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The teaching of mathematics in the Brazilian junior high school: a look from the Jesuit Pedro Browe at the beginning of the 20th century[1]

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ABSTRACT

The study addresses the article The Mathematics in the Gymnasial course, published in 1906, in the annual report of the Gymnasium Nossa Senhora da Conceição in São Leopoldo/RS. As the theme is inserted in the History of Mathematical Education, this qualitative and documentary study is supported by historical research. The article deals of the Mathematics in Brazilian secondary school, at the beginning of the 20th century, from the look of Jesuit Pedro Browe. He considers that the Brazilian secondary school program is presented in a theoretical way, has not space for practical applications. The contents are worked in just four years, less time than European countries. Standing out in the fields of arithmetic and algebra, he defends the intuitive method in secondary school in mathematics in Brazil, influenced by the German gymnasium and based on the Ratio Studiorum. The teaching of mathematics should be practical and utilitarian, as this area is appropriate to develop reasoning, autonomy and reason.

KEYWORDS: History of Education. Jesuits. Mathematics. Secondary School. Intuitive Teaching Method.

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O ensino de Matemática no curso ginasial brasileiro: um olhar do jesuíta Pedro Browe no início do século XX

RESUMO

O estudo aborda o artigo A Mathemática no curso Gymnasial, publicado em 1906, no relatório anual do Ginásio Nossa Senhora da Conceição de São Leopoldo/RS. Como o tema se insere na História da Educação Matemática, este estudo qualitativo e documental, ampara-se na pesquisa histórica. O artigo trata da Matemática no ensino secundário brasileiro, no início do século XX, a partir do olhar do jesuíta Pedro Browe. Considera que o programa de ensino secundário brasileiro se apresenta de forma teórica, não havendo espaço para aplicações práticas. Os conteúdos são trabalhados em apenas quatro anos, tempo inferior ao de países europeus. Destacando-se nos campos da aritmética e álgebra, defende o método intuitivo no ensino secundário de Matemática no Brasil, por influência do ginásio alemão e pautado na *Ratio Studiorum*. O ensino de Matemática deveria ser prático e utilitário, pois essa área é apropriada para desenvolver o raciocínio, a autonomia e a razão.

PALAVRAS-CHAVE: História da Educação. Jesuítas. Matemática. Ensino Secundário. Método de Ensino Intuitivo.

La enseñanza de las matemáticas en la escuela secundaria brasileña: una mirada del jesuita Pedro Browe a principios del siglo XX

RESUMEN

El estudio aborda el artículo Matemáticas en el curso Gymnasial, publicado en 1906, en el informe anual del Gymnasium Nossa Senhora da Conceição en São Leopoldo/RS.A medida que el tema se inserta en la Historia de la Educación Matemática, este estudio cualitativo y documental está respaldado por investigaciones históricas. El artículo trata las matemáticas en la educación secundaria brasileña, a principios del siglo XX, desde la mirada del jesuita Pedro Browe. Considera que el programa brasileño de educación secundaria se presenta de manera teórica, sin espacio para aplicaciones prácticas, y los contenidos se trabajan en solo cuatro años, menos tiempo que los países europeos. Destacando en

los campos de la aritmética y el álgebra, defiende el método intuitivo en educación secundaria en matemáticas en Brasil, influenciado por el gymnasium alemán y basado en la Ratio Studiorum. La enseñanza de las matemáticas debe ser práctica y utilitaria, ya que esta área es apropiada para desarrollar el razonamiento, la autonomía y la razón.
PALABRAS CLAVE: Historia de la Educación. Jesuitas. Matemáticas. Educación Secundaria. Método de Enseñanza Intuitivo.

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Introduction

This study aims to address the article Mathematic in the Gymnasial course, published in 1906, in the annual report of the Gymnasium Nossa Senhora da Conceição, in São Leopoldo, Rio Grande do Sul (RS). The article discusses the presence of mathematics in Brazilian secondary education, at the dawn of the 20th century, and was written by Pedro Browe S.J.[5], a mathematics[6] lens at Ginásio Conceição.

The work developed by Browe turned to the fields of arithmetic and algebra, defending the idea of a complete teaching, relating theory to practical situations, in addition to showing the application of these contents. This desire of the author, according to Leite (2014), reveals the strong tendency in relation to the intuitive teaching in force in this period, since the Jesuits of the Gymnasium Nossa Senhora da Conceição, mostly of Germanic origin, used as references, in addition to the *Ratio Studiorum*[7], the German gym and its pedagogical tendencies.

In this study, it is not intended to evidence contradictions and criticisms regarding Brazilian junior high school in the period analyzed.

[5] S.J. is the badge of the Order, *Societas* Jesus. *Societas*: means that they are Companhia de Jesus, name of the Order in Portuguese. (LEITE, 2014, verbal information).
[6] Denomination used for the full professor, being the highest category of the teaching career. The term "lens" is attributed to the Latin term legente, which reads. (LEITE, 2014, verbal information).
[7] "Pedagogical document and guiding all his actions by the Jesuits, promulgated by Cláudio Aquaviva, in 1599" (BRITTO, 2016, p. 20).

What is evident is Browe's strong tendency to employ the intuitive method[8], through practical and contextualized teaching, valuing students' time and context, that is, teaching guided by practice and not exclusively by the repetition process, centered on the figure of the teacher.

As the theme investigated is part of the History of Mathematical Education in RS, historical research is sought, the support for discussion. To investigate the analyzed material, visits were made to the Anchietano Research Institute, located at UNISINOS, in São Leopoldo / RS, where the annual reports of Ginásio Conceição can be found. Among these reports, the year 1906 stands out, which brings the main source of this study. Thus, in addition to the theoretical-methodological framework, this article presents a brief history of the Gymnasium Nossa Senhora da Conceição, the biography of the Jesuit Pedro Browe and the analysis of his article on Mathematics in the Brazilian junior high school.

The referencial theoretical-methodological

According to Prost (2008), historical facts are constituted from traces left in the present by the past. Thus, the historian's job consists of working on these traits to construct the facts. Thus, a fact is nothing but the result of an elaboration, of reasoning, based on the marks of the past. The author considers the path of historical production as the formulation of legitimate historical questions, a work with documents and the construction of a discourse that is accepted by the community.

Certeau (1982) defines making history, in the sense of thinking history as a production. For the author, history, as a written production, has

[8] This teaching method appeared in Germany at the end of the 18th century and was disseminated by Pestalozzi's disciples during the 19th century, in Europe and in the United States. In Brazil, he was part of the proposals for the reformulation of public education at the end of the Empire, with Rui Barbosa responsible for systematizing the principles of the intuitive method in his opinions and for translating the manual, *Lições de Coisas*, by Calkins. For Swiss educator Johann Heinrich Pestalozzi(1746–1827), student education takes place according to his personality, skills and initiatives. Therefore, he advocates an education that harmoniously cultivates the different human faculties (the brain, the heart and the hands) for the transformation of society. In the intuitive method, the school should teach things related to life, use objects as didactic support and the senses to produce ideas, starting from the concrete and ascending to abstraction (COSTA, 2014).

the triple task of summoning the past that is no longer present, showing the skills of the historian, owner of the sources and convincing the reader. Thus, historical practice is scientific practice while it includes the construction of research objects, the use of a specific work operation and a process for validating the results obtained by a community.

The historian's work, according to Certeau (1982), is not limited to producing documents, texts in a new language. This is because in his research there is a constant dialogue between the present and the past, and the product of this dialogue consists of the transformation of natural objects into culture. In the study of documents, Cellard (2008), highlights that:

> [...] the written document is an extremely precious source for every researcher. It is, of course, irreplaceable in any reconstruction referring to a relatively distant past, as it is not uncommon for it to represent almost all traces of human activity at certain times. In addition, very often, it remains the only testimony of particular activities in the recent past. (CELLARD, 2008, p. 295).

According to Valente (2007), there is a multitude of materials that, together with textbooks, may allow composing a picture of Mathematical Education from other times. For the author, conducting the historical study of school mathematics requires that we consider the products of this culture of mathematics education, which left traces that allow its study, such as the article by Jesuit Browe on Mathematics in the Brazilian junior high school, the main source of this investigation.

The Gymnasium Nossa Senhora da Conceição in São Leopoldo / RS

The presence of Jesuits in the state of Rio Grande do Sul happens in three moments. In the first two moments (1626-1641 and 1682-1767), his presence occurred with the Guarani Indians[9], in Jesuit reductions [10]. Their

[9] Name attributed to some natives brought by Columbus to Portugal, which he called Indians, because he considered them to be Indians.

actions were significant for the history of RS, highlighting the introduction of cattle, the foundation of cities, in addition to a notable enterprise, together with the Guaranis, teaching the benefits of a life in society and family. Another aspect to be highlighted is the artistic and cultural legacies marked by their constructions and works. This was verified until the expulsion of the Jesuits from this territory and their domains, decimating the Guarani ethnic group. (BRITTO, BAYER and KUHN, 2020).

The return of the Jesuits to RS, in 1842, constituted the third moment. He stood out for his missionary action and teaching, initially, with the German immigrant colonies. Gradually, the priests were allied with the colonists and with parish teachers, providing spiritual assistance and improvements in teaching in schools and in teacher training.

According to Britto (2016), the Jesuits did little to act as teachers, but they assisted in the planning and execution of classes with training meetings, in addition to the creation of a normal school, aiming to train and qualify future teachers. According to Rambo (1994), parish schools have been under the command of the Order for approximately 70 years, contributing to improving the quality of education in immigrant colonies.

In 1869, according to Bohnen and Ullmann (1989), the Jesuits created, in São Leopoldo, a secondary school, aiming to train priests and teachers for teaching in Catholic parish schools in German colonies. According to Leite (2005), the Nossa Senhora da Conceição Gymnasium was the great generator of Jesuit training in southern Brazil, with extremely qualified teachers. “This school became, for a long time, in the late 19th and early 20th centuries, the great precursor of Jesuit pedagogy in southern Brazil” (BRITTO, 2016, p. 123). Furthermore, according to Leite (2005), due to the Kulturkampf[11], from Bismarck, German religious, students and priests were sent to Brazil, specifically to RS, in São Leopoldo, at a time

[10] The word "reduce" was used in the sense of purifying, cleaning. Thus, the place where the “reduced” Indians were, that is, cleaned by baptism, was called reduction (BRITTO, BAYER and KUHN, 2020).
[11] *Kulturkampf* or struggle for culture was a 19th century German anticlerical movement, initiated by Otto von Bismarck, chancellor of the German Empire in 1872.

when higher education was not established in the country, in the area of Education, becoming sources of learning.

The pedagogical program of this school prioritized the tendency towards a religious and Christian education, being that, both in the domestic order, as in the practice of the school, this was shown everywhere. In addition to religious training, students received solid literary instruction in their respective courses, following the guiding principles of the *Jesuits' Ratio Studiorum*. In the early years, the teaching program at Conceição was the same used at the Stella Matutina school in Feldkirch (Austria), a model school for the Order at secondary level. "It was adopted from the conception of Conceição until the decade of 1890, when the school introduced the entire program of the Dom Pedro II National Gym" (RABUSKE, 1988, p. 123).

Since 1896, the College has sought, with the Federal Government, the equivalence to the Dom Pedro II National Gymnasium. In the year 1900, this goal was achieved. With the matching, the Gymnasium Nossa Senhora da Conceição obtained not only the right to carry out the exams in installments [12], as well as giving his students a bachelor's degree.

With the enactment of the Rivadávia Corrêa Law, in 1911, all equivalences to the Dom Pedro II National Gymnasium were canceled or extinguished. With that, the Gymnasium lost that status. "Disenchanted by the government act, which removed their official recognition, the Jesuit priests decided to close Conceição, in 1913, to convert it into a provincial seminary" (BRITTO, 2016, p. 152).

At the time, in Porto Alegre there were more Germans than in São Leopoldo. The great reference of RS was the capital, where there was a school of the Jesuits, the Ginásio Anchieta, which functioned, initially, as day school of Conceição. It was also observed in surveys, together with Conceição's annual reports, that more than 50% of the students who studied in the Gymnasium in recent years, resided in Porto Alegre,

[12] During this period, for the student to enter the colleges, it was necessary to take written and oral tests, called split exams. Each institution selected the content to be studied by the candidates, within the set of subjects.

justifying the concentration of activities at the secondary level in the capital of Rio Grande do Sul. One of the main areas of activity of the Order of the Jesuits, pointed out by Leite (2014), consists of outstanding performances in the field of experimental sciences, inaddition to the teaching of mathematics.

> Nineteenth-century Jesuits, as men of their time, were extremely sensitive to the development of science. Nineteenth-century Jesuits, as men of their time, were extremely sensitive to the development of science. They knew the challenges that scientific research posed against traditional doctrines, demanding adequate and convincing answers from even the most refractory philosophers. The evolution of Mathematics, Physics, Chemistry, Biology, Astronomy, [...] required deep scientific knowledge. For this reason, in the formation of Jesuits, much emphasis was placed on the study of scientific issues related to Philosophy. (LEITE, 2005, p. 110-111).

According to Romeiras (2015), the Order of the Jesuits has always been challenged, by default in relation to science teaching. For the author, studies have confirmed that the Order has performed and, still, plays a relevant role in promoting scientific activities in all places where it was and is present with its schools. This fact was evidenced at Ginásio Conceição, in which renowned scientists were present throughout its existence and with outstanding contributions. This fact was evidenced in the Gymnasium Conceição, in which renowned scientists were present throughout its existence and with outstanding contributions.

This fact is also observed in the Gymnasium's annual reports, from 1900 to 1912. According to Leite (2005), the reports of Jesuit teaching establishments in southern Brazil contained, in their first pages, precious studies, prepared by distinguished writers, on the most varied themes of science and letters of their time. These reports are divided into two chapters. The first, prepared by priests of the Gymnasium and addressing the themes previously mentioned. The second part deals with issues related

to teaching and students. Table 1 shows the articles in the first chapter of Conceição's annual reports:

TABLE 1: Articles in the 1st chapter of Conceição's annual reports.

Year	Title of the article	Author
1904	Brazilian funghi.	João Evangelista Rick S.J.
1905	The tragic elemento in the Ignes de Castro episode.	Pedro Schneider S.J.
1906	Mathematics in the junior high school.	Pedro Browe S.J.
1907	Critical study and perimetric calculation of areas in Brazil and its states.	Agostinho Padtberg S.J.
1908	Cryptograms from Rio Grande do Sul in the face of evolutionism.	P. F. Thisen S.J.
1909	The main cartographic representations of the Brazilian coast in the first three glosses after the discovery.	João Batista Hafkemeyer S.J.
1910	The southern coast of Brazil in cartography of the 16th and 18th centuries.	João Batista Hafkemeyer S.J.
1911	Evolution and Constancy.	João Evangelista Rick S.J.
1912	The Origin of Life.	Godolfredo Schrader S.J.

Source: from authors.

Chart 1 reveals the effective relationship of Jesuits with the sciences, in their different fields, observed in the articles of the annual reports of the Gymnasium Nossa Senhora da Conceição. Schmitz (2012) evaluates:

> These themes are relevant and the Jesuits are authorities in the field of science and mathematics. We have good mathematicians, astronomers and many renowned scientists. Have the missionaries who go to the new areas and establish the degrees in which the river is found, Geography. The calendar was not established and there were many people who did not have a fixed calendar, they did not know how to organize the days of the year and the annual routine, so there comes Astronomy. It wasn't just looking at the stars, they were very pragmatic things, that is, how can I calculate and organize the year in terms of calendar. So, when it is said that the Jesuits had the knowledge, it is because they researched, produced new things. (SCHMITZ, 2012, verbal information).

For Rodrigues (2014), Jesuits had a profound training, often with three or four higher education courses. Due to their culture, they stood out in different areas of science. In the field of mathematics, reference is made to the works developed by Pedro Browe S.J. and his contributions to the teaching of mathematics in southern Brazil.

The biography of Jesuit Pedro Browe

As per Spohr (2011), Browe was born in Salzburg, Áustria, in 1876. He joined the Society of Jesus in 1895. He studied Rhetoric in Exaten, Holland, from 1897 to 1898. He studied Philosophy at Colégio Santo Inácio in Valkenburg, from 1899 to 1901. At the end of the year 1901, he completed the Philosophy course and embarked for Brazil and, from 1902 to 1906, he was at the Gymnasium Nossa Senhora da Conceição in São Leopoldo, where he dedicated himself to teaching and authored books on Mathematics. At the end of 1906, he returned to Europe to study theology, becoming a priest in 1912, and no longer returning to Brazil.

During the period he was in Brazil, according to the Jesuits' catalogs, he was a professor in several disciplines, among them, Mathematics in the four years of high school. He also served as an intellectual apostolate as a writer, librarian and examiner of Jesuit books intended for publication. As the author of textbooks, Leite (2005, p. 113) states that "Browe was a pioneer of mathematics in RS, publishing outstanding didactic works." Among which are the *Ensino de Aritmética: Parte Prática* (a collection with 700 progressive exercises, edited by Livraria Americana, Pintos & Comp.ª, of Pelotas / RS, in 1903, with 153 pages) and *Curso Teórico e Prático de Álgebra Elementar,* edited by Livraria Selbach, from Porto Alegre / RS, in 1902, with 252 pages.

Browe only worked as a teacher and author of Mathematics books during his time at Conceição. At the time, the choice for the discipline to be taught was by taste and inclination, as there was no specific training.

However, in the Philosophy course there was the study of issues related to Exact and Natural Sciences. "In Europe, his teaching field has completely changed. From the accuracy, objectivity and coolness of Mathematics, he transferred himself to the complex existential reality of Moral and Pastoral Theology, a discipline that, for several years, centered his attention" (LEITE, 2005, p. 112). This fact, according to Leite (2014), was common among Jesuits in formation who, after attending Theology and ordained priests, declined to other areas of activity, different from those they exercised during the teaching period[13]. Browe passed away in Baden-Baden, Germany, in 1949.

Article analysis *A Mathemática no Curso Gymnasial* from jesuit Pedro Browe S.J.

In the year 1906, the article dealing with the teaching of mathematics in high school in Brazil, written by Pedro Browe S.J, appears on the opening pages of the Ginásio Conceição report (1st chapter). In this article, the author makes reference to the objectives of teaching Mathematics and its contributions, presenting this area of knowledge as quite appropriate to develop, in the disciples[14], reasoning, autonomy and reason.

> The near end that aims at teaching mathematics, as part of the gymnasium course, is to give the disciple that knowledge of the matter that is indispensable to the well-prepared man. To this end, what is taught is more directly related.But how, however, will it aim at a higher target, one as formation and education of the faculties, of the intelligence no less than of the will. Not being the official program alien to these views, ideas manifest it clearly, calling mathematical teaching a powerful means of mental culture tending to develop the faculty of reasoning. That such a high end can be reached, here is the daily practice to confirm it [15]. (BROWE, 1906, p. 7).

[13] "Phases of the formation of a Jesuit: novitiate, juniorate, philosophy, teaching and theology"(LEITE, 2005, p. 23).
[14] Denomination used for students of the time, that is, the individual who receives instruction or training from their masters.
[15] The original spelling is maintained in Browe's quotations.

Therefore, according to the author, mathematics aims to develop reasoning. Hence the importance of daily mathematical practice:

> The application continues from theoria to the individual solution of practical problems, it will eventually develop a certain spiritual autonomy that, not content with the faithful reproduction of the reasoned of others, will pass it through a critical examination, perhaps replacing it with a more grounded one. The constancy and energy of the effort that this method imposes on the youth's will cannot fail to educate and strengthen the persevering and conscientious action in it. Summarizing what we have just outlined, it seems to be the objective of mathematical teaching:
> a) Logically correct and clear reflection.
> b) The autonomy of mental work. (BROWE, 1906, p.7-8).

It is observed that Browe defends the idea of the theory's continuous relationship with practical problems, contributing to the development of the student's autonomy.

In this way, simple mechanical reproduction would be avoided, contemplating the exercise of a criticality and foundation of the applied theory. The author also points out possibilities to achieve these objectives, as well as difficulties to be overcome.

> In the course of logical reflection, it will not be enough for aluminum to see it concretized in particular theorems. It is imperative that coherent parties do not walk apart, destroying an almost organic unit. Let us exemplify. We find it quite counterproductive for good comprehension to separate the three superior operations of power, root and logarithms, dividing them by four consecutive courses. Since they are a tangible nexus, fulfill them now in their entirety or assign at least to the last year a general recapitulation, emphasizing their mutual cohesion. (BROWE, 1906, p. 9).

Therefore, aiming at a good understanding of the contents, the idea is not to divide the three operations of power, root and logarithms. Browe also addresses the importance of assessing the disciples' degree of maturity in order to achieve this intellectual maturation of mathematics teaching:

> Not everything can be proved by reasoning processes and, if possible, they did not match the development of a 2nd or 3rd year student. There is one more avenue for full conviction: evidence of experimental intuition. And since this is the primary source of our concepts of quantity and extent, it is highly physiological to highlight the fundamental problems of Geometry in this way, because the tests, too philosophical, would go unnoticed by most of the children's students, since supposing their comprehension to be mature intellectual that in mathematical teaching, at most, will be the ultimate fruit to whom one aspires, however, by no means, the foundation on which it is built. To do otherwise would be an unforgivable pedagogical error that would inevitably supplant, due to the action of memory, the intellectual exercise that must be aimed at. (BROWE, 1906, p. 9).

Therefore, in order to contribute to the student's mathematical training, a pedagogical orientation is required which, due to the need to comply with the official program, was often not respected, taking steps without understanding the mathematical content.

> They will object that intuition and sensitive memory are, at this age, master faculties that should preferably be developed. But is there any other consequence to draw if not that mathematical teaching, for this age, should be limited to practical teaching and that theory which serves as its immediate basis? The more in-depth reasoning - good pedagogical guidance requires it - must be postponed to the courses in which they behave and claim the intellectual development of the students. Unfortunately, the official program did not share these ideas, condensing mathematical teaching in the lower four years and completely exempting the latter two. (BROWE, 1906, p. 9).

There is an anxiety of the author in relation to the teaching of Mathematics taught by the official program, because, according to Browe, students of the first years of secondary school would have a more practical education, since they need concrete and contextualized activities. Here you can see the author's tendency towards the intuitive teaching method. According to Remer and Stentzler (2009), intuition, highlighted by Browe, is an important foundation of all knowledge, that is, the understanding that the acquisition of knowledge was due to the senses and observation.

For the students of the last years of secondary school, it would be possible to demand a more in-depth content, since they already have a more developed intellectual knowledge. In this case, they present favorable conditions for the understanding and mathematical understanding of theorems with a higher degree of difficulty, due to the consolidated mathematical conceptions, given the student's school trajectory. Browe clarifies that:

> In any case, mathematical teaching requires the hard master to work hard. For the disciple easily admits what he hears to explain and, with little effort, he obtains to memorize it. The master begins to insist on intellectual appropriation. The substitution, p. ex. of the letters and figures you can count on the disciple's unfailing antipathy; the many reasons why and for what the teacher asks, probing the depth of comprehension, will seem to be more needless work. However, there is an urgent need to remove the habit of receptive patience, reinforcing individual and independent work. He performed an operation - he will say why he did it this way and not in any other way, he will have to point out the end he had in mind and the foundation that served him as support. Thus it is that the alumno will learn not so much as this or that theorem is demonstrated, but whatever it is to demonstrate. (BROWE, 1906, p. 10).

It is noted that the author defends the idea that teaching cannot be limited to the mechanical reproduction of content. It is important for the student to demonstrate what he understood and how he came to such a result. This mathematical success is achieved through an individual and independent effort, not simply reproducing the proof of such a theorem, but comprising the different stages of the process. Still, according to the author:

> It happens that the constant emancipation of the words of the book and the master, the conciseness in answering the questions that cut the thread of the exhibition, form no less subsidizing for the learning of the mother language. In the field of school phychology, the exposed method usually arouses a lively interest, which I do not hesitate to call the most energetic spring of youth activity. Therefore, the teacher will know how to give preference to those

> subdivisions of the subject that most seem to invite alumno to look for the path that will lead him to the desired goal. It goes without saying that the opportunities will be more frequent in the field of practical application than in that of theoria. Extremely tiring, an endless string of theoremas whose practical use ignores alumno is harmful to interest. (BROWE, 1906, p. 10-11).

It is up to the teacher, when teaching the contents, to emphasize those that lead the student to find his results, making him the author of the goals, that is, producer of his knowledge, autonomously. For Browe (1906), practical and daily applications facilitate understanding and understanding, enabling the student to reach the established goals, that is, the methodology used by the teacher contributes to awaken and sharpen the desire to achieve mathematical knowledge.

> Show the master how to assess the height of a tree in the yard with the help of them. The elevation of a neighboring mountain, and the taste for mental work will be redoubled in the youth soul. Therefore, it will be inept to differ the practical applications until the conclusion of theoria: quite the contrary, each formula should be followed by exercises and, if not, appropriate equations. (BROWE, 1906, p. 11).

For the author, practical applications, privileging examples, such as the height of a tree and the elevation of a mountain, will sensitize and motivate the student to mental exercise. In this way, the content worked would be fixed. Here we see evidence of Browe's tendency to use the intuitive method, in which the school should teach things related to life, starting from the concrete and ascending to abstraction (COSTA, 2014). Also according to Browe (1906), the Pythagorean theorem will reach its understanding when associated with practical examples.

According to Browe (1906, p. 11), "here is the theory supervised by practice. Therefore, eliminate yourself when you do not admit practical application, either by its nature or by the young age of aluminum." This means that, if the content does not involve a practical application, its teaching will have no meaning and, therefore, it can be eliminated or

worked on at another time with the student, when the student has greater capacity for abstraction.

An outstanding example is the teaching of trigonometry. According to the author, this mathematical content is initially centered on definitions and formulas, which can make the student apathetic and without interest in the subject to be developed. It proposes a teaching focused on practical examples and contextualized, because with practical situations the student will understand the theory.

To account for this, according to Browe (1906), the theory must be restricted, but loaded with applications. Given the practical side, teaching becomes utilitarian and pleasurable, through graded application exercises, punctuating aspects of common life. For the aforementioned author, the teaching program is presented in a theoretical way, with no room for practical applications. Regarding the contents worked in the four years of high school, the following is the report of the author:

> In my opinion, there is an excess of school subjects in the programs in force: the gymnasium course seems to have as its sole objective the intellectual overload of aluminum and the lack of love for the work of the intelligence. The result is to aggravate the psychological aspect of our environment, that is, to accentuate our tendencies towards rhetorization and theoretica, to increase this singular class of pedantocrats and phraseolatras that classical teaching has created, especially in our country. (Brail). (BROWE, 1906, p. 12).

The official Mathematics program in force in Brazil had an excess of content, without giving more time to reflect on its real applicability, prioritizing knowledge not based on complete and applicable situations, based on fixation and memorization exercises. According to Saviani (1992), this teaching is characterized as traditional, intellectual and encyclopedic, since the contents are worked on separately from the students' experiences and their reality. Browe (1906) evidences that in

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the mathematics programs of other countries, the number of hours and the number of years destined to develop the school contents are taught, to the disciples, in greater number of years.

It is worth mentioning that, in Prussia and Sweden, this occurred in nine years, as described in Table 2. According to Browe (1906), what is required in Brazil, in the four years in which the teaching of Mathematics is offered and in each year in particular, as well as the number of hours allocated, there is no similar example in the civilized world. "In the face of this Brazilian scenario, it is impossible to enchant the student for teaching Mathematics, since the number of hours allocated to students does not allow to deepen the content and much less fulfill the program" (BROWE, 1906, p. 16).

TABLE 2: Official programs and division of Mathematics subject in the different junior years.

Country	Nº of Years	NUMBER OF WEEKLY HOURS								
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year
Brazil	6	4	4	5	4	-	-			
Austria-Hungry	8	3	3	3	3	4	3	3	2	
Belgium	7	3	3	3	3	8	3	3		
Denmark	6	5	6	5	5	1	-			
Netherlands	6	4	3	3	3	2	2			
Italy	8	2	2	2	2	2	3	3	3	
Portugal	7	4	4	4	4	4	4	4		
Prussia	9	4	4	4	3	3	4	4	4	4
Russia	8	4	4	3	4	4	4	3	3	
Sweden	9	4	5	5	5	4	3	3	3	3

Source: Browe, 1906, p. 16.

As can be seen from Table 2, which extends mathematical teaching for a greater number of years, in most countries. This longer time to work on the contents would certainly contribute to the development of mathematical

knowledge, respecting the intellectual development of students and providing a greater emphasis between theory and practice.

Corroborating with the findings of Browe, Leite (2014) highlights that in his homeland, Germany, high school students had twice as many classes as Brazilian high school students. Therefore, according to Browe (1906), the content is more restricted, in each year, in the other countries in relation to what must be accomplished in just four years, as verified in the official Brazilian program.

Another aspect to be highlighted is the separation of the teaching of arithmetic and algebra, which was observed in some countries. In these, some contents are worked on in later years, when the intellectual development of the students is more mature. Regarding geometry and trigonometry, the author refers specifically to time. For Browe (1906), a single year would be insufficient to address this issue, as there are many points to be addressed. The short period of time would not allow it to go deeper, as reported below:

> Our geometry and trigonometry program follows an orientation inspired by healthy and well-educated pedagogy, the overload being due only to the scarcity of time. For giving a single full year of performance to all flat geomentrics and space, we find it impossible. Assigning geometry in space to the 4th year postponed the difficulty, in resolving it. The only acceptable suggestion would be to transfer the final exam from the 4th to the 3rd year, assigning the geometry in space and the points on the conical sections. Mechanics and astronomy, forming until now the task of the 5th year, were incorporated into physics and geometry in space, since the complete theory required by the program, is totally foreign to the character of secondary education. (BROWE, 1906, p. 18).

At the end of the article, Browe presents an outline of the Mathematics program in Brazilian secondary education, as described in Table 3:

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TABLE 3: Mathematics program in Brazilian secondary education.

<table>
<tr><td colspan="3">1st year (5 hours)</td></tr>
<tr><td colspan="3">1 - Repetition of operations on whole numbers
2 – Number divisibilitty.
3 - Highest common divisor and lowest common multiple.
4 - Ordinary fractions and decimals.
5 - Metric system. Ancient system.
6 – Complex numbers.
7 – Simple rule of three.</td></tr>
<tr><td colspan="3">2nd year (4 hours)</td></tr>
<tr><td colspan="2">ARITHMETICA</td><td>ALGEBRA</td></tr>
<tr><td colspan="2">1 - Repetition of the fractions and the metric system.
2 - Periodic fractions.
3 - Simple and compound rule of three.
4 - Percentage rule.
5 - Interest rule. Discounts.
6 - Joint and exchange rule.
7 - Mixing and alloying rule.</td><td>1 - The 4 operations on whole expressions. The fundamental laws for calculating the powers.
2 - Algebraic fractions.
3 - Equations of the 1st graph of an unknown. Problems.
4 - Equations of the 1st graph of two and three unknowns. Problems.</td></tr>
<tr><td colspan="3">3rd year (5 hours)</td></tr>
<tr><td>ALGEBRA</td><td colspan="2">1 - Repetition of the matter of the past year, mainly of algebraic fractions and the equations of an unknown quantity.
2 - Generalization and discussion of problems.
3 - Calculation of powers. Powers whose exponent is null, negative, infinite.
4 - Calculation of the roots. Powers whose exponent is fractional. Extraction of the square root of numbers and algebraic expressions.
5 - Numerous irrations. Imaginary and complex quantities.
6 - Exponential and irrational equations of the 1st graph.
7 - Calculation of logharithms. Brigss system. (base 10)
8 - Logharithmic equations of the 1st graph.
9 - Geometric proportions. Company rule.
10 - Equations of the 2nd graph of an unknown. Problems.
11 - Properties of the roots. Discussion of the roots of x2 + bx + c = 0</td></tr>
<tr><td colspan="2">PLANE GEOMETRY</td><td>1 - To the points of the official program, construction exercises and problems are added.</td></tr>
<tr><td colspan="3">4th year (4 hours)</td></tr>
<tr><td>ALGEBRA</td><td colspan="2">1 - Repetition of the material from the past year, mainly from the logarithms and equations of the 2nd graph.
2 - Sponential, irrational and logarithmic equations, reducible to the 2nd graph.
3 - Binomial and trinomial equations.
4 - Reciprocal equations.
5 - Simultaneous equations of the 2nd graph, derived from geometric problems.
6 - Arithmetic and geometric progressions. Elementary notions about the convergence of the series.
7 - Undetermined analysis of the 1st graph. Problems.
8 - Compound interest. Annuities.
9 - Arrangements, permutations, combinations.
10 - Newton's binomial for integer and positive exponents.</td></tr>
<tr><td colspan="2">TRIGONOMETRY</td><td>1 - To the points of the official program, goniometric equations are added.</td></tr>
<tr><td colspan="3">5th YEARS (2 hours)</td></tr>
<tr><td colspan="3">1 - Repetition of the definition and main trigonometric formulas.
2 - Geometry in space and conic sections, according to the points of the official program.
3 - Elementary notions of astronomy.</td></tr>
</table>

Source: Adapataded from Browe, 1906, p. 19-21.

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Browe also presents examples of foreign programs and distribution of teaching materials, making it possible to verify a greater number of years reserved for the teaching of Mathematics, in relation to the Brazilian program. In this way, the task of each particular term is reduced. The author also emphasizes that educational establishments are similar to the National Gymnasium, qualified for any higher education, whether literary or technical. Table 4 illustrates the official program in arithmetic and algebra from Austria-Hungry:

TABLE 4: Austria-Hungry official program in arithmetic and algebra[16].

1st year: Numbering. The 4 operations on whole numbers. Decimal and ordinary fractions. Metric system. National monetary system. *2nd year*: Abbreviated operations. Simple rule of three. Percentage rule. Geometric ratios and proportions. *3rd year:* Rule of three composed. Interest rule. Discount rule. Company rule. Mixing rule. *4th year*: Preliminary notions of algebra. The 4 operations on whole expressions. Binomials square and cube. The 4 operations on algebraic fractions. Equations from the 1st graph to an unknown. *5th year*: Higher powers of binomials. (Pascal's triangle). Arthmetic progressions. Square root extraction. Resolution of 2nd degree equations. Cubic root extraction. Radius of the roots. 1st graph equations with two unknowns. *6th year*: Potentiation generalization (Negative exponents and their application in the decimal system: fractional exponents). Calculation of logarithms. Brigss system. *7th year:* Theory of the 2nd graph equations. Unlimited geometric progressions and application to the conversion of periodic to ordinary fractions. *8th year*: Combinations. Determination of binomial coefficients. Permutations. Repetition exercises on the subject of this program.

Source: Adaptaded from Browe, 1906, p. 21-22.

The Austria-Ungria program, shown in Table 4, distributes the contents of arithmetic and algebra over eight years, four years longer than the Mathematics program in Brazilian junior high school, allowing less content to be worked on each period school. In addition, according to Table 2, while the Brazilian junior high school program totaled 17 weekly mathematics periods, the Austria-Ungria program is organized into 24 weekly periods. Table 5 shows the official program for mathematics in Prussia:

[16] This program is accompanied by a detailed statement and full of educational notices, establishing the scope of each point.

TABLE 5: Official mathematics program in Prussia.

1st year: Repetition of the 4 operations on whole, concrete and abstract numbers. Metric system. National measurement system. *2nd year*: Number divisibility. Ordinary fractions. Simple rule of three. Metric system. *3rd year*: Decimal fractions. Simple and compound rule of three. Percentage rule. Interest rule. Mixing and alloying rule (unit reduction method). Theoremas about lines, angles and triangles. Construction exercises. *4th year*: The 4 operations on whole algebraic expressions. Equations of the 1st graph of an unknown quantity. Parallelogramms. Circle, 1st part. Construction exercises. *5th year*: Algebraic fractions. Equations of the 1st graph of one or more unknowns. Powers with integer and positive exponents. Fundamental notions about roots. Circle, 2nd part. Equivalence of figures. Polygon area. Geometrical reasons and proportions. Proportional lines. Resemblance. *6th year*: Solving square equations of an unknown quantity. Powers with negative and fractional exponents. Theorems on the calculation of logarithms. Brigss logarithms. Circle area. Rectification of circumference. Calculation of . Construction exercises. Trigonometric definitions in the right and isosceles triangle. Surface and volumes of simple bodies. *7th year*: Potentiation, radication and calculations of logarithms. Theory of the 2nd graph equations. 2nd degree equations with more than one unknown. Arithmetic and geometric progressions. End of similarity. Golden section. Generalization of trigonometric definitions. Calculation of any triangles. Calculate from quadrilateral and regular polygons. *8th year*: Compound interest. Annuities. Imaginary and complex expressions. Exercises and repetition problems on the subject of this program. End of trigonometry (sine, cosine and tangent of the sum and difference of two arcs. Multiplication and division of arcs. Exercises). Geometry in space. Application to mathematical geography. *9th year*: Combinatorial analysis. Newton binomial for integer and positive exponents. End of geometry in space. Basic notions of conic sections.

Source: Adaptaded from Browe, 1906, p. 22-24.

The official Mathematics program in Prussia, described in Table 5, is organized in nine years, five years longer than the Mathematics program in Brazilian junior high school, also allowing less content to be worked on per school term. Also according to Table 2, while the Brazilian junior high school program totals 17 weekly periods of mathematics, the official program of Prussia is organized in 34 weekly periods, exactly twice the number of hours in Brazil.

Considering tables 2 to 5 presented, it can be said that foreign countries had a more flexible mathematics program, without overloading content, none of the academic years. This fact would allow a longer time for students to appropriate the contents. According to Browe

(1906), the understanding and understanding of the disciples was important and not a simple reproduction and demonstration of a theorem without its proper understanding.

Final considerations

This study set out to address the article Mathematics in the Gymnasial course. When analyzing the annual reports (1900-1912) of the Gymnasium Nossa Senhora da Conceição, in São Leopoldo / RS, in 1906, an article was found on Mathematics in the Brazilian junior high school, written by Jesuit Browe, professor of Mathematics in Conception. It is noteworthy that the reports analyzed show the Order of the Jesuits and their relevant contributions to the formation of society in Rio Grande do Sul and Brazil, based on the *Ratio Studiorum*.

In the article analyzed, Browe indicates the intuitive method for secondary education in mathematics in Brazil, influenced by the German gymnasium and its pedagogical tendency, and criticizes the government program. For the author, the Brazilian secondary education program was presented in a theoretical way, with no room for practical applications. In addition, the mathematical contents were worked in just four years, less than in European countries, and the weekly mathematics workload in the junior high school totaled 17 periods, while the average workload in European countries totaled 26 weekly periods. . He believes that teaching mathematics should be practical and useful for students, as this area of knowledge was appropriate for developing reasoning, autonomy and reason.

As the study carried out brings reflections on Mathematics in Brazilian secondary education, at the beginning of the 20th century, it contributes to the constitution of the History of Mathematical Education. It is noteworthy that the authors of this work do not intend to evidence contradictions and criticisms regarding Brazilian junior high school in the

analyzed period. Just to highlight the strong tendency of Jesuit Pedro Browe to use the intuitive method in the teaching of Mathematics, influenced by the European pedagogical tendency.

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