CHAPTER 1: Environmental Education Implementation

The classroom level:

1. Implementation models

The way in which environmental education should be introduced to schools is one of the most difficult problems of its implementation in educational systems. Various models have been developed, each one with both benefits and drawbacks. Each country should choose the one which is most compatible with its educational system to be effective. The classroom implementation models can be distinguished in two general categories: the separate topic model and the cross-curricular, integrated models.

Introducing environmental education as a single subject implicates having an additional topic in the school programme. Papademetriou (1998), strongly criticises this model since it is difficult to fit into the already overloaded school timetable.

Moreover, as a separate subject it will take only a few teaching periods per week. This, along with the inevitable comparison and competition with “established” disciplines (such as languages and mathematics), will result in the depreciation and marginalisation of environmental education.

The “separate topic model” does not have a holistic character either. Environmental education has a holistic character in the sense that it seeks to change minds; promoting more awareness, greater understanding and critical reflections on one’s own and others’ values about an issue, through presenting to the person various of its dimensions.
“Holistic education is concerned with educating the ‘whole person’, by developing the mind, body and spirit. It is also about understanding ourselves and our place on the planet, about recognising that we are connected to every other form of life and that the nations and peoples of the world are intricately bound together in one system”. (Sterling and Cooper 1992: 90)

The cross-curricular integrated models are designed to follow the philosophy of the holistic approach:

The **thematic approach** (topic work) deals with one and only environmental (or any other) issue. It may be seen though various disciplines and provide a global concept of the specific issue, but it does not constitute a complete environmental education teaching model since it doesn’t sufficiently cover the environmental education context. A thematic approach is usually applied through projects. It can be most beneficial if used to supplement other teaching strategies. Kilpatrick (1951) (in Theophlides (1997)), suggests that the “project method” poses a problem for the student to resolve and in this way it develops a desire of reaching the solution and “filling up the gap”. Thus the student’s actions are intentional and meaningful (since they are working on a solution to a specific problem) and they are motivated for action.

**Multidisciplinary** and **Interdisciplinary** approaches constitute complete models for environmental education implementation. Both of them present environmental education content through a range of disciplines, contributing, in that way, to its holistic character. The difference between the two approaches lies in the organisation of the matter, either by means of infusion through the curriculum, or by the formation of a single subject.
A Multidisciplinary approach presents environmental matters through a range of disciplines (infusion) (UNESCO, UNEP, IEEP, Environmental Education Series 22., 1993). Environmental matters are distributed and presented through the various curriculum subjects.

Entwistle (1970) (in Theophilides, 1998:15) states that “environment is presented to the students through various disciplines parted and unconnected. Knowledge and skills remain isolated in different “departments”… knowledge exists in unconnected packages and students have difficulties in understanding the environment as a unity”. This happens because the teacher deals with only a few factors of the issue, (the ones connected to his/her discipline) in isolation from the others. Sterling and Cooper (1992) describing this method as one of the holistic approach methods, comment that the learners “will gain only a partial or worse distorted understanding of the issue”.

Fig.1 A Multidisciplinary approach to environmental education (infusion) (Lahiri et al., 1993:49)
The problem of the lack of curriculum coordination is resolved by the interdisciplinary approach which does provide the links between the disciplines. Within the interdisciplinary approach the content of the teaching becomes unified by using matter from various disciplines simultaneously and forming a single subject within which “Distinct subjects are abolished and replaced by an interdisciplinary form of work, i.e. activities which relate to many disciplines at the same time” (Theophilides 1998, p.13)

Environmental education “fuses” the disciplines in an organised and connected way, to help students conceive a global image of the issue. In this case, the environmental (or sustainable) part of the context of various disciplines, joins to form the multi-dimensional profile of the environmental education issue (otherwise, the various disciplines contribute to environmental education formation).
We can and should form curricula that will provide opportunities for the student to place environmental education (or Education for Sustainable Development) in the proper and meaningful perspective. Warren Flint\(^1\) (1999) referring to interdisciplinary education in sustainable development (through science) suggests that “the goal is to teach the future professionals the real need for continued examination of linkages among economic, social and environmental issues in achieving a sustainable global society through science”. This will make students able to take more informed decisions.

As Theophilides (1998) suggests, an interdisciplinary approach helps children learn, without cutting them off from real life, but providing them with opportunities to learn THROUGH life, through the environment, ABOUT life and finally FOR life\(^2\).

Although the interdisciplinary approach has many benefits as a model for the implementation of environmental education, it still has some constraints. Sterling and Cooper (1992: 95) point out that “if the teacher deals with many factors at once, and their interrelationship, the learners may be stressed and confused by the amount of information and complexity”.

Papademetriou (1998) also expresses her fears about this method. She points out that the “diffusion” of environmental education in the disciplines (co-ordinated/interdisciplinary, or not/multidisciplinary) endangers the status of the subject and may lead to its devaluation.

All advantages and disadvantages of the two environmental education implementation models are summarised by Hungerford & Peyton. (1986:14-15), in the following table.

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\(^1\) Five E’s Unlimited, http://www.eeeee.net/fi00021.htm

\(^2\) This, is compatible with the three-fold nature of EE, EE is Education About the environment, through the environment and for the environment.
<table>
<thead>
<tr>
<th>Considerations</th>
<th>Interdisciplinary (Single Subject) Characteristics</th>
<th>Multidisciplinary (infusion) Characteristics</th>
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<tbody>
<tr>
<td>1. <strong>Ease of implementation</strong></td>
<td>Easier to implement as a single subject if time permits in the curriculum; teacher training is less of a problem.</td>
<td>Requires that more teachers be trained; greater coordination of the curriculum necessary, requires less time/content in the existing curriculum.</td>
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<td>2. <strong>Teacher Competencies</strong></td>
<td>May require fewer teachers but with more in depth training in EE. Thus teacher training is less demanding in terms of teacher numbers but more demanding in terms of level of competencies required.</td>
<td>Requires that all teachers from all disciplines be competent to adapt and/or use EE materials although perhaps not to the same depth as in single subject approaches.</td>
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<td>3. <strong>Demand on Curriculum load</strong></td>
<td>Requires addition of this discipline to an already crowded curriculum.</td>
<td>May be effectively implemented with minimal demands on existing curricular load.</td>
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<td>4. <strong>Ease of Curriculum Development</strong></td>
<td>Components easier to identify and sequence</td>
<td>Components must be effectively identified sequenced and accommodated by the existing curriculum.</td>
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<td>5. <strong>Evaluation</strong></td>
<td>A comprehensive evaluation is much easier to accomplish in a single subject curriculum.</td>
<td>Comprehensive evaluation difficult due to the number of variables involved.</td>
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<td>6. <strong>Age level appropriateness</strong></td>
<td>May be more appropriate at secondary than elementary levels. For some types of EE goals may be essential at secondary and tertiary levels.</td>
<td>Appropriate at all age levels with some exceptions at secondary and tertiary levels.</td>
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Nevertheless, the good planning of the teacher, and his/her careful selection of teaching approaches and activities, can ensure a successful implementation. Reinhold (1990) (in Sterling and Cooper, 1992:95) advances a number of ideas to help the teacher resolve the interdisciplinary approach problems and achieve the desired holistic view:

- “Expand your variety of teaching methods and means of expression. This will increase the number of ‘ways in’ to and views of the issue."
- "Take risks to help open up new ways of looking at things…"
- "It is normal practice for education to look at the small local examples of a problem or system … this can often help us understand the bigger example such as the national or global picture…”

Thus the teacher should carefully select the teaching approaches and tools to be used.

2. Approaches to teaching and learning.

Engleson et al. (1991) present several types of educational experiences for the teacher to select and help students learn about the environment. Some of these teaching approaches are abstract and symbolic whereas others are direct and concrete. The more concrete and specific the activity, the more active the learner is and the greater use they make of their senses. Edgar Dale (1969) (in Engleson et al., 1991:42) represents these approaches hierarchically in the following figure.
“Direct Purposeful experiences are those in which the learners have an opportunity to use their senses, hearing, tasting, seeing, touching and smelling - to build up wealth of meaningful information” (Engleson, et al., 1991). They are direct and purposeful with real educational value. One of the activities of this group is fieldwork. Fieldwork indeed maximises the opportunity for learners to feel, react emotionally to the experience and develop awareness and sensibility.

The term “field study” stands for all the work held outside the classroom. It may take place on a regular basis, serving specific aims and intentionally be incorporated in various classes. It doesn’t have to be far away, even the school environment may offer opportunities for outdoor study (Barker et al., 1994). This activity is very important for the holistic approach to environmental education: it gives importance and meaning to the content of learning, because it makes connections with real life situations and real people. Students observe, write, analyse, present and explain their investigations, discuss and listen about their work.
“...all developments in education demand that pupils have first hand experience of real people, real situations, real action and real places. Fieldwork provides this opportunity. Living in today’s challenging world demands skills such as observation, keeping records, problem solving, decision-making, communication and co-operating. Fieldwork develops all these skills.”

(Geographical Association, 1992, in Palmer and Neal, 1994:95)

Learning through nature, not necessarily by means of field study, is also emphasised by Sverige et al., (1994:23-24), by highlighting the benefits that can be extracted from such an approach. From their discussion emerges a “staircase model”, a non age-related model, which highlights how children and adults can develop an awareness of nature and environment.

Fig. 4 The staircase model

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Recognise as a teacher that nature and not the course book in the classroom offers the best source material.</th>
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<tbody>
<tr>
<td>Student &amp; teacher</td>
<td>Find numerous opportunities to exploit nature as source material in a range of different subjects.</td>
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<tr>
<td>Student &amp; teacher</td>
<td>Learn to understand how nature functions and how humans have affected and continue to affect it. Involve recurrent excursions into the immediate environment.</td>
</tr>
<tr>
<td>Student</td>
<td>Establish familiarity with immediate environment. Key elements: exercises, training the senses, exploring nature, basic outdoor rules, learning to recognise traces of human presence in nature.</td>
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“Contrived experiences are edited to omit certain elements of a real experience and thus make it easier to understand. The editing may reduce the size or complexity, or both of a real
life situation.” (Engleson et al., 1991: 42) Special visits belong to this category of activities, since most of the time they are focused on one of the elements and serve a special purpose. An example that Engleson et al. use is the visit to an aquarium: “...an aquarium may contribute greatly to understanding the ecology of a pond... Nevertheless, they insist on also providing a first hand experience of the ‘real thing’...” but the real thing should also be experienced.

In the same way that special visits focus on certain elements, simulation activities reproduce a simplified version of real phenomena, events or procedures (which might be social, political, economic and biological), thus providing a clearer focus on the aims of the activity. According to Katsikis (1992: 23), during a simulation both children and teachers participate taking over “roles” which simulate real life situations. This involves active participation and decision-making. A simulation is based on a problem and is more suitable for multidisciplinary approaches. Finally Katsikis (1992) states that a simulation is a “dynamic activity” dealing with changing conditions and requires flexibility of thinking and answering. Moreover we might consider modern computer simulations as a further enhancement of contrived experience activities.

In the first two approaches to teaching and learning, direct purposeful experiences and contrived experiences, the student makes the greatest use of his/her senses and is most active. In some situations though, it may be impossible for first hand experiences to be provided, nevertheless we can still ensure an active participation of the student and a solid end of the activity.

“Dramatised experiences can help children experience ideas or events that they cannot experience first hand. Dramatisations, like contrived experiences omit some of the
unimportant and confusing elements of a situation and stress the significant ideas.”
(Engleson, 1991: 43)

Katsikis (1992) suggests that role-play is one of the problem solving methods where a
“selected real life situation is dramatised in order to bring out the emotions and feelings of
the participants”. The student may have to deal with controversial issues but in the end s/he
will “develop a sympathetic understanding of other people by gaining new insights into their
own lives”.

Inquiry method as well as controversial issues may take the form of role-play. A decision-
making or ethical query is posed for the student to solve or debate. Role-play may indicate
that the student stands for someone and has to act in a relevant way. This brings up the need
for good and wider information and good knowledge of the issue. In this way the student
becomes an “active and creative individual with the will and ability to seek knowledge and
self development” (Sverige et al., 1994: 44).

Problems investigated through role-play and controversial issues are usually open ended, they
have more than one answer and more than one possible solution. The role of the teacher here
is to supervise, support, encourage and guide. Most importantly teachers should be flexible
and sensitive to other viewpoints able to interpret and fulfil the needs of the students.

Environmental games and dramatisations are equally creative and participative activities.
creating aware, responsible, co-operative and active citizens”. The students must have first
hand experiences in order to acquire personal understanding and a critical view of situations
and phenomena. As mentioned before this is not always possible. For Gardelli (1988),
environmental games are another solution to this problem. “Environmental games connect
indoor activities with events that occur outside in grown ups’ world”. These games take into
consideration the variety of elements that constitute the environment and try to “reproduce”
the complexity of environmental problems by bringing up the values, interests and attitudes
of various social groups. Environmental activities should not simply be “pleasant breaks”
but also be part of a well-organised teaching programme.

After dramatised experiences, Edgar Dale (1969) (in Engleson et al., 1991), suggests
demonstrations. He defines them as “visualised explanations of important facts, ideas,
processes or techniques generally done by a person before a group”. The reasons for which
a wide number of students cannot be involved might be safety reasons, time limitations, or
lack of materials.

A good presentation may include many of the teaching techniques already mentioned, such as
dramatisation, or the usage of models as well as less “learner active” techniques, such as
displays and exhibits.

**Motion pictures and video** compress both time and space and omit unnecessary and
unimportant material. It concentrates on the selected key points. For that purpose they should
be carefully chosen.

**Recordings, radio, charts and pictures** may clearly transmit a message to people who
cannot read. Nevertheless, very little physical activity is involved and they can become
abstract approaches. Finally the most abstract approaches are the ones which make use only
of visual and verbal symbols, e.g. a red cross representing a hospital is a symbol and signs
used by the formula $E= mc^2$ are verbal symbols.
3. Organising the Curriculum

Designing an effective and comprehensive curriculum is a complicated and difficult task even when the goals and objectives are commonly accepted (Volk, 1993:46). In a field, such as environmental education, where controversial issues exist even within its philosophy and definition, designing a curriculum is even more difficult (Volk, 1993).

Acknowledging that there are a number of objectives on which environmental education focuses, Volk (1993) considers as the ultimate objective “the development of a responsible individual and societal behaviour” (p.46). For the achievement of this goal, Hungerford & Volk (1990) recommended six critical components to be considered during the planning of educational programmes in order to be effective in changing the learner’s behaviour:

- “Teach environmentally significant ecological concepts and the environmental interrelationships that exist within and between these concepts;
- provide carefully designed and in depth opportunities for learners to achieve some level of environmental sensitivity which will promote a desire to behave in appropriate ways;
- provide a curriculum that will result in an in-depth knowledge of the issues;
- provide a curriculum that will teach learners the skills of issue analysis and investigation as well as provide the time needed for the application of these skills;
- provide a curriculum that will teach learners the citizenship skills needed for issue remediation as well as the time needed for the application of those skills and;
- provide an instructional setting which will increase learners’ expectancy of reinforcement for acting in responsible ways i.e. attempt to develop an internal locus of control in learners. (Hungerford & Volk, 1990)

Other aims which, according to Volk (1993), should be included in a curriculum design for environmental education are:

- ecological literacy in order to facilitate sound environmental decision making;
- environmental sensitivity, which refers to “an empathetic view of the environment and its problems” (p.49);
- in depth knowledge of the issues that implies not only learning about a variety of environmental issues, but also considering the implications and consequences of these issues;

- issue investigation skills that would allow active involvement of the students in the investigation of environmental issues and result to their responsible citizen behaviour;

- citizenship skills “are those skills that individuals can use to help solve environmental issues” (p.50) and contribute to responsible environmental behaviour;

- a person will engage in environmentally responsible behaviour if they have a feeling of effectiveness, locus of control. The locus of control could be internal, in which case the person feels that s/he has a measure of control over what happens. In the case of external locus of control the person believes that control over what happens is beyond his/her power and therefore s/he is powerless to change the society. This person will therefore not act in a citizenship dimension.

After the investigation of the aims that educators should consider in curriculum planning, suitable teaching approaches must be considered. In education there is no “right or wrong” approach to teaching and learning. The variety of activities mentioned before serve various approaches and various aims. The selection of the approaches to be used is usually very flexible in order to satisfy various criteria:

- the teaching style of the educator
- the discipline in which the environmental education is going to be infused
- the aims set
- the age of the children
- the environmental education issue
For environmental education though, whichever approach or combination of approaches is utilised, “first hand experiences of the environment are at the forefront of teaching and learning” (Palmer and Neal, 1994).

The same degree of flexibility, though, should not exist when organising the context of environmental education to be taught. A model for teaching and learning should be formed in order to ensure continuity of the teaching matter and adequate coverage.

Palmer and Neal (1994: 37) suggest a very helpful framework when planning topics, which consists of two mutually dependent components. This can be expressed as a matrix in which the vertical component corresponds to the core and foundation subjects and the horizontal component corresponds to the cross-curricular theme of environmental education.

The task of preparing such a matrix becomes easier if the teacher first analyses the components of environmental topics, key issues involved and knowledge and skills to be developed (see fig. 5). It is a very useful method of working if the teacher wishes to support continuity and coverage as mentioned before. Nevertheless, the mere construction of a matrix or a working scheme, is not enough for ensuring the two. At this point the urgent necessity for an environmental education syllabus appears in order to define the elements and components of environmental issues. Most curriculum disciplines (e.g. mathematics) have its teaching matter defined and organised for every age group. This may be part of a syllabus and/or the curriculum.

Environmental education in most countries’ curricula is simply mentioned through some guidelines and approach or teaching suggestions. There is no official document that presents every environmental issue that should be learnt by the student. This gap is one of the most important reasons for environmental education devaluation.
### Curriculum Disciplines

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<th>Geography</th>
<th>History</th>
<th>Mathematics</th>
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<tbody>
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<td>Damp places and the consequences</td>
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<td>Waste management in the past</td>
<td>Problem solving</td>
</tr>
<tr>
<td>Water</td>
<td>Water Cycle</td>
<td>How water affects a country’s climate</td>
<td>Water supply network during Roman times.</td>
<td>Monitoring water consumption</td>
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