



FORMING AN OBSERVATION TRAIL FOR THE STUDENTS OF ENVIRONMENTAL PROTECTION ENGINEERS IN ORDER TO DEVELOP THE EDUCATION OF SCIENTIFIC SUBJECTS IN THE FIELD

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Abstract:

The objective of this research: To comply a set of field exercises to evaluate environmental conditions with special emphasis on ecological and biological aspects, for the education of environmental engineering and engineering instructor students. Sets of tests to adequately analyze the environment in a complex way are practically non-existent. The few that exist are focused on some particular, narrow area, primarily examining inanimate environmental factors. The majority of these tests are chemical quick tests to detect the presence and level of a specific substance polluting the environment. The results are descriptive observations, merely stating facts, without offering any explanation for the causes of different phenomena, simply providing factual data measured in a particular moment in time. Based merely on these results, it could be hard or impossible to make any responsible suggestion regarding environmental or land development issues.

Keywords:

Education for the environment, The Application of Field Exercise in the Education of Environmentalism and Nature Conservation, Observation trail, Biologically qualified environment, Ecologically evaluated conditions.

1 INTRODUCTION: THE APPLICATION OF FIELD EXERCISE POTENTIALS IN THE EDUCATION OF ENVIRONMENTALISM AND NATURE CONSERVATION, WITH CONTINUED DEVELOPMENT OF THESE METHODS AS STUDIED

1.1 “Education for the environment”

The survival of life on earth depends on a harmonious equilibrium between human society and the environment. To achieve this balance through the process of sustainable development should be our eternal goal that could be attained only by an increased environmental awareness of people [3]. The necessity of paradigmatic changes has become a matter of life and death in our time. The domain of environmental education has been extended, it is rather “education FOR the environment” [2] [10] [11]. It includes the encouraging of a dedicated, environmentally conscious lifestyle, with constant affirmations, the shaping of behavior, values, attitudes, and emotions, increasing knowledge, and inspiring actions to prevent any further damage and degradation of the environment [9]. The education for sustainability is based on interpreting the environment as a system. The author focuses on observing living beings, because that is also an indication of the conditions of the inanimate components. The explanation of this statement is that transformations caused by use in a region always result in transformations of living beings on some level, thus the condition of living beings is an indicator of the condition of inanimate components [7] (*Figure1*). Environmental field trips concentrating on complex observation of biocenosis can demonstrate causality, and can be operative [4]. [5].



Figure 1 Transformations caused by use in a region always result in transformations of living beings on some level, thus the condition of living beings is an indicator of the condition of inanimate components (The photo (picture) of the author's)

1.2 Environmental Awareness and Field Exercises

The field trip completed together with the students, as an educational learning tool, covered the entire range of pedagogical issues regarding the concepts of sustainability. As opposed to the declarative communication of information, it emphasized an activity driven, “process” nature of learning, as revealed in the author's researches [1]. The field exercises developed a critical approach based on experimental knowledge, and that improved the students' skills to evaluate, to make decisions, to deal with crisis situations. It promoted problem solving in thinking processes, and increased creativity in actions. By applying experimental knowledge, it produced practical, functional knowledge [8]. The experiences of field exercises confirmed that to comprehend the sustainability of environmental systems, it is not sufficient to rely on unidirectional declaration of theoretical data, or direct verbal communication. It is necessary to apply the knowledge in an actual environment because the preservation of the environment focuses on problems, and actions to solve them [8]. The field trips provided an active and constructive learning environment (promoting self-improvement and collective improvement) where knowledge and educational benefits were achieved by individual and collective experiences through completing tasks. That is why a field trip could be considered the method of direct demonstration and presentation, regarding the method of acquiring knowledge for the basics of the ecological approach [8] (*Figure2*).

1.3 Environmental Education: Educational Methods on a Field Trip

The ecological and regional analysis specialty methods together with the environmental educational methods represent the different didactic methods present at a given phase in the educational process. They include means of processing information (e.g. discussions focused on problems, direct and indirect way of presentation, demonstration), means of recording, controlling, and evaluating data, and



the potentials of organized activities [8]. In the interiorization process, the educational effects (interactions) created by educational factors, and the educational methods resulting in these effects, were quite different on the field trip from the methods of traditional classroom education environment, as revealed by the research. The primary difference can be found in the methods of organizing activities: On the field, due to the configurations of the terrain, any activity was efficient only when working in smaller groups.



Figure 2 That is why a field trip could be considered the method of direct demonstration and presentation, regarding the method of acquiring knowledge for the basics of the ecological approach (The photo (picture) of the author's).

Thus an environmentally conscious value system was developed by the indirect educational methods and impacts of collective activities, and by the influence of emerging customs, behavior and activity models, and convictions of the group. Indirect educational methods have not been widely analyzed so far, and consequently have not been frequently utilized in practice, unlike the direct educational methods provided by an instructor which have been fully described and thoroughly analyzed. In the opinion of educational researchers, the problem of applying indirect educational methods is that the results are hard to register [8]. By comparing the results of different groups when completing different tasks and exercises, it was possible not only to determine the level of skills and professional knowledge, but also to measure the degree of personality forming functions achieved. Groups that worked well together in unity, organized the completion of tasks with consideration to individual interests and abilities, and after analyzing and evaluating the test and survey data, they arrived at high quality, interesting, professionally substantial and well established, and photographically well documented conclusions, instead of superficial and shallow conclusions. Differences between groups in conditioning procedures indicated different levels of accomplishment in habit forming methods (mutual help, mutual demand, mutual evaluation and control) during the field exercises. The level of mutually setting examples, and adapting models was different in different groups. Based on the evidence of group records, conviction forming procedures and methods of achieving awareness were crucial both for the development of skills and professional knowledge, and also for educational purposes. The personality developing process operated through mutual discussion, and sharing information, affecting not only the person it was directed to but also the one initiating it. In the



author's experience, when working with groups the project method is the most efficient on the field, because the interiorization of knowledge is achieved as part of, and also the result of a creative process. This supports the idea previously mentioned that field exercises make it possible to measure how effective the indirect educational methods have been [8]. When working on the project, the participants did not simply search for the solution to a particular problem out of context, instead, they observed and analyzed multiple junctions and interconnections. This could not have been accomplished without discussion, arguments, mutual demand and control. It must be emphasized that the completion of tasks to evaluate environmental conditions as described and organized in this dissertation was the most effective when performed in the form of a project. In addition to its function in collective and individual development, the project also contributed to establishing the (holistic) system approach, which is the fundamental principle of sustainable development.

1.4 Methods of Measuring To Qualify the Environment

The tools of education for the environment and nature conservation on a field trip are surveying, measuring, observing, testing. As the result of my researches, a set of tests was compiled to examine the following: Microclimatic and air quality values, establishing the level of air pollution by observing bioindicators, testing the reducing effect of vegetation on noise pollution, testing the soil from the ecological aspect, evaluating the condition of natural waters by observing bioindicators, geological and geomorphologic observations, examining characteristics and quality indicators in communities of living organisms [6] (*Figure3*). Each test is built on the principle of practical evaluation of the environment: When examining the conditions in a biocenosis, both the qualitative and quantitative biological composition, and also the abiotic factors causing the particular distribution in space and time are taken into consideration as characteristic traits. Using the microclimatic and air quality examinations regarding the characteristics of the vegetation as an example, this means the observations are not based only on instrumentally measured data (light intensity, temperature, humidity level) but also on surveying and studying the species composing a phytocenosis in different seasons, and by determining the extent of foliage closing, and the degree of exposition on slopes, some cause and effect connections are also revealed.

The algorithm describing each test in the dissertation is summarized as follows [6]:

- Objective: Description of observation, or measuring
- Task:
 - Description of the process of observation or measuring, determining the time and frequency of task, listing the equipments required, suggestions for the type of equipments;
 - Determining the methods of analyzing recorded data (e.g. creating charts or diagrams, comparing photographic and film documents, cartographic representation);
 - Control: Reference to the requirement of evaluating results, interpreting consequences, drawing conclusions, finding explanations.
- Designating the specific location, appropriate to complete the tasks;
- Summary of results to be expected:
 - As a result of applying methods to process information;
 - As a result of indirect educational methods, accomplished by group activities.

The tests are holistic in nature from the aspect of environmental education (with the exception of measuring noise level.) The tests make an attempt to reveal the causal connections between a living



organism and its environment. No major chemical analyses, and no complicated technical procedures are required, consequently they are significantly less expensive, and yet they provide reliable information about the condition of environmental factors. Analytical measuring by instruments (e.g. temperature, humidity level) are utilized to some extent in the course of the tests.



Figure 3 As the result of my researches, a set of tests was compiled to examine the following: evaluating the condition of natural waters by observing bioindicators (The figure3 is the author's work)

2 METHODS: DEVELOPING SKILLS OF ENVIRONMENTAL AWARENESS BY DESIGNING AN OBSERVATION TRAIL

While researching the possibilities of field trip education in order to increase the knowledge, and develop the skills of environmental awareness for environmental engineering and engineering instructor students, special attention was paid to absolutely avoid any harm or damage to the environment when completing the specific tasks or tests. The other objective was to improve the educational efficiency of field exercises. The development of information processing methods in evaluating the environment was focused on the potential applications and further elaborations of bioindicators. Using the sulphur dioxide pollution examination as an example: The amount of sulphur dioxide present can be measured by instruments, but can also be determined by the degree of leaf necrosis of sensitive deciduous trees measured on a scale of experiences, or can also be determined by the presence of lichen species in the area. The development of educational methods was intended to increase the efficiency of indirect educational methods in a group activity form, and it was accomplished by designing an interactive observation trail. The observation trail provides an opportunity for acquiring active, experimental knowledge and skills in a group, because it focuses on performing tasks through activities, and at the same time



introduces the natural resources, and gives information about nature conservation. The stations of the observation trail are designated at the most appropriate and most informative sections regarding the resources to be demonstrated, and related ecological and environmental aspects, making certain, however, that the natural resources of the environment are not harmed or disturbed.

2.1 Location of Doberdó Observation Trail

The location of the field trip and observation trail project is Budapest's northwest part (Óbuda), between Doberdó street and Kiscelli street, beside Bécsi street (*Figure4*). The location is characterized by the polarized and concentrated presence of a great variety of natural features and phenomena within a small, limited area. The location is easy to access from the Óbuda University, is beside it directly. This location is extremely appropriate to demonstrate environmental qualities from ecological and biological aspects, and to observe and evaluate conditions in an objective manner, which is the very objective of the environmental and nature conservation field exercises. The law regulating the assessment of natural resources defines seven specific areas for the evaluation of conditions. With the exception of two of these areas (condition of agricultural land, and waste management), all other areas (condition of waters, condition of air, condition of living organisms, condition of built components, and level of noise pollution) can be analyzed and evaluated by the observations and exercises described in this presentation at the above mentioned location, thus providing a place of demonstration for field education.



Figure 4 The location of the Doberdó Observation Trail is Budapest' northwest part (Óbuda), between Doberdó street and Kiscelli street. (The figure5 is the author's work Budapest based on a map (<http://korlat.bmknet.hu/hun/kiscell/terkep.html> 2007)



2.2 Interactive Observation Trail in the Óbuda

The 12 stations of the observation trail, can be completed with the assistance of a study guide or “information booklet.” When designing the trail, the educational method was mainly focused on the questions of Where? What? and How? When designating the area, and selecting the topics to be studied, there were two major factors to be considered: The informative value, and the dedication to avoid any harm to the natural resources involved. Through defined tasks, and relevant explanations the trail provides information about geographical features of the area, about geological and surface processes (*Figure5*), hydrological values, biocenosis of the area, peculiarities of the vegetation, ecological particulars, and historical cultural values (*Figure6*). From the aspect of how knowledge is acquired, the designed observation trail can be completed in an interactive way.



Figure 5 Station 6 of The Doberdó Observation Trail; Terrace of Travertino limestone (The photo (picture) of the author's)

The stations are as follows: Opening station (geographical location, marking the boundaries of the region, rules of conduct, itinerary, time frame) (*Figure7*); the abandoned quarry; talus slope and forest community with linden and ash trees; oak trees; observing Travertino limestone; site of prehistoricfossil; the stone chamber.

The algorithm introducing the stations in the study guide is as follows:

- ❖ Name of station;
- ❖ Geographical location of station;
- ❖ Phenomena to be observed, natural resources, collecting survey data:
 - Description of phenomenon to be observed;
 - Tasks;
 - Explanation of the emergence and specifics of the phenomenon.

The algorithm is demonstrated on the 1st station of the observation trail: Station 1: *Abandoned quarry, clay-pit*

- ❖ *Location:* The central part for the area, for the observation trail



- ❖ *Phenomena to be observed, natural resources:* The study of successions of the vegetation (Figure 8)
- ❖ *Task:* Identifying pioneer plant species, and species involved in the climactic forest community in the quarry yard, and the adjacent undisturbed hillside.

Explanation: Succession means the progress of the vegetation. In the quarry yard, due to the disturbance (the mining operations of the quarry), secondary succession can be observed that began when the mining operation was terminated. The area of the quarry was not recultivated, it attained its present condition through the process of natural reforestation. The process of succession is the process of changes in the vegetation in time: Stages of different combinations of species succeed one another, starting from pioneer communities, and ending with climactic communities. The interactive nature of the observation trail was accomplished by completing tasks as a group, and by mutual effects and interactions of members of the group.



Figure 6 Station 7 of The Doberdó Observation Trail; Church of Trinitarius (The picture) of the author's

photo

3 RESULTS, PROSPECTS AND APPLICABILITY

To sum up our research project: It has been verified that a field trip at a natural, actual location provides an extremely effective educational environment to develop the skills of environmental awareness, to convey information regarding sustainability issues, and to substantiate the holistic approach. Considering these facts, the author suggests that field exercises should be given high priority in the course requirements and curriculum of students majoring as environmental engineers and engineering instructors. A field trip focusing on the environment and nature conservation is a form



of educating and learning, and it can be successfully accomplished by completing the Doberdó Observation Trail designed by the author in the Óbuda. From the aspect of environmental education, it has a holistic approach, focusing on the main characteristics of the region in a complex manner.



Figure 7 Opening station of The Doberdó Observation Trail is beside the Óbuda University; (The photo (picture) of the author's)



Figure 8 Station 1 and 2 of The Doberdó Observation Trail; The abandoned quarry, clay-pit (The photo (picture) of the author's)

From the aspect of processing information, it emphasizes causality, interpreting the environment as a system. It is a tool to evaluate the environment ecologically and biologically, and to determine



conditions objectively, assisted by the set of tasks to analyze the environment in the Doberdó Observation Trail, as described in this presentation. From the aspect of acquiring knowledge, it is a method of direct demonstration and presentation accomplished in a natural, actual environment. As a learning process, the field trip focuses on activity, it is an operative learning method based on experience, with preference to working in groups. By elaborating the environmental educational specifics of field exercises, the dissertation contributes to a more effective application of this educating-learning tool in environmental education, also providing a way to measure the efficiency of indirect educational methods.

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2nd International Joint Conference on Environmental and Light Industry Technologies,

21 – 22 November 2011, Budapest, Hungary

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