

<http://jates.org>

Journal of Applied Technical and Educational Sciences jATES

ISSN 2560-5429



“Fertő land along the border project”-curriculum for the complex natural science subject

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Abstract: A profession-specific curriculum and syllabus have been produced with new methodology and content for the Complex Natural Science subject introduced in Hungary in the September of 2016. The one year experiment was conducted with year 9 pupils in Aladár Porpáczy Vocational Training School in Fertőd. The basis was given by Mária Kováts-Németh's work "Forest Pedagogy Project". The first module of "Fertő Land along the border" as study material is "The natural wildlife and development of Fertő Land", which serves to present the geology and climate of Fertő Land. The second, "Place identity and cultural behaviour", discusses the cultural values and local customs typical of Fertő Land. The third part, "Healthy lifestyle", deals with local medicinal herbs and the dishes, medicinal waters, farmers, and folk healing practices characteristic of the region. Part of the project is presented in the article.

Keywords: Project; Module; Complex Natural Science Subject; Environmental Pedagogy; Forest pedagogy

1. Introduction

The Complex natural science subject was introduced in vocational high schools in the September of 2016. Its legal background is the MHR Decree 22/2016 (VIII.25.) amending MHR Decree 51/2012 (XII.21.) on the system of issue and approval of general curricula. In Hungary, natural science used to be treated as separate subjects in primary and secondary education. Physics, chemistry, biology and geography were taught in all types of schools. The interest of students in the natural science subjects, however, was constantly falling. A car mechanic did not want to learn biology or geography, because they did not need these for their profession. Those studying economics or tourism did not see any sense in the subjects of biology, physics or chemistry (Schüttler, 2006). On the other hand, due to accession to the EU, in order to teach in institutions in a similar way to in the west, the names and study materials of subjects had to be changed, and new subjects had to appear. They wanted to create the subject of natural science on the foreign (science) pattern. These processes did not take place from one

moment to the next, but they have been gradually appearing up till the present day. Introduction of the subject did not go smoothly. Research also indicated that no textbook on the subject had appeared on the market, there is no further training for teachers or consultations on methodology (www.nefmi.gov.hu, 2010; Sági and Szemerszki, 2021). Verbal briefings at the beginning of the academic year did not offer sufficient indications and the educators teaching the subject were left with some doubts. The greatest discontentment was caused by stopping natural science subjects in secondary schools, of which only the subject promoting the school's profession could remain (Csorba, 2020). The goal with the new subject was for the students to be as comprehensively informed as possible, and become familiar with natural science research fields. For them to be able to find cause and effect correlations between what they learnt and the phenomena seen and experienced in the world. In the Skills/development requirements section, the General Curriculum offers ample opportunity for making employer's lessons as exciting as possible for each profession group. The attainment of deeper knowledge was not the primary goal with this subject, but just for the world to open up before the students, prompting them to experiment and make investigations independently. Thus opening the way to lifelong learning (netjogtar.hu; Szákovicsné Bérczy and Schläffer, 2017; OFI, 2016).

2. General curriculum expectations and goals

The basic goal of the Complex natural science subject is to shape attitudes. One reason why the natural science subject has been attacked, is that according to teachers, science must be handed on, there is no time to get students to love it, or to get bogged down in interesting points. The attitudes of teachers need to be changed, so that the teachers do not want to teach the text book, but they should be able to accommodate to what the students find interesting. (Varga, 1992; Rácz-Varga, 1997; Schüttler, 2006). By shaping attitudes, they want to help the students to know, when preparing for professional life, how they should study, where they can obtain extra information, and for them to be able to plan and move forward in their field of work. The subject furnishes them with skills that are indispensable in the modern world. The teachers should be able to demonstrate the relationship between research and everyday life (Havas, 2001; OFI, 2016).

Based on the wording of the General Curriculum, the most important goals are for the students to become open to the world around them, thus being able to recognise cause and effect correlations and to draw conclusions. They should know the fundamental natural laws and be able to produce and interpret diagrams for these. They should know the structure of the world

from the lowest level up, as well as recognising the effect of these on living organisms. They should be aware of man's activity in shaping the environment, and the consequences of this. They should be able to reason in the interest of the state of their environment and their own health, taking scientific fundamentals into consideration (netjogtar.hu 2016).

With the achievement of these goals, the students will get to know the world around them. They will prepare for fulfilling their duties as citizens, so that others will not be able to exploit the natural environment of their homeland. They will learn to appreciate and value the rich wildlife of the Carpathian Basin, which is our cultural heritage. Their inclination to pursue an environmentally aware lifestyle will increase, with which they will prepare for sustainable management and a sustainable life (Havas, 2001; OFI, 2016; Szákovicsné Bérczy, 2017).

3. The complex natural science subject and project education

One of the expectations of the General Curriculum, is for students to see cause and effect correlations, and to be able to solve the problems arising critically and constructively. The goal is to establish a society of nature lovers, which pursues an environmentally friendly lifestyle, committed to sustainability.

The complexity of the Complex natural science subject is demonstrated by the fact that the students are given a working knowledge and a broad overview of the world around them. This also means that they will be capable of working together with others in their future jobs, that they will be open, creative and empathetic. They should be able to acquire skills independently. For this, they should be able to plan ahead properly, be capable of selecting from the information obtained, and of correcting their results, so as to be able to give the most perfect answer possible to problems arising (Havas, 2001; Hegedűs 2002; Estefánné Varga and Szikszay, 2007; Kováts-Németh, 2010; OFI, 2016).

The following expectations are laid down in the General Strategy for National Sustainable Development: "In the 21st century, the requirement for the convertibility of basic skills, abilities and acquired expertise needed on the labour market makes it necessary for young people coming out of public education to leave the school system with comprehensive basic qualifications, and to be capable of constantly renewing and updating their knowledge" (NFFK, 2013, p.104).

The General Curriculum sets the target of attitude formation, which covers not only the field of the natural sciences, but also demonstrates broad links with the arts, homeland and folk studies,

mathematics, and a healthy lifestyle. With this procedure, the subject also meets the expectations of environmental training (Havas-Széplaki-Varga, 2004). The Project thematic unit is set at 15 lessons, in order to make the teaching of the subject practice oriented. During the teaching, there is thus opportunity for the students to make fuller independent investigations, to go on study trips and to expand their skills.

Adjusting to these expectations, the Complex natural science subject cannot be taught with traditional educational organisation. Project education, used for so long by environmental educators, must be brought to the fore for this subject too.

In the summary by M. Nádasí (2010), the criteria for project education are as follows:

1. “The starting point should be the question of problem identification by the students, planning should be done jointly.
2. The solution to the project should be linked with real situations through the activity.
3. It should provide means for individualised work.
4. It should provide means for group work.
5. It should be worked out over an extended, continuous, longer time period.
6. The goal should apply to familiarity with or making changes to a situation outside of school.
7. It should be characterised by interdisciplinarity.
8. The educators and the students are equal in rank, though they work together as partners with differing competencies.
9. The students should make decisions independently, and they should be responsible for their own decisions.
10. The educator should retreat into a stimulating, organising, consulting function.
11. The relationships between the students should be strong and communicative” (M. Nádasí, 2010).

Project education is the teaching strategy of environmental education. Environmental education is an integrated science, which together with its companion sciences, is looking for answers to global challenges. The sciences of ecology and pedagogy help the individual to look for constructive answers in order to be able to sustain the ecological balance. Among the expectations and goals of the Complex natural science subject are primarily the shaping of

environmentally aware, responsible conduct, thus a parallel may be drawn between the goals of the subject and environmental education (Rókusfalvy, 2000; Kováts-Németh, 2010; Szákovicsné Bérczy and Schläffer, 2017).

4. Fertő land along the border project

Our school is located in the town of Fertőd. One of the specialisations of our institution is tourism. The Complex natural science subject is part of the curriculum for year 9 entrants, which broadens the students' meagre knowledge of the natural sciences. Most of our pupils live in this area, but they are not familiar with the place where they live. This became clear to us from the preliminary questionnaire, which we had the pupils from the entrant year complete. The first group of open-ended questions applied to the formation of Lake Fertő. The second group of questions were in connection with Fertőrákos Quarry. There were also questions on the questionnaire about the past and folk customs of Fertő Land, as well as about Fertő Hanság National Park. Of the 58 pupils, only 14 were boarders. Of the local pupils, for instance, only 29% had been to the Quarry. Even less than these had attended events organised by the Fertő Hanság National Park. A total of 5 wrote that they had attended some event, this being 0.08% of the whole group.

After evaluating the questionnaire, we compiled the work plan and curriculum for the year in reference to Fertő Land and appropriate for the professional group. We started from Vásárhelyi's assumption (2010), according to which personal involvement has an educational effect. Széplaki's studies (2002) also indicate that pupils' environmentally aware action is best influenced by familiarity with and taking care of local environmental treasures. Kováts-Németh Mária's Forest Pedagogy project work and environmental pedagogy methodology system framed in 1995 served as a basis when compiling the study materials. This latter effectively promotes recognition of the pupils' personal goals, independence and working together, making learning into an experience (Kováts-Németh, 1998, 2006, 2010). The Fertő Land along the border project has been produced on this basis. In a similar way to the Forest Pedagogy project, among the modules appear the natural environment, healthy lifestyle and place identity. We have expanded the Fertő Land along the border project in making the central problem the town and cultural landscape, also including the school building, as well as the natural landscape.

The pupils walked around a central problem, the Fertő Land, with practice-oriented tasks in the course of the year. Which modules we worked with, and within the modules, which module units we formulated, are shown in Figure 1.

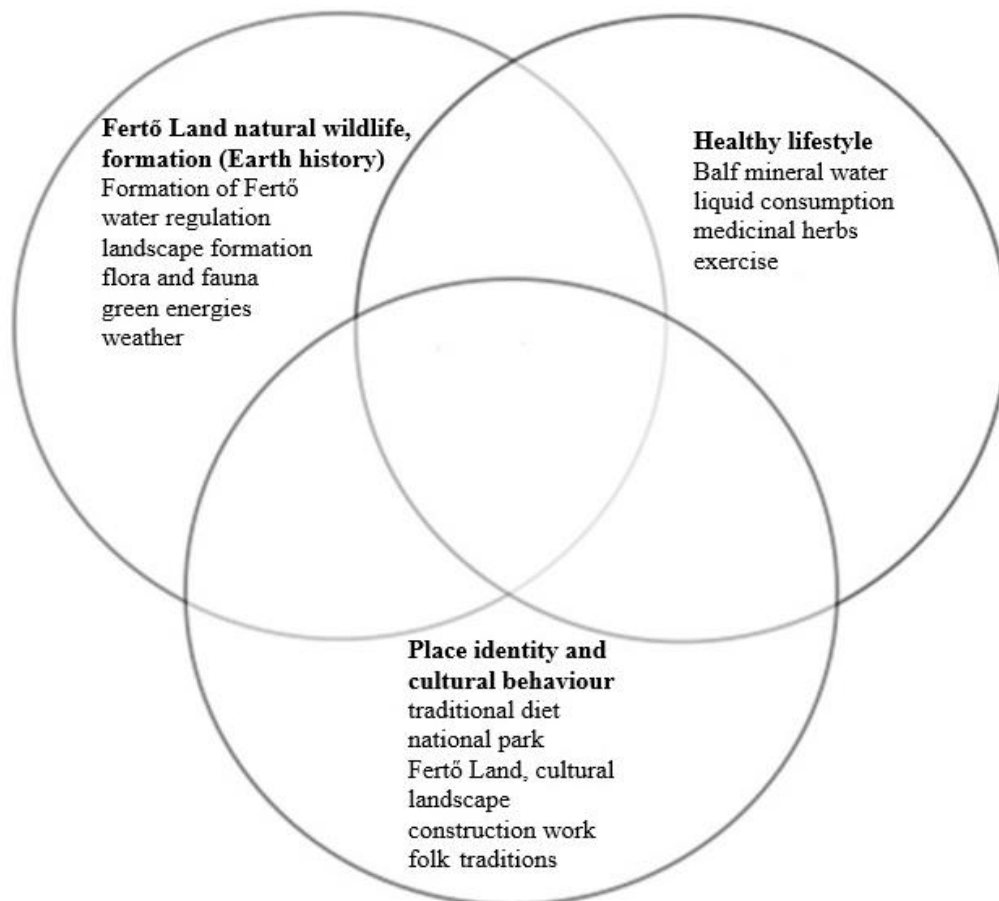


Figure 1. Module units for the Fertő Land along the border project

Fertő Land is a cultural landscape. UNESCO added the region to its world heritage list in 2001. “The landscape, which is our territory, our dwelling space, our workplace, an attractive tourist destination, a witness to bygone times and cultures, is of inestimable value, a cultural treasure created by human hands and natural features arising over millions of years, the destruction of which would mean a severe and irreplaceable loss for the whole of humanity” (Taschner, 2013, p. 6).

Fertő Land plays a key role in the lives of those who live here. They use it mainly for tourism purposes, without even thinking of the diversity of the cultural landscape. In the spirit of environmental education, we also need to deal with the future of the area, the vision for the future of those who live here, and the formation of this. Inherent in these is the preserving power of the cultural landscape (Havas-Széplaki-Varga, 2004).

4.1. *The connection between the General Curriculum and the modules in the “Fertő land along the border” project curriculum*

The curriculum includes recommendations of the General Curriculum, which have been assigned to the given landscape and the instructed profession (tourism) (table 1). In the study materials, we have highlighted the peculiarities of Fertő Land, such as legends, Earth history or simply the medicinal herbs to be found there.

Table 1: Connection between the General Curriculum and the Fertő Land along the border project

Title of thematic unit in General Curriculum	Content of curriculum for topic framed for Fertő Land based on the development requirements of the General Curriculum
Getting into full swing, orientation in space and time	Legends, reality and mysticism of Fertő Land, folk customs, formation of Fertő, beginnings of drainage operations, learning about arguments and discussions, the old landscape, map reading
From where to where?	Earth history on Fertő Land, Fertőrákos quarry, Fertő, rock strata, minerals, building materials
Sets	Atmosphere, atmospheric phenomena in Fertő Land, effects of the atmosphere on local plant covering, protected plants in the Fertő-Hanság National Park, effect of Fertő regulation on the microclimate
Forms and materials in nature	Mineral composition of Balf, viticulture, wine production, proteins, carbohydrates, fats, hydrocarbons in the Hanság Basin, formation of saline soils, chemicals used in the household and their effect on wildlife and man

4.2. *Details of the curriculum*

We will choose one of the topic titles featured in table 1, and analyse it in terms of the curriculum. We show how the General Curriculum recommendations can be adapted to the given professional group and landscape unit. A description of the methodology can be read in the article entitled: Application of the “Fertő Land along the border project” to the complex natural science subject (Bérczy, 2019).

We will deal with the selected topic in the Landscape formation module unit belonging to the module Fertő Land natural wildlife, formation (Earth history).

“Title of thematic unit: From where to where? Sidereal, geographical and biological evolution. Human social behaviour.

General curriculum development tasks: “Observation of connections and correlations between various fields and phenomena, discovery and formulation of similarities and common features.

Deepening knowledge of time and space concepts, developing temporal orientation during cognition of processes of differing scale” (netjogtar.hu).

Timeframe: 8 hours

Lesson titles and topics we use:

Looking into the depths of the Earth

Rock strata – the “building blocks” of the Earth

Development and earth history of Fertő Land

Examining rock strata and minerals

Fertőrákos quarry

Building customs of Fertő Land – what did they used to build with?

Geological structure of Hanság Basin

What do I know about the region?

4.2.1. Curriculum content, study materials

Looking into the depths of the Earth: Formation of the solar system and planets, geological evolution of the Earth, mountain range formation and destruction, volcanism.

Building blocks of the Earth: Mountain range formation and destruction, volcanism, rock strata, limestone

Formation and earth history of Fertő Land: Fertő Basin, Fertő, Balf Block, fossils, evolution

Examining rock strata and minerals: external environmental factors affecting rocks, (man, air pollution, soil pollution), examining strata, mineral recognition (according to local features)

Fertőrákos quarry: earth history of the quarry, human intervention, study of discovered fossils, Roman times, present day, labour camp

Building customs of Fertő Land: appearance of human civilisation on Fertő Land, utilisation of nature, destruction and abuse of nature,

Geological structure of Hanság Basin: Formation of Hanság, peat, peat harvesting, effects of man, draining, damage to nature, reconstructions

What do I know about the region? : systematisation of what has been learnt so far, discussion on human effects

Connection points: Fertő Land plays a very significant role in the life of our school. It appears in every subject. It is a primary criterion for the teachers who teach here, that the pupils should become familiar with the town of Fertőd and the life and past of Fertő Land. In the following, we present how the cultural landscape appears in various subjects.

In the literature subject, they talk and read about the quarry. They study and analyse writings and legends about Fertő. They watch a film, then process their knowledge, for instance, of the film *Eighty Hungarian hussars*, or *Nameless castle*.

In the grammar lesson, they analyse archaic speech and dialect words.

In the history subject, Fertő Land often comes up in chronological order, so it is mentioned in the Roman times, as well as in World War II, in connection with labour camps. They also learn about people groups of the given region.

In mathematics, they calculate the dimensions of the quarried stones, for instance.

In geography, the region is mentioned when studying earth history and rock strata, as well as the minerals and fossils to be found there.

In foreign language lessons, the culture of the region is treated.

The lesson topics have been produced in reference to local peculiarities, using the General Curriculum recommendations. We have used the internet, reference books found in the library, and the learning of people living in the area, in order to acquire knowledge. In the lessons, the pupils worked in groups. The pupils are encouraged to do independent research outside the lessons, so we always ask questions in connection with the material for the following lesson. Learning based on their own experience is important, so they will have their own results, based on their own research. We therefore reach the goal that they feel the things they learn are their own, they come closer to the study materials, and alongside these, to the landscape. A valuable component of the Fertő Land project is that we dedicate 15 hours to excursions, in order for pupils to observe the treasures in reality that they have learnt about in the classroom. We assign 3 hours from this time allocation to walking around the Fertőrákos Quarry, and we also look round the mineral museum located in the vicinity.

At the end of the year, we have final tests written by the two classes of pupils (58pupils) who took part in the experiment (Control group and Experimental group). The Experimental group

(26) studied with the methods of environmental pedagogy, and we applied the Fertő Land along the border project, whilst the Control group (32) took part in traditional, frontal education and we only taught the General Curriculum recommendations. Meaning that we did not draw their attention to the peculiarities of the landscape. It can be seen in Figure 2, that the class which studied with the project model obtained better average results for the class. The class average for the tests of the Experimental group was 4.54, the class average for the tests of the Control group was 3.69. The Experimental group performed +0.85 better. It was proven that education with the project model is more effective than frontal work.

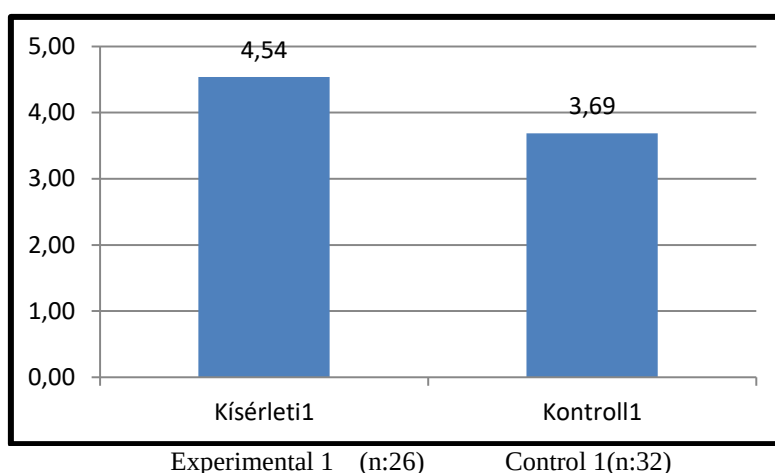


Figure 2. Class averages for the end of year

5. Summary

The module units of the “Fertő Land along the border” project promote the pupils’ constructive life skills in their own living environment. The project method was suitable for our pupils to master the study materials. The topics and the elaborated curriculum help the pupils in the real environment, to get to know and love their surroundings, which is Fertő Land. The content of the study materials is inherently linked to the tourism profession. With integrated education, they acquire usable knowledge. With the aid of the Project thematic unit, they achieve the ability to see and experience in reality what they have learnt in the classroom. They can thus associate the studied concepts with real phenomena. The study materials are thus internalised, because besides acquiring knowledge, they can see and experience their everyday lives, treasures of the past and present, and all this in the light of natural science. The difference between the average results of the tests written at the end of the year confirmed to us that the Experimental group, who studied the material for the year in project education within the

context of the Fertő Land along the border project, acquired usable knowledge in the natural sciences, which they could connect with phenomena seen in everyday life.

The Complex natural science subject can be made profession specific with this solution. Meanwhile we enable the pupils to get to know and love their profession and their immediate environment.

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