University of Sopron
Faculty of Forestry

Themes of the doctoral thesis (PhD)

Opportunities for teaching the complex natural science subject with the methods of environmental pedagogy using the example of Fertő Land

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1. Aims of the research

The aim of the research is for a local curriculum to be produced for the complex natural science subject introduced with the MHR [Ministry of Human Resources] Decree 22/2016 (VIII.25.), in which the educational strategy of environmental pedagogy and the solution specific to the tourism profession are integrated.

The goal is for the curriculum to provide a solution on the local level for three global problems in the interest of sustainability, these being patriotism, the cultivation of traditions and the development of a healthy lifestyle. In classroom teaching, knowledge may be passed on using project pedagogy and its methods. Besides this, field studies also have a place. The goal is for the pupils to observe the skills learnt in the classroom also in their immediate environment, as well as being able to apply the acquired knowledge. The activity-oriented tasks presented using the example of the "Fertő Land along the border" project are also called to develop key competencies. On the other hand, the author focuses on the importance of integrated education and on usable professional and natural science knowledge, so that the habit of lifelong learning may be achieved.

A further aim of the author is to explore the opinions on this theme of the teachers who instruct the subject. The difficulties are presented which are encountered when a subject is introduced which expects integrated knowledge from the teachers. The candidate explores the kind of help the teachers would need in order to be able to instruct the subject in accordance with the expectations of the national curriculum. There is a lack of textbooks in commercial circulation with respect to the subject of complex natural science. A curriculum needs to be produced, which colleagues with other specialisations may also be able to adapt to the profile of their school.

The "Fertő Land along the border" project was tested by the candidate with year 9 pupils coming to the institution from 2016 till 2020, in order to ensure local, profession-specific application of the complex natural science subject. For methodological compilation of the syllabus, the attitude to natural science subjects and the study habits of pupils from other schools were examined, and suggestions on methodology were requested from pupils in order to make the subjects more approachable for them.

2. Hypotheses for the research

1. The **local traditions** and illustrious persons from the area where the institutions of secondary education are located are **unknown** to the pupils studying in secondary schools.
2. It may be assumed that teachers of the natural science subjects regard the complex natural science subject introduced as a new subject as a **methodological opportunity**, where the use of **project pedagogy** appears among the methods in their educational practice.
3. The complex natural science subject may be taught in accordance with the school's **professional profile**, as it is also suitable for **deepening familiarity with the profession** and for illustrating **natural science correlations**.
4. With the activity-oriented methods of the educational strategy of environmental pedagogy, those studying the complex natural science subject obtain **professional and natural science skills**, which are incorporated into their behaviour patterns, resulting in the emergence of environmentally aware conduct.

5. Pupils participating in project education are capable of working together more efficiently on the solution of a problem / task, than their fellow students taught by traditional methods.
6. Besides the project tasks **used in the classroom**, there is no need for the **field studies** and exercises, which may be organised by the institutions according to the recommendations of the national curriculum in the **Project work syllabus** unit.

3. Research methods

For the exploration of the antecedents associated with introduction of the complex natural science subject, as well as teachers' and students' opinions, and for a demonstration of the efficiency of the project, the following methods were used by the author in the study:

Document analysis: Government Decree 110/2012. (VI.4.) on the issue, introduction and application of the National core curriculum was elaborated from the point of view of sustainability, responsibility, physical and mental health and national self-awareness.

The Strategy for National Environmental Education, the General Strategy for National Sustainable Development 2012-2024 and the Public Education Act and its targets were examined, and the Fertő Land management plan was analysed.

The MHR Decree no. 51/2012 on the System of issue and approval of National Curricula was thoroughly studied, as well as in connection with this the national curriculum regulations related to the complex natural science subject.

In an international context the results of the PISA studies were examined with regard to natural science skills, as well as natural science lesson numbers in a few countries.

Data collection: The year 9 pupils from a vocational training school in Fertő Land were studied during the period extending from 2016 till 2020.

The opinions of teachers instructing the natural sciences in vocational training institutions in this country were surveyed using an online interview with questionnaire.

Structured telephone interviews were conducted with educators from similar vocational schools in Hungary specialising in tourism.

The opinions of pupils in primary schools and those in secondary education were requested in connection with natural science teaching with the aid of a questionnaire.

Field study: The complex natural science subject conducted field studies with the pupils in the Project work syllabus unit. Field exercises were held over several days, in which the reed-bed wildlife and saline areas of Fertő-Hanság National Park were visited.

The past and present aspects of Fertőrákos Quarry were also investigated. The pupils studied the ecological and social changes to Fertő Land, the wildlife and reed beds of Fertő. The author observed the knowledge of environmental pedagogy methods acquired by the students, which she later asked for in the form of test-papers, which she analysed.

Data collection by questionnaire: 1. In the questionnaire survey for self-completion received by the year 9 pupils from the Vocational training school in September, the author was curious as to how much they are familiar with the formation, folk traditions and history of the Fertő landscape, and the Fertő-Hanság National Park.

2. An attitude study linked with the natural science subjects was carried out, in order to explore the pupils' study habits, to get a picture of the methods used by

their teachers to instruct the natural science subjects. Based on the pupils' opinions, methods are explored, the use of which may enrich the natural science subjects.

3. In the March of 2018, the writer of the dissertation used an online questionnaire to examine the attitude of teachers regarding the introduction of the subject, and explored what changes had occurred in the institutions, what textbooks and what methods the teachers used to educate, and also investigated the results achieved by the teaching.

4. In the November of 2021, the author conducted structured interviews by telephone with teachers who were instructing the complex natural science subject in the tourism branch. She examined whether a change had occurred in the teaching of the subject introduced in 2016, or in the organisation of the study materials. Which textbooks could be found on the market, what additional teaching aid materials were the teachers using? Did they use the project system in practice, did they take part in field studies?

Efficiency study: The teaching carried out using the methods of environmental pedagogy and the traditional education methods were investigated by the author from the point of view of knowledge acquired and skills application.

The first study was carried out in order for the author of the dissertation to find out how efficiently the pupils could work in a group, and whether there is a difference between the task solving and study materials acquisition of pupils taught in the project and those instructed frontally.

In the second survey, the author compared the knowledge difference emerging in the students instructed with the project method and the traditional method, as well as researching how much the completion of a field study increases the pupils' knowledge, and whether there is a difference between the performance of the experimental and the control groups.

Statistical evaluation: Evaluation and analysis of the questionnaire surveys.

4. Results of the study

With the complex natural science subject, a subject similar to "science" also appeared in Hungarian public education. In order for us to actually reach the level achieved by western education, the teachers' mentality and knowledge must be improved. According to promises, in the autumn of 2022 a new department will be opened in universities, specialising in natural sciences and environmental studies. These teachers will instruct the natural sciences with a new insight. However, the present educators and teachers must resolve the current situation. What and how to teach the children under the title of the natural science subject.

One of the aims of this research was for the author to investigate the attitude of teachers to the introduction and instruction of the complex natural science subject.

Evaluation of the internet questionnaires and telephone interviews of teachers instructing the complex natural science subject in this country indicated that the ***teachers need guidance in preparing the local syllabus***, and for the process of instruction, they require textbooks. Following the investigations it can be ascertained that the teachers are able to instruct the complex natural science subject in accordance with their own studied specialisation. The ***project method is not used widely as yet***, we are still waiting for instruction in the natural sciences as well as project education for the whole year in everyday practice.

Examining the opinions developed by the pupils on the teaching of natural science subjects, it can be ascertained that with the ***activity-oriented tasks, the students would be drawn into*** the practical instruction and the teachers could create a liking for the natural sciences.

Of the global problems, the author chose those which are perceptible locally and which may be portrayed in the study materials for the complex natural science subject. These are the nurturing of traditions, the drop in patriotism, and a healthy lifestyle, the exploration of which on a local level may ***sensitise the pupils*** to detect the problems and spur them on to action, because in small steps such as these, they too are capable of doing something for the sustainable preservation of their living environment.

With the "Fertő Land along the border" project, the writer of the dissertation presents how all the questions of life may be constructed around a central theme. Taking the recommendations of the National Curriculum into consideration, the natural science subject so far instructed as separate disciplines may be woven into the study materials, so that the pupil may be able to interpret and apply it to an appropriate depth in professional life too. Besides all this, the author has also confirmed the applicability of project education.

The study materials of the complex natural science subject may be mastered locally in accordance with the "Fertő Land along the border" project professional group. With the activity-orientated tasks of project education, which is the instruction strategy of environmental pedagogy, it can be achieved that the pupils develop value-preserving conduct. A striving for a sustainable lifestyle is incorporated into their behaviour patterns. Their empathetic relationships with their fellow men are improved, they will be capable of collaborating with others on the solution of a problem. Constructive life skills emerge.

5. Hypotheses

1. In the institutes of secondary education, field exercises are not used, but the national curriculum's description of the complex natural science subject dedicates time to these. The project method and students' experiments are not given a prominent place among the methods used. During field studies, the students can observe the impact of technological processes on nature, resulting in their familiarisation with the risks of the technologies employed. The effect of this is that they consciously apply human constructions and the responsible conduct of a citizen emerges in relation to the environment. Thus in the development of competencies and the expansion of professional skills, the use of field exercises and the varied methods involving activities has an indispensable function in natural science education.

2. The use of project education with activity-oriented tasks plays a significant role in personality development. The renewal of methodology, as well as a change in pedagogy culture is in the interest of us all. In their methodology, teachers are following the pattern that they learnt during their years in higher education. Therefore, they must be given a broad sample of methodological options in the course of teacher training. Teachers must be trained to have a complex approach, so they will be capable of passing on multidisciplinary correlations to the students.
3. The organisation of education and study for the complex natural science subject will only be possible for teachers to follow, if it is prepared on the basis of the nation curriculum's stipulations and it includes recommendations for each professional group. Using the varied methods of project education, the natural science background of the profession may be presented to the

students, by means of which a science with an eye to sustainability becomes part of their everyday lives.

4. With the exploration of local problems, the students get a picture of the dangers affecting the natural and social environment. The discussion and practical solution of problems demonstrated in the local environment and the possible responses to them serve as a pattern for the up and coming generation. With the methods acquired in the educational institutions, they will be capable of acting in the interest of preserving environmental values.
5. In the teaching of the institutions of secondary education, local values must be present in all subjects, so that the pupils studying them may get to know these values and display responsible behaviour regarding them. Sustainability only becomes a part of everyday life, if the knowledge and protection of natural and constructed treasures in the local environment becomes a common goal. The examination and exploration from several angles of the past and present in the school surroundings leads to students bonding with the locality, their behaviour patterns form a basis for sustainability.
6. The students' requirements are only fulfilled by the complex natural science subject if in practical lessons they can perform experiments, and they may also make use of the tools of infocommunication in the learning process. The active participation of the students and communication with each other, as well as working in a team will aid the learning process. They must get to know the team rules, so that they can also be successful individually when doing exercises together. The persons who are expected to enter working life, are those who are capable of working together with others on solving a joint project.

7. We can only improve the results of the PISA surveys, if we also enter the 21st century in education. Using the education and training strategy of environmental pedagogy, constructive life skills are formed in the pupils, they get to know themselves, they learn to participate actively in all areas of life. In the educational institutions, the everyday activities and subjects must be brought into correlation with each other, so that the pupils understand the processes which they cannot link together at present due to the division into disciplines. In possession of the skills thus gained, they will also be capable of applying their acquired professional and natural science knowledge.

6. Suggestions

In the light of the studies so far, additional investigations are needed with regard to the options for education according to professional groups.

For the introduction of a new subject, it is not enough to rely on the knowledge of specialist teachers. Help must be given with educational aids, further training and consultations. Presentation of the "Fertő Land along the border" project offers help with profession-specific and local teaching of the complex natural science subject. Examination of the central problem from the angle of nature, cultural history and a healthy lifestyle contributes to familiarisation with the landscape which includes the schools, to the deepening of professional knowledge, as well as the emergence of a harmonious, well-balanced way of life, and knowledge of a sustainable lifestyle.

Every vocational training / technical school must discuss the possibilities for moving forward with the complex natural science subject in the context of workshops together with other institutions belonging to their own professional group. The subject of the discussion must be a debate on the salient points corresponding to the professional group as a syllabus unit given in the National Curriculum. A discussion of the activity-oriented tasks and methods deemed important for the profession is also primary. The local peculiarities may be incorporated into the local syllabuses by the teachers individually or in collaboration with the schools' teachers. In each institution, the natural science workgroups must hold sessions to discuss what additional professional expectations they have in connection with teaching the complex natural science subject. The colleagues entrusted with teaching must be given help on the school level with finding connection points, as well as with collecting local study material content. The management and the colleagues must also lend a helping hand with

organising and conducting the field exercises, as one school lesson is not enough for running field studies.

The local syllabus and its results created in the individual institutions may be presented to colleagues and enquirers by the teachers in the context of a workshop or a professional conference. It is worthwhile posting good practices on the internet, so that every school can use them in its own educational-training activities.

Training or further training sessions in methodology need to be arranged for teachers with natural science qualifications who are at present in the job in order to for them to be able to continue to instruct the complex natural science subject with the combined approach. Familiarity with the educational and training strategy of environmental pedagogy may help teachers to expand their methodological practice.

On the basis of the results attained in the present dissertation, a review of the educational policy concept is recommended. Instead of reducing the number of natural science lessons, it is expedient to increase this number, in order for the students' knowledge of natural science and technological methods to be competitive. For studying the processes in a complex way, it is advisable not to instruct in separate disciplines, but a natural science subject must be created, in which the students become acquainted with current scientific facts and their everyday applicability in the context of field exercises and independent research.

7. Publications

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