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Conceptions of Environment in a Continuing Education Course for Science Teachers in Brazil*

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Studies focusing on environmental education and continuing education of science teachers play an important role in the science education area. This research analyzed conceptions of environment in a continuing education course for science teachers developed at the University of Sao Paulo, Brazil. The analysis of the material was made using a qualitative approach and content analysis methodology. The conceptions of environment were analyzed and characterized by the use of categories previously defined and selected from the literature. Although different conceptions were identified, the conception of environment as a resource prevailed, demonstrating a serious limitation of the course in the environmental education of the participating science teachers. As a result of the education process, a naive and limited view on environment by teachers was observed. The results point to the need to reformulate continuing education courses in order to favor a more critical environmental education.

Keywords: environment, science teacher, continuing education

Introduction

Over the last decades, science education research that has been preoccupied with the way science is associated with ethical, political and social aspects. In this context, studies focusing on environmental education and continuing education of science teachers play an important role in the science education area.

Kuhn (1980) and other researchers have shown the importance of in-service training for science teachers to keep abreast of changes in their field in subject matter, curriculum development and instructional techniques. Aleixandre and Gayoso (1996) presented an approach that attempts to use environmental education as a thread in scientific methodology courses intended for teacher education. In Brazil, an overview on science teacher education has been recently published (Villani, Pacca, & Freitas, 2009). It analyzes the most significant events that have been occurring in Brazil's educational, social and political areas over the last half century, in comparison with a set of relevant worldwide events.

A clear understanding of the concept of teacher education and the analysis of conceptual frameworks related to professional education conditions are fundamental to understanding the education process in

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which teachers are involved. Based on the classification of paradigms of Zeichner (1983), conceptual guidelines of Feiman-Nemser (1990) and the classification of Pérez Gómez (1998), García (1999) proposed five types of teacher education orientation: academic, technological, personalist, practical and social reconstructionist.

In the academic orientation, continuing education is seen as a process of transmission of scientific knowledge and culture, by means of a specialist training. In the technological orientation, education is seen as an applied science and the teacher as a coach who dominates the applications of scientific knowledge produced by others and transformed into rules of action. The personalist orientation believes that each person develops their own strategies to become a teacher, occupying the main role in teacher training to achieve personal development training. The practical orientation is found in the organization and development of teaching practices, and it valorizes learning from experience. According to that perspective, practical experiences contribute to providing teachers with better training, because they combine observation, direct experience and inter-relationships with more experienced colleagues. The social reconstructionist orientation is an ethical and social reflection, seeking the ability to analyze the social context. In this orientation, teacher education is directly related to processes of change, innovation and curriculum development for teachers, who are considered as individuals committed to the principles of social justice and democracy.

The characterization of the environmental approach in a particular educational context is generally thought considering the analysis of EE (environmental education) expressed in the context analyzed. From this perspective, a lot of research has been developed, identifying different conceptions of EE and proposing different categories to illustrate the form of ownership and the meaning assigned to that expression. As a result, a significant number of categories associated with the concept of EE are generated, whereupon there is a diffusion of meanings attributed to that expression.

This tendency of researches to identify the perceptions and meanings of environment and EE is pointed by several studies available in the literature. Parallel to these studies, other researches have been carried out aiming to characterize different conceptions of environmental education and environment in order to understand the different forms of ownership of these issues.

Sauvé (2005) proposed seven ways of apprehending the environment: as nature, as a resource, as a problem, as a system, as a place to live, as the biosphere and as a community project. These categories are based on the understanding that environmental education can be understood from our relationship with the environment. Considering the importance of environmental education in teacher education, this research focuses on the identification and analysis of the conceptions of environment expressed in the materials produced in a continuing education course occurred at the University of Sao Paulo, Brazil, assuming the environment as a key concept to the consolidation of a process of continuing education committed to an effective environmental education. This research leads us to the understanding of different forms of ownership of environmental issues in these courses, often presented as a challenge for the construction of a critical, complex and reflective thinking (Jacobi, 2005), as needed for the construction of teacher identity (Pimenta, 1999).

Methodology

This research analyzed conceptions of environment of a continuing education course for science teachers developed in 2006 at the University of Sao Paulo, Brazil. Such conceptions were identified through documental

analysis of all material related to the course, including the basic guidelines proposed by the Sao Paulo government, the formal pedagogical project produced by the University of Sao Paulo and the teachers' productions.

The analysis of the documents was made using a qualitative approach and conceptual analyses based on content analysis methodology in accordance to Bardin (2002) and assuming that words mentioned more often are those that reflect the form of ownership of important concepts in the documents examined.

Two types of units of analysis were used: sampling units and context units. Specific parts of content were selected as sampling units and the analysis revealed the frequency of the terms, listed in Table 1, all of them directly associated with the idea of environment.

Table 1

Terms Directly Associated With the Idea of Environment That Were Used in the Research in Order to Characterize the Conceptions of Environment

Terms directly associated with the idea of environment
Environment(s)
Natural environment
Environmental
Socio-environmental
Sustainable development
Sustainability
Sustainable society
Nature

The set of terms related to conceptions of environment was built based on the researcher-object interaction and on exploratory readings of all the material analyzed.

Regarding the context units, not only their frequencies, but also the contexts in which they occur were analyzed. Annotations, tables, diagrams and other sorts of brief communication were all used as sampling units, being part of the first stage of data classification, which also included the type of information source, the topics and themes addressed and the nature of the material collected. After all, the materials were read and the data organization was completed, some categories of analysis were created based on the fact that, according to Bardin (2002), such type of categories can classify the elements of a group by means of differentiation and then regrouping, taking into account previously defined criteria. The information was grouped considering the terms with regular frequency expressing conceptions of environment that was associated with the categories proposed by Sauvé (2005), which are listed in Table 2.

Table 2

Categories of Environment Used for the Classification of Conceptions of Environment Expressed in the Material Analyzed

Categories of conceptions of environment*
As nature
As a resource
As a problem
As a system
As a place to live
As the biosphere
As a community project

Note. * Proposed by Sauvé (2005).

As soon as an initial set was obtained, the categories were assessed regarding their range, diversity and

limit. The idea was to identify the main EE perspective present in the course based on the dimension of the ownership of conceptions of environment.

The course analyzed was organized for the “Web of Knowledge” program, focusing on educational topics related to science teaching and deepening themes of science, in order to promote instructional transpositions and/or recontextualizations of scientific knowledge to the school context.

From the conceptual and methodological approaches of subjects of natural sciences, the teachers created TPs (thematic projects) as a joint proposal between teachers from the same school or between teachers from different areas in order to encourage interdisciplinary collective actions in school after the continuing education course. In these projects, the participating teachers had the opportunity to carry out the planning and preparation of schedules of courses and teaching sequences on a theme, taking an active role during the course. The group of teachers consisted of people in the age range from 30 to 55 years old, the majority of them (71.4%) being women. Their teaching subjects included mathematics, physics, chemistry, biology and science. In this regard, it should be pointed out the considerable amount of biology teachers (33.33%) and the fact that 80.95% of the teachers were assigned to teach subjects related to only one knowledge area.

Results and Discussions

Conceptions of Environment in the Basic Project of the Sao Paulo Government

It was observed that the term “environment” appears in the basic project of the Sao Paulo government with the meaning of place, associated to the context of learning environment. “Nature” was another term identified as a possible environmental focus. However, it is only used to characterize an area that includes some scientific knowledge. In both cases, there is not an explicit ownership of the concept of environment, which demonstrates the absence of environmental education in the basic guidelines established by the Sao Paulo government for continuing education programs designed for science teachers.

The basic project proposes the use of new methodologies focused on innovative practices and use of instructional materials. The training of teachers is focused on the development of skills for the use of new technologies with the adoption of assessment practices as a monitoring tool of teaching, emphasizing the development of skills in a continuing education based on technological orientation, as defined by García (1999).

Conceptions of Environment in the Pedagogical Project of the Course Proposed by the University of Sao Paulo

As in the basic project, the term “environment” appears in the pedagogical project of the course with the meaning of place, referring to school as a place of learning situations. It is established that the environmental approach should be treated as one of the themes to be developed, but no explicit conception of environment is provided.

The absence of an environmental perspective for continuing education can be explained by the need for coherence between the pedagogical project proposed by the university and the one proposed by the Sao Paulo government, resulting in a repetition of several parts of the basic project of the government. In this regard, the pedagogical project can be considered as being only a bureaucratic and formal document without a detailed description of its real pedagogical intentions.

Unlike the basic project of the government, the pedagogical project of the course shows a strong academic

orientation, focusing on specific scholar contents related to natural sciences. A practical orientation in a reflective approach (Pérez Gómes, 1992; Schön, 2000) is also observed, showing the concern of reflecting on the practice itself, involving all teachers in reading activities and records of texts. It is important to note that in both documents, the absence of an environmental perspective is due to the emphasis on a continuing education with technological, practical and academic orientation.

Conceptions of Environment Present in the Materials Used by Teachers During the Course

The frequency of terms related to environmental issues present in the materials used by teachers during the course is shown in Table 3. It is observed that the terms "environment" and "nature" appear with more frequency in most of the materials analysed. However, it was not possible to clearly identify conceptions of environment using the categories proposed by Sauvé (2005). This result suggests that there is not a prescription of a conception of environment present in the materials used by teachers in the course.

Table 3

Frequency of Terms Related to Environmental Issues Present in the Materials Used by Teachers in the Course

Materials used by teachers	*EN*	*SE*	*SD*	*S*	*SS*	*N*
M1	6	0	0	0	0	4
M2	0	0	0	0	0	0
M3	4	0	0	0	0	7
M4	0	0	0	0	0	1
M5	1	0	0	0	0	0
M6	0	0	0	0	0	3
M7	4	0	0	0	0	25
M8	19	8	0	0	0	1
M9	1	0	0	0	0	3
M10	0	0	0	0	0	0
M11	3	0	0	0	0	5
M12	32	0	0	0	0	15
M13	0	0	0	0	0	0

Notes. EN: Environment; *SE:* Socio-environmental; *SD:* Sustainable development; *S:* Sustainability; *SS:* Sustainable society; *N:* Nature.

Conceptions of Environment in Thematic Projects Produced by Teachers

The frequency of terms related to environmental issues is presented in Table 4.

Table 4

Frequency of Terms Related to Environmental Issues Present in Thematic Projects Produced by Teachers

Thematic projects	*EN*	*SE*	*SD*	*S*	*SS*	*N*
TP1	2	0	0	0	0	0
TP2	1	0	0	0	0	0
TP3	6	0	0	0	0	0
TP4	0	0	0	0	0	0
TP5	6	0	0	0	0	1

Notes. EN: Environment; *SE:* Socio-environmental; *SD:* Sustainable development; *S:* Sustainability; *SS:* Sustainable society; *N:* Nature.

The term "environment" was the most cited among the six terms used in the analysis of frequency. Only

the thematic project TP4 did not make use of a term explicitly associated with environment.

In TP1, teachers point out that,

> The theme of global warming was chosen because of the drastic consequences that the planet will suffer in the future, as well as because it integrates related disciplines and can be linked to the social, political and environmental... This theme sends an alert to young people (students) about the problems that may arise. (TP1)

In TP1, TP3 and TP5 (see Table 5), the contents of the curriculum components are seen as knowledge to be acquired to minimize or solve future problems, which is characteristic of a conception of environment as a problem to be solved. The analysis of TP3 and TP5 also shows the presence of conceptions of environment as a resource. Only in TP2, the conception of environment as the biosphere is observed.

Table 5

Conceptions of Environment in Thematic Projects Produced by Science Teachers

Thematic project	As nature	As a resource	As a problem	As a system	As a place to live	As the biosphere	As a community project
1	-	-	*X*	-	-	-	-
2	-	-	-	-	-	*X*	-
3	-	*X*	*X*	-	-	-	-
4	-	-	-	-	-	-	-
5	-	*X*	*X*	-	-	-	-

Note. *X* = Symbol indicating the presence of the conception.

In relation to the conceptions of education, the TPs produced by the teachers show a practical perspective within a reflective approach. However, in the pedagogical project, there was no emphasis on a technological and academic orientation.

These results indicate a possible correlation between a conception of environment as a resource/problem and a practical approach, pointing to the need to reformulate continuing education courses in order to favour a more critical environmental education.

The incorporation of environmental issues in the educational process should include, as a first step, the involvement of the teacher, who should be aware of the need for this issue and then prepared and equipped to meet this challenge. We agree with Carvalho (2001), when he points out that it would be imprudent to reduce certain arrangements. The institutions responsible for education, along with other social sectors, should provide different educational opportunities for in-service teachers in order to ensure their continuing education.

Considering the different dimensions in teacher education proposed by Carvalho (2001), we understand that the course analyzed should explore more the dimension related to ethical and esthetic values and other initiatives that favor a more effective political participation of citizens.

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