

ARITHMETIC TEACHING IN THE ALMEIDA JÚNIOR'S TENURE: THE USE OF GAMES AS A PSYCHOLOGICAL AND METHODOLOGICAL TOOL

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ABSTRACT

This paper seeks to investigate the attempts of pedagogical renewal in the period 1936-1938, particularly when Antônio Almeida Júnior headed the General Board of Public Instruction of the State of São Paulo. During his tenure, he advocated the reorganization of the education system aiming at greater efficiency. Following his guidelines, a few normal schools of the São Paulo state capital adopted modern pedagogical practices assisted by psychological instruments aiming to adjust the students to the school. From the standpoint of Cultural History, we intend to analyze the pedagogical renewals for arithmetic teaching. What changes were established in the school culture for arithmetic teaching taking into account psychological knowledge? The study showed that, in the case of arithmetic, new materials were incorporated into the school culture of the time aiming at a better performance in education.

Keywords: Arithmetic; Games; Primary Education; Pedagogy.

RESUMO

Esse texto busca investigar as tentativas de renovação pedagógica no período de 1936 a 1938, sobretudo quando Antônio Almeida Júnior esteve à frente da Diretoria Geral de Instrução Pública do Estado de São Paulo. Em sua gestão defendia a reorganização do sistema de ensino visando maior eficiência. Seguindo suas orientações algumas escolas normais da capital paulista adotaram modernas práticas pedagógicas auxiliadas por instrumentos psicológicos visando ajustar os alunos à escola. Sob a ótica da História Cultural pretende-se analisar as renovações pedagógicas para o ensino de aritmética. Que transformações se estabeleceram na cultura escolar para o ensino de aritmética tendo em vista os conhecimentos psicológicos? O estudo evidenciou que em se tratando da aritmética novos materiais foram incorporados à cultura escolar da época visando um melhor rendimento do ensino.

Palavras-chaves: Aritmética; Jogos; Ensino Primário; Pedagogia.

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1. Introduction

The early 20th century witnessed an increase in studies that sought, in experimental psychology, scientific support that could give answers to the problems of low-income students of public education. The idea arose from science-based psychology – which aimed to understand the development of the human mind through observation and description of its contents – and medical knowledge of the mental hygiene movement, which aimed to “develop mental disorder prevention devices that could be widely disseminated to the modern urban populations” (CAMPOS, 2003, p. 129). Influenced by these two strands, applied psychology conquered the educational space, especially based on the studies of Alfred Binet² (1857-1911) and Théodore Simon³ (1872-1961) – the developers of the Metric Scale of Intelligence, in 1905, which was originally created to objectively address a pedagogical phenomenon: the creation of special classes for the abnormal. Later, it came to be applied to students of primary classes.

Studies by Binet and Simon have spread through Europe and the United States, assisting pedagogy in the scientific of school phenomena from the standpoint of saving time and improving school performance. In Brazil, the first ideas concerning the use of psychological instruments to measure students’ learning ability and what they actually learned during instruction were intensified in the 1920s with experiences in public schools in Rio de Janeiro, Minas Gerais, Bahia, Recife and São Paulo, to name a few cases.

In São Paulo, one of the main promoters of psychological tools in education was Lourenço Filho (1897-1970).⁴ According to Lourenço (1928), the need to organize the classes with illiterate students and highlight the advantage of the use of psychological tests gave rise to the idea of using tests to verify individuals’ ability to learn, especially in elementary school. His experiments resulted in 1933 in the publication of the work “*Testes ABC para verificação da maturidade necessária à aprendizagem da leitura e da escrita*” (“ABC tests to verify the maturity necessary to learn how to read and write”). Those were tests, as the name reveals, aimed to check the maturity of the student to be educated. They were used as criteria for organizing selective or differential classes. With their application, children were classified into three categories: those who learn quickly, in common conditions of public education; those who usually learn in over the course of the year; and finally, less mature children, who could only learn with proper exercises and expert assistance. These tests were widely disseminated and used in Brazilian schools in an attempt to homogenize the classes for better performance of education and were part of pedagogical renewal attempts in the 1930s.

For this article, we were interested in the renewal attempts of the São Paulo public education in the period 1936-1938, particularly when Antônio Almeida Júnior (1892-1971)⁵ led the Board of Public Instruction of the State of São Paulo. This option is

²French physician and psychologist.

³French physician.

⁴Manuel Bergström Lourenço Filho, Brazilian, educator and pedagogue, known in Brazil as one of the main promoters of the New School ideas.

⁵Antonio Ferreira de Almeida Júnior, professor at the Normal School of Praça (1909), physician graduated from the School of Medicine and Surgery of São Paulo (1921), head of the school medical service of the state of São Paulo (1933), teaching director of the Secretariat of Education of São Paulo (1936-1938).

justified by the fact that, during his tenure, a series of eighteen Bulletins⁶ was published containing normative guidelines aimed at inculcating a scientific way to treat public instruction and practices that attempted to incorporate them into the school culture of the time. These bulletins were “true monographs addressing, in a clear and concise way, a number of subjects of real importance and relevance for those who work in teaching” (REVISTA DE EDUCAÇÃO, 1936, p.169).

During his period as director of the São Paulo public instruction authority, Almeida Junior continued the initiatives proposed by previous administrations⁷ and sought to keep the prescriptions regulated by the Education Code (1933), a document he had helped draft during Fernando de Azevedo’s tenure, which used the same *strategies*⁸ of previous administrations, consisting of publishing official periodicals “as a key tool in shaping teachers’ mentality” (SANTOS, 2014, p.122). The publication of these reports is due to the need to disseminate among public instruction professionals the scientific basis for school reorganization and pedagogical renewal.

2. Pedagogical renewal in the Bulletins of the Board of Education

The collection was inaugurated with the publishing, in 1936, on the *Curso abreviado de administração escolar* (“Short course in school administration”). It consisted of a summer course for the Primary School directors of São Paulo, sponsored by the Institute of Education in partnership with the Board of Education of the State of São Paulo, held on December 12-21, 1935. This Bulletin included a summary of lectures given⁹ during the course. Among the topics¹⁰ discussed, we were mainly interested in the ones related to pedagogical renewal and the homogenization of primary classes.

⁶Bulletins: No. 1 – Short Course on School Administration; No. 2 – Suggestions for Programs in Normal Schools; No. 3 – Children’s School Libraries; No. 4 – The Problems of Primary School in the Rural Areas; No. 5 – Problems in School Administration; No. 6 – The Pedagogical Meetings of January 1936; No. 7 – Failure in Primary School; No. 8 – Regional Teaching Stations; No. 9 – A School of Application; No. 10 – Contribution to a Changing Technique; No. 11 – The Sítio da Saudade School; No. 12 – Official Gymnasiums and Normal Schools; No. 13 – Secondary Teaching; No. 14 – Pedagogical Meetings of January 1937; No. 17 – Normal School Programs; No. 18 – Pedagogical Meetings of January 1938. We have not yet found the titles of Bulletins No. 15 and 16.

⁷Lourenço Filho (1930-1931); Sud Mennucci (1931-1932); João Toledo (1932); Fernando de Azevedo (1933), Sud Mennucci (1933); Francisco Azzi (193-1934); Luiz da Motta Mercier (1934-1935); Almeida Junior (1935-1937). (MELLO, 2007).

⁸From the Certeauan standpoint, the *strategies* postulate “a place that can be circumscribed as its own and, therefore, can serve as a basis for managing its relations with externality” (DE CERTEAU, 2012, p.45). The strategy was established as a mechanism of domination. In this sense, the place of power occupied by those responsible for official teaching prints show “evidences of devices for imposition of knowledge and standardization of practices” (CARVALHO, 2003, p. 130).

⁹Lectures given by the following collaborators: Fernando de Azevedo, Antônio Almeida Júnior, Rodão Lopes Barros, Noemy Silveira Rudolfer, Onofre de Arruda Penteado, Luiz Gonzaga de Camargo Fleury, Carolina Ribeiro, Ernestina Giordano, Maria Antonieta de Castro, Mary Junqueira, Adalívia Ribeiro, Iracema Silveira, Lenira Fracarolli, Celisa Ribeiro de Arruda, Estella Miranda de Azevedo, and Maria José Cardoso Gomes.

¹⁰Day 12: The Function of Primary School; Day 13: The Principal’s Role in Primary School; Health for Primary School; Day 14: Visit to the School Hygiene Inspection; Parent-Teacher Association; Fundamentals of Didactics; The Problem of Promotion and Failure; Day 16: Primary School Support Institutions; Day 17: The Project Method; Visit to the “Marechal Deodoro” School Group; Day 18: Teaching Efficiency Factors; Day 19: Poor Adjustment in Primary School; Day 20: Children’s School

The lecture “*Homogeneização das classes*” (“Homogenization of classes”), taught by Noemy Silveira Rudolfer (1902-1980)¹¹ discussed the precarious performance of primary schools in São Paulo and possible measures to improve the use of public funds, teachers, and students. A convincing strategy by Noemy Silveira Rudolfer was the counterpoint to the trendiest model in São Paulo schools, i.e., the organization of classes without selection criteria, hampering pedagogical practice and resulting in the inefficiency of teaching. The “remedy” suggested, aiming at learning efficiency and greater savings of funds for education, would be the classification of primary school students “through objective trials and intelligence and educational tests.” In this sense, Lourenço Filho’s ABC tests and the Dearborn intelligence tests were suggested for the first year. For second-, third- and fourth-year students, the Dearborn or Ballard intelligence tests and the school performance results for the previous year were used. The classification of students was suitable for “readjusting problematic cases within at most 2 months since the beginning of the school year” (RUDOLFER, 1936, p. 42). In the event that some of these students failed to adapt, special classes were created for individual education. To address the cases of these students, Rudolfer (1936) gave a new lecture addressing the issue. Cases of poor adjustment could be related to the situations of education, social situations, and skills. In the case of teaching situations, it was necessary to diagnose and address individual differences in intelligence.

This course also included the study of the project method, whose experimentation was proposed by the Board of Education and teachers of the public and private network. To do that, a few officials were sent to the Federal District, “to observe and appreciate the modern organizations tested there” (ANUÁRIO, 1936, p 125). This measure was intended to meet Almeida Júnior’s guidelines to disseminate the project method to São Paulo public schools.

At the request of Almeida Junior, Professor Clodomir Ferreira de Albuquerque was assigned to read the reports of regional delegates regarding the pedagogical meetings held in 21 school districts in January 1936, and produce a summary for publication in Bulletin No. 6. These meetings were aimed at meeting the requirements of the Education Code, which established that regional delegates, inspectors and directors of primary schools should meet in the second half of January for a joint discussion of pedagogical and administrative issues. For the 1936 meetings, the Board of Education was asked to discuss the improvement of the school unit performance and convenient testing of the project method, among other topics.

Professor Clodomir Ferreira de Albuquerque’s reading allowed him to highlight the reports discussed and suggested “appropriate measures that had the aim of improving the school system and causes deemed harmful to student achievement and regular efficiency of education” (ALBUQUERQUE, 1936, p. 5). One of issues discussed was related to the homogenization of classes.

Library; Visit to the Children’s Library of G. E. “São Paulo”; Day 21: Homogenization of Classes; Course Closure (SECRETARIA, 1936, p. 14).

¹¹Professor graduated from the Normal School of Brás, assistant of Lourenço Filho in the Department of Psychology and Pedagogy of the Normal School of Praça from 1927 to 1930, when she helped in the standardization and application of the ABC test.

Regarding the performance of school units, the reports agreed that students' intelligence should be measured prior to their distribution in classes; "the organization of classes composed of different degrees" should be avoided "to the greatest possible extent"; and that the classes with weaker students should be entrusted to previously chosen substitute teachers. As for the project method, regional delegates concluded that it was necessary to create experimental schools to practice the method, as well as the promotion by teachers who were already familiar with it. That was done by Almeida Júnior, who asked teaching delegates to list schools that somehow were developing renewal initiatives. The experience of one these schools was published in the Bulletin No. 9. It consisted of the homogenization experience and school reorganization of the primary education at the Padre Anchieta Normal School, formerly called Normal School of Brás.

Not coincidentally, the experience chosen for publication in the bulletins showed in practice the incorporation of the guidelines discussed in previous bulletins: classification of students by testing, teaching methods, classes for poorly adjusted students etc. According to Almeida Júnior (1936: p. 4), that school was "deeply imbued with the spirit of pedagogical remodeling and stirred by a comforting enthusiasm of initiative and innovation."

This Bulletin recorded the diagnostic method and therapeutic intervention used for organization of classes, in this sense, the ABC and Dearborn tests for homogenization of classes and the subsequent higher performance. The classification of students allowed their distribution among strong, medium, medium-low, and weak classes. Weak students aroused greater attention from the directors, resulting in special classes with small groups of children according to the revealed marked delay in learning of "fundamental techniques", i.e. calculation (oral and written), reading, and arithmetic (TOLEDO, 1936, p.16). These classes were referred to as Laboratory Classes and were in charge of the students of the teacher school course, under the supervision of the Teaching Practice teacher, Leontina Silva Busch.

Part of the students soon returned to regular classes and those poorly adjusted required a more thorough investigation by hygienic measures, with the organization of medical and pedagogical records to ensure normal development. School reorganization of the primary education course of Padre Anchieta School was guided by the New School ideas, especially those proposed by Lourenço Filho, who considered it necessary to classify students to organize homogeneous classes, with parallel courses of various speeds and modification of the educational process for pedagogical renovation. According to Lourenço Filho, cure required a diagnosis.

The cure should come from teaching methods, especially those from experiments in experimental schools, such as the project method, centers of interest, and the Maria Montessori method. According to Almeida Júnior's regulation (1936), schools should adopt the project method to the greatest possible extent. Taking into account this instruction, the primary education course of the Padre Anchieta School adopted the project method concomitantly with practices that were already being developed at the school by the traditional method.

That, however, would not be cause for criticism by Almeida Júnior, as his convincing strategy consisted of avoiding severe criticism of the traditional school, as "previously

done by a few passionate reformers,” who considered it a “collection of defects” (ANUÁRIO, 1936, p.128). Rather, he argued that the traditional school had reached the level of a “quite satisfactory *average type of traditional* school, marked on the one hand by inferior schools, explained by the extension of the São Paulo system, and on the other hand, by a number of true renewal attempts.” He also advocated the wisdom of teachers – victims of administrative continuity – for adopting innovations. Nevertheless, he found a few innovations in the São Paulo school, such as the teaching of reading, which had been monopolized by some administrations, resulting in a literacy work that created “artificial interest in learning that is unattractive in nature. These innovations respected thus the precepts of motivation” (ANUÁRIO, 1936, p. 128). This occurred in the teaching of elementary calculus, which was transformed by some teachers into a “fertile pleasant *game* for children” (ANUÁRIO, 1936, p. 129). These examples evidenced that the São Paulo school was a “traditional” but not “traditionalist” choice. The justification for the delay by the São Paulo system in adopting the pedagogical renewal lay in the “healthy caution of large organizations – such as private institutes – in venturing into radical changes”; lack of space to experience innovations; and the lack of commitment from normal schools to teaching technicians at a satisfactory level (ANUÁRIO, 1936, p. 129).

The experience developed in the primary education course Padre Anchieta School aimed to approach the theoretical part developed in the teacher course at the school, and the practical part. The idea was that the students should develop the habit of “investigating, creating or manipulating materials” and never “teach a class without having the objects or illustrative elements that facilitate learning motivation” (BUSCH, 1937, p. 21). The normalist students thus created various educational materials to assist in laboratory classes and, later, primary education. These materials become the “intuitive, practical and experimental teaching, aiming to facilitate the understanding of all the subjects of the curriculum” (BUSCH, 1937, p. 31). Nevertheless, they differed from the materials used by the intuitive teaching of the Lessons of Things¹², as they consisted of previously experimented materials.

Many were the materials prepared by the normalist students for teaching reading, writing, calculus, geography, history, natural sciences, and engineering. In addition to the materials, “hundreds of lesson plans were produced, which had been adjusted according to the Herbartian methodology, the design method proposed by Dewey, or the Decroly system” (DIÁRIO POPULAR, 12/2/1936, apud BUSCH, 1937, p. 170).

One of pedagogical renewals found in experiments for arithmetic teaching included the games. This type of material was suggested by Decroly, as they “yielded appreciable effects when applied in kindergartens and irregular or abnormal children” (LOURENÇO FILHO, 1930, p. 155). Nevertheless, they should not be taken as the essence of the method, as most games did not fit the primary classes. Rather, the idea of a “game situation” should be adopted, to become permanent in the new school (LOURENÇO FILHO, 1930, p. 155).

¹² Also known as the Instiutive Teaching Method, which argues that “the act of knowing begins with sensory operations of the outside world, producing sensations and perceptions of facts and objects that constitute the raw material of ideas.” Acquired ideas are thus stored in memory and examined by reasoning, to produce judgment (VALDEMARIN, 2000, p. 76-77).

That was the idea adopted by the normalist students. The games developed by them were a kind of “activity guided, proposed and controlled by teachers, providing the children with the possibility to repeat what was taught,” that is, school exercises were treated as games in order to attract children’s interest (SANTOS, 2014, p. 10). The Teaching Practice teacher recommended that the games should be “explored with a psychological acumen in order to awaken them easily and gladly maintain children’s activities” (BUSCH, 1937, p.143).

Initially, the normalist students developed teaching plans in the format of small projects with the “goal of efficiently teaching program issues” (BUSCH, 1937, p. 25). These plans resulted in materials that would later be experienced in laboratory classes to assist in the teaching of various subjects in primary education, including posters, games, albums, maps, murals, relief maps, and scale models. The materials produced should “reflect the educational program itself” (BUSCH, 1937, p. 34).

Unlike other materials used in intuitive teaching, this material should come from research and experimentation, standing out thanks to its “psychological mark, which printed the activities around it, from prior imagination of its characteristics and the design and implementation of plans of acquisition to the presence in class, facilitating the objective learning of its intrinsic properties” (BUSCH, 1937, p. 33).

During the experiments with the materials in the laboratory classes, the normalists were able to notice “the games’ power to generate and maintain activities with children who had been deemed overdue for teaching in their classes; yet, by the end of the year, they achieved most of the degree of progress required for their promotion to the next grade” (BUSCH, 1937, p.74). Based on the above, we can infer that the manufacturing of those materials was intended to arouse the interest and keep the attention of students, one of the recommendations of the pedagogic renewal.

3. Games as subjects for renewed arithmetic teaching

The materials produced by the normalist students gave rise to the organization of a School Museum. In addition to the materials produced, this museum contained other types of objects that facilitate teaching. With regard to the teaching/learning of arithmetic, the materials were listed as follows:

1. Posters with digit calculations. Flashcards.
2. Mechanical counter, or small cube collection;
3. Balance with weight collection (illustrations of different weights);
4. Meter in one piece, folding meter, measuring tape;
5. Square meter, cubic meter (detachable);
6. Measuring tape, measuring chain;
7. Liter, half-liter, deciliter, centiliter, milliliter; quarter and ¼ quarter.
8. Metric system map;
9. Level and plumb;
10. School clock;
11. National currency collection;
12. Geometric map;
13. Geometric solids;
14. Protractor, square and large compass;
15. Full drawing kit;

The indication of those materials was intended to meet the program implemented, which showed the practical teaching of measures, the monetary system, application of “numerous games”, and the study of forms “in sight of solids” (SÃO PAULO 1934, p. 69).

Regarding the materials, hundreds of games and posters were produced to be used in primary classes and, more effectively, in *laboratory classes*, as they were entrusted exclusively to second-year normalists. Part of the materials prepared by the normalists was presented in the book “*Organização de Museus Escolares*” (“Organization of School Museums”), authored by Professor Leontina Silva Busch. This book points out eleven games for the teaching of arithmetic, according to Table 1.

Table 1 – List of games for arithmetic teaching

Name game	Teaching degree	Objective
Dice game	1 st year – intermediate stage	Helping speed up addition and subtraction calculation
Flower game	1 st year – intermediate stage	Remembering small calculations
The calculator	1 st year – advanced stage, and 2 nd year	Achieving fast addition and subtraction calculation
Flag game	1 st year – advanced stage, and 2 nd year	Helping in the memorization of the multiplication table
The Aquarium	1 st year – advanced stage, and 2 nd year	Stimulating rapid calculation
The numbers’ race	1 st and 2 nd year	Training speed in varying calculations
Tombola game	1 st year – advanced stage, and 2 nd year	Remembering the multiplication tables
Gifts for the family	1 st year – advanced stage, and 2 nd year	Helping solve vital problems
Flashcards	1 st year – advanced stage, and 2 nd year	Memorizing the multiplication table the quick sum of equal groups of digits
Numeral game	2 nd year	Helping in the memorization of Roman numerals to XXX
Calculation poster (Division with remainders)	2 nd year	Providing an opportunity for mental calculations, remembering the tables with divisions by 6, with remainders.

Source: Table prepared by the author based on the work of Busch (1937).

According to Santos (2014, p. 114), the classes of the 1st year of primary school were subdivided into small groups according to the degree of progress in “syllabication stage”, “intermediate stage”, “advanced stage”, and “final stage or 2nd year (beginning)”. Despite the lack of further details on the programs developed in the *laboratory classes*, the goal of each game showed that most were intended for students of the 1st and 2nd year and aimed at the fast implementation of the four operations and application in problem solving. It is also possible to infer that the use of games in calculus teaching sought to make learning more effective and to reduce the time of implementation via the memorization of multiplication tables, given that the emphasis was on memorization, training and the speed at which the multiplication tables were learned.

Throughout her career, Professor Leontina Busch “advocated the use of games as an indispensable resource for motivation and learning among children.” This is confirmed by the minutes of the pedagogical meeting of May 2, 1945, convened and chaired by her, at which the calculation teaching method was put into debate for the benefit of games that should “have wide application in the teaching of multiplication tables, as they stimulate children’s interest, keeping the attention to the class” (SANTOS, 2014, p. 42). The main idea was that students should learn for themselves by seeing, touching, and manipulating. The teacher’s interference should be minimized to the maximum.

Although the publication on the materials makes no explicit reference to the studies conducted by American psychologist Edward Lee Thorndike, we identified the use of his ideas in one of the materials, i.e., the *Gifts for the family*, used as an aid in solving vital problems. The idea was to propose for the children, on a poster, a list of gifts for father, mother and siblings by asking them to choose a gift for each family member and the method to obtain it. According to Thorndike (1936), this type of activity motivated students to discover the process of addition, without being taught first, in addition to a possible activity in everyday life. This material was adapted from the book “*The New Methods in Arithmetic*”, by Thorndike. According to Marques (2003), the author defended the practice games for motivation and training of arithmetic skills. The connectionist psychologist Thorndike argued that

the statements of the Problems or activities developed by the student contained ‘elements that were identical’ to situations that take place outside the school environment. It was the presence of identical elements that, according to Thorndike, (1905, 1913), would ensure that a connection would be established and that learning happens, as according to the author, learning means connection (SANTOS, I. 2006, p. 137).

Therefore, we believe that the material “*Gifts for the family*” sought a connection between the knowledge acquired on the four operations and a situation likely to occur in everyday life. It is also important to note that Thorndike was devoted to studies of the tests.

4. Final considerations

The Bulletins published during Almeida Júnior’s tenure showed a number of initiatives that sought to improve teaching efficiency by scientific means. To this end, it sought to sort and distribute students in selected classes and reclassify those considered weak throughout the school year. Homogenization alone, however, would not be enough – they saw the need for adaptation of teaching methods, programs, times and guidance to the teachers for implementation of those measures. Finally, a pedagogical renewal was necessary to consider the psychological development of the children.

Regarding the teaching method, it is clear that it acquires great importance in the cure of diagnosed pedagogical problems, though it was not always the same, varying according to the material and the content to be taught. We also noted that the method to be applied should be the one that could best enable student development.

For arithmetic teaching, it noticed that the indications of the incorporation of games in school routine resulted in new pedagogical practices. Such statements are justified because these materials have proven to be the most appropriate method to arouse students' interests, as opposed to the logical order of operations, and to develop speed in basic desirable knowledge for everyday life. Abstraction would be in the background, and teaching occurs initially with the concrete representation based on the use of games. The problems seem to have been prepared by the students so that they could establish the connection between the learned content and everyday life situations.

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