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Images in textbooks of mathematics: Georg Augusto Büchler and Karl Sölter

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ABSTRACT. This article discusses the use of images in mathematics textbooks written by George Augusto Büchler and Karl Sölter, in a cultural historic perspective. Büchler´s first work, written in 1919, was aimed at the school public of school groups and German-Brazilian schools, while the second by Solter, published in 1932, was aimed at primary school. We conclude that the insertion of images in the two books analyzed, based on the intuitive method, had an instructional role but some of the images had ideological and aesthetic roles. Both authors included the images, more attractive to children's eyes, moving away from the abstraction so criticized by Pestalozzi and mathematical content presented in both books are focused on basic concepts of arithmetic, in a close connection between the child's life and the child's school life..

Keywords: arithmetic, image, intuitive learning, textbook

Imagens nos livros didáticos de matemática: Georg Augusto Büchler e Karl Sölter

RESUMO. Este artigo aborda, numa perspectiva da história cultural, a utilização de imagens em livros didáticos de matemática escritos por George Augusto Büchler e Karl Sölter. A primeira obra, de autoria de Büchler, foi escrita em 1919 e visava ao público escolar de grupos escolares e escolas alemã-brasileiras; a segunda, de Sölter, foi editada em 1932 e era destinada ao ensino primário. A inserção das imagens nos dois livros examinados (os quais foram produzidos com base no método intuitivo) teve, segundo nosso entendimento, intenção didática, embora não exclusivamente, já que algumas imagens são de cunho ideológico. Ambos os autores incluíram imagens em suas obras, tornando-as mais atrativas aos olhos infantis e distanciando-as da abstração tão criticada por Pestalozzi. Quanto aos conteúdos matemáticos nelas apresentados, estes estão centrados nas noções elementares da aritmética, numa conexão estreita entre a vida infantil e a vida escolar da criança.

Palavras-chave: aritmética, imagem, ensino intuitivo, livro didático.

Imágenes en los libros didácticos de matemáticas: Georg Augusto Büchler y Karl Sölter

RESUMEN. Este artículo trata, en una perspectiva de la historia cultural, de la utilización de imágenes en libros didácticos de matemáticas escritos por George Augusto Büchler y Karl Sölter. La primera obra, de autoría de Büchler, fue escrita en 1919 y tenía como blanco al público escolar de grupos escolares y escuelas alemanas-brasileñas; la segunda, de Sölter, fue editada en 1932 y era destinada a la enseñanza primaria. La inserción de las imágenes en los dos libros examinados (los cuales fueron producidos con base en el método intuitivo) tuvo, según nuestro entendimiento, intención didáctica, aunque no exclusivamente, ya que algunas imágenes son de carácter ideológico. Ambos los autores incluyeron imágenes en sus obras, volviéndolas más atractivas a la percepción infantil y alejándolas de la abstracción tan criticada por Pestalozzi. En cuanto a los contenidos matemáticos en ellas presentados, estos están centrados en los conocimientos fundamentales de la aritmética, en una estrecha vinculación entre la vida infantil y la vida escolar del niño.

Palabras clave: aritmética, imagen, enseñanza intuitiva, libro didáctico.

Introduction

The thesis of Valente (1999) about school mathematics in Brazil and an investigation by Silva (2000) about textbooks of mathematics of the 19th century show that works devoted to arithmetic rarely received illustrations. One of the few authors to use images for didactic purposes was Antonio Trajano, in his book *Arithmetica elementar ilustrada*, whose first edition occurred in 1879 (Silva, 2000). The situation changed somewhat in the early 20th century when debates about the intuitive method increased in the school environment and

visualization began to be encouraged. According to Choppin (2004, p. 553), the book acquires, mainly from the 19th century, an ideological and cultural function, insofar as it becomes an essential vector "[...] of language, culture and values of the ruling classes", serving as an element of construction of a national identity, as will be seen in the analysis of the two books examined in the research.

The focus of the research, object of this text[1], are on the images contained in the mathematical textbooks written by George Augusto Büchler (from 1919) and Karl Sölter (in the 1930s), authors of German descent who introduced this visual resource for pedagogical and ideological purposes, in their works. The choice of these authors was due to the fact that they brought cultural practices from another educational reality into the Brazilian context, which constitutes an example of knowledge transfer, which makes it possible to understand how the processes of idea transmission occur, and the paths traveled from the appropriation of a certain knowledge by an individual, in a certain place, to the transfer of that knowledge to another place, to a new geographic, social and cultural reality.

Aritimética Elementar is the work, in three volumes, by George Augusto Büchler. In this article, only the first volume was analyzed: the one that was dedicated to the first school year, precisely because it was the one in which the images were most widely used. In *Aritmética para o primeiro ano escolar* [*Rechenübungenfür das erste Schuljahr*], written by Karl Sölter, the images practically replace the text.

It is our objective to attain an interpretation of the insertion of these images as representation. In this sense, we will understand image as a visual representation, in the sense of Goodman. According to this author, "Representations are, then, images that function approximately in the same way as descriptions" (Goodman, 2006, p. 61). Peter Burke (2004), in turn, believes that images want to tell us something, that they are meant to communicate. In the historical sense, we can use them, trying to understand what the images can witness; according to Burke, image is what cannot easily be put into words. In their understanding, the images can provide "[...] evidence for aspects of social reality that texts overlook" (Burke, 2004, p. 37). Flores (2015) broadens the meaning of image as representation, when he says that the image

> [...] seeks to produce meanings, to inform, to describe and to interpret history, images start to be considered as events, in which historical knowledge is engendered in the midst of memories, sensations, thought, imagination (Flores, 2015, p.17) .

In short, agreeing with Burke, we will consider images, as well as texts, 'historical evidences', witnesses of the dominant thought in certain periods of the past, to try to understand, through the analysis of didactic books, the school culture current at the time. We are interested in understanding what the images inserted in two textbooks used in Brazilian primary schools communicate, bearing in mind that they are associated with the social context and that, as Vidal and Abdala (2005) say, they are not neutral, since they are produced aiming to leave for the future representations of the past.

Accordingly, it was highlighted that both books considered here were intended mainly for German schools. They had their first edition in the years 1919 and 1932, respectively, when the process of nationalization began in the country and in which German immigrant schools had to adopt the use of the Portuguese language as official language and follow the civic precepts. According to Kreutz (2010), the nationalization process gradually occurred, and the government sought to favor the nationalization in the ethnic schools with federal subsidies, starting in 1918. However, from 1937, nationalization became compulsory.

Images in books begin to be made more present in the works of authors who follow the intuitive method, so it is relevant to take a look at this method, mainly from the theorizations of Pestalozzi and his commentators.

The intuitive method

The ideas of Johann Heinrich Pestalozzi (1746-1827), arising from his experiences in the field of education, began to have repercussions in Prussia and in German-speaking countries. According to Costa (2014, p. 43), "The importance of intuition is one of the greatest contributions of Pestalozzi: he considers it the foundation of all knowledge and the principle of instruction that must be respected by any form of teaching that is used".

But what did Pestalozzi say about his method? In 1802, in an article, he explained the essence and purpose of his method, however, expressing doubts and uncertainties about him having already, effectively, a method.

> I searched for a long time the word with which I could simply but firmly express: What is really my method? I did not find it and I still do not have it.

[1] This text is the result of a more comprehensive research done in partnership with the project entitled *A constituição dos saberes elementares matemáticos: a aritmética, a geometria e o desenho no curso primário em perspectiva histórico-comparativa, 1890-1970.*

> The reason is clear. The method is not complete; I know that it is not within its scope, I know it is not in its context, I know it only by its fragments (Pestalozzi apud Korte, 2002, 32).

As Trouvé (2008, p. 274) has also identified, the method for Pestalozzi is "[...] unfinished by essence, it should not be reduced to a normative device".

In 1811, Pestalozzi wrote about the idea of a primary or basic education [*elementar bildung*] that every person needs. It is elementary because it returns to the simplest principles. It is not a question of didactics, but rather it is a method for achieving a dignified and practical life for all people. His teaching method is therefore motivated by a policy of society. It is also pedagogical by being able to cure the root of the problem of the school, which must finally help to mediate social conflicts between the poorest, the poor and a small, wealthy minority.

Pestalozzi first tried simpler, more childish ways of making the human being to learn spelling, speaking, reading, writing, arithmetic and geometry (drawing), and then formulated the educational paths and teaching materials.

The influence of the ideas of Pestalozzi on teaching in Germany was so powerful that it lasted until the beginning of the 20th century, according to the German mathematician Felix Klein (1931), when he wrote about teaching in Germany. Pestalozzi tries to make his method more explicit. He says:

> I have tried to simplify the elements of all human knowledge, and bring them into such an order of presentation, whose result appears psychologically in things, to disseminate a comprehensive knowledge and a powerful exercise of the knowledge that is essential for the lowest classes of the people (Pestalozzi, 1829, page 68).

For him, the teaching method, in a very concrete sense, would be a method for reading, writing, drawing and calculating. According to his words, "The way of teaching all is ruled by the eternal laws, which are raised to the human spirit by clear and sensitive intuitions" (Pestalozzi, 1829, p. 71).

The 'method' is what indeed each person is expected to be able to master in order to teach the children of the world and to promote their skills. Its fundamental axiom lies in the following proposition:

> The most essential aspect of which I start is the following: The intuition of nature itself is the true foundation of the real human teaching, because it is the sole foundation of the human knowledge itself. Everything else that happens is only the result and abstraction of intuition (Pestalozzi, 1829, 69).

According to Buisson (1887, p. 2943), "In the current language of philosophy in German pedagogy [...] intuitive teaching hardly means for most teachers, more than teaching by the senses and, essentially, teaching by appearance". The author goes on to explain that intuition by the senses, in the meaning attributed by German teachers to intuition [*Anschauung*], is limited to teaching by aspect, which limits its characterization a little.

Some authors of textbooks, such as those that will be analyzed in this article, understood that an intuitive teaching should be related to a greater "visualization', understood that the images should integrate the text, being an essential part of it. Thereafter, there would be room for some questions, such as: what type of role do the images in the textbooks play: aesthetic, didactic, ideological? Intentionally or not, would they fulfill such roles? It should be point out that, opportunely, here the aesthetic role of the image will be understood as the one in which the image is used as an illustration, with no explicit purpose of containing or transmitting mathematical meaning. It would be used to make the book more attractive to the reader without educational concern. In turn, ideology will be understood as a system of ideas and representations held by both an individual and a social group (Silva, 2014). Ideas and guidelines are inserted in school textbooks to shape generations. It is in the school that it is sought to learn to read, to write, to make calculations and, therefore, to obtain practical knowledge, but the school also conveys knowledge in a manner to ensure subjection to ideology. In turn, the didactic role of the image will be understood here as the one in which the use of the image is clearly linked to the learning purpose of the student, bringing implicitly a teaching method.

We will see, in the following item, how Büchler appropriated the intuitive method and disclose it in the book of arithmetic aimed at the German schools in Brazil.

George Augusto Büchler and the *Aritmética elementar*

George Augusto Büchler was born on 21st May 1884, in Steinbach (Hessen). He had 13 siblings. In this place, he attended primary school for three years and then entered the Secondary School under the Direction of the Grand Duchy [*Grossherzogliche Oberrealschulezu Darmstadt*] of Darmstadt, where he studied: religion, German, French, English, history, arithmetic and algebra, geometry, physics, chemistry, geometric design, free hand drawing, singing, and physical education. In this school,

equivalent to junior high school, he studied according to a curriculum adapted to the educational reforms carried out in that state at the time. The documents of the Blumenau Archives show that he was enrolled in that school in 1901 and 1903. After high school, in 1903, he entered the Teacher Training Seminary [*Grossherzoglichen Schullehrer-Seminars*], in Hessen, obtaining a certificate in Pedagogy and Music (Historical Archive Professor José Ferreira da Silva, 3.B.30, Doc. 08), in May 1904. The documentation does not allow inferring if he completed the course in that institution, which lasted for three years, since that in 1905 he traveled to Brazil.

In 1930, he was appointed principal of the [*Realschule*] Secondary School in Joinville, a position he held for two years. Among the various activities that he exerted, his work as editor of the newspaper *A escola colonial* [*Die Kolonie Schule*] stands out, besides having been the author of several didactic works. According to Mailer (2003), among the works he published are: *Curso de português para escolas de colônia* [*Portugiesisches Sprachbuch für Kolonieschulen*] – intended for the teaching of Portuguese for German immigrants, published in 1914 and reprinted in 1924 by the printing of GA Koehler; *O melhor método de desenvolver o ensino primário no Brasil* (Büchler, 1923); *Guia de cubagem* (Büchler, 1925).

According to information provided by Editora Melhoramentos itself, the following books of the author were published by the publisher: *Arithmetica elementar: livro I - para o ensino primario, de acordo com os programmas officiaes* (1st ed., 1919a, 4th ed., 1942); *Arithmetica elementar: caderno auxiliar do livro 1* (1st ed., 1919b); *Arithmetica elementar*: *livro II - para o ensino primario, de acordo com os programmas officiaes* (1st ed., 1921, 3rd ed., 1935); *Arithmetica elementar: livro III - para o ensino primario, de acordo com os programmas officiaes* (1st ed., 1924, 3rd ed., 1937). In the present work, the focus of the analysis is on the book of arithmetic for the first year. The insertion of images in *Arithmetica Elementar* of George Augusto Büchler is an excellent testimony to the implementation of the pedagogical principles of Pestalozzi. Büchler, as a German cultural agent, transmits and circulates elementary knowledge of a method of teaching that goes back to Pestalozzi. In initiating the preface, Pestalozzi quotes: "Observation is the absolute basis of all knowledge" (Büchler, 1942, p. iii), already positioning himself as an adept of the intuitive method. He justifies in the preface that there is an error in the treatment given to arithmetic in the initial grades, in which the abstraction, the mechanical and mnemonic transfer of the subject matter is privileged. According to him, since "[...] the spirit of the child is only capable of concrete notions by direct intuition; we always try to associate arithmetic abstractions with ambient things" (Büchler, 1942, p. iv). He completes affirming that the vision of things is not enough to attract the attention of children, it is necessary to dose the lessons with instructive and educational tales. Büchler uses the preface of his book to justify a school pedagogical practice that he believes is efficient, since it seeks to soften the transition from the family life of the child to the school life, which makes use and values the pre-school knowledge, which goes from the world of objects to the world of numbers (Büchler, 1942). To achieve his goals, he uses visualization as a means of making the transition from the world of objects, from the world the child knows, to an abstract world of school arithmetic.

In this way, representations appear in the form of drawing in all lessons. In the first one, entitled 'the coffee', it shows a family situation, where a table with six chairs appears, in a double entry table, in which, in the first line, is the family: father, mother and children, identified by their names (Amélia, Otávio, Luiza and Vitor) and, in the first column, are the objects: chairs, cups, napkins and cutlery.

The concept of unit is introduced by associating each member of the family with an object on the table. The other themes for each lesson are placed as titles: purchase of bread, economy, equality, street, milk, ball, wagon, flowers, spider, among others.

The introduction of the theme economy, in which the author seeks to show the first additions and subtractions with 'small' numbers, brings a drawing showing a situation of the family life (Figure 1). A living room in which the father appears in the foreground, in the best armchair, probably explaining the importance of saving, having in his hand an object that could be a safe; the mother, in a secondary role, at a distance, embroidering, the youngest son listening or dialoguing with the father, the two siblings accompanying the situation. If we think of a more sociological analysis of the image, perhaps we can add that the roles in the family are well defined: the father plays the main role of intellectual mentor, who holds power and who guides; the mother plays a subordinate role, performing manual labor and not participating so actively in the discussions. The people's clothing depicts the costume of the time: the little child in short pants and the mother in a long dress. As Burke (2004) points out, the image portraying domestic interiors needs to be seen with its own rules, and these include what should be shown. We agree with him: the designer made

choices, portraying what he wanted to appear in this family scene. Here the meaning we assign to images depends on the context and context is the family life of children, the relationships between them and the school, which imply that school arithmetic must be in connection with the child's family life, including their own family life. The teaching of arithmetic begins with counting people and objects from their family life.

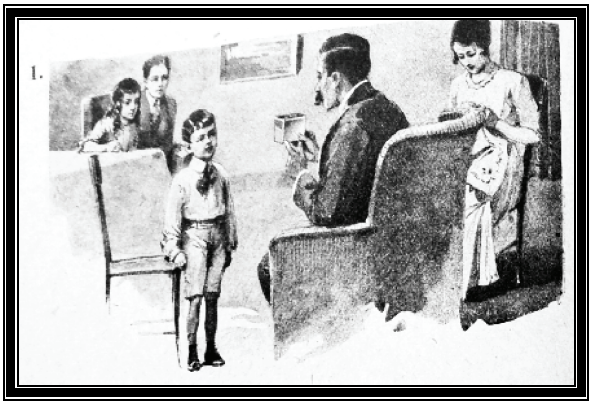

Figure 1. Family Scenes.
Source: Büchler (1942, p. 4).

The images are present in all the lessons and students are encouraged in the proposed exercises to produce their own drawings: "All of you draw this figure (a triangle) on the board with me, counting how many lines you need to draw. One, two, three, it is a triangle" (Büchler, 1942, p. 20).

> As we try to express in words what a particular image exemplifies, we are making choices in an infinitely wide universe of possibilities, because, according to Goodman (2006, p. 250), "No matter how exact any term we use is, there is always another that we cannot determine which of the two is effectively exemplified by the image in question". Thus, the choices that we will make next represent a possibility of reading, one that is related in the first place to the mathematical aspect and, secondly, to an intentionality of the author to portray a situation of daily life, an aspect of the social life or even a political view.

In order to introduce the number four, the author searches in objects of the world of the child for an association with the amount four. Just as a cart and a car have four wheels and a table, four feet, the author uses the image of these objects, 'of the concrete', to construct the abstract concept of four. The example of the introduction of the number four by the image of the cart, the car and the table reveals transports of the time (1920s), in which, in addition to the cart, the car began to be used as a means of transport. It is still possible to deduce from the images that, besides the concept of four, the author wanted to work with the spatial concept, since he introduced the notions of front and back.

As Belmiro concluded, the image "[…] allows to say that the intrinsic quality of its indicial and symbolic nature comes to contemplate the relational bias of the image as a social activity" (Belmiro, 2000, p. 15).

The images are not only useful to illustrate, they are indispensable in the context of the book, essential as promoters of a visual contact of the child's environment with concepts of arithmetic, such as one-to-one correspondence, quantities, equality, unit, addition and subtraction operations.

Activities are suggested from images, as in the case of the scale (Figure 2). The first drawing of this figure shows the scale inserted in a context of sale, to give the idea of equality. The second is a more simplified drawing, suggesting the construction of a scale in the classroom, and the third, an even simpler image, which encourages the child to repeat the simple drawing.

It is interesting how Büchler uses the scale to work on the concepts of equality (when the dishes are in balance) and inequality (when the dishes of the scale are in imbalance), characterizing these situations with appropriate drawings. Thereafter, he introduces the symbols of greater, lesser, and equal. Here again, it is visible that the image wants, on top of everything else, to transmit a method of teaching. An intuitive method, related to concrete: starting from the object scales and arriving at an abstract representation, in the third drawing, and also active, since it stimulates the child to draw the scale in a simplified way.

It is noteworthy that there is visible intentionality of the author when inserting images that relate to the nationality, in which appear a parrot and a toucan, native birds. Two concepts are involved here: quantity and spatiality. The author raises questions about the number of feet and 'toes' of each bird, as well as the direction to which these toes point.

There is a moral connotation, of discipline, visible in the text, because, parallel to the teaching of mathematical contents, the author inserts questions referring to moral and good conduct norms. Some examples appear at the end of each lesson as if they were a message to the student: "Whoever does not keep what he has to ask comes" ((Büchler, 1942, p. 5); "Two eyes, two ears, only the mouth has no pair. It means that it is more prudent to see and hear than to speak" (Büchler, 1942, p. 9); "Patch the cloth; it will last you another year" (Büchler, 1942, p. 70); "Those who lose the month do not lose the year"

(Büchler, 1942, p. 113); "God helps those who work" (Büchler, 1942, p. 120).

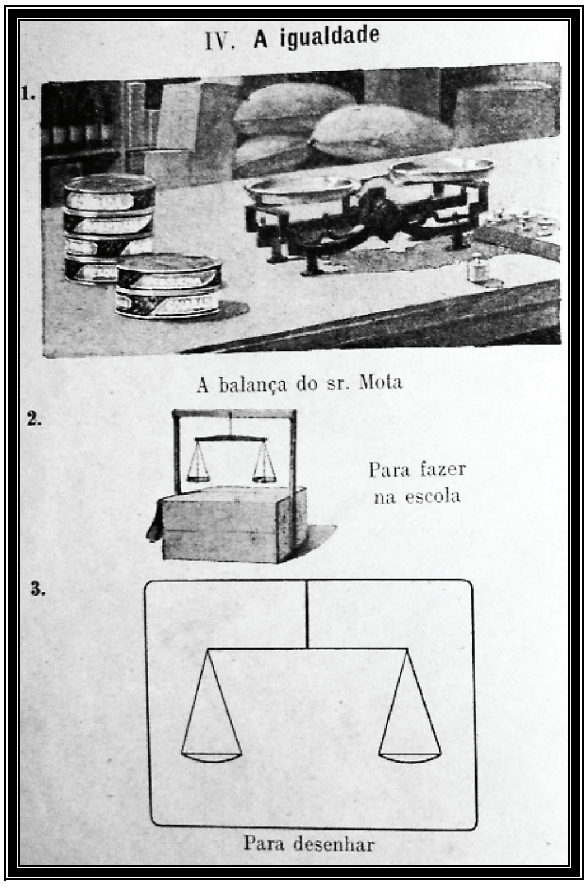

Figure 2. Equality.
Source: Büchler (1942, p. 6).

The number eight appears associated with the number of legs of a spider and the number of fingers in a hand. The drawing shows a child playing: a context of the child's life in which the child, in addition to playing, has contact with home animals such as the spider. The association of the number of legs of the spider with the number eight is the same that is made with the raised fingers of two hands.

The ideology is also present in a visible way in the text. In this period, the process of nationalization begins and the author, symptomatically, includes, among the drawings, national symbols such as the coat of arms, the Southern Cross and the Brazilian coins, making it clear that it is about a book for Brazilians. The design of the coat of arms is accompanied by questions: "How many stars are there in the Southern Cross? Compare the central star with the others!" (Büchler, 1942, p. 23).

It is interesting to observe the way in which multiplication and division operations are introduced and the type of drawings that follow them. For multiplication, he uses two images: the first reproduces a period warehouse, in which, in the foreground, is a battery with matchboxes. In the background are the sacks of cereal, as they were commonly sold at the time. The matchboxes can be read as follows: 2+2+2+2+2= 10 or 5+5=10.

Unfortunately, we find no mention in the book of the authorship of the drawings. However, in another book by Büchler, *Curso de português para escolas de colônia* [*Portugiesisches Sprachbuch für Kolonieschulen*], dated 1914, there is reference to the author of the drawings – Erich Zimmerman. We cannot identify similarities between the lines of the drawings of the two books, which means that different designers may have illustrated them.

The images in the Arithmetic of Büchler exercise aesthetic, ideological and didactic roles. Of the 159 images inserted in the book, all have an aesthetic role, serving as an illustration; the majority has didactic function, constituting in support in the introduction of concepts, such as equality, for instance. However, many images also have aesthetic role, serving as an illustration. In addition, the images that introduce the chapters have ideological background, bringing a situation of the family life of the child. They are in less number in this book. Most of the time, images play more than a role.

It would be naive to attribute only to the author an ideological intentionality of the images inserted in the text; the designer (unknown) and the publisher himself may have interfered with the images. But Büchler, whose formation in the Bensheim Seminary preferred the readings of Pestalozzi, makes clear his intentionality in the use of the images, since for him the "[...] child spirit is only capable of concrete notions by direct intuition , we always try to associate arithmetical abstractions with ambient things" (Büchler, 1942, p. iv). He complements this idea, stating that the vision of things is not enough to draw the attention of children; it is necessary to dose the lessons with instructive and educational tales.

Another author, who follows a line of thought similar to that of Büchler, is Karl Sölter, in which we will analyze next.

Karl Sölter[2] and the book Exercícios de aritmética para o primeiro ano [Rechenübungenfür das ersteJahr]

Using images to replace the text is the proposal of Sölter for a textbook dedicated to the first year of school. A book for a public that has not yet mastered

[2] Karl Sölter's book was published in Ijuí, a city in the interior of Rio Grande do Sul. We do not know much about this author, except that he was born in Germany and emigrated to Brazil (Source: Anthropological Museum Director/Principal Pestana - MADP, in Ijuí).

reading, according to Sölter, should contain many illustrations and little text. This is the justification presented in the preface to the book of 1932. K. Weber elaborated the thirty drawings, according to the author.

The first cover image associates numerals with children. The author seems to want to attract the children to the book, already putting on the cover a drawing that contemplates not only the idea of numbers, but which represents the children themselves, both boys and girls, in the school universe. Here, the paper hat – soldier – of number 10, again has connotation of nationality – as well as the children in order, indicating disciplining.

The image of the first page draws attention (Figure 3), by the picturesque, because in it, the visual appeal to the number 'one' is very strong, as well as the underlying ideology. The teacher shows, on the blackboard, representations of a child, a key and the flag of Brazil. In the classroom, a map of Brazil is hanging. This page does not contain any text, only this image. Besides, the image reveals that the children reproduce in their slates the same drawings of the blackboard, which perhaps means that they were associating the number 1 to each one of the images.

Behind the mathematical meaning of learning the number 1, we can clearly see the ideological variable involved. The nationalization movement[3] in German-Brazilian schools began more markedly in the 1930s, and the map of Brazil and the Brazilian flag were not represented by chance. There was an intentionality of the author to show, in a book of mathematics written in German language, for a public of German origin, a certain Brazilianness. The word Brazil is written with huge letters on the map, most likely trying to demonstrate belonging to the country where the children lived. The key next to the child can symbolically represent the child as the future of the country or the education as the key that gives access to a new world. Besides, it seems that, through the image, the author intends to convey the need for order and discipline in the classroom, since the children are seated neatly on the benches, boys and girls sitting on separate benches, faithfully reproducing what the teacher orders. A single girl looks at the reader, perhaps to give idea of movement to the situation portrayed. The teacher, on the other hand, is dressed with care, in a suit and tie, neatly combed and in an upright position; his desk is on a platform, evidencing the hierarchy between master and disciples. Burke (2004, p. 85) stresses that we should look at this type of image "[...] as a public representation of an idealized self". In this case, the master clothed with power, as the one who holds the knowledge, who determines what is taught and how it is taught. The drawings on the wall of children, a rabbit and arabesques, are also suggestive of a pleasant classroom where it is breathed 'childhood'.

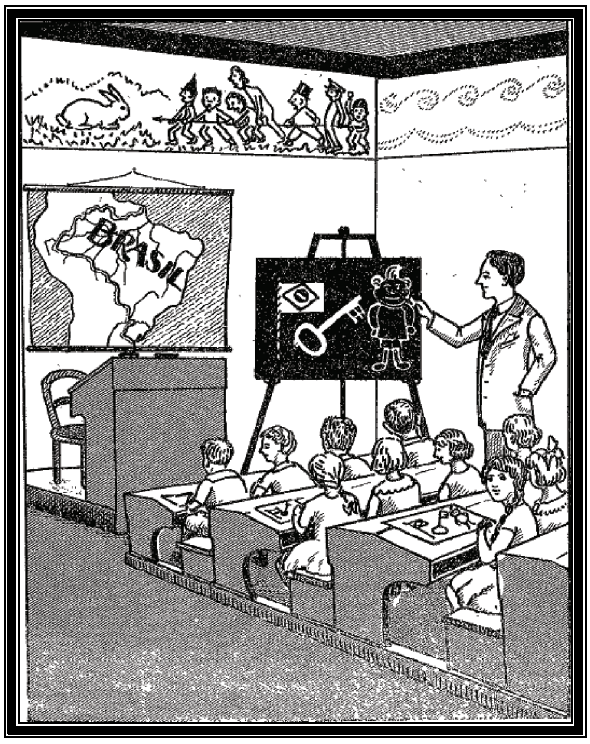

Figure 3. Number 1.
Source: Sölter (1932, p. 1).

Figure 4, page 2, shows children playing in the yard. They are arranged in such a way to give an idea of the quantities from 1 to 5: a girl follows two girls playing with the ball, having, in all, three children involved in the game with the ball; there is also a group of five children playing ring-around-the-rose.

In this image, it is possible that the author sought to present the concept of quantity. However, we can do other readings of the same image: the type of the child's play of the time, such as Ciranda (play ring-around-the-rose), the play with the ball, the outdoor play environment, in front of the school, the trees near the school building. There are no children with disabilities; they all look healthy.

After the introduction of the symbols one to five, he tries to give an idea of the addition operation, including joining situations (idea of addition) using quantities up to four. For example: a child along with another – implying that 1 plus 1

[3] According to Schwartman, Bomeny and Costa (2000), since the beginning of the 20th century, discussions on nationalization had begun, but it was under the authoritarian regime of the Vargas Era that they found an echo for its achievement.

equals 2; two children plus two children; two adults plus two children etc. The image depicts a scene of city of the interior, in Figure 5, with the truck as a means of transportation, the house with its wooden fence, the little dog next to the children, the baby in the lap and the costume of the time, the mother in a long dress with apron and the father with his chalk stripe suit. In the background, the araucarias suggest a landscape of southern Brazil.

Figure 4. Children playing.
Source: Sölter (1932, p. 2).

Unlike the addition and not as simple as it, the subtraction is represented in Figure 6 as a loss: there is a car in which four tires are visible, and there is one flat tire, which may serve to suggest the subtraction 4 - 1. The additions and subtractions are indicated by symbols of black dashes and dots; the numerals 1 to 4 still do not appear. Parallel to the drawing of the car with a flat tire, some activities are proposed: adding and subtracting dots and lines, so that the answer is always a number between 1 and 4.

Merging images and proposed activities, the book evolves with little text, expanding the numerical set of natural numbers, for a student who is still in a preliminary phase of learning the German written language.

The numbers 1 to 10 are presented neatly and associated with the quantity of dots. Other objects begin to appear, to designate quantities, such as a bunch of ten bananas and a basket of 10 fruits, which can be oranges. Brazilianness is evident in this drawing: there are bananas shown, typical fruits in the tropics.

There is a suggestive image of subtraction as loss, in which a baby drops objects lying on the table. So to give an idea that five minus three is two, the baby dropped 3 cups, remaining 2 on the table. We notice that whenever the operation is subtraction, there is a suggestion of white dots (lost color) in opposition to addition when all the dots are black (with color).

Figure 5. Situation of quantities to add.
Source: Sölter (1932, p. 3).

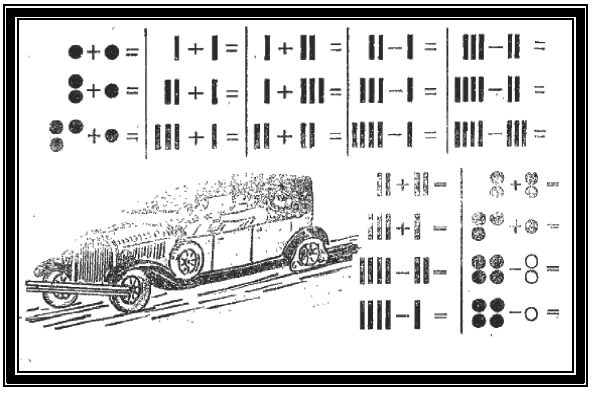

Figura 6. Addition and subtraction operations.
Source: Sölter (1932, p. 3).

One hundred and twenty exercises, without any text, involving, simultaneously, addition and subtraction operations with up to 4 parcels are proposed.

Another image, showing child's play of boys, refers to the mix of ethnicities: a boy wears a typically German hat, but also appears a boy with a headdress and bow and arrow, identifying a native Indian.

To denote the subtraction as the reverse operation of addition, Figure 7 shows a boy with slingshot breaking glass panes. Subtraction appears as a loss, broken glass means less glass panes. The image has a disciplinary connotation as it involves an adult with a wand in his hand, threatening the boy with a punishment. Again agreeing with Vidal and Abdala, the images of yesterday leave their legacy to

the present: physical punishments were applied to children, and there was no tolerance to antics.

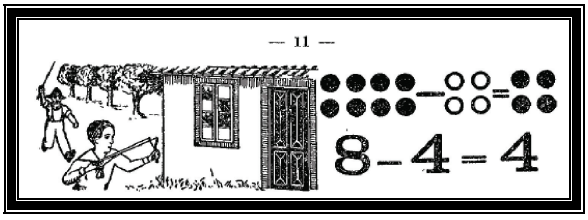

Figure 7. Subtraction.
Source: Sölter (1932, p. 11).

The multiplication operation appears in an image containing an abacus, but without stating that it is such an operation, because there are almost no texts in the book. Introducing a figure with the abacus seems to indicate a school practice that used such a counter for didactic purposes.

The multiplication operation is introduced as addition of equal parcels. However, after a short preamble, there are already some multiplications, which, however, do not exceed 20.

After several exercises, problems written in German are proposed:

Irma has 2 x 2 plums = ...; Irene has 5 x 2 plums = ..; Wilma has 3 x 2 plums = ...; Gerda has 4 x 4 plums = ...; Herma has 5 x 4 plums = ...; 2 pairs of shoes = 4 shoes; 5 pairs of shoes = ... shoes; 9 pairs of shoes = ... shoes; 5 pairs of socks = 10 socks; 7 pairs of socks = ... socks etc.

The division operation begins with the idea of sharing a certain amount of fruit between two children. Thus, some phrases are introduced:

"Waldy shares 10 apples with Nelia. Each receives 5 apples. 10: 2 = ...; Rudi shares with Norma 8 apples. Each receives .... apples. 8: 2 = ...; Erni shares with Ida 20 apples. Each receives .... apples. 20: 2 = ..." (Sölter, 1932, p. 39).

Increasing the difficulty level, divisions by 3 and 4 are proposed. Examples: "3 sisters divide 9, 3, 15, 12, 18, 6 bananas. 3 balls cost 6, 9, 15, 3, 12, 18 thousand. How much does a ball cost?" (Sölter, 1932, p. 39).

The last page of the book shows a suggestive drawing in which 20 rectangles are associated with multiplication tables for 2 and 3, on the right grouping 2 by 2, on the left grouping 3 by 3 (Figure 8).

Sölter considered counting and elementary operations in the numerical set of 1 to 20 as the fundamental basis of all learning of arithmetic. For him, children should be exercised both orally [*mündlich*] and in writing [*schriftlich*], until they completely master this numerical universe, as he states in the preface. There he also promised four books for the first four grades available in both languages: German and Portuguese. We only had access to the German version[4]. Sölter used the image as a distinctive reading horizon, dispensing with the text, while Büchler explored images and texts in a complementary way.

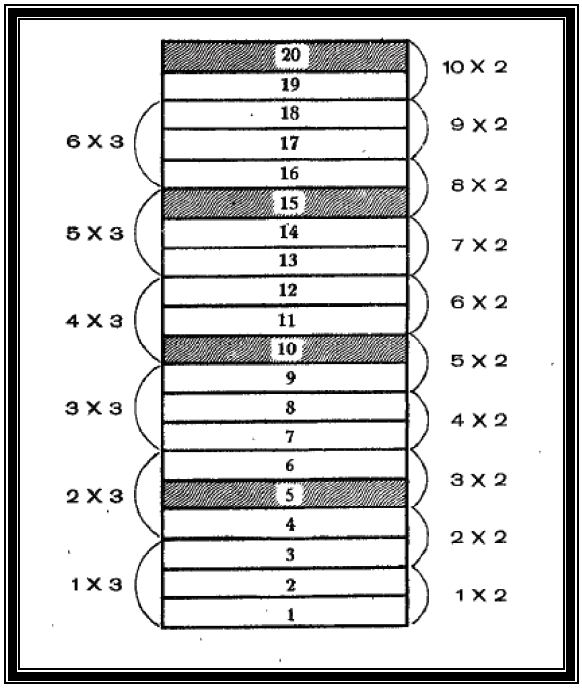

Figure 8. Multiplication.
Source: Sölter (1932, p. 39).

The book analyzed possesses 72 images, most of them have didactic role, some reveal ideological component. We did not find images of purely aesthetic nature.

Final considerations

The images in the books of the two authors have predominantly didactic role. Since these are books for the first school year, the authors, based on the intuitive method, credited visualization with an essential role in learning. Büchler says textually in the preface: "The true ideas of number, such as those of form and color, belong to the facts whose conception are mainly due to the sense of sight" (Büchler, 1942, p. 2). Because he believed that the child spirit is only able to reach concrete notions by direct intuition, he sought to associate mathematical abstractions with the objects of the child's environment. Hence, he presents in his texts 'pictures' of the house of the child, of the school, of

[4]Sölter published 4 volumes of *Rechenbuch*; 4 volumes of this book, which each cost $ 500, appear in advertisement in the newspaper *Lehrerzeitung*, and as edited by Livraria Serrana (*Lehrbücher*, 1935).

children in social situations, of objects and animals of the family universe, which refer to the child experience.

Sölter (1932) produces a book in which he includes a more visual and attractive material to children's eyes, distancing himself from the abstraction so criticized by Pestalozzi. Just as Büchler, he brings to the textbook the daily life of children: school, home, children's play, toys, antics, fruits and food, coins and, mainly, children themselves.

Both authors sought to 'nationalize' the textbook of arithmetic [5], incorporating elements of the Brazilian context, such as national symbols, animals and native fruits. Agreeing with Aumont (1995), we perceive that the productions of images in both books are not gratuitous: they were forged to convey a teaching method, to exemplify the situations that can be placed as motivators for the learning of elementary mathematical knowledge.

As Trouvé (2008) points out, the intuitive method moves from the concrete to the abstract, and in this sense, both authors used images - representations of everyday objects - to construct the abstract idea of number, elementary arithmetic operations, such as addition, subtraction, multiplication, and division. One of the means to achieve their goals is the visualization, as a resource to make the transition from the world of objects, from the world the child knows, to an abstract world of school arithmetic.

Although we should take some care, as Burke says, to avoid considering the image as a 'instant', this immediacy is an illusion, since the images are impregnated with the imagination of the designer who, in creating, often represents ideal situations or copies, making choices of what to include – and, also, to exclude – in their drawings. Representations of domestic, school, and street scenes may have been 'cleaned', showing their models as best they could. Perhaps the teacher in a suit, in Figure 3, describes an ideal teacher on a festive day or in an urban school, and not necessarily the one who worked in the rural area.

The mathematical contents presented in both books are focused on the elementary notions of arithmetic, in a close connection between the child's life and the child's school life. The images contained in these books, as Burke says, allow us to 'imagine' the school past of the lived way of living.

[5] The Brazilian government feared that the German government was using German-language schools in Brazil as a tool to advance German geopolitical interests in Brazil.

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