

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

185,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com



Outdoor Learning Activities as Facilitators in the Construction of Environmental Citizenship

Maria Eduarda Ferreira and Rui Pitarma

Additional information is available at the end of the chapter

<http://dx.doi.org/10.5772/intechopen.70248>

Abstract

The results of an educational research project on a teaching and learning practice developed in the context of primary school teachers' continuing education in which didactic-pedagogical practices of outdoor learning are given a main role are analysed. The research followed a qualitative approach. It was assumed that environmental literacy is based on the premise of training for critical and responsible citizenship, with the aim of developing knowledge and skill for active participation in making decisions and following behaviours, of social-environmental interest. In this context, a didactic pedagogical component on the topic of "Water" was developed and implemented. The didactic strategy followed was that of outdoor learning, with a teaching learning perspective based on the interrelationship between the sustainability of natural water resources and individual behaviour. The following categories of analysis were used: didactic transformation of curricular content; environmental literacy; science-child-environment interaction. This training course highlighted the acquisition by this group, primary school teacher's, of skills that are fundamental to the development of a teaching and learning process that promotes environmental citizenship through the discovery of the surrounding natural environment.

Keywords: continuing education, primary education, environmental citizenship, water, outdoor learning

1. Introduction

Primary education is a privileged opportunity for children's environmental literacy, in line with the construction of environmental citizenship. Children at the beginning of compulsory schooling should have educational practices that allow them to understand the importance of their role in the construction of a society committed to environmental citizenship in a daily base

practice (behaviours). According to Roth [1] there is a causal relationship between environmental literacy and environmental impacts associated to behaviour. The environmentally literate individual understands the existence of interconnection between nature and human societies [2]. We share these convictions and we conclude that an environmentally literate individual must have knowledge, abilities, values, attitudes and behaviours committed to solving environmental problems. In short, critical scientific literacy should be developed in the child. Children must develop skills to analyse critically what they learn. They need to use this scientific knowledge to control, solve problems along their lives, in particular those related to their relationship with nature. The Organization for Economic Co-operation and Development (OECD)/Program for International Student Assessment (PISA) states: “*Scientific literacy is the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity*” [3].

The teaching-learning process, in the context of interaction with problems generated at the local natural/humanized environment, can provide opportunities to experience. That is, the context provides the scenario for a meaningful learning. It propitiates the acquisition of scientific knowledge interconnected to the appropriation of ecocentric values. It prepares the children for exercising an active participatory citizenship. Then, children develop a critical and committed citizenship to the protection, the preservation of the environment and the resolution of environmental problems. Primary school is the formal context that has the tools to develop in children critical scientific literacy and make them environmentally literate. The approach to the ecocentric concept [4], the child must understand that children are part of all ecosystems that constitute the ecosphere. That is why it should be provided education for the exercise of active and critical environmental citizenship from the very beginning of the compulsory school. Primary school teachers play a fundamental role in the appropriation of these skills. The teaching strategies used the most are the transmission of factual knowledge and memorization [5]. The professional development of teachers is subject to a triad of interrelated dimensions: research-action-training. This interdependence must always be present throughout his career [6].

The higher education institutions specialized in initial and continuing education has domain in the diversity of didactic-pedagogical arena. Thus, they play a fundamental role in promoting education for environmental citizenship (environmental literacy). Consequently, they contribute to developing critical scientific literacy in science.

In this research, we analyse the results of a pedagogical-didactic experiment carried out as an outdoor learning activity. The experiment was developed with a group of primary school teachers attending an in service training course at a Higher School of Education.

The core of the didactic experimentation was the relation between contextualization-relation of sciences concepts with surrounding everyday reality. It intended to give meaning to the interrelation between scientific knowledge, values and attitudes for a participatory environmental citizenship.

Water was the natural resource selected for this experiment. The topic “Water” makes part of the curricular area of “Study of the Environment” the Portuguese primary education. The following content was explored: physicochemical characteristics of the molecule; components

of the physical environment; natural resources of the environment; quality of water and existence of living beings in ecosystems; pollution of watercourses; preservation of water resources. The choice of the topic “Water” is justified by the local region having rivers, hot springs, recreational areas framed by river banks and by the scientific community acknowledging that drinking water is determinant for the survival of living beings and a basic right of humanity to meet their vital biological needs. We are living in a time when prospects of guaranteeing drinking water for all are threatened, not only because of availability limitations of this natural resource, but also because of the growing consumption of water by Western societies due to cultural practices, beliefs and anthropomorphic values (nature exists to serve humanity). Quality water alteration in natural ecosystems has consequences on population health. Even more, it has widespread environmental consequences. Each year, about two million people, mostly children under 5 years of age, die of diseases associated to water quality. For example, in Sub-Saharan Africa, 65.2% of the population does not have access to clean water [7]. According to the latest report of the Intergovernmental Panel on Climate Change, the threat of hunger, water rationing and extinction of species is a reality. It is recognized, therefore, the need of the individuals to have interventions for preservation and solving environmental problems of local and global society.

2. Theoretical background

It is a major challenge for teachers of primary education the promotion of interaction with the surrounding natural/humanized environment in a non-formal context, in order to develop skills for environmental responsibilities. Competences of the individual *“integrates knowledge, skills and attitudes and can be understood as knowing in action or in use”* [8]. According to Ref. [9], *“the change in behaviour resulting from learning usually comes from a series of practical experiences and interactions with the environment”*. The sooner the child understands how fundamental it is to value the local natural/humanized environment and develops attitudes based on critical and participative responsibility, in the preservation of this environmental heritage, the greater the possibilities, as an adult, of coming to exercise an active and responsible citizenship. Exercising an active and critical environmental citizenship is participating with environmental literacy.

The Portuguese Law of Fundamentals of the Educational System [10] states that compulsory school starts with primary education. One of its general objectives is: *“To ensure that in this stage of education know-how, theory and practice, school culture and everyday culture are inter-related”*. These goals can only be achieved if the child has the opportunity to interact with the natural and humanized contexts of the environment in which he lives (family, school, social, cultural and environmental contexts). Along his life, the child experiences and acquires knowledge, practices (behaviours) and values that condition his development, the relation with his community, and the global society.

The curriculum of primary education in Portugal [11] recommends that in the curricular area of “Study of the Environment”: *“Students will deepen the knowledge of Nature and Society, and it*

will be up to the teachers to provide them with the necessary tools and techniques in the way they can construct their own knowledge in a systematic way". It also states that: "All human activity leaves traces and causes changes in nature. In this sense, attitudes related to conservation and improvement of the environment, the rational use of natural resources, and active and enlightened participation in solving environmental problems should be promoted".

It is recognized the importance of developing interdisciplinary pedagogical-didactic practices. Thus, it has to be centred in real word contexts and focused on the articulation of scientific knowledge with the development of capacities. These conditions lead to exercise a critical, responsible and participatory citizenship for solving environmental problems.

There is an interrelation between education about the environment, education for the environment and education into the environment. Indeed, the outdoor learning activities allow the use of natural/humanized spaces in the vicinity of the school as natural laboratory of: knowledge, attitudes and values that promotes the practice of a participatory and critical environmental citizenship [12]. Outdoor learning *"is a method where parts of the everyday life in school are moved out of the classroom into the local environment"* [13]. Underlines the need to develop a comprehensive and proactive pedagogical approach, oriented towards solving concrete problems of the environment through interdisciplinary approaches and active and responsible participation of each individual, and of the community [14].

In the structure and programming of the Portuguese primary education [11], it is stated *"the need to carry out active, meaningful, diversified, integrated and socializing learning experiences. This statement is in the guiding principles of pedagogical action"*.

The curricular area of "Environmental Studies" [11] can still be the motive and the engine for this type of learning. Consequently, it could be example of practicing interdisciplinarity among other fields of primary education in Portugal. According to Ref. [15], *"if several subjects are grouped under a common root that meets the interests of the students by combining activities – till now hitherto compartmentalized – they will increase their performance"*.

The methodology of teaching-learning applying outdoor activity stimulates the development of interdisciplinarity among all study fields of the primary education program. This is favourable to the student-centred active learning environment. These activities bring great benefits for achieving the objectives of the educational program, even more, the physical and emotional development of the child can also be enhanced [16]. In fact, the lack of opportunities may result in *"nature deficit disorder"* [17]. It is therefore up to the teacher *"to organize demanding and stimulating learning contexts, that is, formative environments that favour the cultivation of healthy attitudes and the unfolding of capacities, which purpose is the development of skills that allow the students to live in society, that is, to participate and intervene in interaction with other citizens"* [18].

The Ref. [19] divide attitudes into four main categories: (a) attitudes are persevering; (b) attitudes are acquired; (c) there is an association between attitude and behaviour; and (d) attitudes are dependent on individual values. The attitudes can influence cognitive, affective and behavioural structures [20].

Outdoor learning is a pedagogical-didactic resource that provides children with interaction with the natural/humanized environment, and affective attachment to local and global

heritage. It contributes to the development of research capacities and critical and reflective thinking [21]. Outdoor activities are preferred in promoting conservation and environmental protection [22].

Before beginning any outdoor learning activity the teacher should reflect on the following aspects [21]: *“How can learning outdoors enhance and deepen learning within curriculum areas?; Which experiences are best suited to a combination of indoor and outdoor learning?; How can learning indoors best be consolidated, progressed or enhanced using the outdoors?; What opportunities exist for linking learning across the curriculum?”*.

The curricular area of “Environmental Studies” of Portuguese primary education [11] is organized in groups of subjects. The *“In the discovery of the natural environment”* group of subjects states that *“the teacher should promote in his students attitudes of respect for life and nature, as well as sensitize them to the aesthetic aspects of the environment”*. The *“Discovering the interrelationships between nature and society”* group of subjects states *“teachers should promote attitudes related to the conservation and improvement of the environment, the rational use of natural resources, as well as an informed active participation in solving environmental problems”*. The education in primary school should be committed to provide skills that empower children for a proactive citizenship. Then, they will be capable of finding solutions to local and global issues (environmental literacy).

Students have *“rudimentary, subjective, incoherent, inexperienced knowledge, and they are incapable of grasping the complexity of the environment”* [11]. Martins et al. [23] highlights *“the importance of the mental implication of the individual as agent of their learning so that school learning will be seen as a process of (re) construction of this knowledge, and teaching will be seen as facilitator of this process”*. The beliefs of individuals are result of their experience of life, their acquired knowledge and their values [24].

Educating behaviours is a complex and multidimensional task since they are rooted in individual and societal beliefs. Nevertheless, we consider that environmental citizenship attitudes must be learned in practice acquired during the development of children when attending primary school.

The teacher realizes the importance to implement teaching strategies for children to develop skills to solve problems and make decisions [25]. But, the way in which scientific knowledge is introduced can be a serious obstacle to learning. Teaching methodologies are necessary to provide learning for understanding. Problematising, and exploring situations and phenomena constitute moments of discovery, knowledge and opportunities to raise awareness for participation in order to preserve the environment and solve environmental problems [26].

The line of thinking quoted above was possible to be experienced with a group of teachers of primary education that were attending an in-service training course about pedagogical-didactic strategies. In this context, the group developed a didactic pedagogical intervention on the curricular content “Water”. The didactic strategy followed was that of outdoor learning. They were taught about: promotion of participation, interventional and committed citizenship with values for preservation of natural/humanized environment; analysis of the pedagogical-didactic potential of outdoor learning activities, with student-centred active learning, in the development of environmental literacy.

3. Issues and objectives

In this investigation, we have considered the following research questions:

- (a) Do the activities of outdoor learning itineraries constitute proper didactic resources for the transformation of scientific content based on the assumption of promotion of children's environmental literacy?

In this case, the topic "Water" the curricular area of "Environmental Studies" is explored beforehand in theoretical-demonstrative dialogue session with teachers.

- (b) Do have pedagogical-didactic possibilities within the scope of curricular interdisciplinarity?
- (c) Do the itineraries of outdoor learning activities promote the articulation of science-child-environment under a scope of child's environmental literacy?

Thus, to provide answers to the questions we raised, the following learning objectives were defined for the pedagogical-didactic:

- (i) To revisit of the scientific concepts related to the water molecule; (ii) To highlight the ecocentric vision of the natural water resource; (iii) To discover/highlight the potential of outdoor learning activities as a didactic resource of the teaching-learning process in the study field content, from an interdisciplinary perspective to contribute to environmental literacy; (iv) To construct an outdoor learning guide to teach the topic of "Water" based on a perspective of interdisciplinarity and student-centred active learning environment. The didactic resource should provide active, meaningful, diversified, integrated, socializing learning experiences. It must contribute to the appropriation of values and attitudes that promote practices of responsible environmental citizenship, it mean an active, critical and engaged citizenship.

4. Methodology

This pedagogy research was carried out under a qualitative approach [27]. The interpretive nature of this research led the researcher to have a participant-observer role.

The following categories of analysis were considered: didactic transformation of study field content; environmental literacy; articulation among science-child-environment.

The data were obtained using the following instruments: observation (direct and participant), the construction of learning itineraries, and the collection of considerations raised by the participants.

A group of 30 primary teachers participated. The pedagogical study was developed within an in-service training course (continuing education course) for teachers on new methodologies for teaching-learning.

5. Development of the pedagogical-didactic intervention

The conceptual map followed in this pedagogical-didactic study is presented in **Figure 1**. A conceptual map is a strategy that could potentially facilitate meaningful learning [29].

This pedagogical-didactic study was structured in two phases (three sequential moments).

Phase I (Theoretical-demonstrative session lasting 3 hours): (1) transmission of articulated concepts to ecocentric perspective of the natural/humanized environment; demonstration of didactic activities in a non-formal context based on examples.

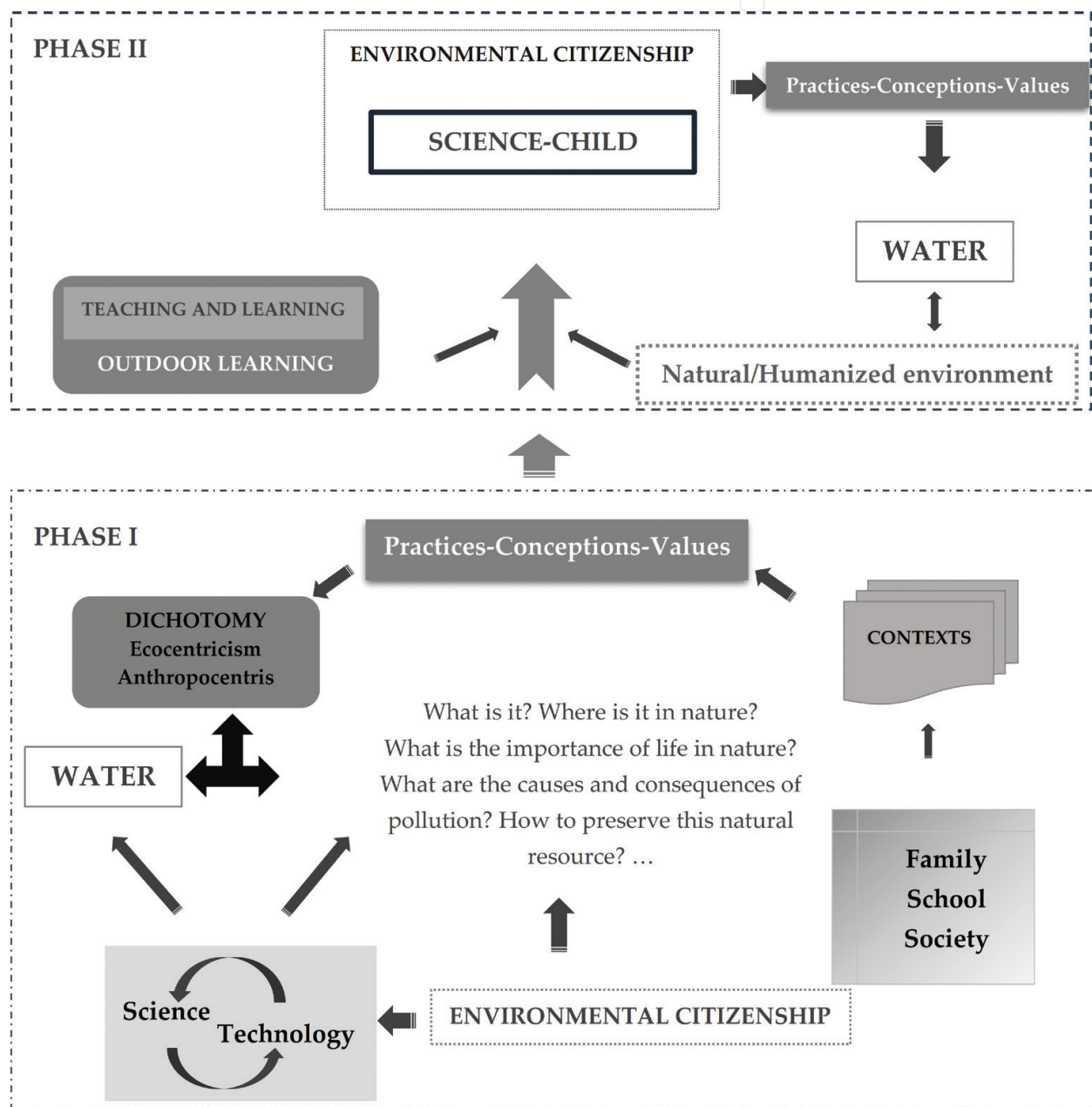


Figure 1. Conceptual map to approach the topic of "Water".

Phase II: (1) participative construction of didactic itineraries for outdoor learning activities; (2) After 2 weeks of autonomous work carried out in group, there was the delivery of the scripts and a written essay on the relevance of outdoor learning activities for children (exercising of decision-making capacities oriented to the resolution of environmental issues/problems based on ecocentric values and critical analysis of scientific knowledge).

Table 1 presents the sequence followed in the theoretical-demonstrative dialogue session for the pedagogical-didactic approach about the topic of “Water” (Phase I of the pedagogical-didactic activity). The PowerPoint tool was used as a pedagogical resource to illustrate concepts and environmental practices. It shows moments in classroom exposition, the valuation of believes in the learning of scientific knowledge as well as in the transmission of ecocentric values and attitudes of environmental citizenship.

Table 2 presents the framing the content of the topic “Water”, presented in the theoretical-demonstrative dialogue session, in the programming the curricular area of “Environmental Studies” for primary education.

For the autonomous work of the group carried out outside the classroom (phase II), it was proposed to create didactic itineraries of the outdoor learning activity, a didactic resource for primary school children, according to what they should foster: (i) knowledge about the content of the water, whose content is part of the curricular area of “Environmental Studies” (terms/concepts); (ii) develop skills such as: observe, describe, record, interpret, evaluate, criticize and decide; (iii) develop ecocentric values and attitudes of environmental citizenship in relation to the natural resource water.

Sequence	Content	Verify/Develop/Explore
1°	Recognition that water is a universal heritage. Extensive topic to be expressed through art (painting, music and dance) and literature.	Believes, ecocentric values.
2°	Characterization of chemical and physical properties. Relation with living matter and existence of life. Understanding the role of water in natural ecosystems.	Believes, scientific knowledge, ecocentric values, environmental citizenship attitudes.
3°	Discussion of the impact of water pollution on human populations and the biosphere.	Believes, scientific knowledge, ecocentric values, environmental citizenship attitudes.
4°	Reflecting on practices and behaviours resulting from human cultural metabolism in water consumption. Discussion on practices and behaviours of preservation of water valorization and preservation.	Believes, scientific knowledge, ecocentric values, environmental citizenship attitudes.
5°	Understanding the potential of outdoor learning activities in teaching-learning contents in the context of natural/ humanized environment.	Scientific knowledge, ecocentric values, environmental citizenship attitudes.

Table 1. Sequential development of the theoretical-demonstrative session.

Sequence	Field content [11]
1°	"... experiencing the activities of plastic expression, contact with nature, knowledge of the region, (...) are opportunities for enrich and broaden the students' experience and develop their sensitivity to aesthetics (p. 89). Collection of diverse human expression forms and forms on how nature expresses itself (p. 139)".
2°	"Recognize the different forms water is found in nature (rivers, streams, wells...) (p. 115)"; "recognize different environments where animals live (earth, water, air) (p. 116)"; "identify some environmental factors that condition life of plants and animals (water, air, light, temperature, soil) (p. 117)"; "identify some physical properties of water (colourless, odourless, tasteless) (p. 123)"; "observe the effects of temperature on water (boiling, evaporation, solidification, melting and condensation) (p. 126)".
3°	"Identify and observe some factors that contribute to surrounding environment degradation (dumps, polluting industries, historical heritage destruction...); enumerate possible solutions; identify and participate in ways of promoting sound environment practices. Water quality: recognize some forms of pollution of watercourses and oceans (sewers, industrial fluids, black tides...); identify some environmental imbalances caused by human activity: extinction of resources, extinction of animal and plant (p. 131)".
4°	"Know and apply standards of:... importance of drinking water (p. 107)"; "recognize the importance and necessity of basic sanitation and water supply (p. 130)"; "recognize the importance of reserves and natural parks for preserving the balance between nature and society (p. 131)".

Table 2. Framing in the curricular area of "Environmental Studies" within the content explored in theoretical-demonstrative session.

6. Data analysis and discussion

The instruments used to collect data in this research were: observation (direct and participant), the analysis of the itineraries of the outdoor learning activity and reflections in written records.

The analysis of results was conducted applying the categories: didactic transformation of the field content, environmental literacy and articulation science-child-environment. These categories were applied in the itineraries of the outdoor learning activity. They were means to verify the passage of a complex scientific language of the water field content to a simplified scientific language. The resulting didactic form fosters the interdisciplinary and articulated environmental literacy. The learning goal is the development of critical attitudes and participatory environmental citizenship. At the same time, the articulation science-child-environment was achieved. The environment should appear as one of the natural-humanized dimensions and the activity should be student-centered active learning environment. In short, the outdoor learning activity should be understood as a teaching-learning methodology in which scientific concepts are approached and articulated according to the couple scientific literacy-environmental literacy. In this context, the environmental literacy category was analysed in the scripts according to the development of decision-making capacities directed to the resolution of environmental issues/problems, based on ecocentric values and critical analysis of scientific knowledge.

We chose to analyse the results by triangulating the three categories of analysis.

Analysing the itineraries, we verified that all the groups chose to explore parks of urban leisure (natural-humanized environment) existing in the margins of a river that was object of requalification: river cleaning, tree planting, restoration of existing trees, training equipment equipping with, construction of recreational equipment (tables, wooden benches and children's playground) and catering infrastructures. It is concluded that these teachers responded positively to the challenge of discovering and valuing the natural/humanized environment near the place. They explored what was next to the school where they use to teach. Through the analysis of the resulting didactic scripts we realize that they prioritize the importance of developing the following skills: to observe, to describe, to register, to interpret and to evaluate.

All the scripts showed a common characteristic: they did not emphasize the scientific content already examined in the theoretical-demonstrative session with regard to the properties and function of water. Only one script included a song to be sung by the children at the end of the activity and the lyrics read: "Come often and do not forget to snack/It is not only lunch and dinner time/water is essential and must be drunk/It is so important that without it there is no life". Perhaps the group of teachers had difficulty in the didactic transformation of the concepts explored in the theoretical-demonstrative dialogue session. According to Ref. [28], there are few teachers at this level of education who have had a good education in science, which will translate into their teaching practices. Then the tendency is to avoid these subjects. However, their preference and consequent adequate didactic transformation were evident in topics related to ecology (ecosystem-living beings, water quality, pollution). Here some examples of the messages in the didactic scripts: (a) "The little river/again you will cross/if you notice running water/do you know what animal to pass? These amphibians are indicators of river water quality. Know why? We must all preserve the environment! How can you contribute to the preservation of this park? "; (b) " We need to preserve the environment by saving water and avoiding waste. Write four ways to save water"; (c) "This site reminds me of the forests that existed on our planet, already dead. What do you think? ". It was identified the conviction of this group that activities of outdoor learning are preferred methodologies for the promotion of environmental literacy, since in all scripts there are messages that points this purpose. Examples: "You are in a public space/That you must preserve/Treat it with respect/For all of us to use it"; "Would this Park exist without this natural resource?/We should therefore keep the space always clean"; "On our right side we find a waste basket. What is written there? Let's read and copy". Under the point of view of Bogner and Wiseman [22], this type of activity aims to promote conservation and environmental protection. The diversity of ecocentric messages demonstrated that the concepts we deal with in this study constitute the foundation of attitudes of environmental citizenship. There is also a concern for interdisciplinarity with the mother tongue (there is a constant call of attention to messages in the park to be transcribed in the script, and the existence of elements that appeal to the registers). The concern of interdisciplinarity with mathematics was evident in all didactic scripts. Here some examples: "It was about 2160 m/That you just walked/If you do it twice/How many Km would you walk?"; "If the volume of this lake/You could determine/Which unit to survey is the best?/Which would you use?"

All didactic itineraries of the outdoor learning activity contain messages of leisure and encouragement of the practice of physical activity. For example: "When the teacher says/Let's

all play/In the playground/And to finish/In the grass you should sit/To rest/And the activity to evaluate”; “You find on your left/A green space to play/It’s what we ask of you/Jump to the axis, without the colleague hurt”.

It is observed in the messages that appear in all the scripts, a prevalence of situations/questions that promote the achievement of social, relational and affective goals.

We conclude that this pedagogical-didactic experiment mobilized the participation, raised the motivation and valorised outdoor learning activities. It was evident in the written reflections that the teachers presented like this: “... can and should be used as a resource as a teaching-learning element proper to the current requirements of the syllabus, since it allows a contextualized learning through which children can be formed Citizens capable of participating consciously and responsibly in society”; “These activities promote (...) the development of attitudes and values towards others individuals and the surrounding environment, they also promote motivation, interest and empathy for these subjects, stimulating the cooperation, the decision making and the spirit of leadership”; “It was good, we felt it would be a good thing to continue this line of training”.

We found that the outdoor learning activity was considered by all stakeholders as a valuable strategy for the development of pro-environment skills. According to Ref. [22], *“There is also strong evidence that young children respond more positively to experiences in the outdoors than adults as they have not yet adapted to unnatural, manmade, indoor environments”*. Teachers concluded that children exposed to these activities can learn in a non-formal direct way, outside the classroom and free from the pressure associated with it. This is similar to Ref. [30]: *“When the child goes abroad, it is precisely the World, in its reality, that offers itself to his eyes. Instead of fabricating objects that represent ideas, and closing them in a closet, let the child out, showing them things in their authenticity”*. According to Ref. [31] *“Children in situations to act cooperatively are to lay the foundations for their better insertion in future society”*.

The group of teachers was very participative, committed and dedicated. They expressed their satisfaction for the pedagogical-didactic practices carried on. They were sensitized and interested in continuing to deepen their knowledge about the benefits of outdoor learning activities because in this regard they said: “for us, this active methodology of teaching-learning effectively promotes learning, critical awareness and civic attitudes”.

It was demonstrated that this pedagogical-didactic practice contributed to the appreciation, on the part of these participants, of teaching and learning methodology to develop children’s environmental literacy. It is concluded, from the observations made throughout this study, that the approach taken in the theoretical-demonstrative session about the water field motivated this group of teachers to the challenge of implementing outdoor learning activities as teaching practices. They look for promoting attitudes of critical and participant environmental citizenship (environmental literacy). It was evident that there was an interdisciplinary relationship with the mother tongue and the field of mathematics. However, it was not evident in the pedagogical-didactic scripts the concern in articulation of science-child-environment, that is, the interconnection of the content of sciences – in this case the topic of “Water” – with the promotion of children’s environmental literacy.

7. Concluding remarks

The analysis of the results showed that this pedagogical-didactic practice of outdoor learning contributed with these teachers: (i) to (re) construct their conceptions about the pedagogical-didactic potentialities of outdoor learning activities; (ii) to promote the predisposition to open the conventional classroom to Nature classroom, demonstrating the intention to implement this pedagogical teaching practices in the curricular area of “Environmental Studies”; (iii) to verified the valorisation of the local natural-humanized environment when transforming scientific concepts of sciences (only those of the area of ecology), in the theoretical-demonstrative session, according to the perspective of articulation scientific literacy-environmental literacy with critical attitude. This training course highlighted the acquisition by this group of skills that are fundamental to the development of a teaching and learning process that promotes a participatory, responsible and critical environmental citizenship through the discovery of the surrounding natural environment.

It is concluded that the activities of outdoor learning, which are part of study field curricular area of “Environmental Studies”, considers *“the local environment as a lived space, and it should be the privileged object of a systematic and methodical first learning of the child since, at these ages, the thinking is directed towards concrete learning”* [11]. It is also considered, based on the analysis made to this pedagogical-didactic activity, that it should be applied to other study field contents of primary education sciences, in order to be able to identify limitations and potentials to make it more effective. It will contribute to the construction of scripts and didactic sequences of learning where the student-centred active learning environment is valued. Also, the articulation between the curricular contents of sciences (in a perspective of interdisciplinarity) and the development of attitudes of critical participation is operationalized. Besides the aspects already analysed in this article in relation to outdoor learning activities, there are other considerations that could jeopardize the implementation feasibility, specifically time factor. Time could be an obstacle for implementation of this type of activities (duration of the outdoor activity to explore the natural/humanized site and the subsequent exploration of the didactic routes after the activity) is a factor. In the Portuguese teaching-learning process, at the level of primary education, the management of the duration of the learner activities by study field is not flexible. This is the reason why this factor is considered a limitation if we admit that these teachers will apply the script that they have built and will replicate the outdoor learning activity to other curricular contents, as they also mentioned in their reflections. However, from our experience, since this line of research has been carried out for several years, we are convinced that there are obstacles to implement radical changes in the teaching-learning process. Pedagogical-didactic activities such as this will certainly contribute to changes, no matter its magnitude. They constitute pedagogical paths that give important contributions to an integrated scientific education based on values of respect, appreciation of natural/humanized resources and its interaction (behaviours). They foster critical and responsible citizenship with a view to the preservation and resolution of environmental issues.

Professional development is an on-going process in which the learning-teaching path is done throughout the professional life, and where the training courses constitute means of

consolidation, evolution and construction of professional skills. According to Refs. [32, 33] teacher training must be demanding and continuous, *“capable of leading to changes in perspective and, later, to new practices to innovative practices, by the attitude and values they introduce, to create another culture of scientific education”*.

It is hoped that this research developed as part of an ongoing course for primary teachers will contribute to the improvement of effective pedagogical practices in children’s environmental literacy developed in the context of science education.

Author details

Maria Eduarda Ferreira* and Rui Pitarma

*Address all correspondence to: eroque@ipg.pt

Research Unit for Inland Development (UDI) – Polytechnic Institute of Guarda (IPG),
Guarda, Portugal

References

- [1] Roth CE. Environmental Literacy: Its Roots, Evolution, and Directions in the 1990s. Columbus/OH: ERIC Clearinghouse on Science, Mathematics and Environmental Education; 1992. 51 p
- [2] Barrett GW, Peles JD, Odum EP. Transcending processes and the level-of-organization concept. *BioScience*. 1997;**47**(8):531-535. DOI: 10.2307/1313121
- [3] OECD – Organisation for Economic Co-operation and Development. The PISA 2003 Assessment Framework – Mathematics, Reading, Science and Problem Solving Knowledge and Skills. OCDE [Internet]. 2003. Available from: <http://www.oecd.org/dataoecd/46/14/33694881.pdf> [Accessed: 20 January 2017]
- [4] Dunlap R. The new environmental paradigm scale: From marginality to worldwide use. *The Journal of Environmental Education*. 2008;**40**(1):3-18. DOI: 10.3200/JOEE.40.1.3-18
- [5] Tenreiro-Vieira C. O Pensamento Crítico na Educação Científica. Lisboa: Instituto Piaget, Divisão Editorial; 2000. 252 p
- [6] Latorre A. La investigación-acción. Conocer y cambiar la práctica educativa. 4th ed. Barcelona: Editorial Graó; 2007. 138 p
- [7] United Nations Development Program (UNDP), Human Development Report 2011. Sustainability and Equity: A Better Future for All [Internet]. 2011. Available from: http://hdr.undp.org/sites/default/files/reports/271/hdr_2011_en_complete.pdf [Accessed: 10 January 2017]

- [8] Departamento de Educação Básica – Ministério da Educação [ME]. Currículo Nacional do Ensino Básico – Competências essenciais. Lisboa: ME; 2001. 227 p
- [9] Inácio M. Manual do Formador – O Processo de Aprendizagem. Lisboa: DeltaConsultores e Perfil; 2007. 54 p
- [10] Portugal, Lei n° 46, de 14 de outubro 1986. Lei de Bases do Sistema Educativo. Lisboa: Diário da República. 1986; n. 237, I Série A
- [11] Departamento de Educação Básica – Ministério da Educação [ME]. Organização Curricular e Programas: Ensino Básico – 1° Ciclo. 4th ed. Lisboa: ME; 2004. 284 p
- [12] Palmer J. Geography in the early years. London/New York: Routledge; 1994. 187 p
- [13] Jordet A. Outdoor schooling in Norway – Research and experiences. In: Proceedings of the Conference Healthier, Wiser and Happier Children; 24-25 January, 2008, Outdoor Education – learning with Mind, Heart and Body Conference; Jelling: Branbjerg University College
- [14] Dias GF. Educação ambiental: princípios e práticas. São Paulo: Editora Gaia; 2005. 550 p
- [15] Balancho MJ, Coelho MF. Motivar os alunos. Lisboa: Texto Editores; 1994. 96 p
- [16] Dillon JS, et al. Engaging and Learning with the Outdoors: The Final Report of the Outdoor Classroom in a Rural Context Action Research Project, Reading, NFER [Internet]. 2005. Available from: www.bath.ac.uk/cree/resources/OCR.pdf [Accessed: 10 December 2016]
- [17] Louv R. Last Child in the Woods: Saving our Children from Nature-Deficit Disorder. London: Atlantic Books; 2009. 400 p
- [18] Alarcão I. Escola Reflexiva. Nova racionalidade. Porto Alegre: Artes Médicas; 2001. 144 p
- [19] Zacharia Z, Barton AC. Urban middle-school students' attitudes toward a defined science. Science Education. 2004;88:197-222. DOI: 10.1002/sce.10110
- [20] Sears J. Children's attitudes to science and their choices post – 16. Paper presented at the British Educational Research Association Annual Conference, 11-14 September. Education-line University of York; 1997. Available from: <http://www.leeds.ac.uk/educol/documents/000000386.htm> [Accessed: 14 December 2016]
- [21] Curriculum For Excellence Through Outdoor Learning. [Internet]. 2010. Available from: http://www.educationscotland.gov.uk/images/cfeoutdoorlearningfinal_tcm4-596061.pdf [Accessed: 14 November 2016]
- [22] Bogner FX, Wiseman M. Outdoor ecology education and pupils' environmental perception in preservation and utilization. Science Education International. 2004;15(1):27-48
- [23] Martins IP, et al. Educação em ciências e ensino experimental. Formação de professores. Lisboa: Ministério da Educação; 2006. 68 p

- [24] Clément P. Representations, conceptions, connaissances. In Giordan A, Girault Y, Clément P, editors. *Conceptions et Connaissances*. Berne: Peter Lang; 1994. pp. 15-45
- [25] Ferreira ME, Porteiro AC, Pitarma R. Enhancing Children's success in science learning: An experience of science teaching in teacher primary school training. *Journal of Education and Practice*. 2015;**6**(8):24-31
- [26] Ferreira ME, Cruz C, Pitarma R. Teaching ecology to children of preschool education to instill environmentally friendly behaviour. *International Journal of Environmental & Science Education*. 2016;**11**(12):5619-5632
- [27] Bogdan R, Biklen S. *Investigação Qualitativa em Educação: Uma Introdução à Teoria e aos Métodos*. Porto: Porto Editora; 2013. 336 p
- [28] Lunn S. What we think we can safely say...: Primary teachers' views of the nature of science. *British Educational Research Journal*. 2002;**28**(5):649-672. DOI: 10.1080/0141192022000015525
- [29] Moreira MA. *Mapas conceituais e aprendizagem significativa*. São Paulo: Centauro Editora; 2010. 80 p
- [30] White R, Stoecklin V. *Children's Outdoor Play & Learning Environments: Returning to Nature*. [Internet]. 2011. Available from: <http://www.whitehutchinson.com/children/articles/outdoor.shtml> [Accessed: 12 October 2016]
- [31] Montessori M. *Da infância à adolescência*. Queluz de Baixo: Portugália Editora; 1980. 101 p
- [32] Pereira A. *Educação para a Ciência*. Lisboa: Universidade Aberta; 2002. 228 p
- [33] Cachapuz A, et al. Uma visão sobre o ensino das ciências no pós-mudança conceptual – Contributos para a formação de professores. *Inovação*. 2000;**13**(2-3):117-137

