

CLAUDIO-RAFAEL VASQUEZ-MARTINEZ, CLARA GONZALEZ, FATIMA CARRILLO, LUIS DELGADO, MIGUEL ALVAREZ, MARIA MORFIN-OTERO**EDUCATION AS AN ENVIRONMENTAL TOOL****Abstract**

One of the main factors in the globalization of problems and opportunities that face human society is science, which deals with matters of health, environment, competitive production, and employment, among other issues, and generally ways for promoting a better quality of life.

Science has become a central part of the culture in the developed countries, where it has been made a priority in the education of citizens. Also, traditional elements of culture have been reinforced when they emphasize and maintain development and a form of democratic life like supportive pillars.

Introduction

The need to address environmental problems requires a perspective that involves a critique of these different areas of knowledge and the development of human knowledge to create alternatives. For that reason, in addition to the influence of economic obstacles and social facts on the sort of development that can be used to deal with environmental problems, the chances of reversing the deterioration of the environment is compounded by the processes of education and the construction of knowledge (Romero, 1997).

Research will make it possible to identify the extent to which the environmental dimension is currently involved in the educational endeavour, as well as the obstacles that may face new educational practices, which range from looking at everyday life in the classroom, to the establishment of programmes of environmental education, mainly in terms of their social impact (Romero, 1997).

Educational philosophy

Educational philosophy is based on Article 3 of the Political Constitution of the United States of Mexico, in which it lays down that:

State education will stimulate and develop all the faculties of the human being in a harmonious way, at the same time as promoting patriotism in the context of international solidarity, independence and justice.

Article 24 guarantees freedom of belief, and education is to be secular and will maintain the absolute right of any citizen to hold any religious beliefs at all; education will be guided by the results of scientific progress, and will fight against the ignorance and its effects, servitude, fanaticism and prejudices.

In addition:

- a) It will be democratic, considering democracy not only as a legal structure and a political regime, but as a system of life founded on constant economic, social and cultural improvement of the people;
- b) It will be national, in so far as - without hostility or exclusion - it will take care of the understanding of our problems, the benefit of our resources, the

defence of our political independence, securing our economic independence and the continuity and increase of our culture; and

- c) It will contribute to the improvement of human existence, as much by the elements that contribute to strengthening education, as with concern for the dignity of the person and the integrity of the family, the pursuit of the general good of society, and taking care to promote the ideals of brotherhood and equality of the rights of all men and women, and removing privilege on the basis of race, religion, social group, gender or individual differences (Political Constitution of the United States of Mexico, relevant text).

There can be no doubt that each civilization has incorporated technical and scientific knowledge into its culture. Philosophy analyses the relationships between education and the generation, diffusion, transference and application of scientific and technological knowledge, to improve the quality of life and social well-being.

In the report to the UNESCO International Commission on Education for the 21st Century, it is stated that: "Faced with the many challenges of the future, education is an indispensable tool for humanity to progress towards the ideals of peace, freedom and social justice" (Delors, 1996).

The same report also argued that lifelong education should be based on four pillars:

- Learning to know, combining a broad general culture with the possibility of deepening the knowledge in a small number of areas. This presupposes the ability to learn to learn, to be able to take advantage of the opportunities education offers throughout life.
- Learning to do, in order to acquire not only a professional qualification but, more generally, a competence that enables an individual to act in a range of settings and to work in a team.
- Learning to live together, developing an understanding of others and of different forms of interdependence, while respecting the values of diversity, mutual understanding and peace.
- Learning to be, cultivating one's personality and character so as to be able to work autonomously, fairly and with a sense of personal responsibility, without diminishing the development of anybody's talents. This includes the development of memory, reason, aesthetic sense, physical ability, and competence, skills and attitudes to promote communication, and among other things:
 - The knowledge of how to generate and apply scientific, humanistic and technological knowledge,
 - The ability to acquire professional skills and attitudes,
 - The will to promote values, and
 - The originality to develop creativity.

Models of science and of education

The contributions made by paradigms in the development of science have been appropriate for the historical time in which they bloomed, and they function as an approach or theory that orients the way a subject is thought about and considered. This is an aid to people, who can believe, think about and organize their

understanding of reality. Scientific paradigms have given rise to the construction of the pedagogical models that inform education:

- Behaviourist theory: The behaviourism of Skinner consists of a passive response on the part of the student, like a machine processing data.
- Theory of the cognitive learning: For Piaget, who worked within the psycho-genetic tradition, learning has its origin in action, based on previous learning and mental organization. Learning must be significant for the student.

Ausubel affirms that the significant learning for the student should arouse interest, motivation, innovation and application for that which is to be learned. Learning by discovery is one means of achieving these goals.

- Social learning theory: Vygotsky sees the student as a cultural being, while the environment has a great influence. The higher mental functions are acquired through social interaction.

No educational model is good nor bad in its own right, but all are perfectible, subject to adjustments, following their surroundings, and the characteristics of the students to whom it is applied, providing methods and resources for the teacher (Galindez, 2009).

The didactic foundation of research

It is said that research is the handling of things, concepts or symbols that allow us to extend, to correct or to verify the knowledge, or to help in the construction of a theory or the practice of an art (Slesinger, 1962). It is also said that research is, “to run errands to discover something” or to conduct intellectual and experimental activities in a systematic way in order to increase knowledge on a certain matter (Dictionary of the Spanish Royal Academy, 2001). A third source mentions research as a process that is conceived as a continuous investigation and as a contribution to explanations that form the construction of knowledge, subjects and environments (Romero, 1997).

In this way research can fulfil one of two fundamental purposes: to produce knowledge and theories (basic research) or to solve practical problems (applied research). Thus, research is a tool that allows us to know our surroundings and its character is universal (Hernandez, 1999).

In addition, using research as a process for the social construction of knowledge, promotes the handling of information from different sources and the development of suitable media to support the communication of data, results, refutations and so on, and thus harnesses the flow of information (Cañal, 1987).

Titone (1981) says that research constitutes the most authentic and natural form of experience for any human being, the most natural and spontaneous route followed by human development generally, and the basis of all effective learning, including that of the student.

On the other hand, Bunge (1983) defines research as a directed process to find problems, to formulate them and to solve them. This process becomes scientific research when it is conducted with the methodology and the objectives of science. Thus, problems will be considered scientific when they take into account a scientific background and use scientific methods, with the primary objective to increase knowledge.

The didactic methodology is based on research, although it does not need to be adapted to strict scientific method, or the habitual work forms of scientists. A didactic model based on research should move forward on a number of equally important levels:

- Toward the development of the general aims of education;
- Toward the development of a scientific spirit, and the mastery of the intellectual operations suited to the scientific method, like a tool that can be applied to structure all forms of knowledge in a progressive way, both inside and outside the context of the classroom and laboratory;
- Toward a drive for unfolding experience, in accordance with the previous principles, and providing for the continuous development of the most natural methods of learning, at the same time as using them as tools of intellectual development.

Research can be accepted without hesitation as a sufficiently solid base to sustain an alternative curricular approach, which acts as a global didactic option that can characterize and organize the scholastic practice coherently (García, 1995).

Research methods

Research methods are a curricular element of singular interest and didactic utility and address many of the questions that need to be solved. In fact, they are essential to making an appropriate universal construction of knowledge possible, to stimulate the processes of research into means, to structure scholastic knowledge and to secure a correct integration of cross-curricular knowledge (García, 1995).

By making it possible to consider the social and natural world from a systemic perspective (Cañal, 2003), they define the range of things that can be researched as subsystems of the means specially selected to generate valid lines of scholastic research, such as the structure of the organization and the integration of scholastic knowledge.

Therefore, the scope of research is used as a high level curricular organizer, capable of suggesting how to organize the development of multiple didactic units throughout a stage of education. For example, the scope of investigation of “the home” could be made up of elements of:

- The characteristic elements of all types that make up the home as a system (family, way of life, other people, domestic equipment, furniture, etcetera);
- The interpersonal relationships (affective, of power, communication, etcetera);
- The relationships of the people who live in the home in a domestic environment;
- The distribution of domestic space and activities;
- The flow of materials and energy in the house; and
- The domestic arrangements (relationships, conflicts, economy, consumption, etcetera).

This list of problems, without doubt, can set in motion the content of many appropriate didactic units suitable for different levels in terms of perceptions, reasoning and complexity. In addition, the different types of research not only provide direction for the selection of problems for different didactic units, but they

are an important help in understanding and organising the general knowledge acquired, and connecting the latter to the personal and specific knowledge of the learner, providing criteria, knowledge and instruments for the construction of new schemes of knowledge, that are broader and more systematically structured (Cañal, 2003).

Educational research as an environmental influence

To address environmental problems, requires a perspective that involves various critiques of knowledge, and involves levels of development of human knowledge, with a search for and/or creation of alternatives or solutions. For this reason, the construction of the environment, understood as the interaction between nature and society, needs a new vision that considers reality as a whole. That is to say, it joins the natural and the social processes and studies the interrelationships between them.

In this context, conjectures and tests should form a complete project for environmental research which is designed to build up a critical analysis of the concrete forms of relationships between society and nature, and of human education, as a strategy of cultural and paradigmatic change, in the search for an integral explanation of the world (Romero, 1997).

How can educational research be conducted and applied in practice?

First of all, it is important to undertake the study of environmental education from a systemic perspective. It needs to be remembered that planning for education on the environment embraces several fields: urban conservation, fairness, contamination, rural environments, environmental human rights, ecology, science, integral education, demographics, energy, poverty, ethics, alternative development, society, technology, quality of life, and so on. In addition, these fields interlink and overlap. The process should make explicit the relationships, interactions, results and consequences of interest, and communicate them widely (Mrazec, 1996).

Secondly, the following should be considered as guidelines for achieving good results from research projects in environmental education:

- a. The results of the research are useful insofar as they meet the educational needs of students. This implies that we, as researchers, must include/understand the environmental problems and the need to solve them, involving students in this process.
- b. The success in the transmission of the results of research depends, for the student, on how it is communicated and the degree to which it is memorable. We cannot hope that our students will understand a badly designed message (Monroe, 1996).

Also, to be able put the results into practice, it is important to remember that research, in any field, starts from ideas. Thus, ideas to conduct research in environmental education can arise at any time and in any place: in the school, when observing the relationships in a neighbouring group, in a park, the construction of an engineer construction, when washing our hands, when throwing out the rubbish, when watching the television or listening to the radio.

Certainly, the majority of initial ideas are vague and require careful analysis so that they are transformed into more precise and structured expositions, through

knowledge of studies and similar and/or previous research. In this way the research idea will be formally structured (Hernandez, 1999).

Continuing with the exposition of the research problem is nothing other than more formally sharpening and structuring the research idea. The elements that need to be considered in posing a problem are:

- The objectives, that is to say, what it to be attempted in the research;
- The research questions, from which the development of the project will be guided. To put it another way, they are the questions to which the project is a response;
- The justification for the study, in which the reasons for the study, and its importance, are explained (Hernandez 1999).

The theoretical framework is developed through stages. In this process the study is sustained theoretically. This implies a literature survey of the topic, to analyze and to set out the theoretical approaches, the previous research and the background that are considered important to frame the study (Rojas, 1981). The theoretical framework, among other things, makes it possible to avoid errors that have been committed in similar studies, to orient the way to conduct the study, and to provide a frame of reference to interpret the results of the study.

It will also define the type of research that must be conducted, that is to say, the way to carry out the project. Some of the most traditional ways of conducting research projects are:

- a. Exploratory study: Where the objective that is pursued is to examine a subject or problem of investigation that has not been studied much or has not been approached.
- b. Descriptive study: Where one seeks to specify the important properties of people, groups, communities or any other phenomena that are analysed. It measures or it evaluates different aspects, dimensions or components of the phenomenon being investigated (Dankhe, 1989).
- c. Correlation study: Where two or more variables are measured to see if they are related or not. If there is a correlation, its exact form is analysed. The usefulness of this is that it is possible to know how a variable will behave when the behaviour of other variables is known.
- d. Explanatory study: It is directed to explaining the causes of physical or social events. Its interest focuses on explaining why a phenomenon takes place, and in what conditions it occurs, or why two or more variables are related (Hernandez, 1999).

According to the type of investigation selected, it will be possible to identify the methods to use. If these are quantitative and objective, all very well. If they are more subjective and qualitative, even better! The only important thing is that criteria should be applied responsibly (Marcinkowski, 1996).

Finally, once the research process is finished, an analysis of the results obtained and an exposition of the conclusions that the research allows us to arrive at will have to be prepared.

Conclusions

Educational policy must be a permanent process to enrich knowledge, orient technical capability toward a structure that privileges individuals and relationships

among them, between groups and in the same way between nations. In this way such policies contribute to a better world, to a viable development, to a mutual understanding between peoples and to a renewal of democracy.

Also, from this perspective, it is advisable to emphasize the ethical, logical, aesthetic and cultural aspects of education, as a means by which a society transforms information into knowledge. Education must be at the service of human, economic and social development. It must reconstruct boundaries and spaces so as to achieve the concept of lifelong education.

In conclusion, it can be said that local sustainability generates processes of participation, that generate a new management of natural resources, where environmental education is the work tool that makes possible new visions of the future and the design of strategies for action on the environmental problems felt by the community.

The task now is to generate not only the indicators of local sustainability, which are already being developed in many countries, but also the strategies of communitarian implementation, so that they are a real tool of sustainable and friendly management of the environment.

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