

School Projects' Methodology in the Frame of Education for Sustainable Development: An Evaluation Case Study

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This research is an evaluation of the methodology used in the environmental programs in secondary education of Heraklion Prefecture of Crete in the frame of education for sustainable development (ESD). An evaluation tool was applied on the application forms (AFs) and the final reports (FRs) of the school programs in order to assess how they promote sustainability and whether they satisfy the general guidelines and principles of the proposed methodology of ESD. The educational methodology, which was used in the programs, combined elements from the method of research essay and didactic research and was not rich in innovative educational techniques. Almost all programs, more or less, promoted the interdisciplinary approach, the teamwork with undertaking of responsibilities, division of roles, and promotion of self-action. Several activities took place outside the school on the field.

Keywords: methodology of school environmental programs, secondary education, sustainable development, evaluation of educational programs

Introduction

Over the last 35 years, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) is the instructor and coordinator, at international level, on issues of education for sustainable development (ESD). In all the conferences of the United Nations, regardless of the subject matter (environment, population, social development, human rights, and democracy), sustainable development has become commonplace, and education is the driving force for the changes needed. The Declaration of the World Forum for Education, in Dakar, in 2000, confirmed education as a fundamental human right, as a key to sustainable development, peace, and stability within each country and among countries, and as a means for effective participation in the societies and economies of the 21st century, which are affected by rampant globalization (Fiske, 2000). An educational institution that develops programs of ESD (ESDP) should operate for, and with, the local community, to build and encourage mutual cooperation, to support lifelong learning and community wellbeing, and to bring real issues into the curriculum with the involvement of various social groups (Scott, 2007). To achieve the “greening” of the school through ESDP, teaching approaches, methods, and techniques oriented to action and interactive communication are required, such as open learning and teaching by projects (Rauch, 2000). Due to the demanding nature of ESDP, several pedagogic skills must be developed to teachers and students (Huckle, 2006b). But, according to a 2008 report, sustainability in English schools often confines to

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extracurricular activities and involves only a minority of pupils, with little integration into the curriculum (Scott, 2010). Many researchers have insisted on the need of an eco-pedagogy, namely, a pedagogy that is appropriate to education practices based on sustainability and a pedagogy that overcomes the anthropocentrism of traditional pedagogies and establishes the symbiosis between human beings and nature as an underlying assumption (Gadotti, 2010). Eco-pedagogy implies a curriculum reorientation, so that some principles may be incorporated in it. According to the United Nations Economic Commission for Europe (UNECE) (2005), ESDP must use a wide range of educational methods and equity-oriented processes to find solutions tailored to learners.

In Greece, ESD was carried out through the school programs of environmental education (PEE), the programs of environmental centers, the thematic environmental networks of schools, and the flexible zone of extracurricular activities on a voluntary basis and with great difficulty (Kalathaki, 2005).

During the last 10 years, the Greek Ministry of Education (GME) has orientated environmental education to ESD by organizing a new framework for the implementation of school PEE, under the title of "Environmental actions—Actions of life-education for sustainability, based on the guidelines of ESD of UNESCO and European Union" (GME, 2006). Regarding the used methodology, environmental education is being carried out in Greek schools, largely by traditional methods, which mainly promote the one-way. This research aims to reveal the methodology in the PEE of secondary schools in the Heraklion Prefecture in order to contribute to the improvement and upgrade of program design, pedagogy, and teaching, to align better with the recommended methodology of ESD.

Methodology

The research methodology is a case study content analysis of literature on archival material (Bell, 1997; Iosifidis, 2003), with a base unit recording the phrase and the paragraph. The research sample consisted of archival material of the submitted programs in secondary education of Heraklion during the 2005-2006 school year, which consisted of 22 application forms (AFs) in printed form, corresponding to 22 final reports (FRs) in print and electronic form and texts written by some of the coordinators of the programs. Eight of these programs had been evaluated separately and had been approved for being funded by the Aegean University. Also, an additional group of 14 programs was selected, which had the lowest protocol number. The sample represents small and large schools of Heraklion, in both rural and urban areas. All the AFs of the programs have the same pattern (title, goals and aims, method, activities, evaluation, schedule, budget, and names of students of environmental team). The FRs had been drawn up by the coordinator teacher of the program variously, containing documents and presentations of the programs, selected songs, music, photos, and video clips. Texts from newspapers, magazines, Websites, and interviews and texts where students and teachers described their experiences and the benefits gained from the program were also included.

For triangulation, texts of teachers and students, AFs, and FRs were used as sources of data collection, as well as other surveys in Greek environmental education, combined in qualitative and quantitative analysis (Vergidis, 1999; Cohen & Manion, 1994).

The organization of the research categories addressed to the basic questions, which composed the main purpose of the research related to the investigation of the used educational methodology from the point of view of ESD. It was preferred not to be encoded by using a known software for the classification of the recording unit in general categories of meaning because the same recording unit for the classification of all the survey

data was not used, and the variety and diversity of meanings contained and assigned to the educational texts differentiated and could not be distinguished through such programs. The criteria, which correspond to the research subjects and questions, and were based on the Greek and international literature (UNECE, 2005; European Union, 2006; United Nations, 2002; Mogensen & Mayer, 2005; Department for Education and Skills (DfES), 2006a; Flogaiti, 2006; Skoullou, 2007; GME, 2006), are included in the evaluation tool for the environmental programs of Greek secondary education through the prism of ESD (Kalathaki, 2013). These 20 criteria were utilized to evaluate the AFs and the FRs in order to assess if the proposed methodology of ESD was applied well for cultivating environmentally literate citizens. The criteria corresponding to the research subjects and questions are presented in Table 1.

Table 1

Methodology of ESDP

A. Connection with	a. School curriculum	1. In courses
		2. Flexible zone
		3. Research essays (projects)
B. Educational approaches	a. Didactic approaches	1. Interdisciplinary/multidisciplinary/holistic/critical pedagogy
C. Educational strategies	a. Teamwork	1. Assigning responsibilities/roles allocation 2. Initiatives (self-motivated)
	b. Solitary work	1. Personal use of computer
D. Educational methods	a. Project	1. Project
	b. Didactic research	1. Collection, data interpretation, perspectives of things, and export/conclusions presentation
E. Educational techniques	a. Innovative techniques	1. Concept map, drama, debate, discussion, moral dilemma, brainstorming, lecture, etc.
F. Educational activities	a. In classroom	1. Experiment, constructions, use of school library, PC, laboratories, etc.
	b. Use of ICTs	1. Internet, fax, short messaging service (SMS), emails, Websites, Web-services, software, libraries, audiovisual, etc.
	c. On field	1. Measurements, observations, recordings, etc. 2. Educational visits to environmental centers, museums, areas of ecological, archaeological, cultural, etc.
G. Details of program design	a. Organization of activities	1. Calendar, task protocol, etc.
		2. Phases of implementation
		3. Activities timetable
	b. Economic management	1. Budget
	c. Participation in program design	1. Joint (students and teachers) targeting and building of the program
H. Rewarding students	a. Moral reward	1. Oral reward/commemorative material

Note. Source: Kalathaki, 2013.

The scoring of criteria was a 5-point scale ranging from 0-4, based on the contents of the archive data, corresponding to 0—“No evidence to satisfy the criterion” to 4—“The design and implementation of the program were very good grade”, educational actions considered adequate, relevant, and effective, the program was designed along the directions of ESD and significantly promoted the principles of ESD. Analogue scale and indices had the team of experts of the UNECE developed for assessing the state of the UNECE strategy for ESD (UNECE, 2005). For scoring criteria became critical reading of the documents, kept notes given in content, comments, and interpretations.

The content of the AFs and FRs was examined in such a way to seek specific types of information and make analysis of their content, and more specifically, discourse analysis (Bell, 1997; Iosifidis, 2003). All recorded observations and comments were taken into account for the final score for each criterion. The scoring of each criterion reveals the degree of harmonization with the methodology of ESD at the design and implementation of the program.

The statistical analysis of the data was performed separately on the 22 AFs and 22 FRs and was quantified by using the specialized software Statistical Package for Social Science (SPSS). Frequencies (*N*) and relative frequencies (%) were exported per each criterion and per research question, in each grade level. Tables 2 and 3 present the results for each criterion, and in each cell, the frequencies and relative frequencies (%) or grades 0-4 taken by the programs were contained.

Results and Discussion

The combination of data and the meaning attributed to them cultivated a more coherent and comprehensive picture of whether PEE, as designed, structured, and implemented, promoted ESD. The studied programs, from a methodological standpoint, beyond the school curriculum, applied innovative teaching methods and techniques in a learning environment that was significantly different from the school, promoting outdoor education and field activities with the support of information and communication technologies (ICTs). Implied multidisciplinary and interdisciplinary approaches were combined with techniques that normally are not used in the everyday school lessons. Also, most important resources in ESD are interlinked of formal and non-formal educational spheres in school projects (Savelava, Savelau, & Bakhnova, 2010). Incorporation of non-formal educational practices into formal educational activities and methods based on the Earth Charter framework demonstrated that students joining the activities became the “change agents”, expressing interest in the new methods of learning and providing the actual change in society.

Below, the results of the survey by research questions and criteria are presented and discussed.

Connection to the School Curriculum

Environmental education is not often taught as an autonomous course, but it ingrains, highly connects, and transversely penetrates science and social school courses by reinforcing comprehensive health and physical education standards and relying on reading, writing, communicating, and mathematics and arts, according to the Colorado Environmental Education Plan (Colorado Department of Education, 2012; Henderson & Tilbury, 2004). In the studied programs, it seems that they were not designed to link with the courses of school curriculum. In the research sample, there were no reports in AFs of the programs with connection to school curriculum at the remarkable rate of 31.8% (*N* = 7) (see Table 2).

The connection with some courses of the school curriculum was, in most cases, an important goal in the program planning, even though this is not mentioned literally. In an effort to bridge theory and practice, the methodology of PEE must use the knowledge gained in the classroom to confront problems and issues faced by the local community and learning should be relevant to their daily lives, the careers they hope to have, and the communities in which they live (McKeown, 2011). The students gain knowledge about the logic behind conducting rigorous multidimensional research, and the intent of creating more knowledgeable researchers, not promoting a specific methodology, seems to be fulfilled by providing appropriate curricula, strategies, and support (Christ, 2009).

Table 2

Methodology of ESDP—Frequencies (N) and Relative Frequencies (%) Per Criterion of the Research Question That Is Mentioned in Connection With School Curriculum (A), Educational Techniques (E), Educational Activities (F), and Rewarding Students (H)

			FRs (N = 22)					AFs (N = 22)				
			0	1	2	3	4	0	1	2	3	4
A			1 (4.5)	8 (36.4)	6 (27.3)	1 (4.5)	6 (27.3)	7 (31.8)	10 (45.5)	5 (22.7)	0 (0.0)	0 (0.0)
E	a.	1.	0 (0.0)	7 (31.8)	4 (18.2)	8 (36.4)	3 (13.6)	0 (0.0)	6 (27.3)	11 (50.0)	5 (22.7)	0 (0.0)
	a.	1.	1 (4.5)	15 (68.2)	3 (13.6)	0 (0.0)	3 (13.6)	15 (34.1)	4 (18.2)	3 (13.6)	1 (4.5)	0 (0.0)
F	b.	1.	0 (0.0)	0 (0.0)	7 (31.8)	8 (36.4)	7 (31.8)	0 (0.0)	1 (4.5)	14 (31.8)	17 (38.6)	12 (27.3)
	c.	1.	1 (4.5)	3 (13.6)	2 (9.1)	8 (36.4)	8 (36.4)	0 (0.0)	3 (13.6)	4 (18.2)	3 (13.6)	12 (54.5)
H	a.	1.	13 (59.1)	2 (9.1)	1 (4.5)	2 (9.1)	4 (18.2)	5 (22.7)	14 (63.6)	2 (9.1)	1 (4.5)	0 (0.0)

Note. Relative frequencies (%) are presented in the parentheses.

Educational Approaches

An important matter of the environmental literacy is the understanding of the processes and systems that comprise the environment, as human influences. That understanding is based on knowledge that is synthesized from across traditional disciplines (Meredith, Cantrell, Conner, Evener, Hunn, & Spector, 2000). Issues addressed by ESD can be approached interdisciplinary and holistically because they comprehensively examine the phenomena, facilitate learning, contribute to quality upgrading, give the objective of transferring knowledge, and expertise with the systemic approach (UNESCO, 1997; Huckle, 2006b). Systemic thinking helps to develop the understanding of connectivity and of the way that a decision relates or impacts to consequences of actions which are not intended (Tillbury, 2011). Almost all programs, just as much, promoted the interdisciplinary, multidisciplinary, and holistic approach to the negotiated issues, as indicated by the 63.6% ($N = 14$) of the FRs (see Table 3).

Table 3

Methodology of the ESDP—Frequencies (N) and Relative Frequencies (%) Scores Per Criterion of the Research Question That Is Mentioned in Educational Approaches (B), Educational Strategies (C), and Educational Methods (D)

			FRs (N = 22)					AFs (N = 22)				
			0	1	2	3	4	0	1	2	3	4
B	a.	1.	0 (0.0)	0 (0.0)	8 (36.4)	7 (31.8)	7 (31.8)	0 (0.0)	1 (4.5)	10 (45.5)	5 (22.7)	6 (27.3)
		1.	0 (0.0)	3 (13.6)	6 (27.3)	2 (9.1)	11 (50.0)	4 (18.2)	4 (18.2)	5 (22.7)	7 (31.8)	2 (9.1)
C	a.	2.	1 (4.5)	8 (36.4)	4 (18.2)	4 (18.2)	5 (22.7)	0 (0.0)	10 (45.5)	5 (22.7)	0 (0.0)	7 (31.8)
	b.	1.	2 (9.1)	4 (18.2)	5 (22.7)	7 (31.8)	4 (18.2)	0 (0.0)	8 (36.4)	5 (22.7)	4 (18.2)	5 (22.7)
D	a.	1.	0 (0.0)	2 (9.1)	12 (54.5)	5 (22.7)	3 (13.6)	0 (0.0)	2 (9.1)	8 (36.4)	10 (45.5)	2 (9.1)
	b.	1.	0 (0.0)	5 (22.7)	3 (13.6)	7 (31.8)	7 (31.8)	0 (0.0)	3 (13.6)	12 (54.5)	4 (18.2)	3 (13.6)

Note. Relative frequencies (%) are presented in the parentheses.

These approaches had not been initially designed in all programs, because they were not mentioned in the AFs, since the corresponding percentage was lower (36.4%; $N = 8$). Environmental competencies of North American Association for Environmental Education (NAAEE) framework for assessing environmental literacy, include the capacity to identify environmental issues, ask relevant questions, analyse environmental issues, investigate environmental issues, evaluate and make personal judgements about environmental issues, use

evidence and knowledge to defend positions and resolve issues, and create and evaluate plans to resolve environmental issues (Paden, 2012). The sustainable schools' framework faces the school both as a learning community and as an integral part of the wider socio-economic community, which is locally based (Scott, 2010).

Educational Strategies

Central methodological axis of ESDP is teamwork (UNECE, 2005; DfES, 2006b). This instructional strategy is enjoyed by students and teachers because it develops personal communication and social skills, improves behaviors, and eliminates vandalism and damage (Gough, 2005). About half of the FRs seem to have been carried out, at a satisfactory level, in the criterion of the work in teams, as 54.6% ($N = 12$) rated to 3 or 4 (see Table 3). The corresponding percentage in AF was 50.0% ($N = 11$). Students who work in teams undertake power, pretend roles, allocate responsibilities, improve the expression of different opinions, develop new skills, and enhance their sense of belonging (Rogers, 1998). The score of the AFs and FRs in this criterion was quite good, since half of the FRs ($N = 11$) were evaluated to 4 (max). The students in teams develop initiatives, offer and accept help, share ideas amongst schoolmates, solve problems, culture appropriate behaviours, and generate new knowledge (Webb, Troper, & Fall, 1995). The promotion of undertaking initiatives by the students seems to be a priority to only some of the programs. The solitary work within a PEE offers to students the opportunity to build knowledge through their own capabilities and interests with their own pace, working alone or in teams in a systematic way (UNECE, 2005).

Educational Methods

The traditional model of teaching of one-way transfer knowledge from the teacher to the students has repeatedly been declared ineffective, because it weakens critical and creative thinking. The used educational methodology, which was rather far from the traditional teaching method, combined the method of research essay (Frey, 2005) and didactic research (Huckle, 2006b). The didactic research is not mentioned anywhere in the archives, although many typical elements are strong in the design and implementation of the programs (see Table 3). The difference in rates of AFs and FRs reveals that, while elements of the method were not originally included in the designed methodology, eventually, in the course of program, the method was applied at a relatively good level. Staying out of the classrooms for a few days is a powerful way of developing key life skills and building confidence, self-esteem, communication, and team-working, as students can visit adventure centers; get involved in cultural and art festivals; take part in expeditions, summer camps, and sports events; and participate in cultural, language, and fieldwork visits abroad (DfES, 2006a; 2006b).

Educational Techniques

The UNECE (2005) strategy for ESD suggests a great variety of innovative techniques for the implementation of the programs, such as discussions, conceptual mapping, philosophical exploration, clarification of values, simulations, scenarios, modelling, role playing, educational games, surveys, case studies, debate, interviews, conferences, brainstorming, ethical dilemmas, field work, etc.. In the implementation of the programs, only a few of the above educational techniques were used. Generally, the rating criteria of this research question fluctuated at relatively low levels (see Table 3). Although the field of environmental education is suitable for trying several innovative educational techniques, they were not tested in most of the PEE of the research sample, as also noted by Mpatsi (2007).

Educational Activities

Spending time outdoors has significant physical and mental benefits by improving mood and mind concentration. Outdoor learning experiences increase students' engagement and enthusiasm for learning, while promoting an active and healthy lifestyle (Colorado Department of Education, 2012). Many activities in the classroom, on the field, in laboratories, and elsewhere recorded in the studied programs. Several of them had not initially been designed in the AFs, but were trialled along the way. The references to the use of television and the printed press were minimal. The extremely high percentage of programs (86.4%; $N = 19$), which received a zero score on the criterion that referred to the media use, was the highest in this study (see Table 3). Field educational activities, such as measurements and observations, are being referred in several recordings of AFs and FRs. Educational visits to centers of environmental education, museums, and areas of ecological, archaeological, and cultural interest were quite frequent in the programs. The centers of environmental education offer very well-organized educational field activities which give the students the opportunity for experiential learning of the ecosystem functioning and to realize the value of the biodiversity and the need of judicious use of natural resources. All the students described the benefits that gained from their educational visits to the centers of environmental education. Wang (2011) showed that presenters, social content, and learning-related condition are critical criteria to improve students' satisfaction in a field day experiences. There is much evidence that high satisfaction leads to increasing learning interests, broadening attentions, stimulating positive social interactions, etc..

Rewarding Students

Rewarding students and offering commemorative material to them are not so common practice in PEE. In the presentations of programs in school and local communities and in the general presentation which is organized by the secondary education administration of Heraklion, at the end of the school year, students receive compliments from their teachers, parents, educational and municipal authorities, and others for their work in the programs participated. There were few reports on commemorative awards and congratulations to the students for their work in the programs, consequently there was a low score of the corresponding criterion in AFs and FRs (see Table 3). A few programs were presented to the public at the end of the school year. The Australian National Agency for Education is in charge of the award assessment of schools that carried out successfully a whole-school sustainability program by a special diploma (Henderson & Tilbury, 2004).

Details of the Program Design

The initial design of the program, the planning of the activities, and writing of logbook and protocol operations have not been mentioned in any program. Probably, they were not necessary to be referred to the AFs or FRs. The schedule of planned activities and actions should be attached to the AF of each program in order to be approved by the Office of Heraklion Secondary Environmental Education. In this schedule, all the planning actions and activities are summarized monthly. This criterion is satisfied by all programs because it was a prerequisite for the approval of the program and accompanied the AFs.

The programs received minimal financial support by the state budget, which does not cover, in no way, their needs, which are often sustained by school committees, families, and other entities. The coordinators of the programs fulfil the budgets, which are usually not taken into account and are not covered by the state budget, as mentioned above. Because all programs have deposited budget implementation as part of the AFs, this criterion has the max scoring.

As teachers and students jointly design and plan the activities of the programs, there were no significant data, hence, half of AFs ($N = 11$) took Grade 1. The analysis of the objectives and activities of the FRs showed that the joint building of the content of the program was the goal of the students and teachers.

Conclusion

It is very difficult to create a complete assessment procedure in which both parties' (students and teachers) assessment expectations are being met because of the crucial contradictions in opinions about assessment in project-based education (Bergh, Mortelmans, Spooren, Petegem, Gijbels, & Vanthournout, 2006).

Apparently, the teachers do not leave the teacher-centered nature of their teaching, they prefer to organize indoor activities than actions in society, as ESD requires, and they probably do not practice Mahatma Gandhi aspect that "An ounce of action is more worth than a ton of teaching. The books offer the knowledge, but the action translates it into understanding". The entirely student-centered nature of ESD on one hand and the deeply rooted traditional teaching methods of the Greek educational system on the other, make the implementation of innovative methods and techniques in schools extremely difficult. Spiropoulou (2001), from the data gathered in the assessment of Greek environmental education in the decade 1991-2000, showed that the methodological practice was mostly on paper. Most of the PEE materialized without specific methodological approaches, with no or little experimental methodology and implementation of new technologies. ESD is a form of education that can penetrate almost all teaching subjects and strategies and promote international, innovative methods and techniques. There are no predetermined ways for sustainable development, as "the journey is the goal and we are aiming in it" (Breiting, Mayer, & Mogensen, 2005).

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