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"It is not Hard to Teach Math": The Prominence of NEDEM in the Diffusion of Modern Math in Paraná's State[1]

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ABSTRACT

This paper discusses the trajectory and prominence of NEDEM (Centre for the Study and Dissemination of Teaching of Mathematics), which is a group that in the 1960s spread the Modern Math Movement in Paraná's state in Brazil. Based on historical sources constituted during the elaboration of eight Master and two Doctor theses, concluded in the first decades of the year 2000, in the Postgraduate Program of the Pontifical Catholic University of Paraná's State, the study, conducted in the perspective of cultural history (Chartier, 1990), shows that NEDEM's group actions had wide reach in the training of primary and junior high school teachers, either with the production of two collections of math books or with the courses taught in different cities of the state. The group became recognized in Brazil for the production of primary and junior high school textbooks, training courses and also due to the entrepreneurial and committed spirit of its founder, Professor Osny Antonio Dacol, which was an expert who left a legacy to the history of mathematics education, being recognized for his dynamic participation in the diffusion of the modern math movement, and as the main representative of the movement in the state.

Keywords: History of Mathematics Education; Modern Math Movement in Paraná's State; NEDEM; Expert.

"Não é Difícil Ensinar Matemática": o Protagonismo do NEDEM na Difusão da Matemática Moderna no Paraná

RESUMO

O presente trabalho tem por objetivo discutir a trajetória e o protagonismo do NEDEM (Núcleo de Estudo e Difusão do Ensino da Matemática), grupo que nos anos de 1960 difundiu o Movimento da Matemática Moderna no estado do Paraná. Contando com fontes históricas constituídas para a escrita de oito dissertações e duas teses, concluídas nas primeiras décadas do

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ano 2000, no Programa de Pós Graduação da Pontifícia Universidade Católica do Paraná, o estudo, conduzido na perspectiva da história cultural (Chartier, 1990), mostra que as ações do NEDEM tiveram amplo alcance na formação de professores do curso primário e ginasial, seja com a produção de duas coleções de livros, seja com os cursos ministrados em diferentes cidades do estado. O grupo ficou reconhecido no Brasil, pela produção de livros didáticos para o primário e ginasial, cursos de capacitação e também graças ao espírito empreendedor e comprometido de seu fundador, Professor Osny Antonio Dacol, expert que deixou um legado para a história da educação matemática, ao ser reconhecido, pela sua dinâmica participação na difusão do movimento da matemática moderna, como o principal representante do movimento no estado.

Palavras-chave: História da Educação Matemática. Movimento da Matemática Moderna no Paraná. NEDEM. *Expert*.

INTRODUCTION

In Brazil, the history of mathematical education was marked in the 1960s by the intense propagation of the Modern Mathematics Movement carried out by the numerous research groups created in different states.[2] Among others, the NEDEM group, founded by Osny Antonio Dacol and made up of professors from different teaching segments, are interested in discussing the teaching of Modern Mathematics.

Seeking to contribute to the history of this movement at the local level, this study analyses the NEDEM group, during the period of MMM propagation in the state of Paraná,[3] showing in his trajectory the main actions and productions in favour of the propagation of the ideas of the movement that revolutionized the mathematics curriculum from the 1960s.

Articulating with ongoing projects at the GHEMAT (Research Group on the History of Mathematical Education in Brazil), in the 2000s, the GHEMAT researchers from Paraná did not take any effort to locate and inventory NEDEM sources, producing narratives that allowed the reconstitution of a history of the group that was present in the diffusion of the MMM in Paraná.

DEVELOPMENT OF NEDEM

The *Colégio Estadual do Paraná* [4] (CEP), cradle of the movement of Modern Mathematics of Paraná preserves until today, in its archives, documents on its history.

[2] About MMM in Brazil, see Oliveira, Silva, and Valente, (Orgs.). (2011). The Modern Mathematics Movement: history of a curricular revolution. Juiz de Fora: UFJF Publisher.

[3] During the period of the study, ten dissertations and five theses involving the Modern Mathematics Movement in the Postgraduate Program in Education of the Pontifical Catholic University of Paraná were produced, as well as numerous Scientific Initiation works, under the guidance of Profa. Neuza Bertoni Pinto. For this paper, we analysed ten of these papers, two theses and eight dissertations.

[4] The history of the renowned and emblematic State College of Paraná officially begins before the creation of the State of Paraná (1853). In 1846, is created the *Licêo de Coritiba*, by Law no. 33, of March 13, sanctioned by the president of the Province of São Paulo, Marechal Manoel da Silva Lima Fonseca. In 1900, already with the denomination of *Gymnásio Paranaense*, is equated to the present *Colégio Pedro II* of Rio de Janeiro. After several changes of denomination the current name, State

It currently has the Guido Straube Museum,[5] in addition to a memory centre created in 2006. Accompanying the determinations and educational modernizations of the new Law of Guidelines and Bases of National Education of 1960 that allowed flexibility and freedom in curricular selection, the college began the study and the applications of the new pedagogy.

In an interview given to Ferreira (2006, page 65), teacher Maria Antonieta M. Martins, one of NEDEM participants, states "a very good thing about NEDEM was the openness given to all teachers who wanted to attend the meetings ". Their meetings were attended by primary, secondary, technical,[6] faculty, and university teachers.

Regarding the theoretical basis of the NEDEM, Professor Osny Antonio Dacol informs that he has sought grounds in:

> Bertrand Russell, and Bourbaki, and with the experience we had within the *Colégio Estadual* [...] then, based on what I knew of ancient theory, Euclidean geometry, and even the concept of number, comparing greatness, I started with the theory of sets, through the set operations, through the logical blocks of Willian Woold[7] and so on. (Ferreira, 2006, p.68)

According to Ferreira (2006, p.65), based in CEP, in 1962, *NEDEM – Núcleo de Estudos e Difusão de Ensino de Matemática* ("Teaching and Dissemination of Mathematics Research Nucleus") is created, "affectionately called by its coordinator professor Osny Antonio Dacol for: "It's Not Hard to Teach Math". Composed by teachers, most of the primary and secondary education of the Complex of the State College, among them Esther Holzmann, Clélia Tavares Martins, Gliquéria Yaremtchuk, Henrieta Dyminski Arruda[8] and Nelly Humphreys. Professor Esther Holzmann, in 1969, "undertook a course linked to the Department of Education San Diego State College, from where she sent contributions for the improvement of the pedagogical material that was being elaborated by her colleagues, here in Paraná" (Portela, 2009, p.110).

Gliquéria Yaremtchuk, effective professor at the Education Department of Paraná "worked at the Institute of Education, initially in the discipline Methodology of Teaching

College of Paraná comes on January 6, 1943, by Decree No. 11232 of the presidency of the republic. Available at: http://www.cep.pr.gov.br/modules/conteudo/historico.php. Accessed on: May 24, 2017.

[5] Created officially on May 8, 1979, the "Guido Straube" Museum was inaugurated only in 1985. On the CEP website we have "by Order of Service no. 4/1979, of May 8, 1979, the director, Professor Osny Antonio Dacól, officially created the Museum, giving it the name of 'Professor Guido Straube Museum', in honour of the master who initiated it. Source: Official website of the State College of Paraná. Available at: http://www.cep.pr.gov.br/modules/conteudo/conteudo.php?conteudo=12 Accessed on: May 28, 2017.

[6] The agreement with the Federal Technical School of Paraná (ETFPR) was formalized through resolution 55 of 02/06/1967 of the Council of Representatives that provided for the development of activities to produce didactic material, extension courses, among others. In addition, in the first volume of the book intended for the gymnasium produced by NEDEM, the name of the ETFPR (Novaes, 2007) appears.

[7] Later Soares (2014) identifies the correct name William Hull; he is the creator of the blocks of attributes that were disseminated by Dienes with the name of Logical Blocks.

[8] The first four were teachers at the Institute of Education of Paraná (Portela, 2009).

Mathematics" (Portela, 2009, p.98), which shows the penetration of Modern Mathematics in the formation of primary teachers in the 1970s.

The teacher Henrieta Dimynski Arruda[9] led the Mathematical Coordination of the Municipal Teaching Network of Curitiba – RMEC, developing important actions in the training and improvement of teachers for the teaching and learning of Modern Mathematics, taught by the team of NEDEM.

According to Krul (2007), there were distortions in relation to Piagetian theory. On the one hand, there was a reference to the students' cognitive development, to the understanding of concepts, and on the other, there was an indication of the need to make extensive lists of "*continhas*" (small calculations), reinforcing memorization.

> The mentioned movement caused changes in the curricular structure of the discipline in the RMEC, organizing the official programs of Modern Mathematics in three blocks [Set Theory; Sets and Operations; Geometry] and introducing the theoretical-methodological assumptions of Jean Piaget [Swiss psychologist] and Zoltan Paul Dienes [Belgian mathematician].[10] (Krul, 2007, p.13)

Dienes' books played a very significant role in the teaching practices of the Municipal Teaching Network of Curitiba (RMEC), in the training and improvement courses, most of the reference works were by this author. The author was the basis for teaching the Decimal Numbering System in the network (Soares, 2014). The College had experimental classes,[11] which were real laboratories for experiments with Modern Mathematics in the 1960s.

Two important milestones for the discussion of the ideas of Modern Mathematics in Brazil were the IV and the V National Congress of Mathematics Teaching, respectively, held in Belém (1962) and São José dos Campos (1967). However, it was the groups created in some Brazilian states that published Modern Mathematics all over the country. "In Brazil, the Mathematics Education Study Group – GEEM – in São Paulo was the pioneer of this dissemination, coordinated by Professor Osvaldo Sangiorgi" (Ferreira, 2006, p.36).

[9] In the 1970s, she was a Pedagogical Advisor at the Institute of Education of Paraná (Portela, 2009, p.97) before assuming the coordination of RMEC.

[10] According to Krul (2007), the main works used by Dienes were: *Aprendizado moderno da matemática; As seis etapas do processo de aprendizagem em matemática; O poder da matemática; Lógica e jogos lógicos; Conjuntos, números e potências e do Piaget, Psicologia e pedagogia; Epistemologia genética; O estruturalismo; Problemas de psicologia genética; Seis estudos de psicologia; A construção do real na criança; Para onde vai a educação*.

[11] "Formed by municipal and state schools, the School Complex met the structural conditions so that the new proposal could be easily divulged." (Ferreira, 2006, p.74).

In Paraná, in 1962:

> Supported in the motto of the industrial, scientific and technological development of the Paraná government, the year of 1962 emerged as very innovative for the mathematical community of Paraná.
>
> The Paranaense Capital hosted the XIV Annual Meeting of the Brazilian Society for the Advancement of Science, where the São Paulo Group – GEEM presented suggestions on "minimum matters" for a Modern Mathematics Program for junior high and high school, already approved in V Meeting of Masters, held in São Paulo. On July 10 of this year, as found in the final page of Course Plan I (Doc. 3), sponsored by the Brazilian Institute of Education, Science and Culture – IBECC (UNESCO), the Faculty of Philosophy, Sciences and University of Paraná brought the course "Introduction to Modern Mathematics in Secondary Education", where Professor Osvaldo Sangiorgi gave the lecture "The dissemination of Modern Mathematics through the various study groups". (Ferreira, 2006, p.64)

An indication of the introduction of Modern Mathematics in the experimental classes was the use in 1964 of a booklet of Mathematical Logic, elaborated by NEDEM and destined to students of the junior high school of the State College.

> The integral classes[12] functioned for NEDEM as a "laboratory", just as the Application Schools were the laboratory of the Normal Schools. They were the students of the Comprehensive Classes and the School Complex, formed by seven state schools, which first used the handbooks elaborated by NEDEM, among them, the Handbook of Mathematical Logic. (França, 2007, p.38)

Another document from 1964, located in the archives of CEP, addresses the convening of teachers to attend, in the noble hall of the College, the lecture given by Professor Stannard Alen, coming from Surrey – England, on the theme "New Methods of Teaching Mathematics" (Ferreira, 2006, p.66; Claras, 2010, p.45).

The good relationship that the founder of NEDEM and Director of the State College maintained with the Secretary of Education of the State of Paraná favoured the accomplishment of numerous courses of qualification of teachers by the NEDEM, an initiative that extended to the interior of the state, reaching schools far from the Paranaense capital (Costa, 2013). In an interview granted to Soares (2008), an academic of the Mathematics course in 1971, in the municipality of Guarapuava, talks about the experience in a course with professor Osny: "I had the opportunity to do a Vector Calculus Course applied to Flat Geometry in 1971, the second year of the Degree, having

[12] Also known as experimental classes.

the privilege of listening and attending as lecturer, Professor Osny Antônio Dacol of the Federal University of Paraná" (Soares, 2008, p.111).

According to Costa (2013), the authors of the NEDEM took the courses for teachers who worked at the Gymnasium in the following cities: Cruzeiro D'Oeste, Realeza, Santo Antônio do Sudoeste, Cascavel, Pérola D'Oeste, Pato Branco, Francisco Beltrão, Jacarezinho, Apucarana, Londrina, Foz do Iguaçu, Medianeira, Céu Azul, Paranaguá, União da Vitória, Palmas, and Maringá.[13] The courses were held only once in each city, during the holiday period or holidays with recess of classes, and the doubts of the teachers were also clarified by telephone with the authors and members of NEDEM. Generally, the contents covered referred to the use of logical blocks, operations with vectors, scalar producer, vector algebra, and vector calculus.

In 1965, an initiative of the Federal University of Paraná promoted training and improvement courses for teachers from the western region of the state. Headquartered in the city of Cascavel, among the courses offered by the Volante University, the Mathematics Course, taught by Professor Osny Antonio Dacol, was addressed. He studied Modern Mathematics teaching the teachers of the Gymnastics Course to work with Logical Blocks (Figure 1).


MINISTÉRIO DA EDUCAÇÃO E CULTURA
UNIVERSIDADE FEDERAL DO PARANÁ
DEPARTAMENTO DE EDUCAÇÃO E CULTURA

VI UNIVERSIDADE VOLANTE

CASCAVEL — 20 a 26 de outubro de 1968

CERTIFICADO DE FREQÜÊNCIA

freqüentou

o Curso de MATEMÁTICA.

Curitiba, 26 de novembro de 1968

Figure 1. Certificate of the training and improvement course (Personal Archive).

Figure 2 illustrates a moment experienced by the Modern Mathematics course given at the *Colégio Agostinho Pereira* in the municipality of Pato Branco in the early 1970s. A manual promoted by CETEPAR was prepared for the course in 1972, the preparation of which was the responsibility of Maria Josefina Franco de Souza and Yolanda Brand, two important authors of NEDEM (Dobrowolski, 2011).

[13] This city was the only one that received the team of NEDEM that elaborated the material for Primary Education, since all the other courses for teachers of this level of education were realized in the capital of the state, Curitiba. (COSTA, 2013, p.72).

Figure 2[14]. Course of Modern Mathematics – *Colégio Agostinho Pereira*.[15] Source: Personal Archive of Professor Líris Guzela Vedana (Dobrowolski, 2011, p.96).

Based on the theories of Dienes in the 1970s, NEDEM developed an intense work with logical blocks in primary education. For example, the use of Logical Blocks in school units of the Municipal Teaching Network of Curitiba (RMEC) was indicated as an enriching action of the teaching and learning process and given its importance was distributed in schools. The use of logical blocks was also taught to the primary teachers at the Institute of Education of Paraná (Portela, 2009).

It is worth mentioning that "with the work developed by NEDEM, the democratization of the participation of teachers in congresses, courses and lectures intensified, giving new directions to the history of mathematical education in Paraná" (Ferreira, 2006, p.127).

The dynamic actions of NEDEM, in the educational network of Paraná, testify to the one affirmed by Hofstetter and Schneuwly (2017) when they refer to the question of the expertise*:*

> […] an instance, which in principle is recognized as legitimate and attributed to one or more specialists – supposedly distinguished by their knowledge, attitudes,

[14] In Figure 2, to the left of the table is Professor Maria Josefina Franco de Souza, a member of NEDEM and one of the editors of the collection "Modern Teaching of Modern Mathematics" by the Paraná group. On the blackboard, a conceptual map of the Modern Mathematics program of the junior high school of this collection, with specification of the objectives (Dobrowolski, 2011, p.97).

[15] The 264-hour course was promoted by CETEPAR from February to December 1974 and comprised 264 hours divided into 5 stages (Dobrowolski, 2011).

> experience – in order to examine a situation, to evaluate a phenomenon, to ascertain facts. This expertise is requested by the education authorities in view of the need to make a decision. The request for expertise, we will see, participates decisively in the production of new knowledge in the pedagogical field. (Hofstetter & Schneuwly, 2017, p.57)

THE PRODUCTION OF NEDEM

Entitled "Modern Teaching of Mathematics", the first collection of books of the NEDEM is composed of four volumes, corresponding to the four junior high schools. The intentional title of the collection was to emphasize that it was teaching, not mathematics, that it was modern.

Published by *Editora do Brasil* based in São Paulo, the first one (figure 3) and second volumes, were first published in 1967, under the coordination of Professor Osny Antonio Dacol, editor of Maria Josefina Franco de Souza and Yolanda Brand, had as co-authors the teachers: Alex Overcenko, Alide Zenedin, Antonio J. Hübler, Aroldo Straube Cunha, Breno Trautwein, Carlos Renato Furstemberg, Darcy Baptista, Evandro Seixas, Genésio Correia de Freitas Filho, Gitel Arszyn, Leoni R. Rocco, Leonilda Auriquio, Ligia Santos Weiss, Olivino Gonçalves Bara, Omar Alcântara Diniz, Osny Antonio Dacol, Roberto Antonio Busnardo, Shigueki Suzuki.

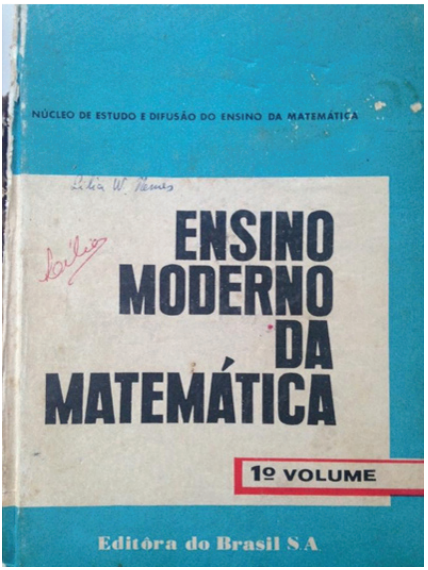

Figure 3. First volume cover (NEDEM, 1967)

The Preface of the first volume highlights the intense efforts of the authors who, in addition to participating in the CEP seminars, transformed study meetings into a

laboratory of experiences. It also reports on the participation of the group in congresses and extension courses, highlighting the classes given to CADES courses[16] and Cultural Extensions (NEDEM – Preface 1st volume, 1967).

Taking into account the mental structure of the child belonging to the age group from eleven to fourteen, when the formation of logical thinking begins, the collection is based on the inductive-deductive reasoning on the elements interiorized by sensory perception, always starting from data real problems, diagrams, schematics, and drawings to aid in the elaboration of logical thinking (NEDEM, Preface, Volume 1, 1967).

On the writing of the textbooks, in an interview given to Ferreira (2006), the teacher Maria Antonieta M. Martins (co-author of the fourth volume) explains, on the dynamics of work:

> Professor Osny proposed the content already with exercises, we went to the room and passed, the exercises had to be very objective, to fall on what the student was studying, we improved the exercises, increased or decreased the number of exercises [...]. The book went like this: in the first year, we discussed the subject and sorted out, in the second year, we passed to the students through the apostille emergency and the next year passed to the book. (Ferreira, 2006, p.67)

A contribution of the NEDEM proposal to the modern teaching of Mathematics was in relation to the ways thought by the group to present the geometry, set theory, transformations, vector concept and logic.

In an interview with Claras (2011), prof. Shigueti Suzuki highlighted the difficulties in publicizing and marketing the book throughout Brazil

> [...] And when ready, we had to repay them. It was a strange thing ... [...] we said listening: we now want to see the profit. But the publisher said, "We have to publish the book, send it to all the teachers in Brazil, and that is not going to leave the publishing house, someone will have to pay." So nobody was in the marketing part, we were not thinking ... barely gave to finish the business [...] We did not have commercial spirit, it had nothing ... it was something like ... And the part financial debt got us too. (Claras, 2011, p.63)

The collection destined to the primary education and organized by some members of the NEDEM was launched in the decade of 1970[17] with a well-illustrated, colourful

[16] The courses offered by CADES – *Coordenadoria do Ensino Secundário* were one-month intensive and emergency courses designed to train teachers to take courses in junior high schools.
[17] In 1970, there was the adoption of the books of the Paraná group in the units of the RMEC (Krul, 2007).

presentation and spaces for solving activities (Ferreira, 2006; Krul, 2007, Soares, 2014; Portela, 2009; Costa, 2013).

Before arriving at this result, the teachers elaborated "Handbooks of Modern Mathematics Activities for primary school students, based on experiences developed with students in classrooms" (Portela, 2009, p.75).

According to Krul (2007, p.76)

> […] in the covers of the editions for the initial years of schooling, images that allude to the technological development that was lived at that time; besides the images and the introductory texts that show the progress of technology, rocket and robot drawings are marks of the didactic publications that were produced by its members for use in schools.

Figure 4. Cover Book of NEDEM for Primary – Volume 2. (NEDEM, 1971).

The publication of the NEDEM books was a relevant initiative for the dissemination of Modern Mathematics in the school context of Paraná. A differential that marked the production of NEDEM, in relation to similar productions, was the highlight given to the work of the group.

Unlike most of the Modern Mathematics books published at the time, those produced by the NEDEM group of Paraná contain the names of the teachers who participated in the production of each book, in all phases, from the study of the new proposal to the edition of the books, which demonstrates the group's integration and collective spirit.

OSNY DACOL: AN EXPERT PARANAENSE OF THE MMM

Problems of constitution, specialization and institutionalization of education experts and also seeking to give more visibility to the knowledge produced by experts in education, Morais (2017), observes: "It should be noted that the word expertise will be used here in the sense of recognition of competence of the one who holds the necessary knowledge to carry out tasks assigned to them, the expert (Morais, 2017, p.62).

In this study, the emphasis given to the importance of NEDEM is mainly due to the initiatives that came from its coordinator, Professor Osny Antonio Dacol, nationally recognized as the main representative of the MMM in the state of Paraná, for the contribution given to the diffusion of knowledge to teach modern mathematics, via a collection of textbooks, courses and consultancies on Modern Mathematics, requested by the State Education Secretariat. These actions that meet the criteria pointed out by Morais (2017).

"Osny Dacol receives the title of honorary citizen",[18] this was the story of the newspaper *Tribuna do Paraná* on November 16, 2005. The reporter points out that such honour was due to her trajectory in teaching, for a lifetime dedicated to the education of Curitiba. The initiative[19] was honoured by former Alderman Adhail Sprenger Passos (deceased in 2003) in 1981, but only materialized in 2005 (Figure 5).

Son of a carpenter and born in the city of Hunter in Santa Catarina came to Curitiba at age 14. In the year of 1950, he entered the Mathematics course of the Federal University of Paraná (UFPR) and in 1953, at the age of 23, he began his career as a professor of mathematics at the renowned State College of Paraná, where he later became director for 14 years.

Appointed Director of the CEP in September 1969 for a triple list, he remained in office for thirteen years and seven months, or approximately until April 1983.

[18] Report related to the newspaper *Tribuna do Paraná* and written by the journalist Rosângela Oliveira on the honor ceremony of awarding him the Honorary Citizenship of Curitiba. Available at: http://www.tribunapr.com.br/noticias/parana/osny-dacol-recebe-titulo-de-cidadao-honorario/ Accessed on: May 28, 2017.

[19] Report "Chamber grants title to Professor Dácol". Available in: http://www.cmc.pr.gov.br/ass_det.php?not=6093#&panel1-1. Accessed on 28 May 2017.

In 1961, he participated in the course of improvement for teachers, held in São Paulo, coordinated by Osvaldo Sangiorgi.

Figure 5. Bestowing of the title of honorary citizen of Curitiba to Osny Dacol (City Hall of Curitiba (2005).

As coordinator of the NEDEM and Director of the CEP, Osny Antônio Dacol, opened the teachers to participate in courses and congresses related to the MMM and also expanded the library of the college with important publications on Modern Mathematics.

The Fifth Brazilian Congress of Mathematics Education, held from January 10 to 15, 1966, in São José dos Campos – São Paulo and coordinated by the Mathematics Teaching Studies Group (GEEM), was attended by 25 teachers from Paraná State. Among the three papers presented by Paraná, we highlight "Introduction or Introduction of Modern Mathematics in secondary school: experimental program for the first two junior high school" in which the coordinator of NEDEM reports experiences in the Experimental Classes of the CEP.

Finally, the NEDEM, a group from Paraná that made efforts to take ownership of the ideas brought by the MMM to modernize the teaching of mathematics, not only got its recognition in Brazil. Due to the commitment and professionalism demonstrated by his coordinator, when he was able to mobilize and circulate among the teachers new mathematical knowledge, it is possible to state that Osny Antonio

Dacol, who died on February 18, 2006, was an expert of the Modern Mathematics Movement in Paraná.

AUTHORS CONTRIBUTION STATEMENTS

Both authors conceived the presented idea, collected and analysed the data, discussed the results, and contributed to the final version of the manuscript.

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