Listening to the Ecosystem of the Turtle: Enabling the disabled to cross the listening paths of acoustic ecology and environmental education

By Charikleia Minotou, Andreas Mniestris, Ioannis Pantis,
Ioanna Etmektsoglou, Stefanos Paraskevopoulos

Abstract

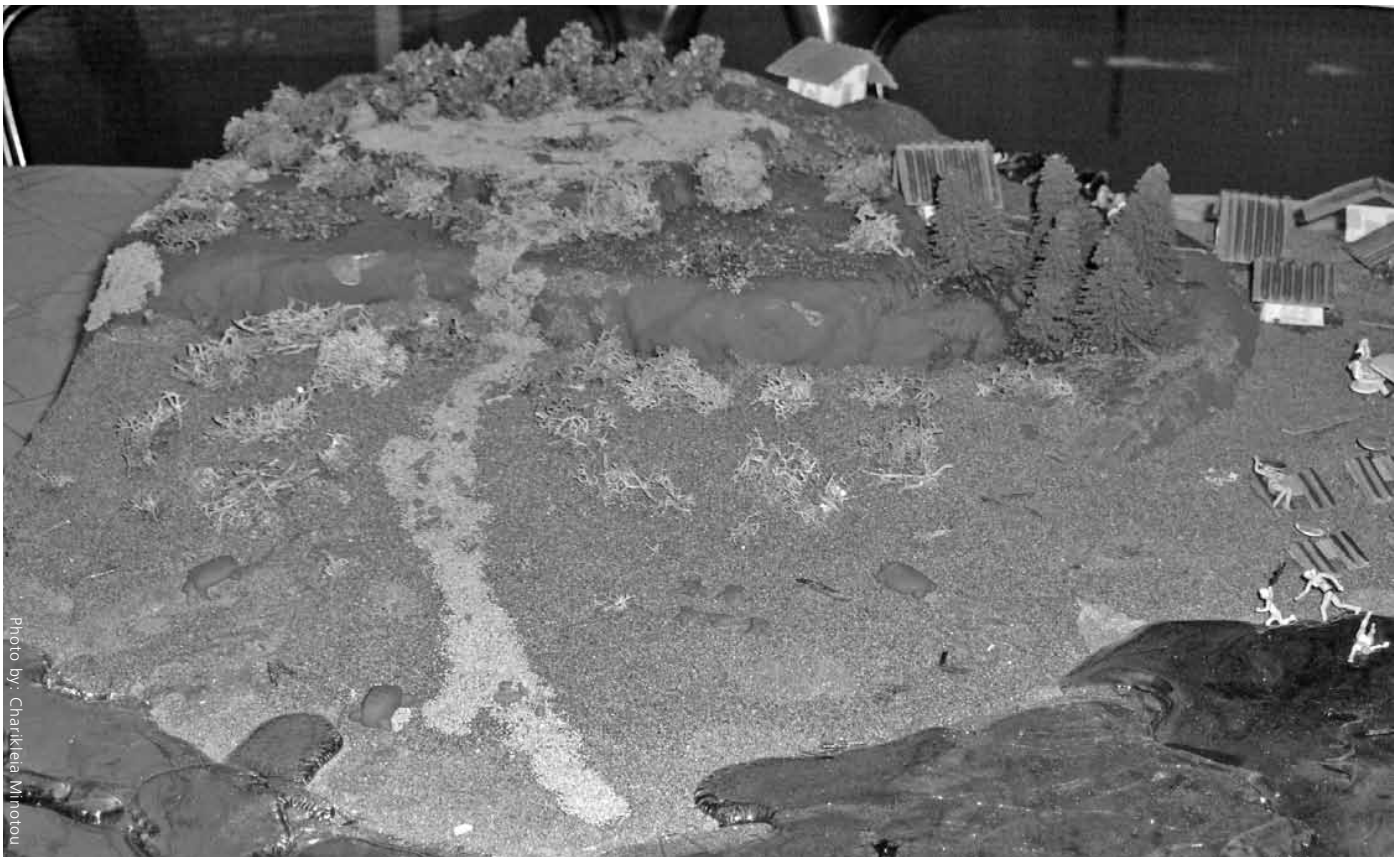
Environmental education and awareness projects foster environmentally friendly attitudes, contributing to the protection of the environment, through active participation. Special Environmental Education provides to groups of people with disabilities, opportunities for both education and active participation in environmental protection projects. The science and art of Acoustic Ecology may function as an especially useful educational tool, which could assist students with disabilities to metaphorically cross the listening path of environmental education.

The National Marine Park of Zakynthos (NMPZ) is officially recognized as a nesting beach of the sea turtle **Caretta caretta**. Within the framework of academic research, appropriate environmental education material was created for special groups, and particularly for people with visual, hearing, as well as mobility disabilities.

The National Marine Park of Zakynthos was chosen as the location for the case study, because it appeared to be an ideal site for environmental education activities that could 'embrace' people with disabilities.

An interdisciplinary approach was adopted for the development of the environmental education material for special groups, combining Acoustic Ecology with Conservation Education, that is, education for ecosystem's management and conservation (Jakobson, 1987, 1991). The current research drew on knowledge from these two fields. The educational material was created and successfully implemented, resulting in the participants' increase of environmental awareness and the development of environmentally friendly attitudes, as demonstrated by the research results.

Keywords: acoustic ecology, special environmental education, protected areas, education for ecosystem's management and conservation (conservation education), disabled.



Model virtualization of the National Marine Park of Zakynthos

Activity box for environmental education with natural materials

1. Introduction: Environmental education – Acoustic ecology – Conservation education

Environmental education that is designed and adjusted to the needs of special groups may help the people involved develop their self esteem. It promotes their social integration, and provides them with opportunities to participate in environmental actions. The process of understanding the complicated systems of nature turns environmental education into a tool for nurturing the participants' self-worth and perception of the self[1] (Pentovoulou–Ziaka, 2007). When designing environmental education material for people with disabilities, it is particularly important to consider ways of activating their senses so as to transfer knowledge through a variety of sensory stimuli and not only through simple visual symbols. From this perspective, image, sound and touch, either individually or in combination, may function as invaluable educational resources and tools. Stressing emotional engagement in the planning of environmental education activities is of utmost importance as well, if one takes into account that in special groups, emotion and sentiment tend to dominate experience and may facilitate knowledge acquisition (Blanchet & Trognon, 2002).

Acoustic ecology can be implemented and utilized as a learning tool for the visually impaired. Sounds, sonic ecosystems, foreground sound, these are the parts that compose a synthesis which may compensate for the lack of visual information about the landscape and its biodiversity (Wojciechowski, 2008).

Recording the sounds of a protected area's ecosystem is a way of mapping the area's geomorphological characteristics, its different species, the landscape, human interventions and presence, as well as cultural elements. The recordings of the sounds produced by various species, like the sea turtle *Caretta caretta* under study in this paper, are accompanied by additional multimedia material, such as videos, which present sounds not as isolated audio files, but as real sounds in their original context. In this way, the material can describe biological processes (e.g. laying eggs), instead of simply presenting snapshots of biological sounds.

1 Gibson (1979) supports that our perceptual systems are at the same time exterosensitive and *propriosensitive*; able to provide us with information about the external and internal worlds. Therefore, based on his ecological approach to perception, one's perceptual acts in the environment may improve his/her perception of the exterior world but also the perception of him/herself in it.

2. Research objectives

The general objectives of the present research were: a) to familiarize special groups with the ecosystems and the species that inhabit them, b) to enhance their willingness to participate in environmental actions, and c) to highlight their options to participate in the management of a protected area through environmental and management activities. Further objectives of the project included social integration, enhancement of self esteem, physical, social, professional, psychological and cognitive development, knowledge acquisition, adoption of appropriate attitudes towards the management of protected areas and development of environmental morality (see Taylor, 1981).[2]

3. Methodology – Environmental education material

In the framework of recording the soundscape of the National Marine Park of Zakynthos, the sounds were first classified into distinct categories. The sounds were recorded during the sea turtle egg-laying season (May-October), and cover four parts of the day: a) morning, b) noon, c) afternoon, and d) evening. Apart from audio recordings, audiovisual material was also produced. The sounds were classified according to the different ecosystems of the area, such as beaches, dunes, seaside pine forests, rural and tourist areas. The classification was realized according to the referential aspects of the sounds (such as in Schafer, 1994/1977). At the same time, we recorded the sounds made by the various animal species that inhabit the protected area. These sounds were not short isolated audio files, but an ensemble of sounds displaying continuity and coherence, that is, a complete soundscape. Particular emphasis was placed on distinguishing between foreground and background sounds as well as on the balance and imbalance of the soundscape – as viewed from the perspective of acoustic ecology – in relation to the management of the protected area.

In the context of the present research project, environmental education material was produced, based on audio and video recordings of the egg-laying process of the *Caretta caretta* sea turtle. The presentation of audio files to the Special Needs groups begins by listening to the recordings of the sea turtle. The recorded files include a) breathing as she emerges from the sea, b) crawling on the sandy beach, producing different movement sounds depending on whether the sand is wet or dry, c) digging with her fins to make her nest, d) laying her eggs to fill the nest, e) covering the nest with sand, f) breathing intensely and returning to the sea. The audio narration that has been added to the audiovisual material helps to provide the participants with necessary environmental information. The implementation of the material showed that, by listening to the turtle's "ecosystem", participants perceive space and time data, such as the geomorphological features, season, human presence and activity, etc.

2 The environmental morality and the respect towards nature, as determined by Taylor's theory (1981) consists of three elements: a system of beliefs, a moral attitude, and a set of norms regarding our duties. Participants can develop a system of beliefs through a holistic program of environmental education, particularly through the knowledge they gain. They can adopt a moral attitude through their participation, action, and awareness reinforcement. They can create a set of norms by engaging in ecosystem management.

The specific combination of natural, urban, rural or human origin sounds constitutes each area's soundscape, and is unique in space and time (see Truax 1999; Schafer 1977). Background sounds, foreground sounds, soundscape changes over time and space at the same locations, all these form the soundscape of the National Marine Park of Zakynthos, which provides disabled participants with data necessary for the protection and management of the area, helping them analyze the situation. These recordings formed the basis for the development of environmental education material for the hearing impaired and for people with mobility disabilities.

As already implied, the environmental education of special groups draws heavily on experiential learning and on the activation of the senses (Chrysafidis, 1994). The environmental education material was created with the objective to include experiential elements that are comprised of audio, tactile and visual tools.[3] Depending on the special group involved, their particular combination may facilitate the transfer of environmental information. During the implementation of the material, the audio recordings were accompanied by a three-dimensional model representing the protected area and by tactile natural materials.

Schafer suggests that one way to improve the soundscape is "to increase sonological competence through an education programme that attempts to imbue new generations with an appreciation of environmental sound" (in Wrightson, 2000, p. 13). Listening is at the heart of acoustic ecology[4] and a sound education, which opens the students' ears to the sounds of the environment leads to an awareness of the unique characteristics of the soundscape (Dietze, 2000). This approach to sound was incorporated in the present research project and in combination with other educational tools (narrations, model, structured activities like biodiversity boxes) intends to help participants perceive the unique character and importance of the protected area through visual, audio and tactile stimuli.

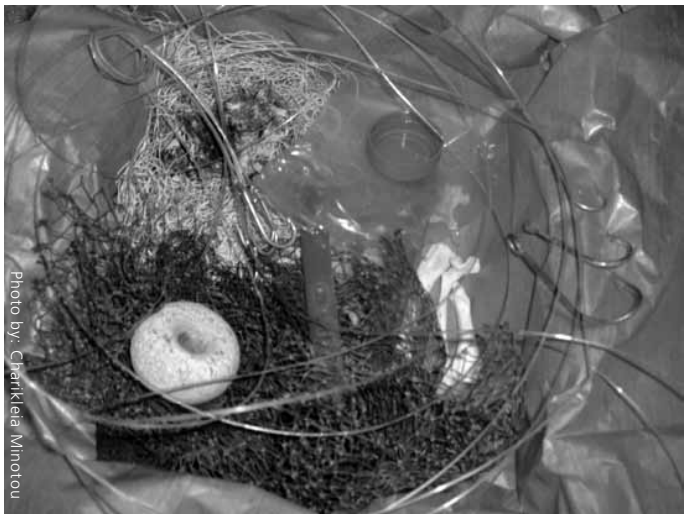
4. Implementing the environmental education material

Five special schools were chosen for the presentation, implementation and evaluation of the environmental education material. The Greek Educational Authorities granted a specific permit for this applied research project. The participants' age ranged from 13 to 25 years. Overall, 110 students participated, of which 65 were with special needs and 45 without disabilities.[5]

Participants' reaction to the presented material was friendly and positive. They displayed a strong willingness to participate, keenly observed the presentations, the video and audio recordings, and experimented with the tactile diagrams concerning eco-paths in the protected area as well as with the tactile material that was part of the constructed model of the protected area. The result of the implementation was that participants were 'virtually transported' to the protected area of the National Marine Park of Zakynthos.

Through the audio recordings, they were informed about the geomorphological features, the biodiversity and human activity of the area. The audio recordings of sea turtles laying eggs helped participants follow the process of egg-laying step-by-step, feeling the suspense, participating with questions, and perceiving environmental information. The sounds provided them with information about the shape of the turtle, her struggle to dig a nest with her fins, her eggs filling up the nest one by one, the volunteers who observed the process for scientific reasons, as well as the foreground and background sounds that influence and determine the data necessary for the management of the area. It should be noted that participants could extract information from the sounds such as as the season, the time of day, the type of landscape and the activities in the area; for example the background sounds of the egg-laying beaches indicated that a neighboring area featured tourist and urban activities.

The environmental education material was evaluated with the use of questionnaires. After each presentation, two questionnaires were distributed, one to the special groups' participants and one to the educators that were present. Based on the statistical analysis, the vast majority of participants (80%) expressed a desire to visit the National Marine Park of Zakynthos, and a significant number (65%) stated a willingness to participate in protection and management actions. Regarding the educators, 96% found that the environmental education material could be easily implemented in special groups and could effectively "transfer" environmental information through audio recordings. The statistical analysis of the relevant questionnaire answers also revealed that participants adopted an environmentally friendly attitude, stating that the protection of the environment is a priority.



Activity box for environmental education with plastic materials coming from human activities

5. Conclusions

Two particularly important fields of environmental studies can be utilized to produce environmental education material and be used as tools to educate special groups. These are: a) acoustic ecology, and b) education for ecosystem's management and conservation (conservation education). The sonic identity of an ecosystem can be easily analyzed and utilized in educating and promoting the awareness of the general public and special groups on issues that pertain to the protection of the environment. The combination of visual, audio, and tactile material, depending on the abilities of the participant groups, contributes to a more effective environmental education and awareness reinforcement.

A particular finding of the present research on special groups is that through ecosystem management and conservation education with an emphasis on sound and acoustic ecology (determining foreground-background sounds, identifying keynotes, sound signals

3 Even though acoustic ecology focuses primarily on sounds, Schafer stresses the importance of a multimodal approach in children's education. According to him, "[...] a total and sustained separation of the senses results in a fragmentation of experience. [He urges us to consider] once again the possibilities of synthesis of the arts." (Schafer, 1986, p. 249) Such an approach could be proven especially effective in the context of developing environmental education material for disabled students.

4 According to Schafer (1986), "the habit of listening [should not be confined] to the music studio and the concert hall. The ears of a truly sensitive person are always open" (p. 246).

5 The environmental education material was implemented in special schools and in general schools with integration classes. In the latter case, the teaching was realized in mixed groups including students with and without disabilities.

and soundmarks, considering issues of sound pollution etc.), the participants appear to experience a strengthening in their willingness and eagerness to participate in environmental management activities, while at the same time they become familiar with the priorities of caring for, preserving and managing a protected area. In addition, they learn how to think about taking measures to solve environmental problems. Secondary effects of such an intervention also include the socialization of disabled people through participation in collective learning and activism for the protection of the environment.

Acoustic ecology in this project acted as a tool and a catalyst for crossing listening paths at different levels. Such crossings – literal and metaphorical – involved the listening paths of the abled and the disabled and those of acoustic ecology, biology, acoustics, environmental education and special education, to mention the most obvious ones. While they were important for the students involved (with and without disabilities), these crossings of listening paths proved to be equally important for the researchers-educators who were given the opportunity not only to create them for others but also to experience them for themselves. Crossing these 'listening paths' appears to have led everyone involved to a deeper appreciation of the environment and the self.

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Charikleia Minotou is an agronomist with postgraduate specialization in organic farming. She has just been awarded her Ph.D. in Protected Areas and Environmental Education for the Disabled, (University of Ioannina, Greece). She is the Vice-President of DIO, the oldest Greek Control and Certification Organization for Organic Products, and the President of AgriBioMediterraneo. Additionally, she manages an organic farm in the Greek island of Zakynthos, where she also devotes time and attention to protecting the local endangered turtle species, through WWF Hellas programmes.

Andreas Mniestris is Associate Professor of Electronic Music Composition at the Music Department of Ionian University, director of the Electroacoustic Music Research Laboratory and member of the directing committee of the Graduate Program on Sound Arts and Technologies. Mr. Mniestris is a founding member of the Hellenic Association of Electroacoustic Music Composers and the Hellenic Society for Acoustic Ecology.

John D. Pantis is Professor of Ecology, and his research interests focus on the fields of community ecology, biogeography and conservation biology with an interest of applying this knowledge to management and conservation of protected areas. He has also worked on environmental education and awareness programs towards raising public awareness for ecology and conservation. His other research interests include landscape ecology and acoustic ecology.

Ioanna Etmektsoglou is Assistant Professor at the Department of Music of the Ionian University, Corfu, Greece, where she teaches courses in psychology of music, music education, and music therapy. She has studied psychology of music at the University of Illinois, U.S.A and music therapy at Anglia Ruskin University in Cambridge, England. She is currently serving as president of the Hellenic Society for Acoustic Ecology.

Stefanos Paraskevopoulos is Professor at the University of Thessaly in the Special Education Department. His main research work includes the philosophy, principles and methods of environmental education, planning and policy of teacher education in environmental education, design and development of special educational materials for environmental education, analysis of the relationships between society and the environment.