Teacher education and citizenship: school projects in environmental studies

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Abstract

This text seeks to present reflections resulting from a doctorate research focused on the analysis, through action-research, of school projects in environmental education developed as part of in-service teacher education, and their contributions to the constitution of new knowledges and didactic-pedagogical procedures for the study of the environment and for the exercise of citizenship. Aiming at the construction of the geo-scientific perspective at school, the environmental education projects made use of different field practices based on remote sensing (satellite images, aerial photography and maps) to (re)cover knowledge from the place of study, with the purpose of building an integrated view of the socio-environmental reality based on the establishment of dialectic relations between the local and the global as a support to the analysis of problems, of their repercussions and implications on different scales of observation. The development of the projects created the opportunity to form teacher-researchers that are innovators, critical, and reflective before the school and socio-environmental realities. Besides, it gave students the conditions to observe and know their own environment and the place where they live, to reflect upon their real situations and, based on this process, propose actions and construct educative interventions in search of solutions for the problems investigated. By incorporating the socio-environmental issue to the pedagogical practice, the school projects attempted to insert school into reality, contributing to form critical citizens that participate in joint and collaborative actions (school, community, public authorities) through social learning, aiming at the development of democratic and sustainable public policies to improve the quality of life.

Keywords

Teacher education – Environmental education – School projects – Citizenship.

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Introduction

The study of socio-environmental reality and its problems has revealed the need to rethink the education of teachers as critical and reflective professionals with an interdisciplinary, constructivist, and communicational attitude, capable of understanding the relations between society and environment, as well as the relations between pedagogical work the exercise of citizenship. This implies, among other considerations, the development of a pedagogical work that considers and values the critique, the dialogue, and the action focused on the construction of a society more just and ecologically balanced. In this process, the role of research in teacher action is significant, insofar as it contributes to teacher education through the analysis and transformation of pedagogical practice itself.

By highlighting the importance of the reflection in and upon the action in the teaching activity, Donald Schon (1995) understands that someone reflecting in action becomes a researcher in the practical context. In his words, in the real world of practice, the problems are not presented to the professional as given facts. They must be built from elements of the problematic situations, which are puzzling, disquieting, and uncertain. According to the author, in order to convert a problematic situation into a problem, the professional must perform a specific kind of work. He or she must reflect upon an ambiguous situation that he or she did not at first understand. In school, the participants of the educative investigation in the classroom (teachers and pupils) must be active subjects in this process (ELLIOTT, 1994), for it is their real, concrete problems and daily difficulties that can or must constitute objects of investigation. And one has to emphasize here that we are referring to real teachers and pupils, social subjects who dialectically *implicate* and are *implicated* in and by the school and socio-environmental context. The teaching-research as a specific modality of action-research and critical analysis of the school and social reality, driven by a dialectical-reflective vision, can be geared towards the transformation of these practices. This is justified by René Barbier (2002), for whom action-research has a deliberate concern with the transformation of reality. It is a kind of research that possesses a double objective: transforming reality and producing knowledge related to these transformations.

Among the main features of researchers-educators and their investigations stands the concern with the development of methodologies dedicated to practical, daily practice, aiming at understanding it and transforming it (DINIZ-PEREIRA; ZEICHNER, 2002). This reveals, according to Barbier (2002), that teachers want to take part directly in the knowledge of their own problems, and it also reveals the need to break away from the imposition of the recipes of the *armchair educators*, for whom the teacher is a mere technician who learns by himself/herself, being therefore enough to follow the *official guidelines* of how to apply those recipes.

Action-research as a critical and cognitive act (KINCHELOE, 1997), in its modality of teaching-research, contributes to form a critical and reflective teacher from the investigation of his/her own practice and from the consequent search for its improvement, as well as, through this process, for the construction of a new school knowledge, turning the teacher into the producer of practical knowledge about teaching (ELLIOTT, 1998). In this sense, teacher education cannot be divorced from a new conception of school committed to the construction of a better society to live in. It must presuppose that, through action-reflection, the teacher can reconstruct his/her practice while the latter can contribute to reconstruct the school and the socio-environmental reality surrounding it through the knowledges generated from the fertile relation between theory and practice.

These assumptions have been at the root of a proposal for in-service continued

teacher education conducted in Guarulhos (SP)[1], aiming at the development of school projects of environmental education with the integrated use of remote sensing and fieldworks to the study of problems of the local socio-environmental reality in urban microbasins (SANTOS, 2006).

The proposal had the objective of contributing to the formation of working researchers-teachers[2] from the reflection about the teaching activity in the classroom and in the field, and in the construction of new knowledge and methodological procedures for the study of the environment, taking into account the importance of the characterization of the place/environment in which the school is located. The theme modules worked with the teachers were the following:

- methodological considerations for the preparation of school projects;
- environment, education and citizenship: the National Curriculum Parameters and the socio-environmental issue;
- the hydrographic basin as a unit in environmental studies;
- satellite images, aerial photography, and maps as a didactic-pedagogical resource in environmental education;
- the role of fieldworks in the development of school projects for the study of socio-environmental problems.

With the development of projects at schools, the participant teachers had as their goal to construct new teaching procedures capable of integrating different resources into didactic-pedagogical activities for the study of the local/regional environment, as well as to prepare proposals/actions aiming at the improvement of the quality of life in the region under study, as an exercise in citizenship. To such end, it was necessary to orient the development of the activities at the schools along principles such as:

- considering the ideas, interests, and needs of the participant teachers in view of the development of the formation proposal presented;
- favoring teachers' individual and collective reflection about the problems and daily life learning difficulties;
- fostering positive attitudes of didactic innovation based on the investigation of the school practice;
- promoting the transformation of difficulties into challenges, considering the objectives put forward by the environmental education project of the school;
- promoting the development of environmental education projects by the teachers.

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1- The formation took place in a cultural extension course approved by the CENP entitled *Educação, meio ambiente e cidadania: desenvolvimento de projetos escolares de educação socioambiental com o uso de sensoriamento remoto e trabalhos de campo para o estudo do meio ambiente e exercício da cidadania* [Education, environment and citizenship: development of school projects of socio-environmental education with the use of remote sensing and fieldworks for the study of the environment and the exercise of citizenship] conducted by the prefecture of Guarulhos/SAAE in partnership with the Directorship of Teaching of North Guarulhos; the University of Guarulhos; the Institute of Geosciences of Unicamp and the National Institute of Space Research (INPE). The processes and products resulting from this formation constituted the research object of the doctoral thesis entitled *Formação de professores para o estudo do ambiente: projetos escolares e a realidade socioambiental local* [Teacher education for the study of the environment: school projects and the local socio-environmental reality] presented to the Institute of Geosciences of Unicamp, Department of Geosciences Applied to Teaching. The thesis received the Capes Award for Thesis for 2007.

2- Seventeen teachers from fundamental education from different disciplines (sciences, geography, history, Portuguese, and arts) and from four public schools located within the area of study (defense zone of the Cabuçu Center in the Cantareira State Park in Guarulhos, SP). The formation comprised the development of conceptual discussions, experimental works and field activities, with a total of 96 hours during an academic year, with 32 hours for formation in five theme modules and 64 hours for the development of the environmental education project at the schools.

- fostering positive attitudes of didactic innovation based on the investigation of the school practice;
- promoting the transformation of difficulties into challenges, considering the objectives put forward by the environmental education project of the school;
- promoting the development of environmental education projects by the teachers.

The option for these principles was based on the supposition that teacher education cannot be dissociated from the transformation of didactic-pedagogical procedures and attitudes of the school; neither can it be divorced from a conception of curriculum built in the lived continuity of the experience of the subjects immersed in the daily life of social practice. The school projects developed tried to identify and understand the local socio-environmental problems raised by teachers and pupils, and also to propose solutions to them with a view to improve the socio and environmental conditions of the community. In this sense, they contributed both to teacher education and to the process of constructing the environmental awareness of teachers and pupils for the exercise of citizenship, from the creation of critical and participative citizens who see themselves as agents modifying their own reality (JACOBI, 2005).

In the experience developed in Guarulhos (SANTOS, 2006), it is possible to identify the development of different activities in the classroom and on the field, such as: map reading in different scales; interpretation of satellite images and aerial photographs; environmental studies in microbasins; conduction of environmental routes; development of socio-environmental diagnostics of the areas under study and interviews with local residents. The activities conducted had as their objective understanding the socio-environmental reality of the region under study, as well as its implications and repercussions to the quality of life of the community. The fieldworks associated to the use of maps, aerial photography and satellite images contributed to understand the process of use and occupation of the local space (microbasin), and also to establish relations at different scales of observation and apprehension of the socio-environmental reality under study. Moreover, they helped to develop new perceptions about the environment from the understanding of the interrelations between the *horizontal and point view* (restricted to the local) and the vertical and *sweeping view* (the local in its context as seen at different scales, from *above*). This contributed to overcome a fragmented and compartmentalized view still present in schools about the approach to complex phenomena such as the environmental ones, promoting their systemic understanding as the pupils noticed that the problems of the microbasin are neither restricted nor explained in isolation, but establish different relations and implications with the borough, the municipality, and the region – or, rather, *implicate* and are *implicated* in a constant coming and going.

With the development of the projects, teachers and pupils conducted a critical-constructivist (re)reading of the local reality. They identified socio-environmental problems in the microbasins studied, collected and analyzed data. They established relations between the information gathered, and developed proposals of solutions to the problems.

The school proposals afforded a glimpse of possibilities of transformation of the local reality, and in this sense constituted exercises in citizenship by the subjects of education (pupils and teachers) in their capacity as sensitizers and conducers of a fine tuning between knowledge, citizenship, and improvement in quality of life. The assessment and study of local s-e problems stimulated the production of articulated, singular and original knowledge about the region under study. With that, the

place established itself, at the same time, as an object of study, of problematization, and of school investigation, as well as of synthesis, a space that promoted and made possible the production of new knowledges and postures. By playing the role of a locus of the teaching and learning process, the school projects contributed to construct a new conception of school curriculum. Contrary to the erroneous idea of *contextualizing* predefined contents, usually listed in didactic books, the pupils here, based on their experience, articulated the school contents to the local reality, producing original and singular knowledge.

The didactic procedures tried by teachers, guided by the reflection upon their practices, allowed them to learn whilst teaching. This happened because school teaching, as a specific communication process, establishes socio-pedagogical relationships between pupils and teachers capable of placing the different knowledges that they carry in an open and continuous circuit, based on dialogue and guided by action-reflection. This process comprises a concept of integrated knowledge according to which it is possible and desirable to reach and/or construct knowledge from the various and different *nodes* of the *net* or grid in which knowledge is woven and presented.

In the case of the procedures developed, it is possible to identify:

- in the geosciences, in environmental education, in teacher continued education, in the use of satellite images, aerial photographs and maps, in fieldworks, in the restructuring of curriculum, in the practices of interdisciplinarity and contextualization, and in the exercise of citizenship, some of the *nodes* that compose this network of endless chains that constitutes knowledge;
- in the processes of research and development of the teaching projects, one of the social functions of the school as a socializing center, constructor and disseminator of knowledges, as well as promoter of new behavior.

Teacher's research and the construction of school knowledge

In the last decades, according to Marilyn Cochran-Smith and Susan Lytle (2002), one of the fundamental paradigms related to the investigation about teaching has been based on the view of the teacher as a technician that must achieve the results of the studies conducted by others outside the daily school context. Under this vision, teachers are seen as objects of university studies which often propose the application of proposals that are distant from the reality of the school and, therefore, cannot cope with the complex problems of the daily pedagogical practice. There is no valuing of the investigation carried out by teachers and, consequently, they ignore their significant contributions, and those of the schools, which could be articulated to the knowledge produced within the academic communities. Alternatively, the school seen as the locus of production of pedagogical knowledge devises the association of teaching with research, introducing teachers to teaching-research processes or, rather, of research of their own pedagogical practices. However, it is known that this is not a simple process, for the difficulties present themselves in the very conception of the role of the teacher and of the school, as well as in the concrete conditions under which the teaching work is developed.

In the work with the group of teachers, it was observed that the conceptions of teaching that they brought with them had significant influence upon the levels of investigation achieved. Generally speaking, the teachers that conceived teaching as a process of transmission of contents seemed to develop their investigations guided by a technical rationality, valuing theory and its practical

applicability, differently from those who saw teaching as a dialogical process of constructing knowledges, and who, therefore, developed their investigations in self-reflective spirals, guided by the practical-theoretical rationality. The development of a practical-theoretical level of educative investigation, as fostered here, implied in conducting the problematization of teachers' action faced with the development of the school projects of environmental education. In this sense, the proposal consisted in articulating fieldworks and environmental studies with the use of maps, aerial photographs and satellite images through the development of school projects of environmental education in urban microbasins. Or, more specifically, the challenges and difficulties of teachers' action faced with the development of such proposal constituted the research problem of the participant teachers, guiding or provoking the investigation process about their pedagogical practices. This finds justification in Schon (1995), for whom, in the world of practice, the problems are not presented to the professional as given but, on the contrary, must be constructed from the elements of problematic situations. It is also justified in John Elliott (1994), for whom it is the real, concrete problems, and the difficulties of daily teaching practice, that can constitute objects of investigation. Nevertheless, an observation should be made here, since if every researcher teacher is reflective, not every reflective teacher is a researcher. The researcher teacher problematizes the reflections, assuming him/herself as one of the active variables of the process, while the reflective teacher may focus on developing answers, concentrating on reflections that do not include him/her. Considering the above, the work with the teachers attempted to develop problematization, to promote the collective reflection about their practices, aiming at understanding the teaching and learning processes, as well as to search transformation based on the investigation of school practice. In synthesis, it sought:

- to consider teachers' ideas at the proposal of using fieldworks and environmental studies with maps, aerial photographs and satellite images for the study of the environment;
- to reflect with the group of teachers about the problems and difficulties found in developing the school projects of environmental education;
- to promote the development of innovative methodological procedures with the activities and resources proposed.

The school project and the development of teaching-research

The school project as a form of organization of the pedagogical work can offer a rich opportunity to value and promote the autonomy of the teacher, and also to stimulate collaboration and integration between people, knowledges, disciplines, and methodologies. For developing amidst the inherent difficulties of school daily life, and for proposing the intentionality of school action, its development implies an exercise of articulating theory and practice, ideal and real, individual and collective, possibilities and limits, in a process of action-reflection. It is the construction of this process that turns the school project into a significant possibility for the education of critical and participative teachers and pupils. Understanding such process contributes to know better the reality of the school, as well as the existing conceptions of teacher, pupil, knowledge, teaching, and learning. School projects are, therefore, understood as a preparatory stage in the construction of a political pedagogical project for the school, resulting from the collective construction of the teaching pedagogical work focused on essential issues of today's society manifested in the context in which the school finds itself in its daily life.

In the present case, all teachers involved in the development of the school project

participate in the same process, albeit in distinct forms at certain moments. And, in this process, it is understood that it is up to the educator/researcher to promote a manner of collaborative research that contributes to the development of teachers with respect to the transformations of their practices. As explained by Angel Pérez Gómez (1995), since it is not possible to teach practical thinking, the figure of the supervisor or university tutor acquires vital importance. He or she must be able to act and reflect upon his/her own action as educator, and to perceive that his/her intervention is a second-order practice, a process of reflective dialogue upon the educative situations. Under a collaborative partnership, still according to this author, the reflection and intervention upon reality become viable from the interaction among peers, which assume specific roles in the process. In this sense, it is up to the educator/researcher to promote reflections with his/her peers to contribute to transform assumptions and practices, and to overcome simplistic and erroneous views present among teachers who still do not see the school as a space for dialogue between different types of knowledges, and of construction of knowledges, and which, therefore, reduce teaching activity to the mere transmission of contents prescribed in official curricula. Such reductionisms have serious implication when, for example, in the case at hand, it is proposed to the teachers the use of resources of remote sensing in the development of projects for environmental study. Since the majority of teachers still do not have access to, or knowledge about, the possibilities of school use of this space technology, when these are presented to them, they generally react with awe, curiosity, or fear. For some teachers, remote sensing technology "is something very interesting, but unsuitable at school because it is not in the school curriculum", or still because "remote sensing is something so sophisticated that it is something for scientists!", according to the testimony of a science teacher from Guarulhos.

Contrary to the idea of *capacitation* which generally conceives the teacher as a technician that must apply the received theories and techniques to solve the problems, in the present case the work of the educator/researcher with the group of teachers aimed at overcoming the distancing between knowledges, with emphasis on the scientific knowledge and its products and methodological contributions. It tried to reestablish or reconfigure the relationship of the teacher with the scientific knowledge, proposing the action of the teacher as a researcher. In other words, it attempted to work from the critical-dialogical perspective, considering the importance of debate and reflection upon the pedagogical action in the construction of new knowledges and school practices focused on the study of the environment. For that, the formative process was oriented so as to:

- consider the teachers' classroom practices, as well as their school context;
- stimulate teacher's research as an axis of his/her formation and, through it, construct collectively, and from the development of school projects, new teaching practices with geoscientific themes;
- promote collective spaces of reflection using the collective pedagogical working hours (HTPC);
- propose the record of investigation processes through the use of itinerary journals.

The work with the methodology of projects at the school allowed teachers to bring closer the activities of teaching and research. The teaching-research they conducted, according to their testimonies, contributed to improve their pedagogical practice insofar as, by investigating more in the classroom, teachers explored forms of innovation and constructed teaching practices more in line with the need for pedagogical renovation, and more articulated

to the reality in which the school is immersed. The development of school projects also contributed to build a pedagogical knowledge about teaching and learning in geosciences and environmental education, turning the school into a center of dissemination of knowledges to the community.

The practices of teacher education in the construction of school projects

The insertion of the teacher into the process of constructing an interdisciplinary school project constituted a rich experience in their formation, considering the development of new attitudes and practices needed to fulfill the common objectives characteristic of group works.

Considering that teaching-research, as a specific modality of action-research, contributes both to form a critical and reflective teacher, from the investigation of their own practice and consequent improvement thereof, and to the construction of school knowledge, teachers' education included the following activities:

- to problematize the pedagogical practice in face of the challenge of dealing with socio-environmental issues at school, aiming at perceiving and understanding the complexity of educational and socio-environmental reality;
- to stimulate the debate among participants, and to organize the ideas that emerged from the discussions, systematizing them in the form of questions;
- to plan and assess actions collectively, considering the development of the school project of environmental education for the school;
- to promote new questions and didactic suggestions in the group, with a view to new reflections and proposals for actions;
- to transform difficulties into challenges by going through the stages of problematization, planning, action, reflection, and new planning.

Considering, still, that the participants in the educational investigation at school (teachers and pupils) must be the subjects in this process of investigation, their real, concrete problems, their difficulties and daily challenges constituted the object of investigation in their environmental education school projects. We refer, therefore, to real teachers and pupils, social subjects who dialectically *implicate* and are *implicated* in and by the school and socio-environmental context, and who have, thus, with their researches, as critical analyses of the school and social reality, the possibility of contributing to transform these practices, respectively. This implied the creation of a space of dialogue and (self)criticism capable of stimulating teachers to reflect upon their daily problems in order to transform them into research problems, whose search for solutions, restructurings and re-significations implied the adoption of action-research, here understood as more than a set of research techniques, as a continuous attention to the relations between educational and social theory and practice (DINIZ-PEREIRA; ZEICHNER, 2002).

In this process collective spaces were created for reflecting upon the teachers' didactic practices and upon the investigations developed by the group. Strategies were developed to allow teachers to perceive the importance of their practice in the process of constructing the concepts of the pupils, as well as the need to rearticulate school contents with their reality, with a view to contextualize teaching, and to allow pupils to analyze their reality and to position themselves before it. It was, therefore, a matter of developing a collective work of critical reflection about the pedagogical practice, aiming at understanding and developing didactic-pedagogical processes

for the study of the environment, and also at constructing new forms of conceiving teacher action and understanding the surrounding socio-environmental reality.

Among the strategies developed during the collective pedagogical working hours (HTPC), we have:

- stimulating the participation of all teachers, considering (always) the development of environmental education project in their schools;
- considering the diversity of teachers and of their points of view;
- identifying their difficulties in this process and reflecting with them;
- observing the advances made, systematizing and evaluating them together, considering the objectives initially agreed by the group.

We should note that there were obstacles and resistances to the process. The difficulties appeared both with the teacher – in the *fear of the new* and its consequences, as well as in their formation deficiencies and in the mismatch between discourse and pedagogical practice –, and with the school – in the school principal and pedagogical coordinator failure to support and make possible the development of the school project. However, it is understood that, despite the difficulties or, perhaps also because of them, the teacher that undergoes an experience such as this will never be the same again, for he/she has learned that it is possible to transform his/her practice, which implies dealing constructively with obstacles.

Fieldworks employing remote sensing resources: the construction of the geoscientific outlook at school

The analysis of the environmental theme requires the integration of different resources into didactic-pedagogical activities at school. Fieldworks making use of maps, aerial photographs, and satellite images contribute to that by stimulating the investigation of problems from the socio-environmental reality in an integrated form, considering their implications and repercussions at various scales. By allowing the gathering of information about the environment, satellite images and aerial photographs stimulate the apprehension of the temporality of the facts in their dynamics, as if they were *photographs of the historical process or photographs of the social relations* at a given time and space and, therefore, of reality such as it is constructed/destructed. This allows understanding the environment as a historical product, woven in the daily social relations, conflicting and contradictory, in which teachers and pupils also play a part (SANTOS, 2002).

An interesting example can be observed in the study of hydrographic basins. To perform an integrated reading of their problems and repercussions in different spaces, we can associate to the fieldworks the use of maps at several scales, of aerial photographs, and of satellite images. One can work simultaneously with maps of the basin/microbasin under investigation, with maps of the borough and municipality, with field photographs, with aerial photographs and satellites images of the region, including those from different periods, with a view to georeference the data collected during the fieldwork, and also to relate them so as to understand their space and time dynamics. With the integrated use of these resources it is possible to identify the river or stream under study, to circumscribe the hydrographic basin, to define points for the collection of water samples for analysis, and thereby locate possible sources of pollution, apart from other important elements to understand the environment under study, such as urban and green areas. The environmental study can contribute to (re)cover knowledge of the place – in the present case, the hydrographic basin – when it is structured so that it supplies elements for the reflection about the influence of social

relations upon the configuration of this place, and about their implications for the quality of life. Conducting different field activities – such as collecting water samples, preparing reports, drawings, photographic records, interviews etc – can contribute in this process of (re)covering knowledge of the place. We speak of (re) covering knowledge because, curiously enough, the place under study is often already part of the daily life of the pupil/researcher. That is to say, oftentimes the environmental studies are carried out in areas already *known* by the pupil, such as the school neighborhood, the borough where he/she lives, the river nearby etc. Nevertheless, when assuming the identity of a researcher in his/her own environment, the pupils acquires the necessary distance from the object, which allows him/her to become aware of, or (re)cover knowledge of, the reality in which he/she lives. Such (re)covering allows the critical apprehension of the environment under focus, which can contribute to overcome passive attitudes before the local socio-environmental problems.

Since the environment is under a continuous and dynamic process of transformation, the real situation of neighborhoods and towns is frequently perceived superficially, as a consequence of this dynamics, being, therefore, little known and, above all, questioned. An interesting methodological procedure that can be developed with pupils to allow them to (re)cover knowledge and update information about the place under study consists in conducting what is called a *socio-environmental mapping* (SANTOS, 2002). The socio-environmental mapping is an important didactic-pedagogical resource to (re)cover knowledge of the place under study in its various aspects. It contributed to gather socio-environmental information to prepare a diagnostic of the local reality, and also gives elements to reflect about the implications of the form of use and occupation of the mapped space to the quality of life of those living there. A few examples of indicators that can be *mapped* are: water streams, green areas, residential areas, landfills, risk areas, paved and unpaved streets, health and leisure facilities, water supply and sewage systems, industrial and commercial plants, contrast between low and high occupation areas, amongst others, apart from the location of the pupil's school and home. In the present case, the pupils in the field, split in groups, created theme mappings through a *record of environmental elements of the microbasin* called V.E.R.A.H.: V (vegetation); E (erosion); R (solid residues); A (water); H (residence/occupation). With the superposition of these theme mappings the pupils created a *Geographic Information System* of the place.

The socio-environmental mapping stimulates the development of didactic-pedagogical activities complementary to the reading of the place, such as reports, interviews, rescuing the local history, photographic records, production of texts, drawings and preparation of play material (mockups and didactic games), amongst others, thereby contributing to the study of the place and to the understanding of the environment as a space historically constructed/destructed by daily social relations oriented by various interests. At school, the development of this activity contributed to form *readers critical of the space*, insofar as it gives pupils the conditions to: know how to read/interpret the space under study; know how to think space in its relations; and know how to transform/make the space, as a contribution to the formation of critical and participative citizens, subjects of their own environment. The socio-environmental mapping constitutes an important instrument of participation of the community, both to gather information and to (re)cover knowledge about the local reality, expressing demands, perceptions and trends of its residence, and to supply elements for the creation of proposals of solutions to the problems identified and, also, to the planning of actions aiming at the improvement of

the quality of life in that place. Conducting interviews with the residents of the area under study is of great help to supplement the socio-environmental mapping, since it is an important resource to learn about the representations and aspirations of the community about their own environment. Interviews, especially with old residents, allow the recovery of the history of the neighborhood or region under study via the record of oral memory and, based on this information, to understand how the process of use and occupation of the place happened up to the present day. For example, testimonies from residents who knew the riverheads of the region – today covered with asphalt –, who swam and fished in their waters – mostly nowadays canalized and turned into open air sewages –, in other words, who *saw* the urbanization process arrive, can be of great help to young urban pupils who, in their vast majority, only know the *end of the story* and live with its consequences. The interview is also important to collect suggestions, expressing trends, particularly when carried out with youngsters. In general, interviews can dig up basic information such as: time of residence at the region, the description of the landscape by the resident, the narrative of social experiences established in the local community, the assessment of local problems and/or deficiencies; the expectations or perspectives of the residents, among other information. On the basis of the data collected in the field through the socio-environmental mapping and interviews, among other activities, the pupils can make diagnostics and projections for the environment under investigation.

The fieldworks and the studies of the place with the integrated use of maps, aerial photographs and satellites images make it possible to develop significant school studies about the relations between society and the nature, considering their space and time dynamics, as well as to ground the development of school proposals for the solution of the problems diagnosed having in mind the transformation of the place. The integrated use of different resources in didactic-pedagogical activities allow the establishment of relations between the local and the global, stimulating the construction of concepts and of reflection about the implications of these relations for the quality of life of the population, considering different scales of repercussion of the problems studied, such as, in the present case: the microbasin under study; the region of Cabuçu, next to the Cantareira Sierra; and the municipality of Guarulhos in the metropolitan area of São Paulo. According to the teachers, such wide and integrated view brought about for the pupils a change in their perception of the importance of preserving the local woods, because, at first sight, relying only on a point observation, many of them overestimated the existing *amount of green* and, afterwards, with the help of aerial photographs and satellite images, it was possible to put the information restricted to the local into broader perspective, and to perceive the *need for the green* for the region as a whole. Such perception agrees with Edgar Morin (1999), to the extent that isolated information or data need to be contextualized in order to acquire meaning, and also reveals the understanding that local problems cannot be explained in isolation, but rather establish different socio-spatial relations and, therefore, *implicate* and *are implicated* in a constant two-way movement. The integration of remote sensing resources into fieldworks allows overcoming a fragmented and compartmentalized view still present in the school of the approach to complex problems such as the environmental ones, affording an articulated and *systemic understanding* of these problems through the establishment of relations between the local and the global. Apart from that, it also contributes to the study of environmental problems and of their repercussions and implications in the context of the dynamic and complex relations between nature and society, as well as to construct

the *geoscientific outlook* in the school as an element to the formation of pupils/citizens well informed and aware of the place in which they live.

The study of the socio-environmental reality

The study of the socio-environmental reality aimed at unveiling the natural, social, economic, political and cultural processes that constitute the fabric of the daily life of the place. To such end, it was necessary to develop political-pedagogical practices capable of enabling the students to:

- observe/learn about their environment, the place in which they live;
- reflect about their real situations, and on the basis of this process,
- propose actions and construct educative interventions into the problems studied, with a view to develop solutions for them, as an exercise in citizenship in a search to transform the socio-environmental reality.

These aims require the development of transforming pedagogical initiatives focused on:

- the environment in which the pupil lives;
- the fieldworks with remote sensing data, among others, as resources that mediate the construction of the pupil's knowledge about this environment;
- the construction of the critical awareness of pupils with respect to their environment.

This implies considering the pupil's environment, the place and its immediate reality, and the understanding that he/she him/herself has of it as the *point of departure* for the activities. Grounded in the direct observation of reality, in the use of different resources, and in the dialogue with their peers and teachers, the pupils make a critical and constructive rereading of this reality; they identify its socio-environmental problems; they establish relations between the information gathered, and also develop proposals to transform it. The recreation of the initial understanding of the pupils results in an exercise in the construction of a critical awareness of the theme under study, constituting thereby the *point of arrival* of the teaching and learning process.

Thus, the school projects of environmental education developed contributed to construct a systemic view of the socio-environmental issues under investigation by allowing, through the integration of the resources employed in didactic-pedagogical activities, the understanding of the interrelations between environment and society. They also contributed to form critical and participative pupils/citizens, capable of understanding the environment in which they live and of proposing alternatives to improve the quality of life. This statement is corroborated by the testimony given by the Science and Arts teachers from one of the participant schools:

> Because it is a work conducted in the neighborhood where they live, the pupils became gradually involved with the project, giving their opinions, telling stories, drawing comparisons, analyzing the problems, and seeking possible solutions within their reach, as for example, making the population aware of the problems of deforestation, irregular building, waste, canalization and sewage treatment, and about the importance of cleaning and recuperating the stream and of stricter vigilance by the local authorities.

And they conclude: "when pupils give their opinion in activities they want to perform, and when the subject is related directly to their experience, they become more interested in the work."

School projects in the study of the environment, social learning and citizenship

Environmental education as formation of citizenship, or as an exercise in citizenship, has to do with a new way of conceiving the relation between society and nature in the search of constructing fairer and more ecologically balanced societies. This implies a permanent learning process, and requires the definition of transparent public policies, proposed and discussed with society as a whole, and focused on improving the quality of life (JACOBI, 2005).

The school projects try to contribute to form citizens critical and participative with respect to their environment. Their development comprises three fundamental aspects: it stimulates the reflection and search for alternatives to the problems posed by the school practice; it contributes to raise the awareness of issues of the socio-environmental reality investigated, and it also promotes the production of knowledges resulting from this process.

Considering that the work of constructing environmental awareness implies a work of constructing citizenship, these projects invest in the construction of Centers of School Citizenship. Comprising pupils and teachers, these centers propose to act as educative spaces for the community, aiming at the multiplication of knowledges produced through the development of the projects of environmental education for the residents of the areas under study. They have as their objective to promote the dialogue between school, local community, and public authorities, with a view to develop partnerships and actions geared towards the search for solutions to the local socio-environmental problems diagnosed during school projects, and to contribute to the definition of democratically organized public policies.

It is worth mentioning here that, since the socio-environmental problems studied by the schools in their communities reflect multiple and contradictory contexts, powered by different interests, values, beliefs and needs, the actions of the Centers of School Citizenship cannot ignore the existence of the social conflicts characteristic of this reality, but, rather, they need to know them in order to deal with them. For that, it is necessary to admit the existence of the conflict in the various local social relations not as something negative to be avoided, but as something positive and, from that, apprehend it as a space open to negotiations, to dialogue or, better still, to social learning. This implies learning *in* and *from* reality, from the critical reflection about the common problems, about the knowledges at our disposal to solve them, as well as from the reflection about ourselves and about our relationships with the others, with a view to negotiate interests for the construction of a better world (WALS, 2007). Social learning promotes the (re) thinking of concepts, the construction of new knowledges and values capable of contributing to transform practices, and the development of new competences, aiming at a fuller and more efficient participation in the solution of socio-environmental problems, in decision-making regarding them, and in conflict management through processes of co-learning (WALS, 2007).

In accordance to such assumptions, the Centers of School Citizenship, as spaces of social learning, express an eminently pedagogical and political character. The projects for local action developed there dialogue with different social organizations, such as community associations, churches, NGOs, Family Health Program, aiming at the construction of *networks* of interest in the community. Examples of issues approached are:

- *environment and health* (sanitary education in partnership with health agents in risk areas);

- *sanitation and environmental education* (organization of communal efforts in partnership with public authorities to clean up water streams and to develop education campaigns);
- *sustainable city* (partnerships to revitalize rundown areas; improvement of planting stock and community herbal medicine orchards);
- socio-environmental entrepreneurship (cooperative of recyclable products; generation of income).

The environmental education school projects under development in these Centers, as political-pedagogical practices, represent, more than a possibility for education, a social need and a political commitment with the construction of a better place to live. They seek to sensitize and mobilize different social actors, from the school action, so as to allow them to participate in the process of transforming school proposals and suggestions focused on the improvement of the quality of life into projects of the organized community. They express a communication channel for school knowledge and for the dialogue about environmental issues, with a view to energize society, to promote the socio-environmental co-responsibility, and to plan a better future.

The creation of socio-environmental awareness at the schools requires the constant exercise of sensitizing teachers, pupils, and community through the development and consolidation of spaces for social learning. In developing these projects, the school will contribute to face the political-ethical challenge of environmental education before the urgent need to construct a more just and ecologically balanced society, grounded on the knowledge and exercise of citizenship.

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