Phenology

a pedagogical handbook

Documentation and inspiration for teachers in the Baltic region from workshops in Nömme- and Pärnu Nature Houses, Estonia in April 2014

NORDPLUS

Project name: Nature Schools Network

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Preface

Background of the project

This pedagogical handbook is a part of the Nordplus project *Nature schools Network* (2013-2015).

When the *Commission on Education of Union of Baltic Cities (UBC)* held its annual meeting in April 2009 in Tallinn, representatives from different nature schools participated and presented their work. After that it was decided that we should create a formal network of nature schools with the aim to develop new strategies and new material for the pedagogical methods to be used in outdoor and natural sciences teaching in Sweden, Estonia, Lithuania and Latvia.
This network was established and has been funded by Nordplus Horizontal 2010-2012 and the network has accomplished:

• Three courses on the themes:
– *Outdoor learning*
– *Humans and nature, where nature is represented by 3 different biotopes – i) water, ii) forest and iii) acre land*
– *Pedagogies in teaching climatic effects*

Three pedagogical handbooks (PDF in english at www.farsnanaturcentrum.se)

- Two class exchanges (Sweden-Estonia)
- One Comenius Regio application (granted for 2011-2013) between Tallinn and Norrtälje Municipality with Nömme Nature House, Erken Laboratory and Norrtälje Nature Conservation Foundation as partners. The network aims were to grow by adding partners and increasing collaboration with local enterprises in the field of nature conservation, nature guiding, local organic food production and monitoring of the environment (researchers) as well as teachers. We had partners from teacher training (higher education, Uppsala university), Commission on

Education and Environment of UBC, small enterprises and we had close collaboration with local teachers from secondary and upper secondary schools joining our workshops and seminars.

Purpose

The purpose of the first three years of the first Nordplus project was to establish a network for nature schools in the Baltic region and to create courses and course material (pedagogical handbooks) for teachers in these countries. As the network was established and the work proceeded, visions for the future came up and became one of the most central parts of the project work. Therefore, this new Nordplus project has three main aims for the following 2,5 year (2013-2015):

1. To have two 3-day workshops/seminars every year, and to distribute the hosting of the workshops/seminars among the partners. This will enable all partners to contribute more and to make the best use of their most prominent fields of knowledge. This will contribute to high quality workshops raising the capacity of the network to a higher level to be used in all participating countries and to be spread to all members of the Union of the Baltic Cities (UBC) and within the network of the Cost action Netlake (EU).

2. To include small enterprises and researchers in the field of nature conservation, nature guiding, local organic food production and monitoring of the environment in the workshops/seminars together with nature school teachers, local teachers and representatives from higher education of teachers in order to contribute to cooperation between the educational sectors and to establish cross-sectoral networks involving participants outside of the traditional education sectors.

3. To produce and edit handbooks for each workshop/seminar event to be used to spread the pedagogic highlights through the networks mentioned above and via the web site.

Aims and contribution for this new project *Nature Schools Network* 2013-2015

The aims - stated by the Nordplus program and including all participating partners in this project - are:

• Increase the exchange of pedagogical ideas and methods related to nature within the Baltic region, contributing to a higher quality in outdoor educational activities

• Develop an understanding for field education on different levels in the school system from elementary school through university, using new input from small enterprises in the field of nature conservation, nature guiding, local organic food production and monitoring of the environment

• after each event, a pedagogical handbook is to be produced and every host partner is responsible to contribute with material and to distribute the handbook in the home country

• Transfer the hands-on knowledge of small enterprises to teachers and educational programs in schools and in the university programs for teachers

Sectors who are involved in the project

- Higher education
- NGO
- Primary/secondary/upper secondary Schools
- Private sector

Environmental Education Center (Pärnu Nature House) in Pärnu.

-A dream for all pupils and teachers!

We really hope that this handbook will inspire teachers to go outside with their pupils and see the large classroom- the nature, the seas, the rivers, different environments and the seasons.

Anna Westerlund, project coordinator

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Phenology

This chapter was built on Melvi Talts (Pärnu Nature house) presentation at the projects activity in April 2014 in Pärnu.

Phenology is the study of changes in nature influenced by seasonal variations in climate. The founder of scientific phenology is Carl von Linné in Uppsala, Sweden. During his leadership the world's first observers network was established in 1750 and methodology of phenological observations was developed. The beginning of phenological observations in Estonia was in 1815.

Why is phenology important?

Phenology's purpose is to observe annually and regularly occurring events in nature and which has significant importance for many important sectors/spheres:

- agriculture/gardening
- forestry
- hunting
- fishery
- economy: construction, transportation (road construction, roadworks) etc
- medicine: studies are used in composing allergy announcements, whereas information regarding flowering plants which may cause allergenic reactions is needed.
- nature protection: helps to evaluate industrial adverse impact on the nature (changes in plants phenological development caused by pollution)

What does it give humans?

- important to get the full picture
- gives new knowledge
- getting to know and love our local nature: plants and animals
- understanding better natural phenomenon and nature's interconnections

- observing nature's evolution helps us to plan our works better
- promotes interest towards science
- gives emotions for nature

How to start?

- By seasonality (spring, summer, autumn, winter)
    - organisms evolve and also give other organisms an opportunity to evolve according to the environment conditions.
    - Observing changes in phenology – are we able to recognize the same objects (different development stages of insects, metamorphosis of the amphibian etc).
- By habitat (field, meadow, forest, reservoir etc)
- By organism groups (birds, mammals, molluscs)
- By individual species phenology (starling, chaffinch etc)
- Based on facts
    - in what phenophase is the object
    - any new additional species
    - percentage of opened blossoms
    - users of blossoms, waiting for the right time (bumblebees, butterflies)

Important notes for the observer:

- Observations have more value when conducted throughout several years in one specific place
- Staking out observation places is recommended
- Observe only the objects you know well
- During busy phenological period (spring and autumn) conduct observations daily/every other day
- Observations are continuous and truthful
- Take notes at observation place
- Each observer has an obligation to protect nature.

Spring

- Changes in inanimate nature
- (Hydrometeorological parameter such as temperature, rainfall etc)
- Start of plants' flowering
- Arrival and nesting of migrants
- Signs of animal activities
- Start of agricultural works
- Interesting observations

Summer

- Changes in inanimate nature (Hydrometeorological parameter such as temperature, rainfall etc)
- Development of plants
- Phenomena in birds and animals lives during summer
- Interesting observations

Autumn

- Changes in inanimate nature
- (Hydrometeorological parameter such as temperature, rainfall etc)
- Development of plants, first ripe fruits
- Appearance of seeds
- Departure of birds
- Animals preparing for winter

Winter

- Changes in inanimate nature (Hydrometeorological parameter such as temperature, rainfall etc)
- Dormancy of plants
- Observation of overwintering birds
- Winter guests
- Signs of animal activities

http://www.looduskalender.ee/

Inspiring learning environments

Examples and methods

Examples 1 *Phenology in springtime*

Aim/purpose

Pupils will learn more about animals, bugs, flowers, trees, birds in the surroundings. Which species of flowers are the first to appear in spring? Was it earlier last year? And if so, the question is why? What is the temperature of the soil?

Preparations

The only preparations are the equipments and maybe put the thermometer in the soil outside.

Material

- Equipment for measure wind speed
- Thermometer
- Equipment to measure ph
- Pencil and paper
- Guides and books about flowers, birds, bugs and trees
- Ipads or computers for information about species

Method

Go outside and measure the temperature of soil and air,

the wind speed and the ph of the soil.

Divide the pupils in groups and let them work with

The working sheets (page 15, 16, 17

and 18)

Reflection

It is an important exercises for pupils measuring the temperature of soil and air, the wind speed and the ph all over the year. Working with phenology helps pupils see the wider context, giving new knowledge and maybe the most important thing- love the surrounding nature! The feelings for the nature, the plants, the birds, the flowers, the seas are a prerequisite for sustainable development.

SPRING ; working sheet

Part I

PHENOLOGICAL OBSERVATIONS Observer's name:

Place of observation: .....

Observation data:

Date ..... Time .....

Temperature .....

Wind speed ..... m/s

Additional notes regarding weather

.....

Part II

NB! Please feel free to use Guides and iPad.

EXERCISE 1

Characterize birds and determine species.

Birds	Nest site	Nutrition	Enemies
			
			
			
			

EXERCISE 2

Do you recognize spring flowers? Write flower's name to each picture.

....

EXERCISE 3

Which birds and mammals use conifer cone seeds for food?

1. .....2. ..... 3. ..... 4. .....5. .....

EXERCISE 4

Do you know first spring butterflies?




....

Which one of those species have sexual dimorphism? .....

EXERCISE 5

What are the stages .....please name.

Examples 2 *Phenology Birds*



Aim/purpose

Pupils will learn more about birds. The names of different species and the life they live.

Preparations

You just need nature or a schoolyard with trees, stones, bushes, grass etc. Start in the classroom and ask the pupils about birds and what they know. Read about birds, see a movie in the classroom and let them read more about birds. Next lesson it´s time to go outside looking for birds and doing this exercise.

Material

- Cards with pictures of different birds that are well known for the pupils
- Material from nature
- Eggs

Method

Start introduction of this exercise with all pupils in a circle. Divide them two and two, in a pair. Then you let them take a card with a picture of a bird species (swan, lapwing, stork, larch…). Now they have 30 minutes to building a nest at a perfect place. How many eggs do they lay? What are they eating? Are they awake daytime or nighttime?

Then it´s time for presentation. Start with one of the nests and one pair starting the presentation. The teacher ask questions about the bird and if the pupils don´t know the answer the teachers can tell more, but the most important part of this exercise are all the pupils own questions about the bird species!!!!! Then walk around to all birds for presentation.

After performing the outdoor exercise, it´s time for processing all knowledge and questions in the classroom. The pupils can study in books, websites and from other places. After that they write and make documentation about the birds and then it´s time for a presentation/theater/book. All pupils in the school will be invited or the parents.

Reflection

This is a really good exercise and a good example of outdoor learning. The pupils are involved in the learning and they are working in small groups. Then they make easy presentations for the class outdoors and the mates are listening. I promise that they after this exercise have many questions and probably they are more motivated learning about birds. I think that they never will forget this lesson! That is a reflection about that the pupils have to learn inside the classroom, outside in different environments and I promise- they will laugh and remember this part of the biology for life!

Examples 3 Phenology – "*Hello spring*"

Seminar/workshop in 15th of April 2014, project "Nature schools network" activity 2 in Pärnu, Estonia.

Tere Kevad told us about an amazing project "Hello spring". Hello spring is an educational activity in the field of natural sciences connecting outdoor studies with using IT. It has run since 1994 and since 2001 the working environment is completely web-based.

www.kevad.edu.ee

Aim/purpose

Observe and study wildlife and nature throughout the springtime. Offer computers supported learning opportunities to younger students. Offer support and extra motivation for science teachers.

The pupils do not know much about the nature around the schools and how they can discover and examine nature. Many teachers are afraid of not knowing the answers. "Hello spring" will help them and it is a good idea to start a similar project in your town or country.

Preparations

Look at the website about "Hello spring".

Material

- Ipads or computers
- Pencils and papers
- Guides and books about plants, birds, bugs and trees

Method

The duration are March-May and “Hello spring” in Estonia are for pupils mostly from primary school (7-14 years of age). The pupils start reading at the website www.tere.kevad.edu.ee. Then it´s time for field trips to identify the species of plants and indicate the arrival of spring. Pupils, observing the indicator species in nature, enter the data of their arrival or appearing to the project web-based database. All results of observations will instantly appear in the web in form of animated maps or/and tables and can be followed by anyone interested.

Pupils will write spring-poetry, draw pictures about spring, participate in spring-themed quiz and take photos. Every week the class chooses three photos and sends them to a competition. Here they also train collaboration. When the year is over a jury in the project choose 10 photos and they make a calendar. The 10 photographing pupils win a camera.

Reflection

This project is really inspiring. The results are so good, so more projects in different countries are a good idea. The expected outcomes are that the knowledge of about local nature among the pupils will be increased. This is also a good example of outdoor learning and the possibility to work with different subjects/aims in the curriculum (biology, science, environment, creative and language).

This website is a hard work, because it will start from the beginning every year.

This website is also a good support for teachers. That is a really important point!

Examples 4 *A year around bug life the education tool beyond price*

Ideas from Urmas Tartes workshop in 15th of April 2014, “Nature schools network” activity 2 in Pärnu, Estonia.

“Summertime is fantastic, but when autumn comes don´t go inside!!!!”

Urmas Tartes

Aim/purpose

Pupils will learn more about bugs and insects. They will see them outside every season and compare the activity and their lives.

Preparations

The teacher needs to choose a good place for working in field. You must think about the weather and the temperature (not below -10).

Material

- Guides about bugs and insects

Method

Go outside with the pupils. You can do it in every season and of course in wintertime. A good idea is starting with an insect that everyone loves - ladybird for example! Look at the ants- go close because they are amazing! The bumblebees are fascinating!

Insect are more active when it´s cloudy. If it is much snow, you can have snowshoes. It is really exciting and funny. Spiders and caterpillars are on the snow. Remember when it is -10 grades no insects are active.

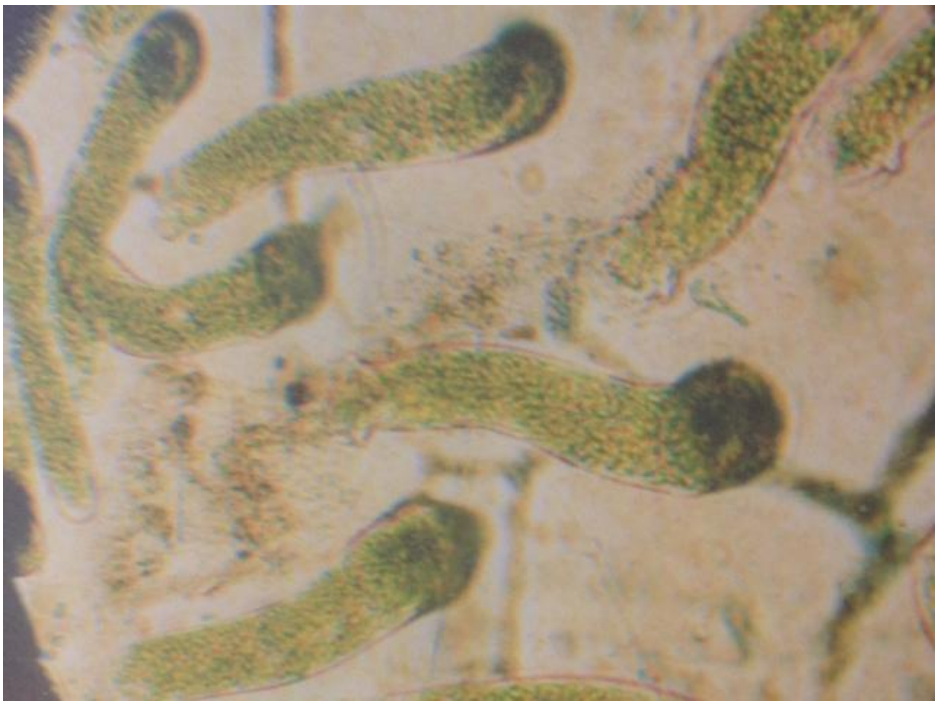
Reflection

It is exciting for pupils being outside in winter observing nature. They need this experiences and knowledge, when it´s time to compare nature, ecosystems, animals….

Don´t forget warm clothes!

Examples 5 *Phenology – Rivers, seas and lakes*

Juri Tenson ´s workshop in 17th of April 2014, “Nature schools network” activity 2 in Pärnu, Estonia.



Aim/purpose

Pupils will learn more about life in the seas, lakes and rivers. They need to go out every year and participate in the science. We don´t have all the answers of the questions; Why are there not special species of fishes anymore? What plankton is this? We don´t have all answers and that is a good way for motivating pupils learning more.

Preparations

If possible, arrange for boat access to the lake or pond to facilitate sample collection from open water. Safety measures such as providing life vests must be planned in advance. Ideally, we would like to return to the same site repeatedly through the growing season from spring through autumn. The best situation is to find the same depths in our lakes and take water from the whole water column in the photic zone.

Divide the pupils into groups that will be responsible for investigating the plankton samples. Introduce the pupils to the sampling equipment and microscopy.

You can also choose a beach, river and looking for life in water.

Material

- Water sampler
- Secchi disk (to determine depth of the photic zone)
- Bucket or container for mixing samples to make a “composite” sample (optional)
- Plankton nets (mesh sizes for larger phytoplankton range from 20 to 64 µm, and for zooplankton range from 64 to 200 µm)
- Bottles
- Camera or telephone
- Simple keys or books for plankton, fishes, insects identification

Methods

You have to take the pupils to the river, the sea or the lake and looking for all life in water. What can they find? When and where?

When the pupils are to study plankton, go to the predetermined sampling point in the lake or pond if it is possible. Use the sampling equipment to collect water samples for plankton analysis. If you are collecting from several depths, use the bucket to mix samples and take a subsample of this mixed “composite” sample for study. Be sure to stir the sample before pouring into the plankton net. (Remember to keep the valve at the bottom or “cod end” of the net closed so the concentrated plankton sample is captured in the cup.) During your class lab session you will need time to look at your water samples and identify what you see through the microscope. Record your data carefully so you can make comparisons with results from different times of the year and another idea is to post the result on-line to compare your findings with other schools or classes. By repeating this sampling during the spring season, you can see the changes in composition of phytoplankton and zooplankton.

Reflection

Juri Tenson had some photos with plankton and he asked the class what it was. He didn´t know. That is a really good start of a lab. We need the pupil´s observations and analyses about the life in water for future!

It is important to go to the same spots with the classes so it is possible to comparing the data. Go there every season! That's the best way of getting to know the whole story of nature, weather it is life in water, life in the forest or even earth!

"Go to the same spots.

Go there many seasons.

Birth - Death.

That's the way for the whole story!"

Juri Tenson, Pärnu 140417

Partners in the project

Activity 2 in Estonia April 2014. A wonderful visit in Sooma National park, Estonia.

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