldo. In the following years, their teachers edited textbooks for their students, being those of arithmetic used in the Colégio N^a S^a da Conceição.

The books were printed in Portuguese, and these have the idea of a teaching relating theory to practical situations and highlighting the application of these contents through many exercises and problem situations.

As for the books, *Elementary Arithmetic Practice: part II* and *Elementary Arithmetic Practice: part III*, were published in the Rio Grande do Sul, by publishers Franz Rath and João Mayer Júnior, respectively, from Porto Alegre. Concerning the book *Elementary Arithmetic Practice: Part I*, a copy has not yet been found.

According to Leite (2014)¹, the creation of a specific material for Colégio São José and later used in Colégio N^a S^a da Conceição, specifically for girls, may be related to the fact that there are few textbooks. In addition, their edits were not frequent due to the number of students. So many were brought in from outside or the centre of the country. Added to this is the fact that the schools were an instrument of evangelization: they certainly did not want young women to suffer the impact of theories contrary to the principles of the Order. The author adds that the need to develop their own materials, especially in the field of arithmetic, may be related to the pedagogical trends prevailing in Europe, where these religious teachers had their formation.

The theme of this investigation is inserted in the History of Mathematical Education in RS, and the methodological contribution is based on cultural history, from the perspective of Chartier (1990). Visits were made to the Anchieta Research Institute (Unisinus) in São Leopoldo (RS), to the Colégio São José das Irmãs Franciscanas to investigate the related arithmetic books, where different editions of these works are found, as well as interviews with the teachers Luiz Osvaldo Leite and Arthur Blásio Rambo, scholars and researchers. When researching the books, the excerpts related to the teaching of arithmetic were compiled for the Colégio N^a S^a da Conceição courses, for further analysis in the light of the theoretical-methodological framework.

CULTURAL HISTORY AS A THEORETICAL AND METHODOLOGICAL APPORT.

Cultural history is concerned with research and the representations of a given culture in a given period and place, such as family relations, language, traditions, religion, art and science. According to Chartier (1990), a challenging issue for cultural history is people's use of objects distributed to them or models imposed on them, since there is always a different practice in the appropriation of objects put into circulation. Based on this perspective, it can be said that the pedagogical press, represented here by the works *Elementary Arithmetic Practical: part II* and *Elementary Arithmetic Practical: section III*, was a vehicle for the circulation of ideas that translated values and behaviours that were intended to be taught through a pedagogical proposal in a practical and useful way with the students of Colégio São José and Colégio N^a S^a da Conceição, both in São Leopoldo city.

¹ Interview given to this researcher, September 2014, Porto Alegre (Private author's library).

Professor Luiz Osvaldo Leite has a degree in Philosophy and Theology from UNISINOS and UFRGS. He worked in the area of Philosophy, with emphasis on History of Philosophy, Ethics and Psychology. He was director of the Institute of Psychology of UFRGS and professor Emeritus of this institution, since 2008. He was a student of Colegio Anchieta from 1944 to 1950 and served as a teacher at that institution from 1956 to 1959 and from 1965 until the 1980s.

According to Chartier (1990), complementary notions of practices and representations are useful for examining the produced cultural objects, the producing and receiving subjects of culture, the processes that involve cultural production and diffusion, the systems that support these processes and subjects and the norms to which societies conform by means of the consolidation of their customs. For the production of the books *Elementary Arithmetic Practical: part II* and *Elementary Arithmetic Practical: part III* certain cultural practices and representations were moved, not to mention that the works, once produced, spread new representations and contributed to the production of new practices.

For Chartier (1990), cultural practices are either authorial (ways of writing, thinking or exposing what will be written), editorials (gathering what has been written to make it study material), or artisanal (the elaboration of the book in its materiality). Likewise, when an author begins to write a work, he conforms to specific representations of what a book should be, to certain representations concerning the themes it will address. These authors may also become creators of new representations, which will eventually find greater or lesser resonance in the reader's circuit (students) or society (in the results achieved). The resolution of the proposed activities generate creative practices and may simultaneously produce social practices. These proposed activities may be carried out individually or collectively, and their content may be imposed or re-discussed. From the development of the activities and the dissemination of the work, many new representations on the subject can be generated - here showing the teaching of arithmetic, in a practical and utilitarian way, which may become part of the collective representations. According to Chartier (1990, p. 17), cultural history has as its main objective to identify how "in different places and moments a certain cultural reality is constructed, thought and given to reading, by different social groups", which is strongly related to the notion of representation.

As per Valente (2007), thinking of school knowledge as elements of school culture and conducting the historical study of school mathematics requires considering the products of this culture in the teaching of mathematics, which left traces that allow its study, as occurs with *Works Elementary Arithmetic Practice: Part II* and *Elementary Arithmetic Practice: Part III*, Documentary sources of this research.

Preceding the discussion of the contextualization of mathematical knowledge in the books, *Elementary Practical Arithmetic: Part II* and *Elementary Practical Arithmetic: Part III*, we present a brief account of the different phases of the Colégio N^o S^a da Conceição from the foundation to the close of its activities at the beginning of the XX Century.

THE CONCEIÇÃO SCHOOL IN DIFFERENTS PHASES

According to Britto (2016), since returning to the Rio Grande do Sul in 1842, the Jesuits have concentrated their activities with German immigrants, starting from missionary work and in the process of formation of these communities, creating new schools and assisting teacher's parish.

In the beginning, “[...] the pedagogical program of this school gave a clear priority to the tendency towards religious and Christian education, and it was shown everywhere in the domestic order and the practice of the school” (Britto, 2016, p. 130). Regarding curriculum structuring, Rabuske (1988) states that little or nothing is known. However, there is a document drawn up in 1880 for the official recognition of the gymnasium whose heading indicates a map of the subjects taught in 1869. In this document is observed:

- Portuguese, French, German, English, Latin, Greek and Tupi.
- Cosmography, General Geography, Brazilian Corography, General History, Brazilian History, Rhetoric and Poetics, Portuguese and Brazilian Literature, Philosophy, Elementary Mathematics, Elements of Natural Science, Drawing, Music and Gymnastics. (Rabuske, 1988, p.123).

This teaching program was the one used by the “Stella Matutina” school from Feldkirch (Austria), model school at the secondary level of the Order. It was adopted for several years, from the school’s inception until the 1890s, when the Colégio N^o S^a da Conceição introduced the entire program of the D. Pedro II National Gymnasium. According to the author, the trajectory of the Educandário Leopoldense can be divided into three distinct periods, during the 43 years of existence, as shown in Table 1:

Table 1
Phases of Colégio N^o S^a da Conceição, as per Rabuske.

Phase	Period
1869-1877	- Only and exclusively German (formation of priests and teachers).
1877-1900	- Increasing prevalence of the Luso-Brazilian element. - Beginning of the instalment exams.
1900-1912	- Match to D. Pedro II Gymnasium. - Closure of activities.

There are no records regarding the textbooks used in the first phase of the Colégio N^o S^a da Conceição. However, it is believed that they were books imported from Germany, because, at this stage, the school was exclusively German². The students came from mostly German immigrant settlements. This pedagogical profile lasted specifically until 1877 when the school began to focus on parcelled³ examinations, called “maturity” exams.

The second phase was characterized by the growing number of Portuguese-Brazilian students. Initially, the boarding students were of German origin. Gradually, these were

² Consisting of students of German origin from the German immigrant colonies of Rio Grande do Sul.

³ Maturity exams performed in the subjects required to enter higher education courses (the so-called installment exams).

giving way to students from different communities of Rio Grande do Sul and other states, becoming the vast majority. This fact became significant because, after this period, Brazilians, according to Rabuske (1988), would almost take over the boarding school, causing various adaptations in the school's daily life.

In this new phase of the Colégio N^a S^a da Conceição, Bohnen and Ullmann (1989) affirm that due to the laurels collected by the youngsters of the Colégio N^a S^a da Conceição, in the “parcelled exams”, in 1878, and with the increase of the number of students not coming from the Teuton communities, the school assumes a new profile: to prioritize the preparation of students for the split exams.

In 1894, the school adhered to the official program adopted by the Dom Pedro II National Gymnasium of Rio de Janeiro. According to Bohnen and Ullmann (1989), the Colégio N^a S^a da Conceição has become an important student in this locality, not only for the contents taught by the teachers but also for the didactic, pedagogical and educational factor. All these factors contributed to the achievement of one more goal: the equalization of the Colégio N^a S^a da Conceição with the Dom Pedro II National Gymnasium.

According to Bohnen and Ullmann (1989), on February 3, 1900, by Decree No. 3580, the Colégio N^a S^a da Conceição obtained the character and rights of a similar high school. With the equalization, the Colégio N^a S^a da Conceição not only the right to take the exams in instalments but also confer the degree of bachelor to its students.

This fact led to the third phase, in the character of equivalent gymnasium (high school). In addition to religious formation, students received solid literary instruction in their respective courses, following the guiding principles of the Jesuit *Ratio Studiorum*⁴. In addition to the rigour of its daily routine, Schmitz (2012) points out, in an interview with these researchers, that the high school followed the standards of the German high school, in which rigid discipline was predominant, considered the maximum value for forming a citizen.

It was verified through the annual reports that the gymnasium (high school) strictly followed the subjects indicated in the official program in the order and rank required. However, it is noteworthy that the choice of the books of Arithmetic used prioritized local authors, such as Father Pedro Browe and Father Luiz Schuler (1904-1912) and the Arithmetic books of the teachers of Colégio São José (1885-1903). Therefore, the curriculum of the official gymnasium followed, leaving the choice of the material to be used by the teachers.

Due to the enactment of the Rivadávia Corrêa Law in 1911, the Gymnasium (high school) loses the character of Gymnasium (high school) equated to the National Gymnasium. At the end of 1912, the school decided to cease the activities, having as the main factor, pointed out by Schmitz (2012), Rambo (2013)⁵ and Leite (2014), the fact that in Porto Alegre there were more Germans than in São Leopoldo. The great reference of

⁴ Manual (method) to study from Companhia de Jesus.

⁵ Interview given to this researcher, April 2013, São Leopoldo (Anchieta Research Institute)..

the state was the capital, and there was a Jesuit college in Porto Alegre (*Ginásio Anchieta*) that functioned initially as a boarding school of Colégio N^a S^a da Conceição, so what was done: the son became a father. In addition, it was observed, in surveys with the Colégio N^a S^a da Conceição reports that more than 50% of the students who had been studying at the high school in recent years lived in Porto Alegre, thus justifying the concentration of activities at the secondary level in the state capital.

In the year 1885, was the first document that deals with the routine of the Colégio N^a S^a da Conceição, is the annual report, printed at the end of the school year. This report highlights the school's objectives, teaching materials, weekly workload and textbooks used by the College. It was noted that the report is reminiscent of the Dean of his stay at this school. In the following years, there were reports at the end of the school year. Figure 1 presents the first report from the Colégio N^a S^a da Conceição found after sixteen years of operation.

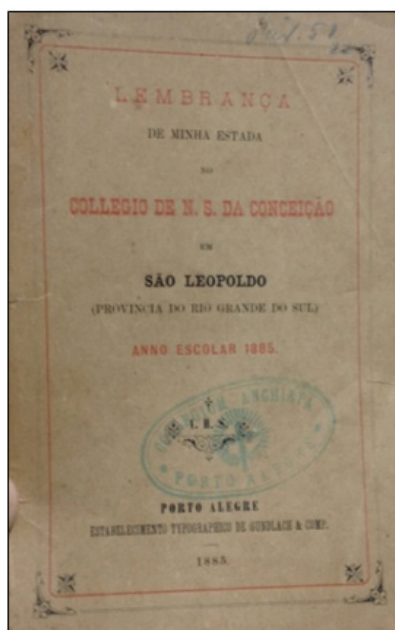


Figure 1. Conceição 1885 Report

In this document, the objectives of the school are clearly highlighted. According to this, the purpose of this college comprises:

The end of this college consists of:

1^o The good religious education of the students, not only instructing them in the doctrine, truths and precepts of our holy religion but mainly in the exercise of the Christian virtues and societies as well as in the civility and courtesy proper to their state.

2° A solid literary instruction, covering the subjects of primary and secondary education, like national language, Latin, German, French, English, rhetoric, philosophy, Arithmetic, Algebra, Geometry, Universal and national history, Geography and any other preparatory requirements required for the academies of the empire.

3° There is also higher education in theology and more subjects for aspiring scholars. Also teaches drawing, music, instrumental and vocal⁶. (Annual Report from Colégio N^o S^a da Conceição, 1885, p.2).

In this same report, we can see the college teaching program, divided into five courses: I Preliminary Course, II Preliminary Course, I Commercial Course, II Commercial Course and III Commercial Course. Table 2 presents the contents of Arithmetic, number of hours and the books used.

Table 2
Arithmetic book and e contents from Colégio N^o S^a da Conceição in 1885.

Course	Contents	Hours	Books
I Preliminary Course	The four fundamental operations. First notions of fractions, decimal and ordinary.	6 hours	Elementary Arithmetic Practice II.
II Preliminary Course	Repetition of the four operations with integer numbers. Decimal and ordinary fractions. Complex numbers. Decimal metric system. First notions of proportions. Simple and compound three rule.	6 hours	Elementary Arithmetic Practice II e III.
I Commercial Course	Repetition of ordinary and decimal fractions. Electrical system and old measurements. Proportions. Rule of three simple and compound, direct and inverse. Simple interest. Discount. Proportion and company rule. Direct and Reverse Alloy Rule.	6 hours	Elementary Arithmetic Practice III.
II Commercial Course	Short repetition of the subjects of the previous course. Simple and compound goods calculation using discount, exchange, etc. rules. Current accounts by direct, indirect, successive methods. Square and cubic root extraction.	5 hours	There is no reference to the books used.
III Commercial Course	Logarithms and their application to percentage rules, interest, tax. Progressions, interest, compound, annuities, incomes. Calculation of goods, specials, letters and public funds. Repetition of current accounts with interest.	4 hours	There is no reference to the books used.

In this article, we emphasize the Arithmetic books used in the Colégio N^o S^a da Conceição in the second phase. The contextualization of mathematical knowledge in

⁶ The citation of the article in Portuguese keeps the original spelling. The English translation has been adapted.

Practical Elementary Arithmetic: Part II and Practical Elementary Arithmetic: Part III is investigated, based on the theoretical-methodological framework of historical research and cultural history. It is noteworthy that the books analyzed are intended for the teaching of arithmetic for the preparatory course, primary and secondary education. Initially, it was intended for use by the students of Colégio São José but was used at Colégio N^a S^a da Conceição for 18 years as the reports of the College point out.

ANALYSIS OF PRACTICAL ELEMENTARY ARITHMETIC BOOKS: PART II AND PRACTICAL ELEMENTARY ARITHMETIC BOOKS: PART III.

The book *Aritmética Elementar Prática: parte II e Aritmética Elementar Prática: parte III* by the teachers from *Colégio São José das irmãs franciscanas* present, as noted in the third edition of Practical Elementary Arithmetic: Part III, a collection of numerous exercises and problems, methodically compiled. In the book edition, published in December 1900, there is a warning note for the first edition, in which the College's objectives regarding book publishing appear, especially in the field of arithmetic. It is noteworthy that the books analyzed are intended for the teaching of arithmetic for the preparatory course, primary and secondary education. Initially, it was intended for use by the students of Colégio São José but was used at Colégio N^a S^a da Conceição for 18 years as the reports of the College point out.

Since there are already a large number of arithmetic books, it would seem superfluous to edit a new one. Nevertheless, it must be confessed that the existing books contain but many rules and explanations applicable to a few examples. The theory will soon be forgotten if not followed by numerous and varied exercises and problems to be solved arithmetically. To learn the art of music, the disciple must do many exercises daily; Is there another way to practically learn arithmetic?

It will be said that the teacher may, with the help of a book, give many exercises to his disciples. We should also note that this little book is intended for the use of girls, so we limit ourselves to what is needed for practical life, leaving the teachers with a more or less special explanation of the few waterings given. (Teachers from Colégio São José, 1900, p.3).⁷

As we can highlight, the analyzed books are intended for teaching arithmetic for the preparatory course, primary and secondary education. Initially, it was intended for use by the students of Colégio São José but was used at Colégio N^a S^a da Conceição for 18 years as the reports of the College point out. During this period, according to Leite (2014), there was no rigour as to the curriculum implemented in the colleges, however, what was observed in the 1885 report of the Colégio N^a S^a da Conceição was a particular

⁷ The citation of the article in Portuguese keeps the original spelling. The English translation has been adapted.

observance regarding the teaching materials worked in the academies of the empire. According to the author, the priests of the Colégio N^a S^a da Conceição faithfully followed the official guidelines.

Therefore, the contents of Arithmetic presented in the books are in agreement with the leading academies of the empire, as these have been used by the Colégio N^a S^a da Conceição since 1885 as described in the college report.

The book *Arithmética Elementar Prática: parte I* (Elementary Arithmetic Practice: Part I), was not located, but according to the book *Arithmética Elementar Prática: parte III* (Elementary Arithmetic Practice: Part III), 1900, on page 177 is the index of the materials worked in each part. Part I is divided into five chapters, intended for elementary preparatory education, with initial knowledge of Arithmetic. It should be noted that no report by Colégio Conceição contains the use of this book in its courses. Table 3 presents the contents worked on Practical Elementary Arithmetic: part I.

Table 3
Contents about book *Arithmética Elementar Prática: parte I*

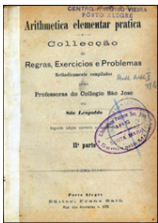
Book chapters and contents <i>Arithmética Elementar Prática: parte I</i>	
Chapter I	Exercises about numbers from 1 to 10.
Chapter II	Exercises about numbers from 1 to 20.
Chapter III	Exercises about numbers from 1 to 100.
Chapter IV	Exercises about numbers from 1 to 1000.
Chapter V	Exercises about numbers from 1 to 100000.

The book *Arithmética Elementar Prática: parte II* (Elementary Arithmetic Practical: Part II), published in 1890 by Franz Rath Publishing House (Porto Alegre), has 54 pages divided into three chapters. The edition to be analyzed is the second correct and altered, dated 1890. According to reports from the Colégio N^a S^a da Conceição, the book was used in the years from 1885 to 1903, when the Ginásio Conceição (high school) started to use the arithmetic books of the priests Pedro Browe and Luiz Schuler.

The first edition was not located; however, it was found that, besides the second dated 1890, the third edition occurred in the year 1902. Therefore, it can be concluded that the first edition appeared at the dawn of the eighties in the nineteenth century. Table 4 records the cover of this edition, chapters and content worked.

Table 4

Contents about book *Arithmética Elementar Prática: parte II*.

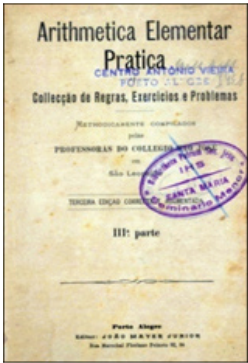
Chapters	Contents	Arithmética Elementar Prática: parte II
Chapter I	The four math operations	
Chapter II	Reduction of complex and not complex numbers and the four operations.	
Chapter III	Decimal fractions.	

The book *Arithmética Elementar Prática: parte III* (Elementary Arithmetic Practice: Part III), published in 1900 by the Publisher João Mayer Junior (Porto Alegre), has 177 pages divided into 13 chapters. The analyzed edition is the third correct and altered dated 1900. The reports of the College Conception report its use from 1885 to 1903.

The two previous editions were not located, but in a note presented on page four of this book, there is a record of the second edition dated November 12, 1889. Thus, it is concluded that the first edition appeared at the dawn of the 19th century. Table 5 records the cover of this edition, chapters and content worked.

Table 5

Contents about book *Arithmética Elementar Prática: parte III*.

Chapter	Contents covered	Arithmética Elementar Prática: parte III
Chapter I	Decimal fractions.	
Chapter II	Prime numbers.	
Chapter III	Ordinary fractions.	
Chapter IV	Metrology.	
Chapter V	Reasons and proportions.	
Chapter VI	Rule of three.	
Chapter VII	Interest rule.	
Chapter VIII	Discount rule.	
Chapter IX	Proportions and company rules.	
Chapter X	Mixing and alloying rule.	
Chapter XI	Power and roots.	
Chapter XII	Elements of Geometry.	
Chapter XIII	Mixed problems about the rules given in this booklet.	

The analysis of the books on the teaching of arithmetic used in the Colégio N^o S^a da Conceição in their respective courses, from 1885 to 1903, was carried out through qualitative analysis, both prepared by the teachers of the *São José das Imãs Franciscanas*

School. This study is based on a Bardin content analysis instrument, built with five analysis units described in Britto (2016). The works were analyzed observing two of these units: pedagogical aspects and the contextualization of mathematical knowledge with examples and applications through problem situations.

Regarding the pedagogical aspects was observed that the books *Arithmética Elementar Prática: parte II* and *Arithmética Elementar Prática: parte III* make a brief introduction of the contents and be worked through definitions, rules and sometimes present examples, following fixing exercises. Later many situations of practical problems contextualizing the daily life of the students. Figure 3 presents the systematic presented by the books exemplifying the worked theory.

<p>Greatest common divisor (m.d.c) is the largest number that divides two or more numbers without leaving a remainder.</p> <p>Rule to find the greatest common divisor of two numbers:</p> <p>The largest number is divided by the smallest; if there is no remainder, the smallest of the two numbers will be the largest common divisor. If there is remainder, the smallest of the numbers are divided by it; if this second division leaves no remainder, the first remainder will be the greatest common divisor, but if it leaves a remainder, the first remainder is divided by the second, and so on until it reaches a null remainder. The last divisor employed will be the greatest common divisor of the two proposed numbers.</p> <p>Example: Determine the greatest common divisor of the numbers 2814 and 1806.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">2814</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">4</td> </tr> <tr> <td style="padding: 5px;">1806</td> <td style="padding: 5px;">1806</td> <td style="padding: 5px;">1008</td> <td style="padding: 5px;">798</td> <td style="padding: 5px;">210</td> <td style="padding: 5px;">168</td> <td style="padding: 5px;">42</td> </tr> <tr> <td style="padding: 5px;">1008</td> <td style="padding: 5px;">798</td> <td style="padding: 5px;">210</td> <td style="padding: 5px;">168</td> <td style="padding: 5px;">42</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;"></td> </tr> </table> <p>Maximum common divisor (m.d.c) is 42.</p> <p>Rule to find the greatest common divisor of many numbers: - The greatest common divisor of the first two given numbers is sought; then m.d.c between the obtained divisor and the third given number, and so on until all given numbers have been employed. The last m.d.c is the proposed numbers.</p>							2814	1	1	1	3	1	4	1806	1806	1008	798	210	168	42	1008	798	210	168	42	0	
2814	1	1	1	3	1	4																					
1806	1806	1008	798	210	168	42																					
1008	798	210	168	42	0																						

Figure 3. Definition and rules to get the m.d.c. (*Arithmética Elementar Prática: parte III*, 1900, p.17).⁸

The excerpt presented reveals the systematic used by the authors to introduce a new unit, but in rare cases provides an illustrative example. It presents the definition, followed by a large number of exercises to be developed. Figure 4 provides an example of the definition, resolution procedure (rule) adopted by the authors and following fixation exercises.

<p><i>Adição das fracções.</i></p> <p>1- Para somar <i>fracções que têm o mesmo denominador</i>, somam-se os numeradores e dá-se a esta somma o mesmo denominador.</p> <p>2- Quando as <i>fracções têm diferentes denominadores</i>, deve-se primeiramente reduzi-las ao mesmo denominador a pplica-se depois a regra.</p> <p>3- Para somar números mixtos, somam-se primeiramente as <i>fracções segundo a regra</i>, depois extrahem-se da somma as inudades que ella contém, ajuntrando-as á somma dos inteiros.</p>

Figure 4. Adding ordinary fractions. (*Arithmética Elementar Prática: parte III*, 1900, p.26-27).

⁸ The example of figure 4 of the article in Portuguese keeps the original spelling. The English translation has been adapted.

It is evidenced in the examples of the worked content that it is up to the teacher to explain following the concepts and rules previously established. Therefore, the success of the proposed activities depends a lot on the teacher, on the methodology used, which in the next step was verified orally and in writing, ending with a collection of problem situations. At this stage, there was a strong tendency for the process of repetition and memorization.

Noteworthy that in the second edition of *Arithmética Elementar Prática: parte III* of 1890, the authors justify that the activities, followed by rules, exercises and practical problems [...] aimed at “facilitating for students a practical study of a science in which almost all the girls had an aversion” (São José College Teachers, 4).

This large number of exercises to which the authors refer was suggested shortly after the repetition of definitions and rules, focusing on the repetition process, very characteristic of this period. This fact is strongly evidenced in the first edition when the authors report that [...] “the theory will be easily forgotten if they are not followed by numerous and varied exercises” (Teachers of São José College, p.3). Figure 5 highlights some of these exercises that focus on the written repetition process.

Por escripto						
1. Somma-se	2341	5417	62518	25233	631272	534215
	6238	2281	12371	32645	217516	245663
2.	11	116	2311	102312	5100200	
	21	120	1223	41203	712301	
	12	212	5114	13120	23124	
	31	200	2030	2325	1100	
	14	341	320	30	162	
3.	300	+ 260	+ 40	+ 30	+ 11	= 4000 + 2000 +
	+ 390	+ 400	+ 25	+ 32	+ 42	=
4.	3120	+ 22	+ 102212	+ 131	+ 41203	=
5.	92	+ 41	+ 53	+ 61	+ 72	+ 82. 611 + 523 +
	+ 720	+ 902.	5213	+ 4132	+ 8411.	
6.	821	+ 228	+ 117	+ 108	+ 123.	7040 + 2118 +
	+ 2121	+ 196.				
7.	5218	+ 7337.	9428	+ 4369.	2117	+ 3239 + 5316.
	92319	+ 3227	+ 4225.	51119	+ 62038	+ 2117 + 119.
8.	808	+ 506	+ 703	+ 907	+ 209.	3007 + 5004 +
	+ 6006	+ 7001	+ 9002.	70012	+ 50028	+ 90116 +
	+ 9005	+ 407.				
9.	6038	+ 5055	+ 1078	+ 4065	+ 8091.	20365 +
	+ 40538	+ 70286	+ 60736.			
10.	786	493	857	698	576	756
	397	769	968	759	869	895
	974	395				
11.	386	+ 473	+ 265.	675	+ 384	+ 297.
	+ 681	+ 392	+ 449	+ 29	+ 7.	
12.	3588	+ 7629	+ 5833.	4978	+ 6481	+ 3596.
	6844	+ 7094	+ 3609	+ 9472.		
13.	12936	+ 29447	+ 36544.	44768	+ 52371	+ 28848
	+ 31973.	19563	+ 4713	+ 5936	+ 725	+ 89 + 7.
14.	371578	+ 618466.	437545	+ 663487.	723965	+ 808742
	+ 513982.	591369	+ 272835	+ 17505	+ 9685	+ 3518 + 29.
15.	a. 25730	b. 625938	c. 9			
	31631	433615	73			
	5728	41389	496			
	4083	15078	2947			
	517	6317	13889			
	96	230	578516			
	7	16	4395624			

Figure 5. Exercises that excel in the process of repetition (*Arithmetica Elementar Pratica parte II*, p.7, 8).

According to the authors, the didactic guidelines for the teaching of arithmetic in the College emphasized the fixation of the worked concepts centred on the development of skills emphasizing the written and mental calculus, the repetition was characterized a strong strategy, that is, learning the contents was almost exclusively through memorization, and the few became a habit, like playing a musical instrument, exemplified by the authors in their first edition.

Figure 6 shows examples of activities to be developed orally, showing the mental calculus. Dealing with daily chores, it was indispensable for future housewives to handle elementary calculations quickly and accurately.

Oralmente.		
1. Quanto custa 1 metro, quando		
12 metros custam	36\$000 rs.	
91 " "	182\$000 rs.	
18 " "	3\$600 rs.	
24 " "	4\$800 rs.	
3 " "	27\$000 rs.	
2. Um metro custa 2\$500 rs.; quanto custarão 5, 7, 9, 13, 14, 18, 24, 30 metros?		
3. 3 Kg. custam 6, 12, 18, 24, 30, 33, 48, 60\$000 rs.; quanto custa 1 Kg.?		
4. 1 litro de vinho paga-se com 700 rs.; a quanto sahirão 8, 10, 12, 15, 20, 30, 40 litros?		

Figure 6. Activities to be developed orally. (*Arithmetica Elementar Pratica parte II*, p.20).

In the teaching of arithmetic, according to Kreutz (1994), the priority was the operations that could be done mentally, in the concrete circumstances of life. Therefore, the emphasis was placed on the *Kopfrechnungen* (mentally made calculations), as in everyday life, people would often have to calculate without having paper and pencil handy.

At other times, presented in Figure 7, some exercises initially suggest being developed orally and then developed in writing.

Oralmente	Por escrito
1. Qual é o numero de laranjas contidas em 2 cestos, se no 1.º tem 340 e no 2.º 367 laranjas?	1. Dous balaos de laranjas continham: o primeiro 345 e o segundo 542; tirando 47 do segundo para põ-las no primeiro, quantas ficam em cada balaio?
2. Qual é o numero de taboas contidas em 8 carroças, se cada carroça leva 18 taboas?	2. Um negociante recebe 4 encomendas, cada uma de 450 garrafas; elle já remetteu por duas vezes 370 garrafas de cada vez; quantas garrafas elle deve mandar ainda?
3. Quantas velas ha em 24 embrulhos, contendo cada embrulho 6 velas?	3. 2 irmãos repartiram entre si 2424\$000; se o mais velho recebe 1875\$000, qual é a parte do mais moço?
4. Quantas peras havia em uma pereira, sabendo-se que se colheram 340 e que restam ainda 407 peras?	

Figure 7. Math problems. (*Arithmetica Elementar Pratica, parte II*, p.24,25).

The excerpt described in Figure 4 highlights the importance of mental calculus, worked out, usually, right after the definitions and rules established. For Rambo (1994), calculus exercises were a practical and indispensable resource for the individual acting in his community:

The familiarity and management of mental and written calculus, at least to the level of simple and compound interest, of the rule of three and others, represented the bare minimum of tools necessary for solving the multiple problems of everyday life. (Rambo, 1994, p. 154).

In addition, Leite (2014) adds that there were few books in circulation. Written calculus and mental calculus were a compelling mastery of calculus.

Following the systematization adopted by the authors, where initially the contents were defined, rules of the resolution, exercises developed, first orally and later in writing, complemented with practical problems situations contextualizing the worked content highlighting the daily lives of students. Three hundred fifty-five problem situations were identified in the *Arithmética Elementar Prática, parte II*, distributed in the three chapters. In *Arithmética Elementar Prática, parte III*, there are 866 problem situations, usually at the end of each content worked. Figure 8 presents four problem situations involving elementary operations.

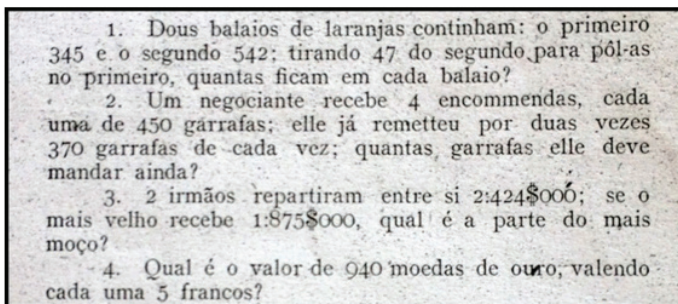


Figure 8. Problems with fundamental operations. (*Arithmética Elementar Prática II parte, p.25*).

The problem situations presented to students should be focused on practical application in a utilitarian way, valuing their day-to-day. According to Kreutz (1994), the pedagogical process should always start from the reality of the students, contributing to a more effective insertion of the students in this same reality.

When simple and compound rules of three were worked, 146 problem situations were co-created, introduced through theoretical explanation, classifying them as direct and inverse. For its resolution, we use a systematization that contemplates the theory followed by examples of application, as shown in Figure 9.

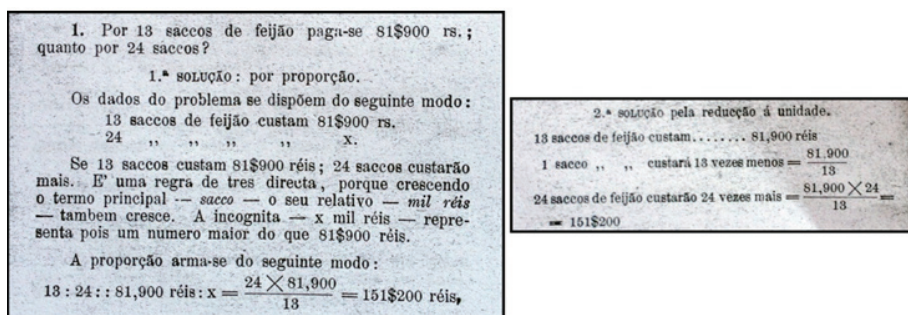


Figure 9. The problem of rule of three simple. (*Arithmetica Elementar Pratica parte III, p.82,83*).

The excerpt described in Figure 9 shows the procedures adopted for the resolution of the three-direct rule, initially through unit reduction and also by proportions, followed by application activities. The same systematics are adopted to work the inverse three rule.

The book also has the three-compound rule, as shown in Figure 10. Initially, there is a brief theoretical explanation, application example and resolution procedures.

Figure 10. Compound three rule problem. (*Arithmetica Elementar Pratica III parte, p.91*).

The excerpt from the book highlights two procedures for resolving the three-compound rule. According to the authors’ suggestion, “In the three-compounded rule, the method of unit reduction is preferable to proportions, because of its simplicity and clarity, and its elegance” (Teachers of Colégio São José, p.91). Following, there are 26 situations of fixing problems involving that rule.

It was observed that in both Arithmetic, the use of problems to fix and understand the contents is strongly prioritized. Figure 11 presents problem situations that contextualize the worked theory.

Figure 11. Application Issues. (*Arithmetica Elementar Pratica III parte, p.61,84,113*).

The problems address situations that contextualize the contents and their application. In the first example, we work on the rule of three associated with cheese production, milk and animal husbandry. In the second example, the discount rule associated with the commercial practice is worked out and ends with the mixing rule addressing average and temperature variations. Therefore, it is the theory centred on practical and useful applications to the formation of the students.

Concluding this analysis, there was a predominance of problem situations. Often the authors resort to problems that point to the theory worked in a practical and utilitarian way, as noted in the preface to the book *Arithmetica Elementar III*, when the authors justify the edition of the book. According to the authors, the proposed problems are essential for students to understand the theory, because teaching without practical application will not help in their formation.

FINAL CONSIDERATIONS

The publication of Arithmetic books by the teachers of São José das Irmãs Franciscanas School from São Leopoldo at the dawn of the 19th century, in the 19th century, at the secondary level, is one of the milestones in the RS instructional process for teaching feminine. Based on the guiding principles of the Order, it was aimed at, something useful limiting the practical life of the girls of the college.

From the framework of cultural history and historical research and two units of analysis, pedagogical aspects and contextualization of mathematical knowledge, in addition to the Annual Reports of the Colégio N^o S^a da Conceição from 1885 to 1903, the books entitled *Arithmética Elementar Prática: parte II e Arithmética Elementar Prática: parte III*, by the Teachers of the São José College used by the students of the Colégio N^o S^a da Conceição from 1885 to 1903.

The publication of specific books for the students of Colégio São José, according to Leite (2014), can have several explanations: initially, the fact that there is little material in circulation; and in a second moment, the pedagogical trends in Europe, where these authors, all sisters, had their formation. Another explanation would be its use even as an instrument of evangelization.

In the observed books, a large number of exercises, which leads us to believe that the process of repetition in its resolution was the predominant teaching strategy used by the authors to fix the studied contents, besides the mental calculation from practical problem situations of the students' daily life, characterizing the teaching methodology employed.

Working with integers, fractions, power, and roots, a large number of repetition exercises for memorization were identified so that the students mastered the operational rules and resolution procedures (theory) well. Already in the other chapters, many practical and contextualized problem situations were observed. Therefore, the proposal defended by the authors consisted of a teaching not limited only in the theory and mechanical reproduction of the proposed contents, but the theory should be guided by practice. For the authors, it was essential to limit the contents to what is necessary for practical life.

This historical study on the Teaching of Arithmetic present in the Franciscan Sisters' books, and used at the Colégio N^o S^a da Conceição, allowed penetration into the school culture, in a particular place and time, thus contributing to the History of Mathematical Education in RS.

AUTHOR'S STATEMENT OF CONTRIBUTIONS

S.L.M.B developed the theoretical framework, conducted the research activities, interviews and data collection. A.B. supervised the project, guided data collection and revised the theoretical framework. Both authors reviewed the collected data, discussed the results to write the final version of the text.

DATA AVAILABILITY STATEMENT

Data supporting the results of this historical study will be made available by the corresponding author, S.L.M.B. upon reasonable request.

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