

Olga Bechara's practices in the Secondary Experimental Classes at Socorro (1959-1962)

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Abstract

This article aims to analyse the practices of Olga Bechara in the Secondary Experimental Classes at Instituto Narciso Pieroni, located in the city of Socorro, from 1959 to 1962. During this educational experience, Olga Bechara worked as a Math teacher and Pedagogical Guidance Assistant. As a Math teacher, she made use of dynamic teaching methods and innovative pedagogical practices. As a Pedagogical Guidance Assistant, she was responsible for applying the Sociogram technique with the Secondary Experimental Classes. In order to analyse Olga Bechara's experience with the Secondary Experimental Classes in Socorro, theoretical and methodological assumptions of Oral History and Memory Studies were used.

Keywords

Olga Bechara. Math teaching renovation. Secondary Experimental Classes. Sociogram.

Práticas da educadora Olga Bechara nas Classes Secundárias Experimentais de Socorro (1959-1962)

Resumo

Este artigo visa analisar as práticas da educadora Olga Thereza Bechara nas Classes Secundárias Experimentais do Instituto Narciso Pieroni, localizado na cidade de Socorro, de 1959 a 1962. Nessa experiência educativa, Olga Bechara exerceu a função de professora da disciplina de Matemática e de auxiliar de Orientação Pedagógica. Como professora de Matemática, utilizou métodos dinâmicos e ensaiou práticas inovadoras no ensino da disciplina. Na função de auxiliar de Orientação Pedagógica, foi a responsável por aplicar a técnica de Sociograma junto às turmas das Classes Secundárias Experimentais. Para analisar a experiência de Olga Bechara nas Classes Experimentais de Socorro, utilizou-se dos pressupostos teóricos e metodológicos da História Oral, bem como dos estudos sobre memória.

Palavras-chave

Olga Bechara. Renovação do ensino de Matemática. Classes Secundárias Experimentais. Sociograma.

**Prácticas de la educadora Olga Bechara en las Clases Secundarias
Experimentales de Socorro (1959-1962)**

Resumen

Este artículo pretende analizar las prácticas de la educadora Olga Bechara en las clases experimentales secundarias del Instituto Narciso Pieroni, ubicado en la ciudad de Socorro, de 1959 a 1962. En esta experiencia educativa, Olga Bechara ha ejercido la función de docente de la asignatura de Matemáticas y auxiliar de Orientación Pedagógica. Como profesora de Matemáticas, usó métodos dinámicos y probó prácticas innovadoras en la enseñanza de la asignatura. En la función de auxiliar de Orientación Pedagógica, fue responsable de aplicar la técnica de Sociograma a las Clases de Grados Secundarios Experimentales. Para analizar la experiencia de Olga Bechara en las Clases Experimentales de Socorro, se utilizaron los supuestos teóricos y metodológicos de la Historia Oral, así como los estudios sobre la memoria.

Palabras clave

Olga Bechara. Renovación de la enseñanza de matemáticas. clases de grados secundarios experimentales. Sociograma.

1 INTRODUCTION

This article discusses the experience of educator Olga Thereza Bechara in the Secondary Experimental Classes at Instituto de Educação Narciso Pieroni as a Math teacher and as an assistant to Pedagogical Coordinator Maria Nilde Mascellani. The educator participated in the implementation of Secondary Experimental Classes at Instituto Narciso Pieroni in 1959, a renovating educational experience which engendered principles of Progressive Education in Secondary Education. Instituto de Educação Narciso Pieroni was a public state institution which functioned since 1950, located in the city of Socorro, in the state of São Paulo (SP). The implementation of Secondary Experimental Classes was part of a process of renovation in Brazilian Secondary Education, beginning in the 1950s. In Brazil, the Progressive Education movement, back in the 1920s, occasioned attempts of renovation in Primary Education. However, Secondary Education wasn't included, or prioritized, in movements that aimed at pedagogical renovation.

In the following decades, two historical landmarks affected Brazil differently, the Second World War (1939-1945) and New State Dictatorship (1937-1945). Despite the apparent distance between school and these events, both influenced education in the country.

The issue of redemocratization and national reconstruction, emphasized after the fall of the New State and in the post-war period, would be reflected on the educational debate. [...] both the government and the academic-scientific community argued that the main purpose of the educational process was the democratization of society. (XAVIER, 1999, p. 72-73, our translation).

The connection between education and development has never been that unanimous among different society spheres. The country expresses dissatisfaction with the current teaching model in schools, a consequence of the Organic Law on Secondary Education, implemented in 1942 by the Minister for Public Education and Health Gustavo Capanema. The Capanema Reform of Secondary Education was severely criticized and started to be problematized by many Brazilian educators, mainly due to its traditional, elitist, gender segregating and excessively nationalistic bias (DALLABRIDA, 2014). In the 1950s, many factors converged for Secondary Education to be analyzed and considered relevant for the country's development. With this, the National Institute for Educational Studies and Research (Inep, in Portuguese) and the Secondary Education Board (DES, in Portuguese) started to pay more attention to Secondary Education in Brazil. Anísio Teixeira, head of the Inep board since 1952, was responsible for implementing several operations such as CADES (Campaign for the Improvement and Diffusion of Secondary Education), aiming to improve the national education system.

In order to contextualize the experience with Secondary Experimental Classes at Instituto Narciso Pieroni, it is relevant to mention Luiz Contier, Brazilian educator, who, in 1951, returned from an internship in Sèvres, France, at *Centre International d'Études Pédagogiques* (CIEP), where he got to know the *Classes Nouvelles*, an educational project developed by Gustave Monod, grounded on active pedagogical methods. After returning from Sèvres, the educator started, at Instituto Alberto Conte, located in the city of São Paulo (SP), a renovating pedagogical experience inspired by French *Classes Nouvelles*. Luiz Contier appropriated the principles of *Classes*

Nouvelles and tested their application at Instituto Alberto Conte. Facing the limitations imposed by legislation, Luiz Contier used some tactics to implement that pedagogical model, some changes and adaptations carried out to adjust to the Brazilian context. That educator was a pioneer in the use of active and innovative methods in Secondary Education (VIEIRA, 2015).

The educational test developed at Instituto Alberto Conte, inspired by *Classes Nouvelles*, was a reference for the elaboration of the Experimental Classes project at São Paulo public schools (VIEIRA, 2015). This experience impacted DES and gained an important ally, professor Gildásio Amado. Directing DES since 1956, he engaged and provided measures aiming toward an education renovation, becoming a necessary agent to establish the Secondary Experimental Classes project. After seeing the experience developed by Luiz Contier at Instituto Alberto Conte, Gildásio Amado, at the first Jornada de Estudos de Diretores de Estabelecimentos de Ensino Secundário (Study Days of Directors of Secondary Schools), exposed the reasons for the implementation of Secondary Experimental Classes for the Minister for Education and Culture (AMADO, 1958), in a document that justified the proposal for implementing Experimental Classes in Secondary Education.

Afterwards, the principles contained in that document were incorporated by the “Instructions on the nature and organization of experimental classes” (BRASIL, 1958), which establish that “[...] experimental classes intend to test the application of pedagogical methods and school processes, as well as curriculum types compatible with high school legislation” (BRASIL, 1958, p. 80, our translation). The instructions constitute a group of prescribed rules that regulated the aforementioned experiences. Therefore, in this sense, the educational test implemented by Contier at Instituto Alberto Conte was fundamental so that, on January 2nd 1959, Ordinance n. 1, implemented by the Ministry for Education and Culture, authorized Experimental Classes throughout the country.

Starting in 1959, there were many renovating experiences in Brazilian Secondary Education, based on the appropriation of international pedagogical models, especially from France. These experiences happened both at public and private schools, and most of the latter were Catholic schools. At public institutions, the French *Classes Nouvelles* were the main reference. Catholic schools embraced the educational renovation

movement based on Personalized Pedagogy, a method organized by Jesuit priest Pierre Faure, which consists of the union of different Progressive Education models adapted according to Catholic principles. Instituto Narciso Pieroni was the first school in the Brazilian context to officially institute the Experimental Classes project, which took place from 1959 to 1962.

Olga Thereza Bechara, Maria Nilde Mascellani and Lygia Furquin Sim were the main implementers of the project. Lygia Furquin Sim, the principal of Instituto Narciso Pieroni, did an internship at Sèvres and returned excited with the experience of *Classes Nouvelles*, which later contributed to the implementation of the Secondary Experimental Classes in Socorro. Letícia Vieira (2015) also highlights Maria Nilde Mascellani as central in the project and states that her presence as keynote speaker at the Experimental Classes Inaugural Class at Instituto Narciso Pieroni “[...] evidences the centrality of her activity and the knowledge she had of the pedagogical premises they intended to apply in the experience” (VIEIRA, 2015, p. 122, our translation). Maria Nilde Mascellani took on the job of Pedagogical Coordinator, a role instituted as a pre-condition for an Experimental Class to function. In this context, Olga Bechara participated in the implementation of the Experimental Classes as a Math teacher and as Pedagogical Guidance Assistance.

Olga Thereza Bechara grew up in Bragança Paulista, attended kindergarten, Primary School and Secondary Normal School at a Catholic school that was part of the Filhas de Jesus (Daughters of Jesus) congregation. Between 1951 and 1954, she studied Pedagogy at the College of Philosophy, Science and Literature of Campinas, a Catholic institution affiliated to College of São Bento. At the time, the curriculum of the Pedagogy course offered classes on Mathematics Complements and on Educational Statistics, which enabled a license to teach Math in the first cycle of Secondary Education (FERREIRA; PASSOS, 2014).

The educator developed innovative activities as a Math teacher. She tested modern methods for teaching Geometry before the boom of Modern Math Movement, an international movement for the renovation of Math teaching (BÚRIGO, 1989). It is important to mention that Math teaching, in the 1950s, was also part of the educational renovation agenda and was present in several debates and conferences. As assistant to the Pedagogical Coordinator, Olga Bechara took up the task of designing sociograms

with the students, a technique that develops very specific abilities. Created by Jacob Levy Moreno, the sociogram is a tool of sociometry that represents, through graphics, the social relationships between individuals of a group (ALVES, 2008).

Situated in the field of oral history, this article uses studies by Bosi (1994) and Le Goff (2003) about memory as a theoretical framework to analyze the practices of educator Olga Bechara. The sources of information consulted were primary documents found in articles, theses, dissertations, reports, periodicals, and an interview with Olga Thereza Bechara (2016). In addition, we consulted secondary documents published in books that discuss this theme. It is important to emphasize that the interview is understood here as a support for collective memory (LE GOFF, 2003). According to Le Goff (2003, p. 469, our translation), “[...] memory is an essential element of what we usually call *identity*, individual or collective”. Therefore, considering the specificities of this type of source, we use oral testimony as “[...] an element on which the writing of history leans and that, as such, is subject to verification” (VOLDMAN, 2006, p. 256, our translation). In this sense, due to the dimension of Secondary Experimental Classes, we can contextualize that “[...] when a group works intensely in tandem, there is the tendency to create coherent schemes of narration and interpretation of facts [...]. The group’s point of view builds and seeks to establish their image for history” (BOSI, 1994, p. 66, our translation).

We chose to study the practices of educator Olga Bechara due to the dimension of her actions at the school in Socorro, as well as due to the dearth of studies that discuss the practice of Math teaching in Secondary Experimental Classes. This study is divided in two parts: the first part analyzes the innovations put into practice by Olga Bechara as a Math teacher in Secondary Experimental Classes. The second part discusses Olga Bechara’s actions as Pedagogical Guidance Assistant and main responsible for the elaboration of sociograms.

2 OLGA BECHARA AND THE RENOVATION OF MATH TEACHING

Olga Bechara undertook the teaching of Math classes during the Secondary Experimental Classes project at Instituto Narciso Pieroni (1959-1962). These educational experiences should conform to the premises established in the “Instructions on the nature

and organization of experimental classes” (BRASIL, 1958). In order to implement them, they should create projects with teaching methods and processes following functioning rules, such as planning directed activities, which would enable the student to “[...] actively participate to acquire their own method of work and conscious and dynamic lifestyles” (BRASIL, 1958, p. 81, our translation). Thus, the teachers who worked with Experimental Classes had to follow these determinations.

Additionally, the document presented criticism of the Secondary Education of the time, such as the “[...] lack of flexibility; verbalistic teaching; dissociation between students’ needs and interests” (BRASIL, 1958, p. 83, our translation). Criticism of Secondary School expressed problems with Education, a consequence of a curriculum created by the Capanema Reform. In this context, Math education received the same criticism, due to excessively abstract and theoretical classes, problematized by educators in the field. About the methodology for teaching Math in the 1950s, Búrigo (1989, p. 40, our translation) highlights:

Lectures were the rule, and not even exercise solving by students in the classroom was a generalized practice. When it happened, the students were presented with standard exercises, which should be solved in the same manner as a ‘model problem’, emphasizing bulky calculations. Demonstration of theorems were exposed by the teacher and memorized by the students to present at tests. Didactic resources employed did not go beyond chalk, a blackboard and a textbook, if there was one.

In the 1950s there were also the first conferences about Math education in Brazil. Contemporary of renovating educational movements, these events were spaces for discussion about the practices of that subject. In that period, the methods used to teach Math in Secondary Education were predominantly traditional. Thereby, renovating educational movements rose, aligned to expansionist ideas of the time, which intended to modernize Secondary Education.

The educational experience of Experimental Classes intended to incorporate active teaching methods into Secondary School, and the institutions that implemented the project adapted and adjusted it to Brazilian reality. In Socorro, the appropriation of the premises of *Classes Nouvelles* was adapted according to the concepts of the staff at Instituto Narciso Pieroni. With a curriculum that aimed to educate a critical student able to change social reality, Mascellani (2010, p. 85, our translation) states that:

We devised objectives, created the curriculum within a design that approached known topics of general culture (in History and Geography) and those that elicited the study of the municipality's social, economic, political and cultural reality. Group tasks, classes with dialogue and problematizations, curriculum integration, the option of teaching-learning through concepts, the selection of significant content from the point of view of the student's critical insertion in their social environment, diagnostic evaluation and permanent stimulus of social intervention in the community would become characteristics of the Experimental Classes project at Instituto Narciso Pieroni.

The *classes nouvelles* became the main reference in public schools; however, at Instituto de Educação Narciso Pieroni in Socorro, some authors in that pedagogical model were more evident, such as John Dewey. Furthermore, we notice a strong influence of authors such as Emmanuel Mounier and Paulo Freire on the project's philosophical and pedagogical foundation. Thus, the most common pedagogical practices in Experimental Classes in Socorro were group tasks, directed study, integration between curriculum fields and study of the environment. Olga Bechara enthusiastically remembers her journey as a Math teacher in Experimental Classes in Socorro. During an interview, she mentions a class that was remarkable for the students:

So I gave all operations through geometry and the kids needed all the measurements so that it wasn't abstract. They had to have the meter, had to have a decimeter, had to have a square decimeter and a square meter. The day we taught cubic meter (laughs), Cláudia says she never forgot, I had the students assemble a cubic meter in the classroom. One would make a square meter on the floor, another on the wall, one on one side, another on the other side, so they had that huge cube, six second graders got into the cubic meter. And cubic meter? Measure it. Kids have no idea how big that is, even us grown-ups don't know how big a cubic meter is. (BECHARA, 2016, p. 8, our translation).

The educator developed dynamic teaching practices, considering her students' specificities and the complexity of the subject she was teaching. Following the proposal of Experimental Classes, she used active teaching methods, bringing into practice a subject that had been thus far criticized for its excessively theoretical slant. Olga Bechara discusses teaching geometry and explains what distinguished Math education at the Experimental Classes of Socorro from traditional classes on the subject in Secondary Education:

[...] I started backwards, I started with intuitive, inductive geometry, shapes, rectangle, square, let's measure, let's calculate perimeter, with intuitive geometry we did differently: given the sides, find the perimeter, given the perimeter, find the sides, and so it goes, rectangle, square, triangle, what we find on the way. Then when it came to perimeters I showed, for example, in the rectangle, I have two identical sides, the sides appear twice in the addition. After perimeter we started areas, started multiplication... Until starting areas, we had seen only addition and subtraction, I did distributive, commutative property, all with perimeters. After I moved on to areas, I began multiplication. Then students understood what multiplying is: repeating the factor a number of times. Because nobody learns that, nobody teaches, nobody knows, the teacher who is teaching doesn't know! (BECHARA, 2016, p. 7, our translation).

We can highlight that Olga Bechara mentions her leadership in the use of innovative practices, later implemented by the Modern Math Movement. “[I worked] everything we had to see about multiplication and division that way, kind of like in reverse, and later Modern Math instituted it” (BECHARA, 2016, p. 8, our translation). The Modern Math Movement consisted of an international thought current of renovation in Math education, initially developed in the United States and Europe. In Brazil, it took place between 1960 and 1975, through modernizing teaching proposals, opposite to traditional ones (BÚRIGO, 1990).

Besides teaching the subject contents, through pedagogical practices, they developed the general educational objectives, included in the proposal for the Classes in Socorro, such as “[...] developing critical attitude concerning the economic, political and cultural reality of the country and the community. Develop among the students social commitment towards the community” (MASCELLANI, 2010, p. 86, our translation). Olga Bechara (2016, p. 11, our translation) mentions an activity of environmental study carried out in Socorro:

[...] there was a loan at BANESPA for small farmers, and Socorro was filled with small farmers, we would visit the lands of small farmers and see the people handling the beans, you know? Handling rice, very primitively, they got that little rice, beans, came and traded for eggs, for meat in the city. So we did some of the BANESPA loan campaign for the small farmer. With that, students got to know reality, got to know the reality of the small farmer in Socorro, found out about many traits of reality. So Environmental Studies in Socorro was more along those lines. [...] A critical view: ‘Go see it!’. Seeing, they got to know it. No need to preach. Just let them see.

The student is encouraged to experience reality and reflect about concrete experiences, unlike lectures, where the person often has to reflect about situations that are far from their reality. An educational experience that aimed at creating a critical individual “[...] because the study of the environment concerned the curriculum, but also concerned problems of the country that they would know” (BECHARA, 2016, p. 12, our translation). During the Environmental Study activities, the students visited different spaces, such as the properties of small farmers and tire and automobile factories. Environmental Study configured the main characteristics of the experience in Socorro, interdisciplinary tasks. By studying the community’s social, cultural, economic and political reality, the students were encouraged to see themselves as the agents of their stories, able to transform the environment where they live.

The curriculum integration developed in the proposal of Socorro gained prominence and attracted the attention of Secretary of Education Luciano de Carvalho. He was familiar with the English Comprehensive School and was excited about that educational model. When he visited the Secondary Experimental Classes in Socorro, he was enchanted to see a task developed by the students, an interdisciplinary activity connecting Crafts class to other fields of knowledge. “They made a dinosaur, I think, one of those animals, and the Crafts teacher made it out of newspaper and glue. [...] And Luciano de Carvalho admired those things” (BECHARA, 2016, p. 9, our translation). The Secretary of Education wanted to expand the educational experience developed in Socorro and later invited Maria Nilde Mascellani to be part of the team tasked with renovating Secondary and Vocational Education.

At the classes of Instituto de Educação Narciso Pieroni of Socorro, there was a central theme that integrated the teaching of all subjects, with History as the axis of coordination of curriculum integration. Olga Bechara integrated the teaching of Geometry contents with History of the Middle Age, for example, using the construction of scale models of medieval castles, through which the students exercised their Math knowledge, a practice that opposes the traditional abstractions related to Math education at the time. The centrality of History in all subjects shows the political character of the proposal, committed to historically placing the individuals and the knowledge of that space. We notice that the concept of individual as a socially and

historically constituted being fundamentally guides the proposal of Socorro, as well as a humanist pedagogical approach.

Another activity frequently used in Experimental Classes was directed study. “Because then you work closer but also don’t have to be hovering over them, they study and we only guide the study. ‘Only’ guide, it’s not ‘only’, because it’s a lot of work” (BECHARA, 2016, p. 19, our translation). Also, “[...] the student has to learn to think in that field, how they will analyze the content of the field we’re working with [...]” (BECHARA, 2016, p. 18, our translation). The students didn’t use textbooks, but were encouraged to research a source book. In this context, the directed study activity aimed at the student’s autonomy. They developed abilities and skills essential to self-teaching.

Evaluation methods were primarily qualitative, however, students still received grades. Olga Bechara (2016) mentions that the student’s personal progress was considered in the evaluation, that is, if the student progressed throughout the classes. Self-evaluation was also used in the Secondary Experimental Classes in Socorro, and later, in Vocational High School¹, this evaluation method was improved. Self-evaluation intends to help the students realize their weaknesses and capabilities, becoming aware of their learning process. Olga Bechara (2016) describes how she carried out the self-evaluation activity with students: “[...] I had them correct themselves, because there’s nothing like you seeing your own mistake, when you make a mistake you don’t forget” (BECHARA, 2016, p. 22, our translation). Self-evaluation develops the ability of self-criticism, i.e., the ability to cast a critical look on one’s own actions.

At the Secondary Experimental Classes of Instituto Narciso Pieroni, there was an emphasis on developing critical thinking, in order to turn students into agents of change. According to Mascellani (2010, p. 87, our translation), “[...] we exercised social participation and the practice of options, decision making, basic premises of citizenry [...] the students, working as a group, were the main actors in the teaching-learning process”. Olga Bechara (2016) mentions, at the end of the interview, the national

¹ Vocational High Schools constituted an experimental educational project developed between 1961 and 1969 in the state of São Paulo, inspired by the pedagogy of Experimental Classes in Socorro (CHIOZZINI, 2010; MASCELLANI, 2010).

conference that took place in September 1965, in Rio de Janeiro, the first Symposium on Renovated Secondary Education. She emphasizes that Vocationals already existed, but the event discussed the work done at Experimental Classes.

Olga Bechara taught at the Secondary Experimental Classes of Instituto Narciso Pieroni from 1959 to 1961, and in that last year she conciliated her work in Socorro with student preparation for Vocational High Schools. In 1962, she left the Experimental Classes Project and became part of the team of Vocational High Schools, invited by Maria Nilde Mascellani. The project developed at Instituto Narciso Pieroni stood out, becoming a reference for the development of Vocational High Schools, both for their creation and as an internship for the first teacher group that went to the Vocational High School.

3 OLGA BECHARA'S PROTAGONISM IN THE CREATION OF SOCIOGRAMS

During the Secondary Experimental Classes at Instituto de Educação Narciso Pieroni de Socorro, Olga Thereza Bechara employed the sociogram with the classes, which helped the project's Pedagogical Coordinator, Maria Nilde Mascellani. Those two teachers took a course to learn the sociogram technique at the Regional Center for Educational Research (CRPE, in Portuguese) in São Paulo, with professor Hilda Taba. At the Classes in Socorro, Olga Bechara was responsible for the creation of sociograms. She reports that, because she liked combinatorial analysis, soon she was an expert at sociograms and states: "[...] I did all sociograms in both experimental classes" (BECHARA, 2016, p. 5, our translation). According to Alves (2008), the sociogram is the graphical representation of the sociometric test, both tools of sociometry conceived by Jacob Levy Moreno. Thus, Alves (2008, p. 52, our translation) says:

[...] sociometry carries out the mathematical study of psychological properties of groups in order to measure personal relationships within a group or between groups. [...] Therefore, this research method [sociometric test] aims to unveil relationship structures present in the studied group, as well as to mobilize committed and spontaneous participation from its members. The sociometric test measures the amount of organization in a group, investigates the group's structure and the position (sociometric status) occupied by its components. With this

tool, it is easier to identify isolated members, group leaders and the criteria supporting the group around its objectives.

Through the sociogram, the teams that would work together during classes were defined. According to Bechara (2016), all activities in the classroom were done in groups, and individual activities were done at home. Thus, in the beginning of the school year the class was divided in teams; in this case, the students could choose their own work group, or a temporary sociogram could be done. After approximately one month, the class would provide conditions for a more categorical sociogram. After the groups were defined, the students had to learn to work well with the others. Teams could be altered later, in the following trimester, but until then everyone needed to exercise sociability. Since the sociogram represents, through graphics, the relationships between individuals in a group, its creation requires the existence of established social relations. Olga Bechara (2016, p. 15, our translation) comments on the sociometric test and the sociogram in the composition of the work groups:

[...] you have to make the students choose, then you have to see the choice load of that student, how many were chosen first, second, third, and I asked up to five, because sometimes there are groups that are too closed, you have to find ways out, sometimes you can't. So you make the groups and tell the kids, you will be granted one choice. I won't let more than one. Then you have to assemble the teams based on the students' choices, you have to comply with at least one choice.

Sociometry enables the identification and understanding of an individual's influence among their peers, revealing attractions and rejections within the group. And the sociogram comprises the design of the social relations in the group analyzed because it is product and producer of an intentional process that studies human relations. These techniques, developed to identify the social configuration of a group and classify the role each individual occupies, enable the visualization of each participant's behavior. Therefore, sociometry's raw material are the relationships built in groups. According to Alves (2008, p. 53, our translation), the application of a sociometric test encompasses four steps:

1. criteria are established, which are the reason why we choose, which motivates the subject to a determined end. It consists of formulating a direct question, which leads each member of the group to express their affective choice concerning the others;
2. each member of the group must

make their positive, negative and indifferent choices followed by why they chose that way. [...] five choices are enough, but all members of the group must participate; 3. doing the part of the test called perceptual, which consists of saying who, within the same group, the members believe would be chosen and why; 4. the choices are read together in the group and the sociogram is created. These steps are recorded on a double entry paper and translated into the sociograma.

Therefore, the sociogram is a graphic that represents the choices, preferences and rejections of participants. Its construction process is initially based on the participants' choices, which are recorded on paper and, later, traced in a graphic design, but the position on the graphic, besides being determined by choices, is also calculated based on criteria. The calculation of values is systematized with formulas and numerical values, constituting a social matrix that, once analyzed, provides the bases for the production of the sociogram. According to Alves (2008, p. 53, our translation), the positions occupied in the sociogram by group participants were defined by Moreno *apud* (ALVES, 2008, p. 53, our translation) as:

1. isolated – individual without mutuality doesn't choose or gets chosen by anyone;
2. rejected – individual with negative choices;
3. peer – when there is mutual choice (positive or negative) between two participants of the group and no other connections;
4. chain – open series of mutual choices based on any criteria, for example: A chooses B, B chooses A, B chooses C, C chooses B, C chooses D, D chooses C etc.;
5. triangle – when there is mutuality of three group members, with the same sign;
6. square – when there is mutuality of four people, with the same choice;
7. circle – the members of a group don't need a specific bond to maintain the dynamic bond; it's a configuration that shows group cohesion;
8. star – group member who receives the expected number of choices, or more, based on the same criteria.

Therefore, the sociogram encompasses a map of affective bonds, in which the geographical position of each individual indicates their role in the group as well as reveals the reciprocity relations established by the subject. The involvement of students with sociometric techniques reiterates the bases of the educational project in Socorro, that aimed at educating a student initiated in research practices, with an attentive and observant look. "Studying the importance of research for the progress of humankind and as a planning basis" (MASCELLANI, 2010, p. 85, our translation). Olga Bechara (2016, p. 19, our translation) discusses the contributions of the sociogram and of group work for the development of critical thinking and responsibility in students:

[...] So you can use a group with contradictory dynamics, when you work as a group you can develop in the student a line of participation, of contribution, as you can develop a dynamic of manipulation. Even in these five groups there was a group where the boss, the research coordinator, made one of the group members the manipulator, under his guidance, then made a lot of subordinates in the same group project. I worked at a school that wasn't experimental, it was pluricurricular. After I left Vocational, at Ascendino Reis, and a teacher said: Olga, what did you do to the students? The students now divide the grade, they don't give everyone the same grade anymore. Exactly. They learned the contribution of each one in the group and give the grade proportional to the contribution. The grade I told them it was their salary. Who contributed, who did a lot, and who didn't show up don't deserve the same, do they? No. So they know and act differently. And they justify why one had a grade and the other had another.

In addition to enabling the constitution of more cohesive work groups in the classroom, the sociogram enabled the visualization of social structures and hierarchies established in the class. The use of the sociogram at Instituto Narciso Pieroni marks the social dimension of the project and the socializing vocation of this educational experience that sought the subject's integral qualification. Individuals who participated in this process exercised their sense of responsibility, as well as their self-criticism abilities. Activities focused on the development of critical thinking, of a critical outlook toward one's own attitudes, but also toward peers' attitudes. Group work, self-evaluation, environment study and the use of the sociogram are marks of the socializing curriculum in Socorro. Secondary Experimental Classes at Instituto Narciso Pieroni promoted socializing education that, through dynamic teaching methods, intended to form a critical citizen.

4 FINAL CONSIDERATIONS

Although *classes nouvelles* constitute the main pedagogical reference in the Secondary Experimental Classes at Instituto Narciso Pieroni, Maria Nilde Mascellani evokes the leadership of this proposal due to its socializing character. We notice that some appropriated pedagogical and philosophical models constituted hybrid teaching methods that integrated innovative methods and a problematizing education. The appropriation of French pedagogical models was adjusted to the Brazilian reality, or even

the reality of the Socorro community, which shaped the experience. However, this adaptation process didn't happen outside of processes of production, circulation and appropriation in which the pedagogical models were effected.

In this context, educator Olga Bechara exercises the teaching profession guided by the objectives indicated in the proposal for Experimental Classes in Socorro. In addition, with teachers' practices under the rule imposed to Experimental Classes, it was necessary to commit to the renovating ideals to work with the educational project. In this sense, the educator, in line with the renovation perspective, manages to test dynamic teaching practices, while developing social aspects in the students' education. Curriculum integration also enabled innovative teaching practices. Experimentation in teaching methods current to educational tests in Experimental Classes, besides effecting a movement of renovation in Secondary Education, mobilized an update in subjects, separately. As a Math teacher, Olga Bechara tested active practices, through which she taught contents aiming at the students' critical insertion in their social context. She applied activities of Environmental Study, Directed Study, Group Work, Self-Evaluation and Interdisciplinary Tasks.

Additionally, Olga Bechara took on the role of Pedagogical Guidance Assistant, which consisted of creating the sociogram for Experimental Classes. The technique was used in order to define the teams for group work. Based on criteria established in the sociometric test, the sociogram showed the relationships in the groups. Considering that the sociogram is a graphic that represents the relationships between individuals in a group, creating it requires the existence of social relations. The use of this technique reiterates the pedagogical and philosophical bases of the Socorro project. According to Mascellani (2010, p. 84, our translation), "[...] we defended the creation of pedagogical proposals aiming at human and social values and the formation of citizens".

In conclusion, this article sought to understand the innovation in Math education and the use of the sociogram by professor Olga Bechara in the experience of Secondary Experimental Classes at Instituto Narciso Pieroni based on her teaching memory. At that school in Socorro, a renovating pedagogical test was carried out in the high school course, becoming a reference for the implementation of Vocational High Schools in the beginning of the 1960s. Therefore, through her innovative practices in Math education

and the use of the sociogram in high school, Olga Bechara contributed, creatively, for the renovation of Brazilian Secondary Education.

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