



Compendiums of school arithmetic in the theoretical corpus of educational sciences

Compêndios de aritmética escolar no *corpus* teórico das ciências da educação

Kátia Sebastiana Carvalho dos Santos Farias¹

Abstract

This article problematizes the use of the *Compendio de Pedagogia*, by Antonio M. da Silva Pontes, *Elementos de Arithmetica*, by Cristiano B. Ottoni, and *Cours théorique et pratique de pédagogie et de méthodologie*, by Thomas Braun, in the training of mathematics teachers for the "primary school", and also the newspaper *A Instrução Publica*, the *Revista do Ensino*, reports of the Presidents of Rio de Janeiro Province and of the Normal School Director. The theoretical-methodological approach is inspired in Wittgenstein and Derrida. The *corpus* showed traces of two traditions of arithmetic books: some aimed at the mercantile practices and others at the school practices, some of these aimed at training teachers. As for arithmetic teaching practices, from the 1870, the intuitive method was recommended. The compendiums integrated the official curriculum and structuring of the school subjects, as well as they were relevant in the formation and institutionalization of the Brazilian school in the 19th century.

Keywords: Arithmetic teaching; Normal School; First letters school; Curriculum.

Resumo

Este artigo problematiza o uso das obras *Compendio de Pedagogia*, de Antonio M. da Silva Pontes, *Elementos de Arithmetica*, de Cristiano B. Ottoni, e *Cours théorique et pratique de pédagogie et de méthodologie*, de Thomas Braun na formação de professores de matemática para as "escolas de primeiras letras", e também o jornal *A Instrução Publica*, a *Revista do Ensino*, relatórios dos Presidentes da Província do Rio de Janeiro e do Diretor da Escola Normal. A abordagem teórico-metodológica se inspira em Wittgenstein e Derrida. O *corpus* manifestou rastros de duas tradições de livros de aritmética: uns destinados à prática mercantil e outros às escolares, alguns destes voltados a formar professores. Quanto às práticas de ensino de aritmética, a partir dos anos 1870, foi recomendado o método intuitivo. Os compêndios integraram o currículo oficial e a estruturação das disciplinas escolares, bem como foram relevantes na formação e institucionalização da escola brasileira no século XIX.

Palavras-chave: Ensino de aritmética; Escola Normal; Escola de primeiras letras; Currículo.

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¹ Doutora em Educação pela Universidade Estadual de Campinas. Professor da Universidade Federal de Rondônia. Departamento de Matemática / DMAT/UNIR, Programa de Pós-Graduação em Educação Escolar - Mestrado e Doutorado Profissional- PPGEEProf. Brasil. Email: katiafarias2014@gmail.com. ORCID: <https://orcid.org/0000-0001-5646-8604>

Introduction

This text, inserted in the history of mathematics education thematic field, problematizes referential contexts of the teacher training activities political-administrative management and school educational management in the Imperial City of Niterói, in the Province of Rio de Janeiro, around the years 1835-1889. We trace memories of formative practices mobilising arithmetic culture, understood as "any and all normative and public systems of signs produced through mathematical activity carried out by different communities of practice, and not only by the professional mathematicians' community" (Miguel, 2005, p. 146). Here, we mobilize the word memory not to mean a superior mental capacity of the subject or inherent to the human species, but to refer to a set of traces of meanings in movement, i.e., mobilized in the act of performing a practice and, therefore, according to one or more communities of practice purposes, values and ways of seeing (Miguel, 2012).

We emphasize the importance of teacher training practices², since, in the 19th century second half, this was a topic of great debates and discussions in our country. Moreover, the emphasis we give to the Rio de Janeiro Province Normal School, in Niterói, is due to the fact that it was the first Normal School created in Brazil, in 1835, to train primary teachers.

Such as Miguel (2010), we understand that one of the historiographical nature research requirements, under the philosophical perspective in which we place ourselves, is the constitution of an archive of specific and relevant practices to the investigation purpose. In the context of this study, such practices are seen as language games that took place in the space-time context of the teacher education field in Brazil. Thus, we problematize the schooling education, considering teacher training activities of the first public Normal School of Brazil. A "convenient" education, schooling, as a civilizing project of the 19th century Brazilian society, to be accomplished in the first letters schools. This goal is based on the view that education is among the most elementary and necessary activities of human society.

We re-signified and mobilized language games such as: arithmetic teaching, teacher training, first letters school, which were unpacked through our reading of the narrative games (documents analyzed in this research and that make up Farias' thesis, 2014) - reports³, journals, newspapers containing public instruction for teaching. Reports of the Presidents of the Province of Rio de Janeiro presented to the Provincial Legislative Assembly of Rio de Janeiro (1835-1889) and of the Normal School Director; the *Compêndio Elementos de*

² In this research context, practices are understood as interactive games of sociocultural practices "spatio-temporal of actions (public or private; individual or collective) coordinated and regulated that mobilise cultural objects, knowledge, purposes, desires, beliefs, values, affections and power relations" (Miguel, 2012).

³ The documents mentioned in this text are part of the Public Archive of the State of Rio de Janeiro and the National Library Foundation. In this latter, we selected and acquired the documents by means of microfilmed digital copy.

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Arithmetica, by Cristiano Benedito Ottoni⁴, the *Compêndio*⁵ *de Pedagogia*, by Antonio Marciano da Silva Pontes and the *Cours théorique et pratique de pédagogie et de méthodologie*, by Thomas Braun. The movement was to "open up" the language games showing not truths, but contradictions and conflicts, an analysis process which we call "derridian deconstruction".

We work from the "narrative acts" perspective, since the act of narrating always refers to a pre-existing story. Narrating is a telling. The act of telling (re)iterates and deforms pre-existing discourses. It is important to see the narrative act as a cultural act. The storyteller adapts and innovates the story he/she retells; thus, stories are transmitted and deformed (McDonald, 2001). In other words, narratives are, in the last instance, renarratives. This means that the only access to the tale in "itself" is made in the act in which it is told or retold, whereby the story is inevitably rearranged, deformed and put into a new version, which possesses its own singularity and can then be told again or retold (McDonald, 1994).

The reading of narrative games (compendia, reports, newspapers, among others) led us to produce a new narrative language game, in which we practiced not only an interdiscursivity between these narratives, but also between them and other language games, produced in different human activity fields, in order to expand the visibility horizon of the mobilizing practices of school culture in teacher training in the Rio de Janeiro Province Normal School (Farias, 2014).

How can we understand the social-political function of the reports, newspapers and compendia of this time and what emphasis was given to school education? Let's go to the renarrative.

The provincial president was an official appointed by the emperor. Reports were presented annually to the Provincial Assembly to enable the legislator to monitor and supervise the actions taking place within the province in all sectors, including public education. In these reports there are records of the public power guidelines in relation to the education type that should be established in Brazilian society. All official projects were passed through the sieve of parliamentary discussions, in which was often registered the public men's dissatisfaction with the official measures adopted by the provincial administration competent agencies.

In the province presidents' vision regarding political-pedagogical action, the Normal School was the only secondary education establishment in the rich and important province of Rio de Janeiro and had the purpose of qualifying, in theory and in practice, intellectually and

⁴ Cristiano Benedito Ottoni (1811-1896) was a teacher, engineer and military officer. He was general deputy between 1848 and 1869, as well as senator between 1879 and 1896. He published his last work, *Elementos de Harithmética*, in 1852, in Rio de Janeiro. The second edition of *Elements of Arithmetic* was published in 1855. http://www.senado.gov.br/senadores/senadores_biografia.asp?codparl=1568&li=17&lcab=18

⁵ The term "compêndio" (compendium) was used to name books produced for teaching purposes. They were also called "Elements", "Lessons", "Manual", "Points", "Postilas".

morally, the citizens who were destined to be primary teachers, because "it is public education, especially primary education, as the basis of the most serious social interests in the present and in the future, the subject with which governments are most openly concerned" (Rio de Janeiro [Província], 1876). We ask: how does the educating act mean in the province political representatives' intentional context? "Educating means forming an honest citizen, indispensable to the consortium of order and freedom" (Rio de Janeiro [Província], 1876, p. 29).

We also question: how was constituted the curriculum of normal students to be teachers? How were the taught contents defined? How was the curriculum mobilized in the process and everyday practices materiality? How did school arithmetic compendia participate in the theoretical corpus of educational sciences constitution, which gained some autonomy from the 19th century last quarter? We consider these questions understanding that the past is not a place to seek explanations or lessons for the present, but a field of dialogue.

The Brazilian primary education institutionalization

The Constitution of 1824, in paragraphs 31 and 32, art. 179, emphasizes public education as the first need of the people, because it is their headlight and spiritual nourishment: national education, through popular education (Brazil, 1867). The political constitution has safeguarded this people's right and obligation of the government (*Revista do Ensino*, 1883). Thus, the Constitution guaranteed instruction to all citizens. Such promises, however, only began to be partially fulfilled with the Law of 15 October 1827, approved by the General. This Law provided for the creation of first letters schools, fixed their content and created primary education for the female sex. The aforementioned Law denotes the first effort by independent Brazil to establish itself as the controller and responsible for the education of its population, given that it made official the institutionalization of Brazilian primary education and recommended the creation of first letters schools in all cities, villages and most populous places.

It was heard from teachers that "educating and instructing are almost synonymous, especially in primary schools. That is why man is not only an intellectual being, but also a physical and moral being; the school must attend to these three manifestations of its individuality" (*O Ensino Primario*, May 31, 1884, p. 30). Teachers advocated that moral education should begin in the early years, as this would tame the individual's temperament and character. They understood that in early age everything is easily achieved. That the impressions of childhood last a lifetime; and what was learned in the early years, one would never forget. This thought is also expressed in educational magazines, as shows the following excerpt: "We can see how important it is to avoid this happening. We are little more than habits and education; it is, therefore, of the greatest convenience to make acquire good habits and repress vicious attempts" (*A Escola: Revista Brasileira de Educação e Ensino*, 1877, p. 12).

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From the seventies of the 19th century, the social function of primary school changed and began to have special features. One of them, for example, was to attend the thousands of individuals released from slavery, in the greatest ignorance, without beliefs, without notion of duties, and that needed to receive, in school, the instruction and education necessary for their complete regeneration⁶. Another special feature of the new social function of the school was to attend also to the great influx of immigrants, whose intellectual and moral interests could not be indifferent to those who directed the society destiny, in view of the fact that "to primary education are attached high social and political problems, and it is necessary to foresee and guide the events so that they do not deviate from the path of national interests" (Rio de Janeiro, 1889, p. 3).

What was the school in the capital of the Empire? "It was the place in which childhood should learn to read, write and count. Neither the family demanded more, nor would the legislator grant anything else" (Rio de Janeiro, 1871, p. 26). In the primary schools of the province, there was one compulsory and other optional teaching programme. The compulsory programme should be carried out in public schools and private schools supported by the provincial coffers; the optional one would depend on the combination of teacher's and pupil's desire (but in very few schools the two desires were combined). Therefore, after five years of schooling, the boy would leave with a slight tincture of national history, geography and linear drawing or geometry. Sometimes only one or other of these subjects was taught, and so incompletely that there was no use for him shortly after leaving school. The obligatory program included: moral and religious instruction; reading; writing; arithmetic and the legal system of weights and measures (Rio de Janeiro, 1871).

What are the effects of the civilising political project in terms of school education? How were the people affected? It was very unpleasant the state of primary education and strong the incredulity of the people towards the school, as we can see in the following excerpt:

The statistics proved it! There was a very low attendance to the first letters public teaching! There was an imperative need to break the heavy veil that covered up the sad state of popular education in the province. Only the eighth part of the child population participated in its benefits. More than a hundred thousand children were left abandoned to penury, destruction and the inevitable vices in illiterate people's life, representing immense force wasted in the great struggles for civilisation, fatherland and humanity. Among the main difficulties in increasing attendance at public elementary education was the despairing indifference of many parents to the instruction benefits, because it was necessary to utilize their children's service. This was a characteristic of that time. This is, undoubtedly, a strong point! The men's ignorance. Can we talk like this? Society was constituted with elements such that the school was a dangerous establishment and therefore an object of aversion (Rio de Janeiro [Província], 1889, p. 38).

⁶ In the Rio de Janeiro of the imperial phase, prevailed the Comtean positivist belief in the school and the theatre as institutions regenerating society.

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Did the darkness suit them? We do not know. Most pupils did not complete their primary studies and were taken out of school as soon as they showed some progress, because the parents thought that their children already knew enough for the purpose they were destined, which usually happened with the most skilful and diligent. Thus, the teacher struggled with difficulties to present, in the final exams of the year, a result corresponding to the zeal with which he fulfilled his duties (Rio de Janeiro [Província], 1889).

Mathematics teaching in the Normal School: two types of schools and organisation of teaching subjects for girls and boys

José Carlos de Alambary Luz, the Normal School director from 1868 to 1875, sent annual reports⁷ to the Public Instruction Board, informing the Normal School situation, both in relation to the "teaching march"⁸ and in reference to the most urgent needs.

In the Rio de Janeiro Province Normal School context, in 1868, the 2nd chair was organised as follows: first year, "Arithmetic and Metrology"; second year, "Algebra, Geometry and Linear Design"; third year, "Mathematics Applications to Mercantile Bookkeeping, Chemistry, Physics, Mechanics, Surveying and Linear Design".

Considering the 1869 reform, Alambary Luz presents a detailed chart on the three years of the course, the first, second and third chairs, as well as the teaching subjects in the Normal School, as shown in Table 1:

Table 1 - Details of the three years of the Course, the First, Second and Third Chairs, as well as the teaching subjects at the Normal School

YEAR	CHAIR	TEACHING SUBJECTS
1ST YEAR	FIRST	Reading and Grammar; Writing; Christian Doctrine.
	SECOND	For boys: Arithmetic, covering Metrology. For girls: Arithmetic, until Metrology.
	THIRD	Sacred and Ancient History, up to the Romans' conquest of Greece; General Physical and Political Geography.
2ND YEAR	FIRST	Exercises in syntax, grammatical and logic analysis, spelling dictation; writing and Christian doctrine.
	SECOND	For boys: applied Arithmetic, Algebra up to 2nd degree equations, excluding Geometry. For girls: Proportions with practical exercises, notions of Geometry for understanding linear drawing, cosmography and metric system, with reference to the capacities.
	THIRD	Cosmography, Europe, Asia, Africa and Oceania Geography, continuation of ancient, middle and modern History.
3RD	FIRST	Dictations, analysis, style and composition exercises; Pedagogy: practice in the annexed school.
	SECOND	For boys: applied Arithmetic, Algebra up to 2nd degree equations excluding Geometry. For girls: Arithmetic, Algebra and Geometry Applications. Line drawing.

⁷ In compliance with § 2, art. 35, Regulation of April 21, 1869.

⁸ Expression also used by Comte (1978, p. 3).

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YEAR	THIRD	Geography of America and particularly of Brazil. Rio de Janeiro Province Chronography, Modern History, especially that of Brazil. The study of the particular Geography of each country accompanies that of History.
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Source: Report of the Rio de Janeiro Province Normal School Board, on July 19, 1869 (Adapted by Farias, 2014).

We draw attention to a characteristic feature of the 19th century educational reality: the hierarchisation of two primary schools for boys and for girls. Two types of schools - male and female - were created to serve the children in Rio de Janeiro Province. This is not just a simple division into two types of schools. The major distinction was in the mathematics teaching programmes indicated for each case. Since the *First Letter Schools Law*, in 1827, girls did not study geometry and arithmetic was much reduced in relation to the content provided for boys. While the study plan envisaged for boys comprised operations with natural numbers, fractions, decimals, proportion, geometry applications and elementary notions, the plan envisaged for girls only involved the four fundamental operations.

In the plan of 1869, the distribution of teaching subjects in the Normal School was organised differently, for boys and for girls, in the second chair⁹, "Arithmetic and Metrology; Algebra; Notions of Geometry and Linear Drawing". The boys should study Arithmetic, comprising Metrology, in the 1st year; applied Arithmetic, Algebra up to 2nd degree equations, in the 2nd year; and Linear Drawing and Arithmetic, Algebra and Geometry Applications, in the 3rd year. For the female pupils were offered: Arithmetic until Metrology, in the 1st year; Proportions, with practical exercises, Geometry notions for understanding Linear Drawing, Cosmography and Metric System, in the 2nd year; and Linear Drawing appropriate to the female sex, as well as Arithmetic Applications, in the 3rd year (Rio de Janeiro, 1869).

In this same conception, there was the Primary School Attached to the Normal School for boys and girls. In the School Attached, for boys, the Arithmetic class was divided into seven classes: the 1st class, composed of pupils who mastered numeracy and studied the summing table; the 2nd class, with pupils who did sum counts; the 3rd class, for students who already did diminishing counts; the 4th class, with those who mastered multiplication; the 5th class, for those who knew how to do division counts; the 6th class included those who studied decimal fractions; and, finally, in the 7th class participated the pupils learning the metric system and complexes. For the girls, the contents division was almost the same, being the number of subdivisions per class a little less (Rio de Janeiro, 1869).

We understand that the school contents division for boys and girls, in that phase of the Normal School existence, would meet the school educational purposes of that society and what was at stake as a civilising political project. Thus, we agree with Chervel (1990) in the sense that, in each period, the school is tributary of complex objectives, which are intertwined and combined in a delicate architecture of which one has the tendency to look for

⁹ The word "chair", in this paper, is used to designate a set of disciplines

models. This is where the opposition between education and instruction comes into play. All these aims together give the school its educational function. Only a part of them obliges it to provide education. But this instruction is entirely integrated into the educational scheme which governs the school system or the studied branch. School subjects are at the heart of this device. Their function consists, in each case, in placing an instruction content at the service of an educational purpose.

The arithmetic practices in teacher training in the Rio de Janeiro Province Normal School were carried out under conditions of human activity different contexts, which impacted, in a complex and even contradictory way, the educational purposes and the organization forms not only of the Rio de Janeiro Province Normal School, but also of the first letters schools, especially regarding to the formative role and the arithmetic practices.

Compendiums as a curricular force in the primary school teachers training in the 19th century

Compendia were strongly valued in the school subjects structuring and acted as fundamental in the formation and institutionalisation of the Brazilian school throughout the 19th century (Soares, 2011, p. 1). We have found trails¹⁰ of two traditions of arithmetic books for various fields of human activity, that is, two types of works mobilising arithmetic culture: books intended for mercantile practice and school books, some of these aimed at training the trainer, such as the *Compendio Elementos de Arithmetica*, by Cristiano Benedito Ottoni. For example, the Normal School teaching program, dated 1869, norms that for the second chair (Arithmetic) "Arithmetic and the weights and measures legal system", the teacher should propose problems related to real life, domestic, rural and industrial economy.

We also find trails that arithmetic became schooled with an intense moralizing slant; this vision is strongly perceptible in the *Compendio de Pedagogia*, by Antonio Marciano da Silva Pontes. These trails are also found in the newspaper *A Instrução Publica*, which, in 1872, translated and published weekly parts of Braun's compendium, which started to be translated in Brazil in the 1970s of the 19th century. Altogether, nine articles were published: *Arithmetica - examples of practical teaching*; *Arithmetica - ordinary fractions/Aritmetica practical teaching example*; *Arithmetica - fractions transformation - practical teaching examples*; *Metric System - Practical Teaching Model*. There are also trails of the Braun's ideas mobilization in the reports of the Normal School Director, from the 80s of the mentioned century, since, in them, Braun's compendium is cited as a strong reference.

The Braun's work publication in the newspaper *A Instrução Publica*, a strong media of the time, may have influenced the primary teachers, since they had access to this

¹⁰ Here, we use the word "trail" not in the sense that Carlo Ginzburg mobilizes it in his *O fio e os rastros*, in which he expresses the view that "the true is the point of arrival; there is a relationship between the thread – the report thread, which helps us orient ourselves in the labyrinth of reality - and the traces" and that seeks to tell the story by using "the traces, true stories" (Ginzburg, 2007, p.7). Alternatively, we are using "track" according to Jacques Derrida's thinking about the production of identity and difference process.

newspaper, including as writers. Not only in the Rio de Janeiro Province, but in Brazil as a whole, until the end of the 19th century, the demand for pedagogical material was still disproportionate to the small supply. The very few circulating works were in foreign languages. Compendiums, such as Braun's, were generally embracing and intended to offer an "integral" orientation, a sure guide that could orient all the activities inherent to teaching, from pedagogical theory to administrative practice, even establishing conduct norms and an "appropriate"¹¹ lifestyle to the profession profile.

The Pedagogical Compendium by Pontes: pedagogical practices and the arithmetic teaching

In the Pedagogy chair, first of all were used handouts prepared by this chair teacher, Felipe José Alberto Júnior, who until the year 1868 was the Normal School former director. From 1868, the Pedagogy chair was occupied by Antonio Marciano da Silva Pontes, who drew up handouts inspired by Thomas Braun, in the *Cours théorique et pratique de pédagogie et de méthodologie*. Later, Antonio Marciano da Silva Pontes wrote the *Compendio de Pedagogia* that, from the 1980s, became part of the Normal School students pedagogical training.

The Escola Normal syllabus, dated 1869, was notably very extensive and presented, together with the contents, the didactic way of working them; this aspect is a strong point that leads us to a possible understanding of the pedagogical practices experienced at the Rio de Janeiro Province Normal School teachers training. The syllabus described not only what should be taught, but mainly how it should be taught. Thereby, for example, in relation to Pedagogy, it was determined that "the pedagogy teaching shall be divided into three parts: 1) education in general and school education; 2) teaching methods and school discipline; 3) the schoolmaster's distinctive characteristics and duties".

In the annexed schools, the third-year normal students began by listening to the lessons as monitors, then became responsible for conducting classes under the primary school teachers' direction, on days when the Normal School was attended by a different gender from that of the class in practice; twice a month, under the pedagogy teacher's supervision, each pupil performed the functions of master and, with the help of his colleagues, directed all the teaching work, wrote official documents, crossed out and filled in charts as if he were the owner of the chair. At the end of the exercise, the normalist who ruled the school wrote a report of all the successes that had taken place, exposing his opinion on the way in which the monitors performed their duties (Rio de Janeiro, 1869).

Regarding to reading, the programme stated:

The teacher should ensure that the master student understands what reads, accurately observes sentence structure and has an easy and correct pronunciation. Likewise, in relation to the national language: "he will avoid the abuse of theories and grammatical subtleties, he will occupy the pupils a lot with exercises applying the rules and

¹¹ Perhaps because this profile the compendium prepared by Professor Marciano da Silva Pontes was printed, containing all the prescriptions that the teacher, based on the program previously approved by higher authorities, understood to be necessary for future teachers training (Villela, 2002, p. 187).

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precepts; he will do frequent exercises in syntax, grammatical and logic analysis; written exercises. These will be corrected by the teacher or by the students under his direction, etc. (Rio de Janeiro, 1869).

The part on Geography even detailed the type of teaching material that should be used to aid teaching: "The Geography teaching will be done through the use of globes, armillary spheres and charts; and will cover the sphere and charts notions, the seas..." (Rio de Janeiro, 1869). Let's see how interesting, in the case of History:

According to the program, the teacher does not scrutinize the particular annals of each people; he exposes the great events that marked the old Empires passing, patenting the causes of their decadence and extinction; he cites the names and actions of famous men who influenced the destinies of their homeland and of the world, and points out the remarkable progress in the sciences and arts (Rio de Janeiro, 1869).

The *Compêndio* deals with Arithmetic in the third part, chapter V, "Methodo de Arithmetica":

Not all children are gifted in calculus due to a special talent lack. Although modern pedagogues suggest that children should not be required to take lessons when they do not yet know how to study, this is not the way it is done in schools, in order not to go against our society customs and also because approval of families, who do not approve this teaching system (Pontes, 1881, p. 156).

In Pontes' (1881) vision, the arithmetic teaching, for children beginning this study, should be purely mental. The use and study of the arithmetic practical part should necessarily precede a more complete and at the same time more theoretical teaching, considering that: "Verbal calculus is most useful in life and the child should be accustomed, since the very early age, to perform it by means of verbal exercises. For children who do not yet know how to write, the arithmetic teaching cannot be otherwise" (Pontes, 1881, p. 158). In addition, the author recommends that:

The Arithmetic teaching should begin by making the child count to 10, to 20, to 30, etc. Children, even the smallest, learn this with the greatest ease and become readily familiar with spoken numeracy by means of some innocent toys and games, such as 'dominoes, the bilboquet, the mesh', etc., with which playing they learn successive addition by 2, by 3, by 5, etc. (Pontes, 1881, p. 158).

In the *Compendio de Pedagogia*, Pontes wrote a footnote that we consider of fundamental importance to understand his methodological guidelines for the arithmetic teaching, using the intuitive method. Let's see:

We do not intend by these examples to inculcate that the teacher should employ such means in class, which would certainly disturb the school order and discipline; but in the hours of rest and recreation the children can, by playing, learn many useful things, without costing them the least effort. In the school, the teaching pictures and others generally employed in intuitive teaching can be used for the same purpose with great advantage" (Pontes, 1881, p. 159).

We understand that these are trails of Comte's positivist philosophy. In Pontes' (1881) perspective, values, rules and norms function in a spectral way.

Ottoni's Arithmetic - Arithmetica Elements of in the Rio de Janeiro Province Normal School

Cristiano Benedito Ottoni was part of the the primary teachers' formation history in the noble Rio de Janeiro Province. His work *Elementos de Arithmetica* was mobilized as an official curriculum for the arithmetic and algebra teaching, in Rio de Janeiro Province, from the year 1868, adopted in the second chair of the curriculum, "Arithmetic and Algebra in the student-masters training ", until the year 1878.

There was an expansion of the Normal School curriculum in which the contents "Metric System" and "Complex" became part of all teaching programmes of this school. Then, from the year 1868, all the Arithmetic contents would have been revised or adapted according to the compendium *Elementos de Arithmetica*, by Counsellor Ottoni, in order to train student-masters.

Elementos de Arithmetica was part of the master students' education for almost a decade. In the reports, the Normal School director, in the part called "teaching march", imperatively registered: "the course today is based on Ottoni's Arithmethica, it comprises numeration, the Arithmetic four fundamental operations, fractions, complexes, rule of three, interest rules, discount" (Rio de Janeiro, 1869, p.13). In several reports one can see the statement: "the compendia used in mathematics teaching were still the same as in previous years: Ottoni's Arithmetic and Algebra" (Rio de Janeiro, 1872, p.11). Ottoni's *Arithmetica* covered all the points of the Rio de Janeiro Province Normal School teaching programmes up to the year 1878. Besides the definitions, Ottoni's work presents problems for almost all the treated subjects. The work is rich in examples, using expressions such as: "Thus, for example"; "Let's take these examples for now" (Ottoni, 1855, p. 13). All subjects in the book follow an Arabic numeric organization until 220. For each treated subject, Ottoni presents a definition. Sometimes, on the same page, there is more than one definition.

Since the Regulation of 1862, year in which the syllabus was extended, the Normal School started to include the content "Metrology". In the Regulation of 1869, the "Complexes", the "National System of Weights and Measures" and the "Decimal Metric System" were included, as well as the conversion of the units from one system to another, as instructed in Ottoni's compendium. In the author's words,

[...] the 2nd edition of the compendium contained a great number of modifications and corrections, daughters of my observations and experiences in 22 years of teaching. I did my best to also improve the 3rd edition, given that all the work after the first one had in view the fact that my compendium had been adopted and followed in the Pedro II school since 1856. To the chapter on decimals I attached a decimal metric system exposition that I judged sufficient for its intelligence and practice, in order to adapt it to the reform attempted by the law adopted by the perpetual county (Ottoni, 1879).

The arithmetic compendium prepared by Ottoni is organized in two parts and eight chapters. The first part contains the topics: " Integer operations"; "Fractions"; "Complexes" and "Decimals". In the second part, the topics " Numbers General Properties "; "Powers and Roots"; "Ratios and Proportions"; and "Progressions and Logarithms" are covered. The author explains why he presented the Complexes after Fractions in the following terms:

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In the compendium, complexes are in the third chapter, after fractions. But I make it clear, at the very beginning, that this chapter dealing with complexes, as well as the chapter dealing with decimal fractions, which are addressed in the next chapter, chapter four, which is in fact a continuation of the chapter about fractions. I understand that the chapter on complexes contains nothing more than applications of the fractions' general theory to particular species (Ottoni, 1855, p. 74, 75).

We understand that the presence of the unit named "Complex Numbers" in Ottoni's *Arithmetica* can be understood as the "trail" of a belief in the power and strength of mercantile (and, therefore, extra-school) mathematical practices, relatively to school and bookish arithmetic practices of abstract, universal and structural character, put into circulation by later "innovative" pedagogical perspectives.

The arithmetic teaching in primary schools: Thomas Braun's writings in the newspaper *A Instrução Pública*

The arithmetic lessons, with examples of practical teaching, elaborated by Thomas Braun, were largely valued in the newspaper *A Instrução Pública*¹² publications between the years 1872 and 1888, period in which this newspaper was directed by José Carlos Alambary Luz¹³. Articles generally have the following titles: *Arithmetic practical examples by Th. Braun*; *Arithmetic by Th. Braun*; *Arithmetic by Th Braun – Ordinary Phrases*; *Arithmetic – Teaching practical examples*.

In 1872, in the aforementioned newspaper, in the introductory part of the article *Arithmetic - practical examples* first lesson, Braun emphasizes that the arithmetic teaching purpose in primary schools, through practical teaching, is to develop the intellectual faculties of boys, accustoming them to reflect, articulate their ideas, enunciate with precision and clarity, to give them useful and even indispensable knowledge in many circumstances of ordinary life (*A Instrução Pública*, 1872, p. 111).

Thomas Braun has a broad view on the intuitive method. Among the pedagogical principles defended as a basis for the arithmetic method and teaching in primary schools, calculus should be intuitive. Not only must the first representations of number be based on intuition, but all operations must be brought to intuition, so that the child may find for himself, by his own reflection, the most convenient procedure. According to the newspaper *A Instrução Pública* (1873, p. 75), the "*Arithmetica* by Thomas Braun, the most practical elementarist of the time under study, was the manual used for the primary education teaching qualification exam".

In his work *Cours théorique et pratique de pédagogie et de méthodologie*, aimed at the primary teachers training, Thomas Braun (1854) speaks out strongly against the arithmetical method which was followed in schools; he argues that, above all, after Pestalozzi, the arithmetic teaching was submitted to the new pedagogy general principles.

¹² At the *Fundação Biblioteca Nacional* there are about fifty articles published in the newspaper *A Instrução Pública* dealing with the Arithmetic teaching.

¹³ Rio de Janeiro Normal School Director

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Let's listen to Braun's words: "See how absurd the numbers teaching is! The mechanical way as many primary school teachers work with numbers in schools. Here, one is satisfied with such a mechanical way that the children are completely disconcerted if the teacher happens to change the order of the factors" (Braun, 1854, p. 54).

In Tomas Braun's view, calculus should not be taught to the pupil as a simple memory work. It is necessary that, in acquiring the skill in calculation, the child exercises, at the same time, his intellectual faculties and form his judgment. It is necessary, in a word, that every operation be a rationality about numbers. In calculating, the one who proceeds according to the indicated rules, without cause knowledge, calculates mechanically (mechanical calculation). It is necessary to avoid exercising the pupils exclusively in the calculation mechanism. This would be to violate the first of all pedagogy principles.

Thomas Braun (1854) explains his pedagogy by stating that it is not advisable to draw strict limits to the calculus teaching in primary schools. The pupils will learn those operations which in their future conditions may be indispensable, but they should learn them in such a way as to operate with a certain skill, realizing exactly what their task is. In his conception, it is important that, when leaving school, the pupil knows well the four fundamental rules about integers, the most common fractions and decimals, the weights and measures legal system and how to apply these rules to everyday life problems.

The child who has been exercised to calculate by thinking and to think by calculating, except in exceptional cases, will not encounter difficulties from which he will not be able to get rid of. If, in each branch of teaching, the result depends largely on planning, that is, on the systematic order from which it proceeds, this is especially true to the arithmetic, since in this branch, what follows must always be deduced from what precedes it.

Thomas Braun (1854) invites teachers to observe his guidelines, which have in their favour the sanction of experience, and presents a long list of advice for teachers, among which we list some:

- to be based on reasons, so that each given notion leads the student to find the result(s) through intuition;
- not to abandon the student before to be sure of having provoked in his mind a clear and exact representation of the treated subject;
- not to lose sight of the fact that, in all teaching, it is necessary that, first and foremost, the student can understand what is taught;
- to make each rule discoverable by the student himself, using convenient examples; that each found rule can be expressed in a clear, exact and concise manner; each progressed step must be related to the previously acquired knowledge
- not to delay in applying all that has been explained to the children and understood by them; not to go a step further before the children have acquired the desired ability;
- mental calculation follows immediately the written calculation, never one should be taught excluding the other;
- always consider the numerical system as the basis, without haste;

- to impose on the student the obligation to express himself in exact terms and to explain the step he took to find the result; never use units of measurement other than those recognised by the legal system.

In addition, the author recommends that teachers should always be within the students' reach. It is necessary that, in the problems, they know how to distinguish, without much difficulty, the relationship between the given numbers and the unknown number, so the teacher needs to be meticulous in the different signs' employment and figures representation. If greater attention is required by the teacher, it is especially in this situation where students are usually exposed to the greatest errors (Braun, 1854).

Final considerations

We retake one of the main questions of this text: how were the practices of arithmetic culture mobilized in the formation promoted by the first Normal School in Brazil? With this and other guiding questions, this research took as inspiration the thought developed by the philosopher Ludwig Wittgenstein (2012), as well as the deconstruction thought of Jacques Derrida (1971); with this philosophical basis, we dealt with language games performed by the practice of writing and put ourselves in the trails of other language games that helped us to mean the questions, problematizing the use of the *Compendio de Pedagogia*, by Antonio Marciano da Silva Pontes, the *Elementos de Arithmetica*, by Cristiano Benedito Ottoni, and the *Cours théorique et pratique de pédagogie et de méthodologie*, by Thomas Braun, as pedagogical practices with the purpose of training teachers to work in the mathematics teaching in the so-called " first letters schools ".

With this research, we understand that the Normal and Primary Schools in the Rio de Janeiro Province are situated in an education and instruction vision proper of the 19th century second half. The Rio de Janeiro Province, at that time, needed administrative and political reforms that undoubtedly involved education, a field of intense debate in the period in focus. The Rio de Janeiro Province Normal School positivist educational project, from 1868 onwards, defended an education that would transform the common man in order to put him at the service of the society regeneration, that is, a civilising, developmental and progressive political project, with a liberal-meritocratic nature. This vision of education is present in the Normal School project of creation, institutionalisation and political-pedagogical action, as an institution that prepares teachers to work in the first letters school (Farias, 2014).

In this sense, school education - through primary schools in the Rio de Janeiro Province - was the Brazilian society great project in the 19th century. In the second half of the 19th century, the discourse related to the popular classes' education, through the instruction and children training, was present in the general measures of "good government", even though the popular classes were, in fact, excluded from school.

From the 1970s of the 19th century onwards, in the view of provincial presidents and other school education authorities, the primary school social function changed: the school

should have special characteristics, to the point of having a political-pedagogical consensus that the public school should serve the thousands of individuals who had come out of slavery, ignorant, without beliefs, without notion of duties, who needed to receive the necessary instruction and education for their complete regeneration. It was also the school's function to attend to the great influx of immigrants who settled in the province and whose intellectual and moral interests could not be indifferent to those who directed the society destiny. Thus, major social and political problems were linked to primary education, being necessary to predict and direct events so that they did not deviate from the national interests Path.

In the trails of arithmetic culture in primary schools mobilizing practices in the Rio de Janeiro Province, we understand that, from the 1870s, in all education branches, the teacher should follow the best method, the most adapted to the primary school, that is, the intuitive method; however, this method was not well accepted by teachers.

In our research, we found trails of two arithmetic books traditions for different fields of human activity, that is, two types of works mobilizing the arithmetic culture: books intended for the mercantile practice and school books, some of these intended to train the teacher, such as Ottoni's arithmetic book. The contents "Complexes and Weights and Measures", which compose the compendium *Elementos de Arithmetica*, by Cristiano Benedito Ottoni, were part of this training.

In a first moment, trailing the mercantile arithmetic use, we verify the importance given to the "Weights and Measures" unit in arithmetic school curricula, not only in Brazil, but also in England and Portugal. Finally, the "Complex Numbers" unit presence, in Ottoni's arithmetic and in those of other Brazilians and Portuguese, can be understood as trails of a belief in the power and force of mercantile (and therefore extracurricular) mathematical practices, in relation to school and bookshelves arithmetic practices – with an abstract, universal and structural character - put into circulation by later "innovative" pedagogical perspectives.

In the period in focus, the presence of complex numbers in arithmetic textbooks, as well as in teacher training curricula, could be seen as a kind of "resistance" manifested by measurement practices based on uses and customs - and which constituted a constellation of "arithmetic practice", that is, arithmetic effectively practiced in different contexts of human activity keeping each other "family resemblances", the gradual constitution of a single, uniform, generic, abstract and universal type of "arithmetic school" that would later be practiced, giving the living and operative diversity of the "arithmetics of practices" the label of "traditional practices". We also have found trails that arithmetic became schooled with an intense moralizing slant, most vehemently in the *Compendio de Pedagogia* prepared by Antonio Marciano da Silva Pontes.

References

- Brasil. (1967). Constituição de 1824, art. 165. Brasil. *Constituições do Brasil. Constituição de 1824*. São Paulo: Saraiva.
- Braun, T. (1854). *Cours théorique et pratique de pédagogie et de méthodologie*. Bruxelles: F. Parent, Editeur, deuxième édition,
- Chervel, A. (1990). História das disciplinas escolares: reflexões sobre um campo de pesquisa. *Teoria e Educação*, 2.
- Comte, A. (1978). *Curso de Filosofia positiva* São Paulo: Abril. (Coleção Os Pensadores).
- Derrida J. (1971). Firma, acontecimento, contexto (Comunicación). In *Congreso Internacional de Sociedades de Filosofia de Lengua Francesa*. Montreal, 1971. Captured on march 5, 2013, from: http://www.jacquesderrida.com.ar/textos/firma_acontecimiento_contexto.htm.
- Farias, K. C. S. (2014). *Práticas mobilizadoras de cultura aritmética na formação de professores da Escola Normal da Província do Rio de Janeiro (1868–1889): ouvindo fantasmas imperiais*. Doctoral Thesis in Education. Campinas. State University of Campinas.
- Ginzburg, C. (2007). *O fio e os rastros: verdadeiro, falso, fictício*. Trad. Rosa Freire d'Aguiar e Eduardo Brandão. São Paulo: Companhia das Letras.
- McDonald, H. (1994). The narrative act: Wittgenstein and narratology. *Surfaces Revue Électronique*, IV. Captured on december 20, 2014, from: www.pum.umontreal.ca/surfaces/vol4/mcdonald.html.
- McDonald, H. (2001). Wittgenstein, narrative theory, and cultural studies. *Telos: critical theory of contemporary*, 121, 11-53.
- Miguel, A. (no prelo). A pesquisa historiográfica sob uma perspectiva wittgensteiniana. In *I Encontro Nacional de Pesquisa em História da Educação Matemática - ENAPHEM*. Vitória da Conquista, BA. 2012.
- Miguel, A. (2005). História, filosofia e sociologia da educação matemática na formação do professor: um programa de pesquisa. *Educação e Pesquisa*. São Paulo, v. 31, n. 1, p.137-152, jan/abr.2005. Available on: <http://www.scielo.br/pdf/ep/v31n1/a10v31n1.pdf>.
- Miguel, A. Percursos indisciplinados na atividade de pesquisa em história (da educação matemática): entre jogos discursivos como práticas e práticas como jogos discursivos. *Bolema*, v. 35, p. 1-57. Rio Claro (SP): UNESP, 2010.
- Ottoni, C. B. *Elementos de Arithmetica*. 2ª ed. Rio de Janeiro: Eduardo & Henrique Laemmert, 1855.
- Pontes, A. M. S. *Compendio de Pedagogia: para uso dos alunos da Escola Normal da Província do Rio de Janeiro*. 3ª ed. Nictheroy, 1881.
- Soares, F. S. (2011). Professores – autores de compêndios de Matemática no século XIX. *Anais eletrônicos do XII CIAEM-IACME*. Recife, 2011. Available on: https://xiii.ciaem-redumate.org/index.php/xiii_ciaem/xiii_ciaem.
- Wittgenstein, L. (2012). *Investigações filosóficas* (7a ed.). Petrópolis, RJ: Vozes; Bragança Paulista, SP: Editora Universitária São Francisco.

Research sources

a) Reports of the presidents or vice-presidents of the Rio de Janeiro Province

Rio de Janeiro (Província). (1876). *Relatório do Presidente da Província do Rio de Janeiro*, pelo Presidente conselheiro Francisco Xavier Pinto Lima, na primeira sessão da vigésima primeira legislatura, no dia 22 de outubro de 1876. Captured on march 7, 2011, from: <http://brazil.crl.edu/bsd/bsd/808/>.

Rio de Janeiro (Província). (1889). *Relatório do Presidente da Província do Rio de Janeiro*, conselheiro Carlos Affonso de Assis Figueiredo na abertura da segunda sessão da vigésima sétima legislatura em 15 de outubro de 1889. Captured on march 9, 2011, from: <http://brazil.crl.edu/bsd/bsd/820/>.

b) Reports of the Public Instruction Director

Rio de Janeiro (1889). *Relatório do Diretor de Instrução Pública (M. Ribeiro de Almeida)* anexado ao relatório apresentado à Assembleia Legislativa Provincial do Rio de Janeiro pelo presidente, conselheiro Carlos Affonso de Assis Figueiredo. Rio de Janeiro, julho de 1889.

c) Reports of the Rio de Janeiro Province Normal School Director

Rio de Janeiro (1869). *Relatório do Diretor da Escola Normal, José Carlos de Alambary*, 19 de julho de 1869. Anexo ao Relatório do Vice-Presidente desembargador Diogo Teixeira de Macedo, de 1 de outubro de 1869.

Rio de Janeiro (1871). Relatório do Diretor da Escola Normal, José Carlos de Alambary Luz, em 20 de julho de 1871. Anexo ao Relatório do Diretor de Instrução Thomaz Gomes dos Santos, em 23 de agosto de 1871.

d) Newspapers

A Instrução pública (1872). Microfilmed material of the Fundação Biblioteca Nacional do Rio de Janeiro. Collection: PPR SOR 3795 (1).

e) Magazines

A Escola: Revista Brasileira de Educação e Ensino (1877 e 1878). Vols. 1-2. Microfilmed material of the Fundação Biblioteca Nacional do Rio de Janeiro. Accessed on: <http://memoria.bn.br/DocReader/docreader.aspx?bib=351199&pasta=ano%20187&pesq=>

Seção Pedagógica - These (1884, 31 de maio). *O Ensino Primario, Anno II*, 27-30. Microfilmed material of the Fundação Biblioteca Nacional do Rio de Janeiro. Available at Biblioteca Nacional do Rio de Janeiro. Collection: PR SOR 03398- 03393.

Notas da carteira de um educador (1883, 5 de abril). *A Revista do Ensino, 1º Anno* (4),56. Microfilmed material of the Fundação Biblioteca Nacional do Rio de Janeiro. Collection: PR SOR 03398.