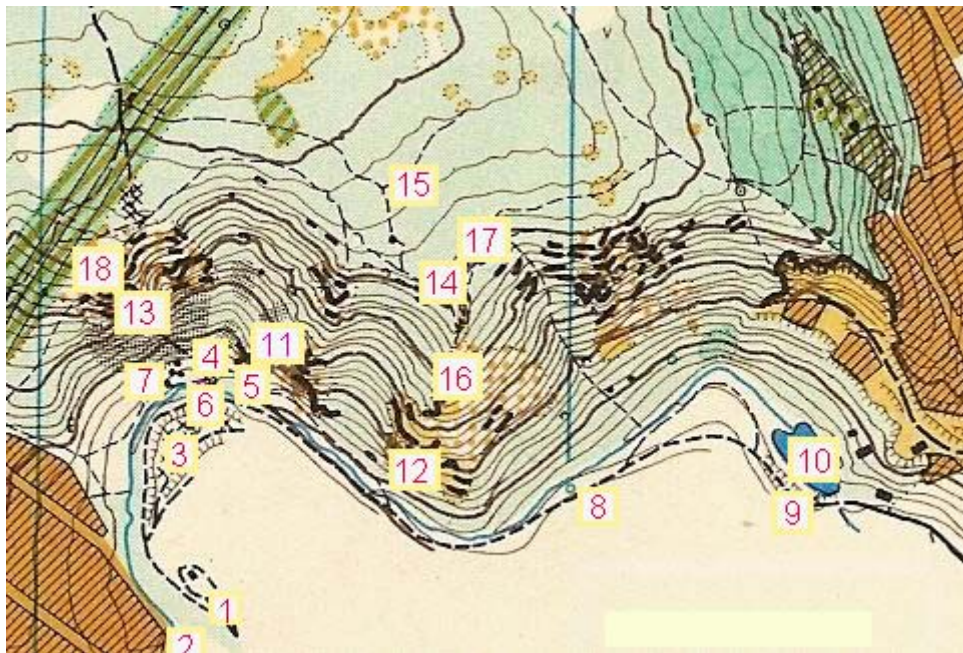


University of Western Hungary

THESES FOR PH.D. DISSERTATION

The Application of Field Exercise Potentials in the Education of Environmentalism and Nature Conservation, With Continued Development of These Methods as Studied in the Mariaremete Canyon

By JUDIT KATONA NEMETHNE



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1. Objective

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.

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.” 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.

The author of this dissertation has set her goal to contribute to the education of acquiring knowledge and developing skills of environmental awareness for environmental engineering and engineering instructor students, by compiling specific and complex field exercises to be performed at a location most adequate environmentally and educationally, also making suggestions for the specific location. Since the usual methods and procedures of observation are mostly standardized and abiotic with a lack of biologically and ecologically focused methods, the aim of my research was to establish and develop such methods.

The education for sustainability is based on interpreting the environment as a system. With this in mind, the author organized the field exercises in this dissertation following the holistic ecological approach, with emphasis on the main characteristics of the region, and the interrelated connections of different environmental factors. This dissertation 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. Environmental field trips concentrating on complex observation of biocenosis can demonstrate causality, and can be operative.

2. Methods

The author has studied and analyzed the available sources and literature relevant to environmental education and sustainable development prior to analyzing the environmental educational aspects of field education.

Experiences of exercises (ecological, environmental, and nature conservation) performed outdoors by students of environmental engineering are integrated in the summary of environmental education methods of field exercises, and the potentials for further development are based on these experiences.

The selection of a location appropriate for field exercises followed extensive inspections, surveys, and observations of different locations. Presenting the nature conservation resources found in the Mariaremete Canyon as a potential location of field exercises was based on information provided by the relevant literature, and also on previous and present research results of the author, and lessons learned in the course of practical instruction for students.

The observation trail designed by the author in the canyon to provide a complex, ecologically focused analysis of the environment, was based on the author's observations, inspections, and field survey data.

The environmentally and ecologically significant areas of the region were marked on a field survey map, using an EORT map on the scale of 1 to 10,000 magnified to the scale of 1 to 5,000, and the map of the observation trail was marked on a map (designed for orientation races) of the Zsiros Hill on the scale of 1 to 15,000, and magnified to the scale of 1 to 5,000.

The geological and geomorphologic analysis of the nature conservation area was based on the data of previous researches by the author, completed in 1981 and 1986.

The surveying of the vegetation, and determining the species involved in a particular biocenosis, was performed in a grid system, with 400 square meter grids in the forest communities, 100 square meter grids in karst bushes, 4 square meter grids in grassy communities, along the banks of the rivulet in a 5 by 20 meter strip.

To determine any changes, the data was compared to the survey data obtained in 1989 by the author, and photographic documentations of the area from 1981 and 1989.

3. Research Data

3. 1. 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.

- 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.

- The experiences of field exercises at Mariaremete and Fenyogyongye 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.

- The field trips at Obuda and the Remete Canyon 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.

3. 2. 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.

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.

- 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. The research results of the field trips at Fenyogyongye and Mariaremete provide an excellent argument to prove this theory wrong.

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 at Obuda, Fenyogyongye, and Mariaremete.

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.

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.

3. 3. 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.

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. Also: To perform the actual application of these exercises in a natural environment, on a specific geographical location, the Mariaremete Canyon.

- Environmental engineers are frequently asked to prepare studies of the potential environmental effects of new constructions and land development (e.g. the development plan in the 3rd district of Budapest regarding the extension of the highway along Harmashatar Hill, also the noise pollution survey along Becsí Road: these studies were based on field survey data, the survey records are enclosed in the appendix of this dissertation.) That is one more reason why field exercises and observations must be an integral part of the course requirements in the college level education of environmental and educational engineers, in addition to the primary and fundamental goal of educating them for environmentally conscious lifestyle and behavior.

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.

- 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.

- 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:

- 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, in the Mariaremete Canyon.
- 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.

3. 4. 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.

3. 5. Location of Field Exercises (Observation Trail)

The location of the field trip and observation trail project is in the northwestern part of the Buda Mountains, between Mariaremete and Remeteszollos, in the 1600 m long valley of Nagy-Ordogarok, known as the Mariaremete Canyon. This is a nature conservation area of maximum priority. The canyon 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 Nagykovacsi highway.

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 (1995, No LIII) 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 dissertation at the above mentioned location, thus providing a place of demonstration for field education.

- A complex evaluation of conditions is based on the study of biocenosis (as previously stated in the objectives.) To further assist the environmental field exercises, this dissertation includes a vegetation map prepared based on the author's research and survey data, presenting a digitally processed biocenosis computer model of the Mariaremete Canyon. Using the vegetation map helps students with orientation at the different stations of cenological observations on the observation trail. This dissertation summarizes the species involved in previous phytocenosis survey data. Thus future field exercises focusing on cenological observations will be able to reveal any changes in a particular biocenosis, and the causes of these changes.

- The preparation of the biocenosis model for the nature conservation area also contributes to the creation of a biotic module, as referred to in the regulations of "TIR" (Nature Conservation Information System, 1996, No LIII, Section 67.) Biotic modules aim at systematic monitoring of the types of environment of living organisms, starting with lists of species, and adding cenological survey data.

- The canyon offers great potentials to survey inanimate environmental factors, which is significant from the aspect of evaluating the environment, and to observe their effect on living organisms. It also presents an opportunity to introduce many different categories of nature conservation resources (e.g.

epigenetic valley, terraced faults of limestone surface in advanced karst state, genesis of thermal caves, measuring water quality, reading microclimatic data, biocenosis in forest and grassy communities that ensure the survival of one third of the endangered species of fauna and flora in Hungary, and also cultural values represented by archeological findings in caves.)

The consequences of human interference can be studied at the quarry of Hosszuerdo Hill, and also in the area surrounding the settling plant at the eastern exit of the canyon. The filled in area around the settling plant, and the succession of plants in the quarry yard amply demonstrate the consequences of human intrusion. The pioneer weed communities are indicators of degraded conditions in the area (See Station 3 of the observation trail.)

3. 6. Interactive Observation Trail in the Mariaremete Canyon

The 18 stations of the observation trail, as described in this dissertation, 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 (as previously mentioned in chapter 3. 4.): 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, hydrological values, biocenosis of the area, peculiarities of the vegetation, ecological particulars, and historical cultural values.

- From the aspect of how knowledge is acquired, the designed observation trail can be completed in an interactive way.

The stations are as follows: Opening station (geographical location, marking the boundaries of the region, rules of conduct, itinerary, time frame); river capture; the abandoned quarry of Hosszuerdo Hill, talus slope and forest community with linden and ash trees, karst bushes and forest community, slope steppe complex; rivulet Nagy-Ordogarok; blue beech and oak trees; loess gorge; swampy lake, the settling plant in the Ordog valley, soft wood gallery forest; observing Triassic limestone; site of prehistoric fossil; the stone chamber of Remete Hill; the plateau of Remete Hill, calciphilous oak grove, turkey oak forest; sink hole; karst field; Hetlyuk caves; limestone with saxicolous grass.

- 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 3rd station of the observation trail.

Station 3: Abandoned Quarry in Hosszuerdo Hill and View Point

Location: the southwestern side of the canyon

Phenomena to be observed, natural resources: The study of successions of the vegetation (Fig. 21)

Task: Identifying pioneer plant species, and species involved in the climactic forest community in the quarry yard, and the adjacent undisturbed hillside of Hosszuerdo Hill.

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 and the lime-kiln 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 comparison of photographs taken in 1981 and in 2005 (Fig. 18 and 19) clearly demonstrates the succession of the vegetation on the (northern) side closer to the canyon of Hosszuerdo Hill.

- 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.

4. 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 observation trail designed by the author in the Mariaremete Canyon.

- From the aspect of environmental education, it has a holistic approach, focusing on the main characteristics of the region in a complex manner. 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 Mariaremete Canyon, as described in this dissertation.

- From the aspect of acquiring knowledge, it is a method of direct demonstration and presentation accomplished in a natural, actual environment. It was assisted by the hiking map of the Mariaremete Canyon as described in the dissertation, also by the vegetation map that indicates the location and demarcation lines of various plant communities. The biotic model referred to by TIR (Nature Conservation Information System) can be created based on the cenology survey of the canyon. It could also provide data for future surveys, and by comparing the lists of species involved, observations can be made regarding the degradation of the area.

- 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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