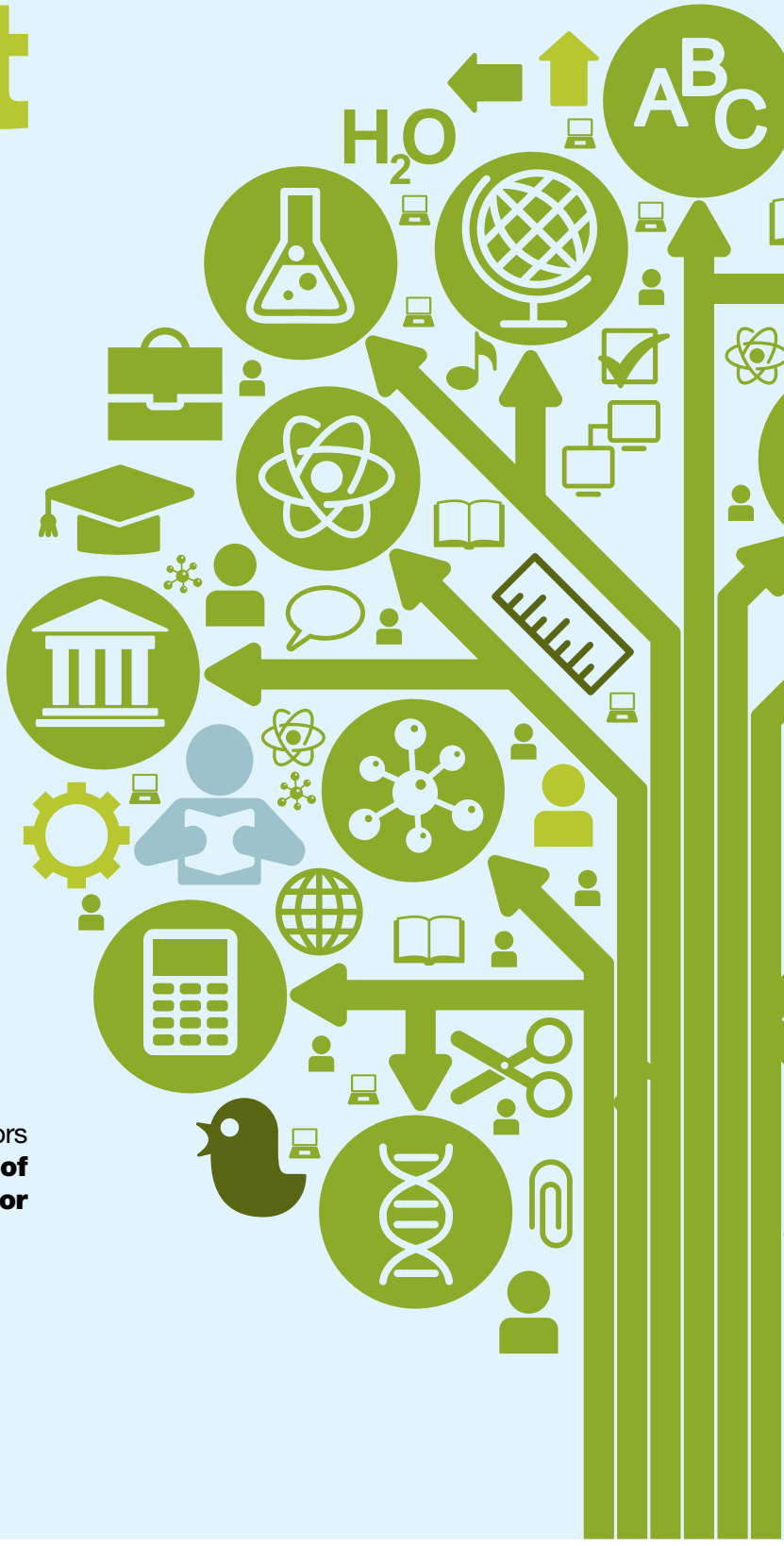
VIA UNIVERSITY COLLEGE

In&Out

Learning outside the classroom

Volume II
Subject Course



A further training course for teachers and educators
"Into the outdoor classrooms, adaption of new subject-related approaches in outdoor learning"

Education and Culture DG
Lifelong Learning Programme

'This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.'

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Printed in Denmark
Publisher: VIA University College
This publication is a product of the EU Project: “ In & Out” made in cooperation with partners from: VIA University College (DK), Linköping University (SE), University of Bucharest (RO) & University of Marburg (DE)

1. From laminates on the River Lahn to baskets in Bucharest

By Mikael Skånstrøm

I went on a journey from the middle of February to the beginning of May – not just a physical journey from Marburg to Bucharest via Bovbjerg and Linköping, but also a journey of understanding and working with the concept of “Learning outside the classroom”.

I started armed with plenty of teaching material and laminated sheets of A4 paper, and ended up with nothing more than a Swedish measuring stick and any opportunities that the places and people I met had to offer.

I met more than 50 people from many parts of Europe – people with a genuine interest in the potential of teaching outside the classroom. And more than anything else, I was forced to reconsider all the different ways in which I teach mathematics and perceive teaching in general.

Marburg in March
It’s a chilly morning in mid-March in Marburg.
This is my debut. I’m meeting the German participants in the EU project called “Into the outdoor classrooms – adaption of new subject-related approaches in outdoor learning”. This is the first of a series of tests in which I have been appointed to be a mathematics expert, the aim being to gain experience of teaching mathematics outside the classroom in cooperation with teachers and museum staff. This is the second objective of the project: encouraging people from the formal and non-formal sector to work together outside the classroom to focus on basic teaching and four different subjects: language, science, physical education and mathematics.

For months leading up to this meeting in March, I have been doing a lot of hard thinking. How do people work with mathematics in the other three countries, how can you put together a meaningful course of teaching that includes both teachers and museum staff, and how can I transform my Danish ideas about teaching mathematics? After all, I’m used to teaching indoors, and I always take the needs of my students and the curriculum into account even though I might not be the most conventional of teachers. I felt pretty sure that I could convince the Danish participants of my approach to the subject. But how would it be received by participants from other countries with other curricula and traditions? These were the thoughts that had occupied me during the planning stage.
In early March the proposals were ready – about a dozen ideas either demanding or providing better opportunities for solutions outside the classroom than inside it. I had visited Marburg in February and arranged with the German leader of the project, Martin Lindner, that the work should take place on and near the River Lahn just outside Marburg. So my ideas had become more specific, and some of them were actually related to specific locations. They had been mailed to Martin and he agreed to copy them – and to laminate them as well!

Just before I left I was talking to my outdoor teaching guru Karen Barfod in another connection. She quoted the words of Malene Bendix, who once said that when you work outside you don’t need to take any sheets of paper with you – and you definitely don’t need any laminated sheets of paper! Even though Karen added with a smile that Malene was something of a fundamentalist, I still had a few doubts about what I was doing. At that very same moment, Martin may have been busy laminating three copies of all my proposals.

The raft named Rudolph
But now we have all arrived. Seven German participants, Katarina from Sweden (working with language), and me with my three sets of laminated proposals and indelible pens. Six of the German participants are working with something called “Abenteur- und Erlebnispädagogik”, while the seventh (Bob) is working with young pupils who he takes out into the forest one day a week. Katarina has a Master’s degree in outdoor education from LiU (Linköping University). So there is only one person present who works with mathematics.

And that’s me…..
The tasks on the laminated sheets of A4 paper have been designed to fill exactly one page, and so a (mathematics) teacher can present them to pupils from different grades. Most of them contain more than one option for differentiation. So it isn’t difficult for the German group of teachers to measure the size of the raft named Rudolph with a home-made measuring tape, to find out how fast the River Lahn

flows, to suggest a method for calculating roughly how many acorns are lying under a big oak tree, or to line up in various orders depending on a range of different parameters. Nor do they have any difficulty in finding nearby. Half of the dozen laminated proposals are actually used, and I take them home with me to adjust them a little and translate them into Danish.

Columbus and Bovbjerg lighthouse
After a day of science subjects and historical physical activity at Hjerl Hede, we're eating chilli burgers and steak house fries and drinking local beer from the island of Fur at the Columbus Restaurant in Lemvig. The table is covered with a huge paper tablecloth, and while we're waiting for our meal people suddenly start drawing and writing on the tablecloth. This is because the next day will include exercises in both language and mathematics, and the conversation (in Danish, Swedish and English) leads to the development of a joint plan involving activities arranged like pearls on a string. The string stretches from our arrival at the nearby lighthouse, down the road to the beach, on the beach itself, on the road leading away from the beach, and ending up back in the area around the lighthouse again – at least a dozen.

The next day another task has been added, but some of them have been placed on standby because they're hard to carry out on the edge of the North Sea. For instance, there aren't many red cars to be seen – in fact we only saw a few cars of various colours all day long. The tasks have been translated, but based on previous feedback none have been laminated this time; and having been involved in all the work done on the tablecloth at the Columbus Restaurant, I'm determined not to present the tasks on pieces of paper. Instead I will present them live on the spot, using the props that I've brought with me.

I know the participants and what they're capable of, I've edited the tasks, and the atmosphere is attentive. People seem curious to find out what they will be asked to do.
The weather looks pretty settled, as it often is in the month of March, and even though it feels a bit chilly every now and then the surroundings offer a wealth of active outdoor teaching rooms, and most of the language and mathematics pearls on the teaching string are brought into play with a very satisfactory result.

The group go their separate ways in a happy mood, keen to try out what they have learned back home at their schools and in collaboration with the museums. And I have now found out that a good number of my tasks really do work – even without being laminated first!
I look forward to our meeting in Linköping with confidence.

Life in the freezer
Not everyone manages to catch the soft little ball at the first attempt. This is partly because most people are wearing mittens or gloves, and partly because some people don't even want to catch the ball – so they look the other way and avoid eye contact with the people throwing it at them with a number for which some sort of calculation has to be made. Both things surprise me. Can it really be that cold in the middle of April on the edge of a Swedish lake outside Linköping? There is a pretty major chill factor of course (the wind is whipping across the lake); and even though I'm the only one not wearing a hat or gloves, we all realise that working outside the classroom can be a pretty chilly experience. But everyone takes things with a smile, as long as there is no mathematics involved (and I mean absolutely NO mathematics!) This is the second thing that surprises me, but even on the first day I realised that some of the Swedish participants actually have a mathematics phobia, and that apart from a single participant the group as a whole isn't interested in my subject in the slightest.

I reconsider my tasks while we're working with language on the first day in a landscape of oak trees, and realise that they simply will not work. Not in their present form, and definitely not if they are defined as mathematics. I need to find new paths – and I may even need to build a new ring road! During the evening I look for new solutions, which I then adjust early the following morning before breakfast at the round table with the Swedish newspapers. In the end I ask the participants to help find the answers to questions such as "How many? How high? How fast? and How large?"

All my sheets of A4 paper have now been abandoned (laminated or not), and the only things left are a piece of purple string, a Swedish measuring stick, a soft ball and a duck that turns out to be happy to move in a straight line picking up breadcrumbs from the breakfast table. It actually waddles 2 metres in 2.06 seconds – and please note the accuracy of this measurement: down to 100th of a second, no less!

Everyone shows great enthusiasm in trying to find answers to the questions; and before the chilly weather forces us to abandon the activities a little earlier than planned, all the questions have been answered.

What I learned was that working outside the classroom can happily go hand in hand with a bag of assorted objects, the things you find in the countryside, and a series of interesting questions that have to be answered. In fact, these were the only factors involved in this particular situation.

Botany in Bucharest
It's not just the 30°C temperature in Bucharest that makes things different compared with conditions in Marburg, Bovbjerg and Linköping. In fact almost everything is different.
We're going to visit and work at three different museums with a group of about 18 teachers and museum staff, only a few of whom feel confident enough to communicate in English. Only one of them teaches mathematics. But luckily Alexandru turns out to be an excellent interpreter.
The only thing I have brought with me is my indispensable Swedish measuring stick and the purple string. Oh yes – and a Powerpoint presentation based on Ole Skovsmose's ideas about what he calls "Learning Landscapes", in which I try to communicate the way I perceive mathematics. I show this presentation in Bucharest without really knowing how I can connect it to the activities I am planning to carry out. All I have is some information and photographs I found on the internet about Grădina Botanică a Universităţii din Bucureşti, Muzeul Naţional al Satului "Dimitrie Gusti", and Muzeul Naţional de Geologie.

I can see the connections myself – and perhaps some of the participants will see them too when they are asked to measure trees in the botanical garden, make timelines with strings, and throw stones into baskets from various distances in the museum with the old houses from various regions – as well being asked to find both fractions and in the museum of geology.

All without a single sheet of A4 paper.

And the journey has only just begun....
The journey ends officially in the autumn of 2012 after the Geopark conference in Arouca, Portugal in September, where the results of all our efforts will be presented. But with regard to the way I plan to present mathematics to students in future, my journey has only just begun. At the moment I am convinced and determined that part of each semester will take place outside the classroom.

But in the meantime I need to find my black knitted cap in the wardrobe, and then I need to go out and buy myself a pair of warm gloves and some decent outdoor-school-shoes.

In&Out

2. Methodology of using the place to subject related education

By Karen Barfod

During the last decades, there has been an increase in the use of outdoor settings in formal educational activities (Bentsen, 2010). These activities tend to focus on environmental, health and issues concerning self-development (Szczespanski, 2007, Nicol, 2007, Gustafsson, 2011). In Denmark and Norway (Bentsen 2010, Jordet, 2010), the use of outdoor learning processes has extended beyond this point and developed a subject-related approach, that involves further use of the outdoors complemented the curriculum prescribed content of the subjects.

That is, children use the outdoors as a place to learn a specific subject-related content, e.g. sinus / cosine in mathematics, the difference of play and games in physical education and so on. To support these activities, programmes at non-formal learning environments has been developed as special designed museum visits, nature-school programmes, education in geoparks, programmes within youth work and so on.

In and Out
The "In and Out" project addresses two main issues - The use of non-formal learning environments in compulsory education to enhance the subject-related learning and the courses in this field for a dual target group. The main subjects have been Language, Mathematics, Physical Education and Earth science, with sporadic occurrence of other subjects as art and handcraft, history, biology and so on. To describe how we did it, and to set it into a relation with the main subject-related terms, we have described the use of the subjects in the courses. In this chapter you will find both descriptions of the views and use of the subjects, and "Good practice" step by step descriptions on how to do the activities.

The chapters are written by the subject experts of the projects: Dr Alexandru Andrasanu, Bucharest University, Lecturer Eva Kätting and lecturer Katarina Johansson, Linköping University, Lecturer Mikael Skånstrøm, VIA University College and Martin Lindner, Phillips Universität, Marburg, Germany.

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2.1. Mathematics and "Learning outside the classroom"

By Mikael Skånstrøm

'All right then, how can we check if the height that we measured with the Swedish rod is correct?' Karen asks the rain-soaked pupils.
'No problem. We could cut down the tree,' suggests Jesper with a grin.
'Exactly!' Karen hands him the saw.
'Can I, really?'
'It's an order!' Karen says with conviction.

It is not that difficult to measure a tree that lies down, and now the competition is to see which of the groups that have come the closest to the actual height. The best group had come up with a result only 5 centimetres from the actual height of the tree; and this only by means of a rod divided into ten parts of equal size, an estimate, and the rule of three.

Another couple of trees have to be cut down in the name of mathematics, however, a deal with the caretaker had been made and this way we actually helped him do his job. In spite of the cold and wet, this exercise elevated the mood even more, though we had already done 'cube-baton' and 'find-the-calculation-that-fits' on the wet lawn.

To solve the three problems we had to go outside – not merely because trees are outside, also because the tasks took space to be active in. Basically, there are problems in mathematics that are better solved outside – outside in the real world rather than in the pretend-to-be-real world represented by two-dimensional experiences and pen and paper indoors in the classroom. Besides, mathematics is all over the place outside the classroom, so why not make use of the real world, it being there!? Leaving the classroom also means that you can set problems that can only be solved outside.

There are problems that may be solved outside with an advantage, and of course there are problems with which it doesn't really matter if you are in or out, or you may not be able to solve them at all outside.

Outdoor School – knowledge in the real world
The four categories above are seen from the point of view of setting problems. Should we include ideas about learning, though, the need for learning in other places and in other ways is widened. In 'Udeskole – viden i virkeligheden' ('Outdoor School – knowledge in the real world') in the paragraph: 'Learning through experience, action and understanding', the brain researcher Kjeld Fredens is quoted for three concepts of memory (Bendix M. og Barfod K.: Udeskole - viden i virkeligheden, Skoven-i-skolen, 2012, p.27, in authors translation):

1. *Personal memory – experience*
   Experiences are stored through what can be sensed and the activity of feelings in the personal memory: what we learn through experience we often have to learn only once to remember.

2. *Memory of activity – action*
   The memory of activity is the practical memory. In this you store knowledge learned through actually doing things – and often you learn best from another person (craft's apprenticeship).

3. *Semantic memory – understanding*
   Understanding of theories belongs to the semantic memory. In this are knowledge, hard facts, and everything transferred to us through signs and symbols – what you can read in a book, a sheet of music and in a mathematical formula."

All three kinds of memory must be brought into learning – though not necessarily at the same time or in the same room. Being in the 'room' outside is exceptionally good for learning through experiences and action, while the classroom is good for reflection and understanding. In other words, it is not a question of indoor or outdoor teaching, rather indoor and outdoor teaching.

To return to the Swedish rod and the trees the participants cut down: Not one of them will forget this day. Most likely they will remember the method used to solve the problem about the height of the tree – they can feel and smell that day in the rain. On the other hand there is a risk that knowledge gained solely by solving problems of the same kind using pen and paper and formulas will be remembered with less precision – if at all.

Back to the dry in the classroom, it suddenly made much more sense to talk about similar-angled triangles and similitude. Obviously, using other tools for measuring the trigonometrical terms of sinus, cosine, and tangent could have been added to do even more precise calculations in case you were not satisfied with the ± 5 centimetres. About accuracy, think of Carl Friedrich Gauss (1777 – 1855), one of the most distinguished mathematicians in history, when he said: "Nothing expresses lack of mathematical education more than an extraordinary accuracy in calculating numbers."

Undoubtedly, Gauss would have been satisfied with the heights the pupils found using the rod, since it would have been far-fetched to talk of centimetres with digits when measuring trees.

Is 'How tall is the tree?' a good outdoor school course, then?
In 'Outdoor School – knowledge in the real world' Malene Bendix and Karen Barfod (2012) state nine criteria for making a good outdoor school course. These are criteria that may be used in the process of planning, carrying out, and evaluating a course outside the classroom, here they are quoted and translated by the author (see table 1):

Regarding 1:
The syllabus for mathematics must be visible
The reasons for measuring the height of the tree can be found mainly in the mathematical area of geometry.

While measuring the tree the pupils will work with:
- Scale, similitude and congruence
- Measuring and calculating in connection with circumference, surface and space
- Geometrical calculations using Pythagoras' sentence
- Trigonometry in connection with right-angled triangles

In addition the pupils will:
- Interpret mathematical models' description of the real world
- Use mathematical tools, concepts and competences solving mathematical problems in connection with daily life, society and nature
- Recognize the possibilities and limitations of mathematics when describing the real world
- Participate in the development of strategies and methods in connection with mathematical themes
- Test, organise, reason and generalise during the work with mathematical problems

Regarding 2:
Work indoors and outdoors must collaborate
The results of the efforts are taken inside for further study in class. Here, other ways of finding the height could be discussed and it would be an obvious choice to include Information Technology.

Regarding 3:
The pupils must work together
It would be impossible to solve the problem without cooperation: One person has to hold and read the rod and one person must to mark every tenth of the tree. When the tree has to be cut down you need one person to do the cutting, one person to hold the tree, one person to steer . . .

Regarding 4:
The pupils must work with actual situations and clear and relevant goals
Collaboration between practice and theory is obvious when measuring and cutting down the tree. The height of the tree is relevant since it is supposed to fall in a spot clear of people or things.

Regarding 5:
The teaching must be oriented towards problems/ tasks and linked to practice
To be able to solve the problem of finding the height of the tree, the pupils have to use competences of measuring and calculating together with the geometrical concept of similitude.

Regarding 6:
The pupils' work and understanding must be supported by the outdoor surroundings
For obvious reasons the problem with the tree can be solved only where the tree is!

Regarding 7:
The course must include experiences that stimulate the senses
Every pupil will remember his or her role in connection with this task and relive the action and excitement; not only if the measure was accurate, but also if the tree would land in the right spot. Moreover, woods are full of smell and sound.

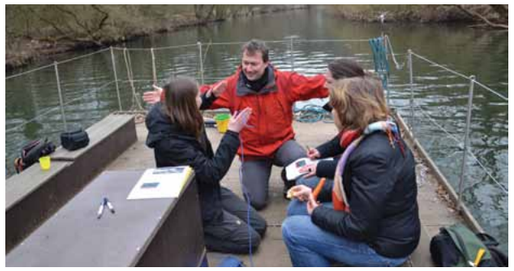
Regarding 8:
The course must be evaluated, rounded off, put into perspective, and reflected upon so that experience and action become knowledge and understanding
Notes must be taken down in connection with this problem. Once back in the classroom, these notes will be organized and supplied with drawings or photos. The problem must be substantiated and presented perhaps on a piece of paper, or in a video recording.

Regarding 9:
The teacher must be able to 'sit on his hands'
In the problem with the tree the teacher sets the scope and gives the instructions about the rod. Next, all activity is left to the pupils. In the process, the teacher has to scan every situation for new academic possibilities, though.

	Nine criteria for the good outdoor school course	**Elaboration**
1	*Syllabus for the subject must be clear*	*Academic goals must be clear to the pupils, the teacher, the parents, and the school administration*
2	*Work indoors and outdoors must collaborate*	*The pupils must work with the same subject areas both indoors and outdoors so that the teaching makes up unison learning*
3	*The pupils must work together*	*The course must include group work. Groups of 2 – 4 pupils normally work well.*
4	*The pupils must work with actual situations and relevant and clear goals*	*The teaching situation must make sense to the pupils*
5	*The teaching must be oriented towards problems/ tasks and linked to practice*	*To be able to solve the practical problems, the pupils have to bring their knowledge about the subject into practice in order for this knowledge to be useful and to be remembered*
6	*The pupils' work and understanding must be supported by the outdoor surroundings*	*The place is central. It ought not be possible to carry out the problems/ tasks indoors or in the gym*
7	*The course must include experiences that stimulate the senses*	*Include tasks of feeling, smelling, tasting, etc. so the pupils have experiences of the senses that are connected to each other*
8	*The course must be evaluated, rounded off, put into perspective, and reflected upon so that experience and action become knowledge and understanding*	*Keywords and log books, either when they are outdoors or indoors the day after, may add to the oral summary – and at the same time work as documentation, a place to keep important information and communication with the parents*
9	*The teacher must be able to 'sit on his hands'*	*The primary job for the teacher is to be a guide for the children's own processes of learning; that is to say, give them working space to obtain learning. The teacher must be able to seize the innate learning potential of any given situation without ignoring the goals of the course plan*

Table 1: Criteria used in the process of planning, carrying out, and evaluation a course outside the classroom

When the classroom is Rudolph 08
Change of scenery from Danish weather and the height of trees to Marburg where the river Lahn floats through the city on its way from the Rothar Mountains to the mouth in the Rhine near Koblenz. On the outskirts of the city, the German organization BSJ (www.bsj-marburg.de) has a small raft of wood. With a small motor it is able to drive up against the current if the current is not too strong. On board Rudolph 08, as it is called, there is room for about 15 people according to size and age. The staff from BSJ has to work with a number of prepared and orchestrated tasks while we chug up and down the river. The work outside the classroom itself will be dealt with in another section. We go up the river which is about 30 meters wide. On the one bank there is a road with random traffic and large houses. On the other bank, there is an open space which covers the area towards the highway from which you can hear the humming of cars. In one of the houses there is some renovating going on and sometimes you can hear loud banging noises.
You would think that surroundings like that would disturb the eyes and ears of the people on board of Rudolph 08; this was not the case though. When working together on the tasks the room around the raft seems to close in on us. Possible interruptions from the outside don't seem to have any effect on the work done here. In traditional classrooms in which you are entrenched by walls, windows and a door it often doesn't take much to distract students. In mysterious ways it seems to work opposite here – it is as if impulses from the outside define the 'classroom' on board the raft.



Something different happens on the raft – something different from a similar situation in a classroom. Naturally, it doesn't take as long for the groups to design a measuring line and suggest various objects to measure on both a human and on the boat as it would have in a classroom.
A teacher would normally react to this with a:
'Then what are they going to do?' or 'How to challenge them now?'

However, here they place their things on a wooden box in the middle of the raft and start a conversation about the last trip they were on with a group of children who had been very interested in some birds that flew across the river. The conversation is relaxed and in no way does it interfere with the work still going on at the other end of the raft. During this 'recess situation' reality takes a minute to impose when a helicopter passes over the raft on its way to the mountains in the distance. The group discuss its business while the other group finishes its work and we all can evaluate this first part of the task.

Something happens in the relationship among the pupils and in the relationship between teacher and pupils too.
"If the teacher and the pupils choose to be outdoors, the norms are altered. Ordinary roles such as teacher, pupil and expectations to each other are stirred and the criteria for inclusion in teaching become negotiable. Most likely, the teacher and the pupils will get to know each other in new and surprising ways. In that way, teaching outdoors merely as a variation of the teacher-pupil relationship will potentially enhance the inclusiveness of the teaching because it is likely that more pupils will be addressed in the communication and teaching." (Kruse, 2005)

You have problems – and then you have problems
It is apparent and of critical importance that the problems/tasks are adapted to the target group that you work with. You have to make both academic and didactic considerations before you present the problems. Having said that, you can then make your presentation partly as deductive tasks – for instance in laminated sheets for the problems set without actual questions or handed out props. Regardless of method it makes sense to bring in Ole Skovmose's "Landscapes of Investigation" (table 2):

Table 2: Landscapes of Investigation

	Tradition of exercises	**Landscapes of investigation**
References to pure mathematics	*(1)*	*(2)*
References to a semi-reality	*(3)*	*(4)*
Real-life references	*(5)*	*(6)*

In the abstract to "Landscapes of Investigation" Ole Skovmose writes:
"Moving away from the exercise paradigm and in the direction of landscapes of investigation may help to abandon the authorities of the traditional mathematics classroom and to make students the acting subjects in their learning processes." (Skovsmose, 2011, p 123).

The model is not an argument for teaching mathematics landscapes of investigation only, but it invites to teaching in different ways – ways that a course book itself does not suggest. In books the problems are often perceived as complete problems that are either rather mathematical or set in a semi-reality in which people like A and B can shop or race each other. For practical reasons materials produced by publishers often leave out numbers and information the real world. Landscape of investigation type problems are placed in the teacher's guide or as suggestions for further work that the pupils opt to do.

"Can you find the fractions?", "Wanna bet?" and "How tall is the tree"
The numbers (1), (2), (3), (4), (5) and (6) refers to Table 2: Landscapes of Investigation.

There are three examples of outlines for mathematical problems to be set at the end of this article.

"Can you find the fractions?" is meant to be number (2) and "Wanna bet?" and "How tall is the tree?" can be both (4) and (6) – depending on the presentation. Both can be set into a narrative context, still, if the janitor has a problem with the height of the trees and if the bet is laid with actual stakes it may as easily become a part of the real world.

Moving both the actual classroom and the authority of the traditional classroom of mathematics outdoors makes good sense because mathematical themes become engaged on other terms and in other ways of working than what the traditional paradigm basis for problems would normally make room for.

Not only does it provide the opportunity to solve problems as a process based on conversation and the pupils' various potential and qualifications, it also gives them the chance to participate in the development of their own strategies and methods in connection with mathematical themes.

In the task "Wanna bet?" the participants have to stage a bet based on experiments with the material they find in the spot they are at. Participants have to study, organize, reason and generalize before they can present the bet. Among mathematical competences is the ability to ask questions that are characteristic for mathematics as well as have an idea of what kind of answer to expect. Besides, having competence of reasoning is to be able to plan and carry out reasons for mathematical claim along with being able to follow and assess other people's mathematical reasoning.

When working with a task as the one described above it is not necessary to go outside as it could easily be set with minor props inside, but the possibilities would be limited by the things and the room present. The Outdoor School argues for giving the pupils a chance to sense a place which is relevant for the variety of material. In addition, the participants will have a chance of taking a little exercise.

Numbers and algebra is a mathematical theme that traditionally thrives in landscapes of investigation (1) and course books are filled with problems like ½ + ă= _____, and the examples within fractions have developed from cake-shapes to pizza slices. Those who think of themselves as poor at mathematics often think of fractions and the mathematical discipline of 'solving an equation' as synonymous with the subject. One of the reasons for this might be the above mentioned rather unbalanced work with mathematics. In "Can you find the fraction?" the problem is taken out of the classroom and from (1) to (2) or (4), and the participants are encouraged to find fractions as they appear in the real world around us. They are not just numbers on a piece of paper but actual parts that form a whole so that it creates understanding for the concept and in this way trains the participants' competences in decoding and using mathematical symbols and forming a translation between everyday language and the language of symbols.

"How tall is the tree?" can be perceived as a task oriented towards use. In this version it is designed to be deductive in order to introduce the Swedish rod which in turn can be used as one of several ways of solving a problem from the real world. When you set a problem to the participants, the first question is always: Can you make mathematics of it? Can the problem be set, limited and solved – preferably with the goal of being able to generalize from the results? In the dialogue the scope and limitation of different mathematical concepts are called upon and the participants have to have competences of using resources that might help solve the problem (here the Swedish rod). In this way the task moves from (3) through (5) to (6).

Laminated or not?
It goes without saying that the presentation can have many different expressions depending on the background of the participants, the place you are at and the content the teacher wishes to study.

According to criterion no. 2 in 'Content of the Outdoor School' it is important that parts of the teaching takes place outdoors and parts of it takes place indoors. In other words, it is not critical whether the outdoor part is diligently explained in laminated sheets. Some outdoor teachers choose to see it as a quality not to include sheets at all, while others think it strengthens the focus of the problem when you add written text and the chance of making notes.

The three tasks have all been designed to take up no more than one sheet and then it is left to the teacher to decide whether to take them outside or let the question be the main focus for work outside the classroom.

In the essay 'From laminates on the River Lahn to baskets in Bucharest' (Skånstrøm, 2012, in this book) the development for a teacher is described. It started with a number of laminated problems in Marburg in Germany and ended up with a purple line and a Swedish rod in Bucharest.

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2.2 The Language Subject Outdoor in practice

By Katarina Johansson

Didactic methods in language learning/teaching

In Language learning/teaching and for all subjects in school, the places we choose and the strategies or methods we use in our teaching are important. Didactic comes from the Greek word didaskein and means to teach. It is important that the teacher knows what teaching is, its aims, its purpose and the connection between these different parts. Just as in indoor teaching/learning, the outdoor teacher has to ask: What? Where? How? When? and Why?
What content do I have in my teaching and how do these elements affect the pupils during their learning? Which places can I use to make it easier for pupils to learn? How and what methods can I use to involve the pupils in their own learning process and in a pleasurable learning? When do I use Outdoor teaching? And why do I use these various teaching methods? In these cases, some research in this area such as how the brain works and our ability to learn can be useful. Physical activity impacts us in a positive way, strengthening our abilities in concentration and memory as well as increasing our patience and perseverance.
It is easier to argue why it is better to work with some parts of outdoors and indoors if the teachers plan the lessons according to the didactical questions. Otherwise the work would not be as conscientious as it should.

Literature

Understanding is important to learning and we are looking for patterns in all possible contexts. To see these patterns you cannot refer to one text. You have to see several of examples which all include the pattern. Gärdenfors in Jensen (red) (2011) concludes that a general principal is that we retain subjects better in our memories if it is presented in multiple contexts. Gärdenfors states that traditional schools focus on theoretical learning and that theory should be combined with experience. The pattern gives meaning to these concrete activities.

When we talk about outdoor teaching/learning, first-hand-experiences are important and must be combined with theory in order to see patterns within a context. But how can the environment and different places impact the language learning? And how can we achieve linguistic environments that enhance pupils' awareness of language? There are a lot of theories about how to teach language. The spoken language may be studied in function (that is, how we use the language), in content, (the meaning of the words and sentences) and form (about phonology, morphology and syntax) – how we look at the small sounds of a language, to how words are formed, to how 2 we combine words into sentences. The dimension of learning is divided into parts as for example genes and environment and individual and in group. It is about how we learn, in what kind of places, the interaction between people and the communication with others, especially in the spoken and written language. Piaget (1896-1980) supports the constructivist theory that people acquire knowledge through activities. He also emphasized children's individual investigations of their own environments. Vygotskij (1896-1934) supports the sociocultural theory, meaning that the key to mental development is social interaction, emphasizing also the social importance of environment. Svensson (2009) explains Piaget's thoughts about language development as a result of increased cognitive ability as opposed to Vygotskij who means that language develops as a consequence of people seeking social contact. Piaget and Vygotskij, as I mention in this text, both consider the necessity of a general intellectual ability in order for language development to take place, communication from a broader perspective and that the occupations and experiences of children are central to its language development.

The learning is situated as Gärdenfors (red) (2011) writes, meaning that if the children only learn inside a classroom then that is useful only in that classroom. He states that the aims in school can lose their meaning because of this. The pupils have to transfer the knowledge into other contexts if they are to see the similarities between what they have learnt and other situations.

In Outdoor Education we use the phrase "place-based learning" because the place is very important to a variety of subjects. As an example, if pupils are to learn about frogs, it is easier to work in the pond to see them, feel them, look at their behavior, see what they eat and so on. We have to lift up the pedagogical dimensions of places, as von Wright, in Jensen (red) (2011, chapter 8) writes. She means that learning is both a long-term process and a situation in a special context. If we use places outside the classroom, then learning is expanded and the pupils can transfer and use their knowledge.

Sandberg (2012) writes about outdoor teaching/learning at universities and means that when we are outdoors "in a place," we are all together in a group and notice a particular phenomenon together. We have immediate experiences when we use our senses and, through a combination of words, abstractions and sensual experience, we gain new experiences and knowledge. Sandberg also writes that in Outdoor teaching/learning there are a lot of advantages. For example, the landscape is not divided into subjects, making it easier to work with problem-solving and in themes; the dialogues are therefore different when we work, walk and stand close to each other and Outdoor teaching/learning offers a variety that stands out and complements traditional teaching/learning.

Subject courses
Exercises practicing language learning in different landscapes in this project have taken place around the Lahn river in Marburg Germany, at Bovbjerg Fyr in Denmark, in the Oak Landscape in Linkoping, Sweden and in a Botanical Garden, as well as Village and Geology museums in Bucharest, Romania.

The aims of the exercises were to use the body and the senses in learning, to be physically active, use selected places and the materials they present and to identify opportunities to mix different school subjects in an interdisciplinary way. The exercises also achieve the aim of having fun during the learning process.

The language exercises started with a short introduction of what a language is in general, the content and characteristics of language so that the participants have a background to the exercises. Language is involved in every subject but the aims of working with language outdoors is to put a name to what we see, understand terms and use different places to gain new experiences. The exercises include parts of speech, communication, drama, cooperation, imagination, creativity, fantasy and involve discussion and problem-solving. We use the spoken language but also body language in the exercises.

Conclusion
To teach outdoors is a good way to see pupils working in different ways. Theory and practice complement each other and some pupils are often more comfortable with practical work and can achieve their goals if they have a chance to show what they know in different school subjects in places other than the classroom. The classroom is not the only place for teaching/learning and in this project we have worked with two target groups (formal and non-formal educators) to investigate whether they have an interest in cooperating. Teachers have many experts in the community to cooperate with, a lot of possibilities for various teaching methods to make pupils more interested and to include in the learning process. Learning can be enhanced by bringing these two kinds of educators together.

The didactic methods that we used in the language subject exercises during this project have been ways of giving methods to teachers, guides and other non-formal educators. It has also been a way to give them ideas to form their own work according to their own curriculum and guidelines as well as offer ideas for further discussion about cooperation.

Continuous work and cooperation have been discussed in terms of formal and non-formal learning, and we hope that this project is a start for a good relationship between the two target groups.

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2.3. A contemplative approach in Physical Education in nature

By Martin Lindner

In this part the experts from the University of Marburg in Germany only focused on a natural or near-natural environment and not on different non-formal learning environments (like geoparks or museums).

The learning environment for Physical Education usually is the gymnasium or gym hall, at least in Germany. In order to teach swimming that is compulsory in Germany teachers and pupils are visiting the swimming hall but not a pond or a lake and not the Sea or a river. This might happen while school classes are on a journey for a week but not as part of Physical Education. In order to teach running, jumping and throwing the learning arena is a gym hall or a track and field stadium but not the forest, the beach or the meadow. In the last two decades Physical Education teachers are more open to new activities. They have now integrated sports like canoeing, kayaking, rowing, sailing, surfing and climbing into the curriculum. Except for climbing that can be taught at an artificial wall in the gym hall all other sports are depending on a natural or near-natural environment like a lake or a river. These sports are therefore called nature sports. Of course these learning environments that are not standardised if you compare them to a gym or a swimming hall are offering different and valuable experiences and enhance the knowledge of the pupils.

Change of perspective
The activities in nature or near-natural environments can be regarded either in a context of sport that is connected to training and competition or in a context of adventure education[1] that is connected to experiences and „Bildung“[2]. To do a sport like kayaking or surfing also means to regard the environment as an arena. The river or the lake is not seen as a river or a lake but they become scenery for the activity. Referring to adventure and experiential education a research group at the University of Marburg (c.f. Becker et al. 2006b) is discussing aesthetic dimensions while individuals or groups are out in natural environments[3].

What happens on a hike through the mountains in the Alps? How do we as individuals perceive the mountain landscape? We see e.g. a lot of summits and ridges, slopes and crests, trees and plants; we might see clouds, the sunrise, the sunset and valleys. The fabulous nature setting might attract us more or less and we subsume the specific summit, the specific crest and the unique sunrise under our own concept of a mountain landscape. We only see and we only recognize what we know; based on our filter. It is more or less a rough observation.

If the specific is subsumed under the general nothing new (knowledge) will be generated (e.g. if all Swiss and French mountain pines are subsumed under mountain pines the specific looses its value). By the term of aesthetic experience of John Dewey it is not the recognition of the known but the process of perception that is necessary for education. To perceive means to analyse an object in this way that its characteristics can change habits and attitudes of earlier times. Recognition is a sight by which we only see what we know, so John Dewey. (Blohm 2003)

Looking closely as a technique of alienation
As mentioned above one normally has to use a fast and superficial perception in the daily life. This seeing evaluates things in reference to its attribute and practical value.

Having the same concept like Dewey the German pedagogue Horst Rumpf distinguishes between two kinds of seeing: A „look“ or a „close look“ that enables to see the unknown and the new on the one hand and a „glance“ which recognizes and classifies without rousing because everything is normal and known on the other hand. [4]This kind of encountering the world in the way one perceives it is not an act of awareness; it is an act of recognition.

To look close means to look at things as one see them for the first time, like unknown things that are not able to classify in an easy way. Rumpf (1999) describes a close look with getting a new sense that implies a slowing down, aggravation and displacement. To look closely, to feel into as one see it the first time, means to trace the unknown into the known. It is an experience that does not use the sense for a fast registration and recognition. Through this specific way the examination with the phenomenon gains another quality. Step by step more and more details are discovered in the assumed known landscape.

1. A structural analysis of the differences of adventure and sports has been made by Becker et al. (2006a).

2. The German term “Bildung” has no equivalent in any other of the European languages. Although the term Bildung, in the past has been translated into the English term “education”, this translation is seen as being to broad to capture the meaning of the German term. “Bildung” not only implies the dimension of teaching but also that of learning (“sich bilden”), not only knowledge and skills, but also values, ethos, personality, authenticity and humanity. The verb “bilden” is mostly used in its reflexive form (“sich bilden”).

3. The value of adventure activities like canoeing or climbing in a context of an educational process has been outlined by Peter Becker (2008a, 2008b).

4. „Und es wäre eine wichtige Unterscheidung gewonnen: die zwischen einem Hinschauen, das von Neuem, Unbekanntem sich betreffen ließe – und einem Blick, der wiedererkennt und einordnet, ohne sich aufstören zu lassen, weil alles normal und bekannt ist.“ (Rumpf 1999, p. 2f.)

And within the examination through the close look a mountainous landscape becomes a unique extract of the world. This kind of interest takes time, it takes a focus on the moment and on the objective, therefore decelerates and implies a resistance examination with a phenomenon. The German philosopher Martin Seel outlines that it is „the pausing which is the time of aesthetic nature, it is the merge in this kind of perception“[1].

Rumpf calls this procedure a “didactic of alienation” (Becker & Vollmar 2005). He asks to make the known into something strange that is valuable to deal with. This didactical approach will lead to a better or deeper understanding. As the observer is irritated by the strangeness he also is astonished about the world he is looking at. The astonishment itself is a special way of questioning the world and a way to develop curiosity and therefore questions about what one sees. Why is the landscape looking like this? Why is the water running this specific way? Why are these flowers at this place? Or why do the trees reach different altitudes on different sides of a mountain?

The benefit of using the close look is to recognise a way of encountering the world which is different from the daily one. On the one hand the aesthetic way shows the ability of astonishment and on the other hand it affords possibilities to reflect the different impressions of the close look.

Drawing instead of taking photos

Using the arts could be a method that could help to focus more on details without being to artificial, a way to invite people to get a deeper understanding of the world through an aesthetic approach[2].

Taking photos with a camera entices us to retain the moment and the place as it was in reality, to retain the moment and the place in order to remember them. The camera records the scenery totally unemotional and idealess. This technique seems to be perfect because it does not looses any details from the picture detail. But coming back to the ideas of Dewey and of Rumpf which are described above the unemotional and idealess recording might support the temptation not to look very closely, to remember but not to experience, to see but not to understand. Moreover taking photos might adjourn the processing of a situation into the future.

At the same time it prevents from a deep penetration from an “involvement in the hear and now”, like Horst Rumpf[3] is saying.

Drawing is a handicraft that is going through head, heart and hand (Pestalozzi). The first line on the white sheet is the starting point, the second line follows the first line and so on. The drawing develops part by part. By contrast with photographs, a drawing does not have to show everything.

The narrative power of a drawing lies in simplification: strokes are more intense in places that are important to the artist, and dissolve at less important details. Moreover, drawing is exciting because it is so authentic. This is also one response to the digital manipulation of images. Paradoxically, it is the apparent subjectivity and intimacy of a drawing that makes this medium more credible than a photograph.

Furthermore drawing is a part of deceleration, of leisure. The assessment takes some time. The deceleration also offers the possibility to extrapolate the object part by part. This kind of alienation (to bring the daily perception into distance) allows to see more than before. The former known becomes more and more unknown.

Questions are coming up. And because of the wish to draw what one see one will try to understand in order to finish the drawing.

1. „Die Zeit der ästhetischen Natur ist das Verharren, Verweilen, das `Aufgehen` in diesem Wahrnehmungsvollzug.“ (Seel, 1996, p. 196, translation by the author)

2. Using the arts was inspired by the work of the British painter, writer and social reformer John Ruskin (1819-1900). In arts Ruskin saw the possibility of understanding the beauty of nature. (Botton 2002)

3. „...es geht um Anwesendwerden im Betroffensein – um die Anwesenheit in einem Betrachten, das sich im Hier und Jetzt aufhält, in kontemplativer Gelassenheit, ohne auf Nutzwerte oder begriffliche Ausfilterungen, gar auf Leistungsbeweise erpicht zu sein.“ (Rumpf 2010, p.11)

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2.4 Learning science outside the classroom

By Alexandru Andrasanu

Science could be regarded as a coherent enterprise of organized knowledge and testable models and predictions offering a logical and rational explanation of the world. A study of European Commission (2004) states that "science is the systematic study of the nature and behaviour of the material and physical universe, together with mathematics, the social and economic sciences, and some branches of the humanities".

Science education is a key issue of modern society and different studies and policies arrived to the consensus that science should be a compulsory school subject (Osborn and Dillon, 2008). Science teaching is concentrated during secondary school, knowing that students` engagement or interest in science is largely formed by the age of 14 (Osborne and Dillon, 2008). At the European level there is a trend to extend the teaching of science down into the primary school and the early years, and make it compulsory throughout the secondary grades. The main objectives for science education are to develop a scientific literacy in order to prepare people to engage with many of the issues confronting contemporary society and to prepare young people to follow further study in science (EC, 2004).

Science curriculum is different from one country to another, in some countries science is taught as general science or integrated science whereas in others science is taught as separate subjects such as biology, physics, chemistry, earth science, geography (Mullins et al., 2009). In many cases science curriculum and teaching processes are split into 'subjects' and 'disciplines' that correspond to the academic classification of the sciences into research specialities. Even the curricular approach is different and covers only "spots "of the whole science realm or, even worse, parts of the model we have of the real world, there are common goals to be achieved: to enhance students` knowledge, understanding of science fundament, and make students to be curious and open minded and to become able to integrate theoretical and practical approaches.

Teachers are the key persons in presenting science to the students and prepare, moderate and evaluate the learning process and outcomes. They have to handle complex learning situations required by different science disciplines and student diversity in terms of cultural background and knowledge. Teachers` education plays a crucial role in the effectiveness and outcomes of science teaching. There are many situations where teachers are expected to learn on the job. In other cases there is an overemphasis on the structure of a subject discipline during teacher training, instead of on the learning process. An important concern is the way that knowledge from science education research could be implemented in curricula and teacher education – there is a significant gap between science education research and science teaching practice. The success of science teaching is related to teaching methodology, teacher selection, teacher training and the lifelong learning and professional development of the teaching workforce (PRIMAS, 2010). Professional development began to be recognized as an on-going process of teacher growth rather than a series of discrete remedial events to fix their inadequacies (Dass and Yager, 2009).

The assessment of science education has different approaches at different levels, national and international, focussing on different issues and grouped in four main categories:

1. Assessment of students` achievement relative to the curricula (IEA/TIMSS) or the assessment of more general students` competencies in science that are considered to be important in the present and future society (OECD/PISA). Unfortunately, these studies are often understood as international competitions, and results are presented as league tables with winners and losers (EC, 2004).

2. Critical reflections focussing on exploring the state of science education across Europe, an important example being the Nuffield Foundation seminars (Osborne and Dillon, 2008);

3. Assessment of the relevance of science from the angle of the learners and what young people themselves express as their concerns. For example ROSE project developed different instruments in order to test how to improve the relevance, attraction and quality of Science and Technology education and to gather information of emotional and attitudinal nature held by students (Schreiner, C., Sjøberg, S., 2004);

4. Policy analysis in relation to the education of young people in science and mathematics as part of the European policy for science and society initiatives (EC, 2004, EC, 2007, PRISMAS, 2010);

All these studies proved that science education is not an easy task and cross-cultural comparisons and the stress and tendency to harmonize and to become alike has to be in balance with local and national approaches (Schreiner, C., Sjøberg, S., 2004). There are voices stating that science education as practiced is not appropriate for the needs of contemporary youth and the "failure is caused by a set of unquestioned norms of practice or values, a set of fallacies on which present education is based" (Osborne, 2007) reflecting an old-fashioned view focused on 'fundamentals' of science which, all too often, are abstract and far from the science ideas which form the focus of debate of now days.

The potential of out of the classroom science education is a key issue, mentioned by different studies and strategies, but not formally integrated in practice in European formal and non-formal educational systems. Its didactic potential remains largely unexploited as revealed by the Association for Science Education Outdoor Science Working Group (ASE OSWG). In this report, among the six recommendations made, some mention the need to create connections with experts, advisers, existing good practitioners, and fieldwork providers and to develop a research programme to investigate the full range of educational impacts of field work in science (ASE OSWG, 2011).

In this context our In and Out project proved to be innovative in terms of cooperation between the educators from the formal and non-formal sectors, development of new approaches in non-formal education and extending the investigative work, and 'hands-on' experimentation in connection with the school curriculum. The project offered the chance of schools and science teachers to cooperate with other actors involved in science education like non-government organisations, scientific and educational communities, museums and educational centres. With my background in geology, I was interested during the project on the way earth science subjects could be integrated in out of the classroom activities, in concordance with the school curriculum.

Earth science education

To the broad public and school students there are few very popular subjects like dinosaurs, volcanoes and earthquakes but earth science is considered as a special issue and hard to understand. This fact is well expressed by IGEO Newsletter (2004) "although geosciences play a pivotal role in the wellbeing of people… it does not rank high in the eyes of the society. As a result, policy makers and bureaucrats make wrong decisions, brilliant minds do not pursue geosciences as a career and geosciences do not even find a proper place in school curriculum..."

The earth science curriculum in Europe ranges from specific courses in geology, to interdisciplinary courses related to Earth and Life as a system or integrated into the geography and biology curriculum, like in Romania. Even the curriculum is different, basically the content and especially the learning outcomes have to be similar. According to TIMSS documents (Mullins et al, 2009) secondary students should be able to provide description based on concepts of time scale, describe earth materials, some physical process and geological events. Students are expected to interpret and use maps, differentiate between daily weather change and general climate, know about natural resources and their uses. Also they are expected to have some knowledge of the solar system and how phenomena on Earth are related to cosmic phenomena.

A comparison of different curricula content is difficult to be made but we can identify six major basic themes as compulsory for earth science education:

1. Geologic time "deep time" is considered by Trend (2008) to be "at the heart of geology and providing a context for many topics within the geosciences".

2. The Earth system both as an entity and as part of the Solar System. Basic understanding and observing the relationship in complex natural systems and the relations between its subsystems: lithosphere, biosphere, atmosphere, hydrosphere and their evolution through time. Development of the capacity for a holistic approach in understanding connections among subsystems and the environmental threats we are facing today;

3. Visualizing the Earth components and their spatial and temporal relations, in order to develop visual representation of natural bodies and process, mental capacity for 2D and 3D models, capacity to understand maps and diagrams;

4. Practical application of knowledge both inside and out of the classroom. The capacity to recognize rocks, fossils, processes and patterns, and to analyze the quality and certainty of observational data supporting earth science concepts;

5. Understand and use of specific terms, concepts, models which is also basic requirement in every educational field;

6. Understand the role of natural resources, their exploitation, sustainable use, and conservation. Perception of Earth heritage as the valuable part of global and local cultural identity.

These themes could be broken down into more specific items and compared with existing earth science education curricula. For a national survey in Romania we identified 23 major items (see table 3) and a qualitative evaluation was done for existing curricula, programs, syllabus, student books in geography and biology for secondary schools, as the only disciplines teaching earth science. A synthesis of our evaluation is presented in Table 3 (see next page).

Table 3: Synthesis of qualitative assessment of selected items as reflected in different official documents and school books for secondary school.

Items assessed	Existence	Definition	Graphic support	Exercises	Applications	Skills development
Mineral and rocks	*D*	*D*	*P*	*N*	*N*	*N*
Earth structure	*D*	*P*	*Y*	*N*	*N*	*Y*
Plate tectonics	*D*	*Y*	*Y*	*N*	*N*	*N*
Orogens	*D*	*Y*	*Y*	*Y*	*Y*	*N*
Volcanism / Volcanoes	*D*	*D*	*Y*	*Y*	*N*	*P*
Continental drift	*D*	*Y*	*Y*	*Y*	*N*	*N*
Erosion, relief	*D*	*D*	*D*	*D*	*D*	*D*
Continents and oceans	*D*	*D*	*D*	*D*	*Y*	*D*
Rock age	*Y*	*N*	*N*	*N*	*Y*	*N*
Time scale	*D*	*Y*	*Y*	*N*	*N*	*Y*
Life evolution	*D*	*Y*	*Y*	*Y*	*Y*	*N*
Fossils	*Y*	*N*	*N*	*N*	*N*	*N*
Earth through time	*D*	*Y*	*Y*	*N*	*N*	*N*
Major biologic events	*Y*	*Y*	*Y*	*Y*	*N*	*N*
Soil	*D*	*D*	*D*	*D*	*D*	*D*
Water cycle	*D*	*D*	*D*	*Y*	*D*	*Y*
Earthquakes, landslide	*D*	*Y*	*Y*	*Y*	*N*	*Y*
Anthropic impact	*D*	*D*	*D*	*D*	*D*	*D*
Earth resources	*D*	*D*	*D*	*D*	*D*	*D*
Earth heritage	*D*	*P*	*P*	*P*	*P*	*P*

D - detailed description of the item; **P** - partial description of the item; **Y** - presence of the item; **N** - absence of the item.

The main conclusions of this survey are that all items are part of the educational materials for secondary schools and, for the most part, are quite well defined and illustrated. The weak points are represented by the application of knowledge outside the school and skills development for hands on activities in the real world.

A second survey tried to find out the progress in terms of knowledge and interest of secondary school students for natural environments and field work. Our aim was to examine the ways in which children understand, interpret and engage with nature and particularly the way children are using or understanding earth science issues already presented as part of geography and biology secondary school curricula. I need to mention that geography is compulsory from 5th to 8th grade and biology is compulsory from 6th to 8th grade.

The relation between children and nature, children's perceptions of nature components, attitudes and experiences of nature is a complex issue regarded from the perspective of losing contacts as a consequence of shifting to the indoors. The subject of perception is very sensitive and difficult to assess and Trend (2009) stressed the need to distinguish between type of interest (situational or individual) and focus of interest (entire subject or just a topic within it). The study is only a pilot one and more in-depth research has to be done in order to refine the evaluation and to have an accurate perspective of the children's perception of nature.

Eight schools from rural areas and a small town were selected and a total of 400 students from years 10 to 14 representing the 5th, 6th, 7th and 8th grade answered to questionnaire under teacher supervision, with an average of 100 questionnaires for each grade. Open-end questionnaires were designed to avoid to influencing student`s terminology.

The children`s perception was evaluated in terms of interpretation, interest and attitude. Each one the answers allowed us to identify what children have considered to be the main components of nature, their roles, areas of interests for further educational activities and the ways children are foreseen to engage with nature (earth system). A comparative analysis of the results shows that there are differences between 5th grade students and the older ones in terms of nature interpretation. For the 5th grade children nature means 100% plants and animals. For the other ones only 50% see nature as living things and the other 50% see nature as a sum of plant, animals and other elements, grouped in the general term "environment". There are no big differences between the answers of children from rural schools and those from town schools. Earth science items issues are present mainly in very general terms like mountains and relief and only few in more specific ones (dinosaurs, volcanoes, soil). The approach of natural elements is positive and for the most part children are interested to know more about them but mainly in a passive way: to be guided by specialists or through the internet or to read more. Fewer students are interested in filed works, hands-on activities or nature conservation activities. Out of the classroom activities are seen as relaxing field trips (excursions) and not as learning activities. The data suggests that students' perceptions of nature do develop throughout secondary school becoming broader but no more sophisticated, e.g. moving away from plants and animals to being more about environment but no more details about its components. However, the data also illustrates that there are no variations between students in the same year.

The ways of improving teaching earth science should include a large variety of activities such as school-based curriculum development, professional development and training of biology and geology teachers for secondary schools, and combining the out of the classroom activities, computer learning environment, and laboratory experiments.

Learning earth science out of the classroom

Teaching earth science out of the classroom seems to fit very well with the need to go into nature and study different types of rocks, strata as time record, faults, folds, fossil, soils, recent sediments and different natural phenomena. The first thought I had at the beginning of the project was that will be easy to find appropriate places where an important part of these features could be observed and explained, in concordance with the school curriculum. As usual, the reality is different. When we have visited the four selected places in Denmark, Germany, Sweden and Romania to plan the subject courses I discovered that only two of them have some geological features: the sand dunes along the sea shore in Denmark and the wetland area in Sweden with a few boulders of metamorphic and magmatic rocks left over by the former ice sheet melting. In Germany the place was a few hundred meters of plain area along the sandy right bank of Lahn River and in Romania a botanical garden, an open air museum and a geologic museum. In that moment I started to envy my colleagues from different geoparks developing interesting geological trails or the international team of the NEED project and their excellent educational package dedicated to field activities (Ronan et al., 2010). After several group discussions with the project`s members and Guy Martini, our external advisor, I realised that is an interesting challenge to teach earth science issues in places we have chosen and where no obvious geological features are present.

In order to design out of the classroom activities we need to answer to several basic questions. The first one is *"why to go outside the classroom?"* This question is obvious because it was one of the objectives of our project but this objective was based on different studies and reports (Braund and Reiss, 2004; HC, 2005, ASE OSWG, 2011) indicating there is clear evidence that education outside the classroom is of significant benefit to students, enhances the teaching of science and other subjects, develops social skills and gives self-confidence. According to Braun and Reiss (2004, p 4) "Science is indeed hard to learn as much of the research into children's learning has shown. Yet, when pupils visit or are taught in places that explain science in new and exciting ways, they frequently seem to be more enthused. There is, we believe, something about these contexts and places that brings about change through increasing the desire in people to find out and understand more."

A plastic conclusion comes from ASE OSWG report on outdoor learning (2011) "the study of biology, geology and the rest is a living experience, and without fieldwork it can be (and often is) killed stone dead".

A second question is *"where to go?"* To have a good answer we have to consider education outside the classroom in its full sense and not just a school trip (HC, 2005). Out of the classroom learning could take place in many different settings depending on some limiting factors (see table 4) and on the significance we assign to a certain place, the so-called "concept of place".

Table 4: Limiting factors in choosing a place for out of the classroom learning activities in earth science, biology and geography

Limiting factors	**Comments**
Safety regulations	*Risk or the perception of risk is one of the main limiting factors in organising out of the classroom activities due to the need to be in accordance with health and safety rules to avoid accidents or claims against teachers and the increasing bureaucracy related to. Safety conditions means also places away from noise, traffic, pollution, dangerous animals, poison plants, rock falls, other possible hazards, places that keeps students focused etc.*
Teacher involvement	*The need for a proper organisation, with clear educational objectives, curriculum oriented, in concordance with safety rules, with trained teachers and motivated to take part and manage in a proper way, partnership with training canters.*
Clear teaching objectives	*The objectives could range from specifically oriented subjects (rock types, faults, landscape, fossils, flora and fauna, habitats, soils) to specifically oriented topics (water and air quality, waste management, walking trails, natural and constructed areas, museums, visiting centres, botanical gardens, factories, research institutions, farms, sense of place)*
Non-formal sector support	*Existing facilities or support for out of the classroom activities offered by existing educational or visiting centres, museums, visiting trails. Educational programs offered by the non-formal sector: School forest (DK), Stone, water, Ice (Northern countries), Junior rangers (DE, RO), European Geoparks Week (50 territories from 19 European countries) etc.*
Time	*According to the teaching objectives, costs, safety conditions, distance from the school (locality).*
School policy	*Safety rules, teacher training system, financial support, partnerships / networks, publicise the benefits, assessment*
Parents and community support	*Support for school out of the classroom programs, grants, local or national policy, rewards, support offered by different associations*
Costs	*Cost of transport (accommodation if is the case), subsistence, proper equipment, safety equipment, guidance, working tools (lenses, hammer, compass, plastic bags, boxes etc.)*

There are numerous studies dealing with the "concept of place" and its role in education and culture. A place is not only a geographical location but is also a subject to be interpreted and used in education (Batford, 2012), or could be a subject of stories (Stewart, 2008), or an overlapping of five different dimensions (Grunewald, 2003, p 627), or a space shaping our learning experience and our lives (Greenwood, 2009, p 1). In our approach related to earth science learning objectives we consider in a first pahse the place as a 3D space, a tridimensional piece of Earth that could be divided in separate components as materials: living things, buildings, roads, pounds, lakes, rivers, soil, relief, rocks, wood etc. All these elements could be identified, described, measured, named and some of them oriented in space (cardinal points) and plotted on a map. Measuring the distances between different elements, identifying their borders we can draw 2D or 3D models. Also we try to identify natural phenomena taking place or the traces of former ones as interactions between Earth subsystems: lithosphere, biosphere, hydrosphere and atmosphere.

In a second phase we can imagine our place as part of a time evolving landscape. A good description is offered by Ingold (1993): "Imagine a film of the landscape, shot over years, centuries, even millennia. Slightly speeded up, plants appear to engage in very animal-like movements, trees flex their limbs without any prompting from the winds. Speeded up rather more, glaciers flow like rivers and even the earth begins to move. At yet greater speeds solid rock bends, buckles and flows like molten metal. The world itself begins to breathe. Thus the rhythmic pattern of human activities nests within the wider pattern of activity for all animal life, which in turn nests within the pattern of activity for all so-called living things, which nests within the life-process of the world". In this way a time dimension was introduced, the geologic time (deep time) a threshold concept in earth science education and understanding of Earth's long history (Trend, 2008).

A threshold concept as defined by Mayer and Land (2008) is an "akin to a portal, opening up a new and previously inaccessible way of thinking about something. Example of threshold concepts are the complex numbers and the limits in mathematics, signification, in literary and cultural studies. In geology deep time is considered a threshold concept, also the specific language and the understanding of space as an overlapping of different meanings and continuously changing in time.

A threshold concept is related to troublesome knowledge – knowledge that is 'alien', or counter-intuitive or even intellectually absurd at face value (Mayer and Land, 2008). In every subject is important to know about threshold concepts and the direct connection with troublesome knowledge as defined by Perkins (1999). He argues that conceptually difficult knowledge is encountered as troublesome in all curricula but perhaps particularly in mathematics and science. Some examples could be given: the failure to apply mathematical techniques to science studies, difficulties to explain the mathematical functionality behind a diagram, difficulties to connect and integrate conceptual scientific topics or models in the world around, the mix of misimpressions from everyday experience and the strangeness and complexity of scientists' views of the matter.

Educators could foster secure meaning to these "threshold "concepts by stimulating cognitive, emotional and intrinsic elements of interest, including a curriculum designed deliberately to take individual learners through several phases in the growth of their deep time or interest (Trend, 2008). Learning outside the classroom in different places is an important piece of the process and creates strong personal emotions and hands-on experience. The time line and "deep time" could be introduced in specific places by different regular events that could be observed or imagined (succession of day and night, succession of seasons or birthdays etc). Time history is based on changes and events: the growing up process, different personal events, age of the trees, age of the buildings, historical events, geological events or phenomenon (Ice Age, former environments, dinosaurs extinction) that could be added to the imaginary landscape film.

The places we can select for out of the classroom activities could be grouped into two main categories: outdoor ones and indoor ones. The outdoor space is very diverse but taking into account the above report between wild nature (especially geological features) and human settlements or build infrastructure could be grouped in three main categories: natural places (wild areas like natural mountain protected areas, geoparks, or not-inhabited areas), semi-natural places where anthropic impact is present but not dominant (parks, botanical gardens, rural areas) and totally inhabited areas where space is dominated by built infrastructure (cities, villages, industrial areas, open air museums, science lands). All these areas could be seen as 3D models of Earth spaces made of local and alien raw materials mixed in different degrees, an overlapping of tangible and intangible heritage and part of evolving landscapes.

If we classify the indoor places from the point of view of earth science learning objectives these could be placed in several categories: spaces related to natural science (exhibition or collections of rocks, fossils), places that reproduce natural phenomena (research centres, laboratories, greenhouses), places for learning and research (universi-

ties, institutes), places for education and public awareness (geological museums, visiting centres) and other types (other type of museums, factories, memorial houses etc).

The last question is “what to do outside of the classroom?” The main objectives going outside is not just to offer a conventional school science lesson, but to achieve “changes in pupils‘ attitudes to science and the values that they place on the process and modes of learning that they encounter in contexts beyond school”(Braund and Reiss, 2004, p 4). One of the main subjects of our discussions during the project was about the objectives and content of teaching activities and agreed with the idea that out of the classroom means a different context, different learning objectives, and different approaches of curriculum-related subjects and to combine them with language exercises developed by Eva and Katarina and mathematics by Mikael. As Martin stressed if something can be done inside is not the case to be done outside, and adding Karen`s advice proved by Mikael: no laminates outside!

In order to define the learning objectives first we have to cope with the offer of different places in terms of earth science subjects (materials, systems, time, and process, and resources, natural and cultural heritage) with general items of earth science curriculum. Table 5 presents the results in terms of degree of presence (from (+) to (++++)) or absence (-).

A close overview shows that almost all places (A ,B, C, D, E, F, G, and H) have enough elements to be used in teaching earth science in certain degrees. The places we selected for the subject courses could be placed in category D for Germany, B for Denmark, D for Sweden, and D, E and G for Romania. For the subject course in Romania for a better cover of earth science curriculum by out of the classroom activities a three day module was designed, each day covering a specific subject. For the first day in the botanical garden the main subject was space: its components and representation in simplified models - a map. On the second day in the open-air Village Museum the main subjects were the relations man – space/ space – time / space - man.

Table 5: Degree of coverage of curriculum items in earth science in outdoor and indoor places

Main curriculum items in earth science	**Type of out of the classroom places**							
	Natural		*Semi –natural*		*Inhabited places*		*Indoor*	
	Geology dominated (A)	*Other (B)*	*Geology dominated (C)*	*Other (D)*	*Extensive use of natural raw materials (E)*	*Other (F)*	*Related to natural science (G)*	*Other (H)*
Geologic time, Earth history	++++	++	+++	+	++	+	++	+
Earth`s subsystems relations, evolution holistic approach, environmental threats	++++	++	+++	++	+	+	+	+
Earth components (biotic and abiotic), borders, spatial and temporal relations	++++	++	+++	++	++	+	+	-
Visual representation of natural bodies and mutual relations, 2D and 3D models, Drawing and understanding of maps and diagrams	++++	+++	+++	++	+	+	+	-
Recognize rocks, fossils, processes and patterns	++++	+	++	+/-	+	-	++	-
Understand and use of specific terms, concepts, models	++++	++	++	++	+/-	-	+++	+
Natural resources, exploitation and use	+++	+	+++	+	++	+	+	+
Landscape evolution	++++	++	+++	++	+	+	-	-
Tangible and intangible geological heritage	+	+/-	+++	+	+	+/-	++	+
Stone made objects	-	-	+++	+/-	++	+	++	+

The third day in Geological Museum was dedicated to combining scientific methods (hands-on geologic activities) with the language and senses. The module is described in a separate chapter.

In planning out of the classroom activities we have to adapt the learning objectives to the place components in comparison with the curriculum and syllabus. An useful tool for long term preparation, development and evaluation of out of the classroom activities is Bloom`s taxonomy diagram (Bloom, 1956, Krathwohl, 2002), that allows one to follow the evolution of tasks and outcomes from the simplest to the most complex. The method is easily understood and is widely applied offering the possibility to compare your own work with other groups work in the same field.

In our case for subject course planning we used the criteria proposed by Malene Bendix and Karen Barfod (2012) and presented by Mikael for mathematics in this book (Skånstrøm, 2012) to define the objectives, activities, outcomes and evaluation criteria. As an example we are presenting the short description for the first day activities in the botanical garden in Bucharest. According to table 5 the place is of category D and some of the earth science syllabi items could be identified in certain degrees. In this case the main objective of all activities will be to realize a 2D model of the place that means to map the place.

Regarding 1:
The syllabus for earth science must be visible
A map is an accurate graphic representation of cultural and natural features on the ground, and has to present natural and manmade features at a certain scale, use contour lines (depending on topography), assign names to different features, be accurate and objective and transferable. While drawing the map students will work with:

- identifying natural elements (tress/forest, pounds, relief/ local irregularities) and manmade components (alleys, stairs, buildings) and their borders and contacts;
- measuring and calculating distances, surface, spaces
- identifying cardinal directions using the Sun`s position or a compass (that could be built on the place using needles, leaves and cups of water). Introduction to Earth /Sun relation in the Solar System and the magnetic field and magnetic properties of different materials;
- create a model of a real world which is a rough approxi mation of reality and have to decide which components are more important to select for this model
- use mathematical tools, concept and competences in connection to daily life
- identify raw materials and if they were reworked and how and by who (cultural heritage)
- measuring the age of the trees directly (tree rings) or indirectly according to species / year growth ratio. Identifying the names of tree species and the difference between popular names and scientific names (Linnaean taxonomy) used both for plants and animals, living ones of fossils
- introduction to time line and measurement methodology. Relative time and geochronology (trees` ages based on direct measurements)
- recognise the possibilities and limitations of observation methods and the role of observation in scientific method
- development of strategies and methods for objective observation of real world elements
- test, organise, reason and generalise with science problems
- identify and name landmarks. Objective and subjective description of objects
- test the transferability.

Regarding 2:
Work indoors and outdoors must collaborate
The results could be taken indoors to draw graphics, compare with Google Earth or other types of maps. Integrate the map into larger ones and connect with other natural and man-made features, work on the issue of map scale and mapping the Earth surface.

Regarding 3:
The students must work together
The problem needs team work and cooperation. One person to measure, one to take notes, another one to identify the main features to be mapped and described. The work requires also interdisciplinary knowledge and different types of skills. The work will be organized in teams; each team will map one area then cross-check the maps and finally unify them into a bigger one.

Regarding 4:
The students must work with actual situations and clear and relevant goals
There is a strong connection between practice and theory. This is relevant because the theory is trying to depict the reality and somebody could use the map to orient or to find the “treasure”.

Regarding 5:
The teaching must be oriented towards problems/ tasks and linked to practice
To be able to map the natural and man-made elements of one space the students have to be able to solve problems of measurement of spaces, distances, heights and to also identify species, calculate, use models, and produce a model to be used by others.

Regarding 6:
The students' work and understanding must be supported by the outdoor surroundings
The final map will be a simplified model of that space reality, is unique. The skills acquired could be used to draw the map of another place, but the results are totally different. Only the concept is similar. The students have to identify and select the elements to be measured and mapped themselves.

Regarding 7:
The course must include experiences that stimulate the senses
Actually the students are directly involved also in an activity of interpretation of a natural place for themselves and for others. Following the Tilden`s principle (1957) that any interpretation relates to something within the personality or experience of the participants. Individual work and team work are combined. Each student has a specific role adapted also to his personality and skills and will remember his role and his activities in relation to the others but also in relation to different space elements, including smell, noise, sounds.

Regarding 8:
The course must be evaluated, rounded off, put into perspective, and reflected upon so that experience and action become knowledge and understanding
The final map is a product of individual and team work, and also with inputs from the teacher and other sources when returning indoor. There are several ways evaluate results including self –evaluation, colleagues` evaluation using the map of the place, from the teacher and an external evaluation done by comparison with Google Earth or other maps. All the notes taken are used for on place activities but also for indoor activities in other lessons or disciplines: mathematics, physics, and biology.

Regarding 9:
The teacher must be able to 'sit on his hands'
The activity is broken down into subsequent exercises, each with specific objectives and evaluations (see the module presented in this book). Some of the results of each exercise are used or related to the next one. The teacher sets the objectives, describes the methodology and gives instructions. Then all activities are left to the students. In the process the teacher is supervising for improvement, new connections with other subjects, and redesigning subsequent exercises. All activities are done by the students and the final product is the result of their work for them to be proud of.

The main learning outcome of the course is the shifting in perception of space, time, and the science-real life connection. Students could start to understand that each place is part of some larger territory and, regardless of location, it is possible to identify the continuous interaction between spatial and non-spatial realities (phenomena, process), shaped by its physical structure (geodiversity), biological structure (biodiversity) and human activities during its historic evolution. Each place still bears the traces of these interactions and both physical structure and tangible and intangible heritage define a place and these could be identified, measured and modelled to certain degrees.

An interdisciplinary approach to places, the continuous interference of mathematics, language, science knowledge, methods and models for the same place help students to understand that nature is studied in separate disciplines for didactic or historic reasons only in schools. Quoting Edgar Morin (1999, p16) "minds shaped by disciplines lose their natural aptitude to contextualize knowledge and integrate it into its natural entities. A weakened perception of the global leads to a weakened sense of responsibility (each individual tends to be responsible solely for his specialized task) and weakened solidarity (every individual loses the feeling of his ties to fellow citizens).

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3. Review on testruns experiences – an evaluation of Foundation and Subject course

By Karen Barfod

This article draws up the main conclusions we have on the evaluation of our test runs, when we held courses for a dual target group concerning learning outside the classroom. It is a condensate of discussions, formal evaluations and reflections upon our test runs conducted in the four partner countries of this project with different cultures, experiences and habits in the cooperation between the two main target groups of the project. As a condensate, some points of views have been left unattended, and some have maybe not been given the space that they deserved.

The basis for the conclusions is a five step ladder that we have climbed during this project:

- Project group studies, discussions with external advisors and development of the first test run (foundation course)
- Carrying through and evaluating the first test run
- Discussions in the project group, follow ups on the evaluations, refinement and adjustment of the course
- Second test run (subject course) carrying through, evaluating and adjusting
- Discussions in the project group, refinement and getting to the main common advices presented here

Bringing two target groups together with the aims of strengthening the cooperation, and working with an outside the classroom approach to learning, using non-formal learning environments has given us challenges and new insights. To develop the courses, we have used intensive evaluation strategies (see box 1) and a flexible program that has been changed due to the local conditions (e.g. places to go, participant backgrounds and so on), participants evaluations and proposals and systematic lecturer evaluations. But from the beginning, there has been a clear line in the methodology that has been used.

The two Courses

From the beginning, we planned to have the course package divided into two parts – The Foundation Course with a basic theoretical approach and methodological testing, and a second Subject Course, where we unfolded the methods in a more specific curriculum based approach.

The first part, the Foundation Course, was planned due to the principle of "Learning about learning outside the classroom by doing learning outside the classroom" (VIA, 2010). The participants heard and read basic theoretical approaches, e.g. the ideas behind experience based education, but they also participated in a lot of hands-on activities. These activities were reflected upon due to models of different approaches, and the experiences were discussed in smaller groups.

The second course, the Subject Course, was planned with more hands-on practical exercises and more visits at places of learning – museums, geoparks, the river Lahn and so on. The purpose of the test-runs was to demonstrate that it is possible to make cross-curricular and subject related curricular activities and to test the cooperation between the dual target groups. Furthermore, the idea was to show that the content of the learning can change according to the place, how the place can be the resource of learning. The purposes of the test runs have been fulfilled satisfactorily. Precise descriptions on the activities can be found in this manual. During the courses, focus was on the cooperating and exchange-of-knowledge part in the group, and with less focus on the "expert knowledge". That is, there were scheduled parts with discussions between the participants, and the participants had to teach each other. We also went to the specific places (e.g. museums), where some participants worked.

"Nice that we are mixed museum staff and teachers" (DK), "are convinced that all participants understand the benefits of both non-formal education for educators and trainers. I'll probably do a collaboration with a provider of non-formal education presented the course." (Participant of the Foundation course in Romania). One of the main objections against the Foundation Course – in spite of we thought there was much activity – was that it was too sedentary: "To much chair Wednesday" (Participant of the Foundation Course in Denmark). The second test run had much more activity, e.g. participants doing subject specific exercises outside and at the museums, and this was rated much higher: "Different kinds of activities, Open ended activities" (Participant of the Subject Course in Sweden), "Lots of very good activities, not only subjects" (Participants of the Subject Course in Germany), "Practical exercises, nice to see so many practical exercises" (Participant of the Subject Course in Romania).

The Foundation Course[1]

Goals:
- To provide the qualifications needed to use learning outside the classroom[2] as a didactic teaching approach
- To bring the dual target group together by providing a common ground, knowledge and understanding of each other`s professionalism in order to establish the best possible interaction and ensure qualified and innovative teaching in the schools.

Content:
- Place based learning, experiential learning and sociocultural learning theory
- Teachers role at resource centers (e.g. museums)
- Potentials in formal and non-formal learning environments
- Practical exercises and hands-on experiences
- Evaluation

Methods:
- High level of participant contributions
- Lectures
- Discussions (group work and exchange of knowledge)
- Observations and visits to non-formal learning environments
- Analysis and synthesis (SWOT)

Evaluation:

The main conclusions on the first test run were:
- The dual target group enhances the outcome of the course.
- The participants are very happy to work and visit and are less happy to hear long lectures.
- The participants emphasize the importance of time for exchange of knowledge.

The Subject Course:

Goals:
- To integrate curricular subjects into learning outside the classroom in the cooperation between the two target groups, with focus at Mathematics, Language (mother tongue), Science and Physical Education.
- To facilitate interdisciplinary discussions and exchange of knowledge between the two target groups.
- To create a base for further cooperation between the two target groups in order to enhance the learning processes of the pupils.

Content:
- Place based learning, experiential learning and sociocultural learning by practical exercises. Working holistically across curricula, but still having subject experts to sort out the subject relevant parts
- Visits and work at selected sites, working with the place as the content of the learning
- Practical exercises and hands-on experiences, presentations by course participants
- Focused networking and future relations
- Evaluation

Methods:
- High level of participant contributions
- Practical, open-ended exercises
- Discussions (group work and exchange of knowledge)
- Observations and visits to informal learning environments
- Analysis and synthesis (SWOT)
- Small written task

Evaluation:

The main conclusions on the second test run were:
- The course is meaningful, and there are huge possibilities at the selected sites and that the interdisciplinary approach can offer much to the learning process.
- The dual target group enhances the outcome of the course and work together in a very positive way.
- The participants are very happy to practical exercises, selected sites, work and interactions.
- The participants emphasize the importance of spending time to exchange knowledge and experience transfer.
- The participants want to continue the network started here, and have made agreements on a "exchange of ideas and experiences"-day next year (DK, RO)

Texts:

To send out texts to the participants before the course has several advantages. The participants prepare themselves mentally on the content and the area of the course, and they gain some common background for discussions and workshops.

But it is always difficult for the participants to get time to read in advance, as many teachers only get there time paid 1:1 when they attend courses – that is, that they do not get any time to prepare themselves.

1. A detailed presentation of one of the courses (RO) and some of the common activities can be found in following chapters.

2. This is more or less a quotation from our application, but as we have grown wiser, the term "outdoor learning" has been changed to "learning outside the classroom", as it is a common understanding that "Outdoor learning" is very connected to nature, and does not always include learning in other environments outside the classroom, e.g. as museums, geosites and so on

After the evaluations on the first course, where the participants actually wanted to have known more before they came, we decided to send out some material, so the participants had the opportunity to read in advance. In the SurveyXact evaluations very few participants stated, that they have read the articles. Most common "excuse" was lack of time and that the articles were in English.

Conclusions for all test-runs:
About the frames:

1. Duration of the course
2. Target group
3. Places and time
4. Lecturers from both worlds
5. Course leader

Ad 1: Duration of the course
Three days gave us the opportunity to work continuously and intensively, without losing focus. When we continued 3 days, it gave us the possibility to follow up on processes, and continue discussions from the day before. As the courses actually consisted of 2 courses, divided by a year but with the same participants, it was like meeting old friends again and continuing the flow of knowledge development and exchange. "3 days in a row" (DK, good things)

Ad 2: Target Group
Be sure that there is some kind of balance in the participants group between the two target groups – this can be supported by disseminating the courses in many ways and at many places before start. It is our experience that it is good if there are more less the same number of participants from each target group. Central in this work is communication on all levels and in many ways. So we planned both to tell our network about the courses, to send out invitations to websites, personal invitations, radiobroadcasts and so on. This did also open cooperation with new partners and learning environments, e.g. some organisations that we did not work with before, and for many of us the concept of Geoparks, that we did not knew existed from the beginning. The dissemination before the courses and the recruitment procedures are of great importance for the success of the courses, as the participants input during the courses is so important.

Ad 3: Places and time
The courses could be held as overnight boarding, with common meals and sleepovers. If this is not possible, prepare to take the participants to different settings, e.g. museums, nature and so on. In most of the test runs, participants went home after each day. As the course was so intensive, many participants wanted to "stay in the flow" and be in the group during the meals, the spare time and so on. Given the opportunity for this, the networking part would have had even bigger impact, and the courses would also be accessible easier for those that do not live in the vicinity. So, if possible, arrange some "getting together" meals, bonfires, sleepovers together. In the evaluations, this was pointed out several times: "Spend more time together. To organize a field trip for two days and spent the time together" (participants review from Romania), "Sleepover for everybody – to experience the deer etc" (participants review from Denmark)

The work we did using different places, mostly on the second test run - e.g. the raft at the river Lahn (GER), the peasants museum, arts museum and nature (DK), the landscape and the cityscape (SE) and so on - was very high rated. It also forced the lecturers to use the nearby environment as the learning arena and challenged them. The participants commented this: "Very different places different days" (participants review from Sweden), "Very good to work at "a place" (participants review from Romania), "Well chosen places – Hjerl Hede and Bovbjerg fyr" (participants review from Denmark)

Ad 4: Lecturers from both worlds
Invite professionals as lecturers from both groups, as the approaches to learning are different. As this project originated from institutions taking care of the in-service teacher training and the post-graduate training of the guides etc, the approaches mainly stemmed from the school sector. It is very important to know the theoretical input from both sectors, and having not all the competences "in house", it is important to invite people from the other world. What we experienced during this project is, that all institutions, museums, geoparks and so on we asked, were very helpful and willing to cooperate. It is also very important, to visit some of the places represented by the participants – it gives respect, ownership and new insights for the rest of the group. The planning of the course should be done by the lectures in common. And a continuous person – a course leader – is good to take up questions and lead the discussions. If the places are the content of the course, then the lecturers need to have seen the places upfront.

Ad 5: Course leader
The lecturers and the course administration need to be very flexible and the weather can be a challenge and make the conditions difficult. And a person who follows the group and take part in all the activities can be able to "show the red line" and follow upon questions. In this context, with many participants usually being in charge and leaders, and with a group of responsible project members, it must be clear WHO the leader is and who makes the decisions, e.g. on having the lunch a bit earlier or continuing the exercise for a while and so on. A course leader would be that person.

About the content:

1. Practical sessions important
2. Exchange of knowledge
3. Open Questions
4. The approach
5. Cross-curricular

Ad 1: Practical sessions important
Participants evaluated the practical sessions and the visits as the most important in this course. During the first test runs, several visits and a lot of exercises showing important principles of learning outside the classroom were conducted. Even so, the participants wanted more time spend out at the museums, in nature and so on, and more activities. A very delicate balance between "hands on" activities and theories, reflection and development must be drawn in this kind of courses. In the subject courses, we worked with how to use the subject at this place, both with examples "best practice" and by letting the participants make their own activities. These parts were very useful and very well evaluated. You can find examples in this manual. From the evaluation: "Super with so many practical activities" (Participants evaluation, Denmark

Ad 2: Exchange of knowledge
Sharing knowledge has to be frameset, e.g. not only in time but also with some methods. As the participants are such a resource of knowledge, a systematic approach for sharing knowledge can be useful[1]. We scheduled "Exchange of knowledge" sessions, and developed methods for it – e.g. that the participants should each tell, in small groups, 10 minutes about one experience of taking pupils out of the classroom – and the others could ask, and discuss. The Danish Ministry of Culture (Brændgaard, 2010) point out, that discussions and work together between schools and museums should be enhanced.

From the evaluations: "Exchange of experience between teachers and museum staff", "Nice with a lot of people with different background" (Partcipants evaluation, Denmark), "Lot of exchange of knowledge" , "Good cooperation between the different target groups" (Participants evaluation, Romania), " Exchange of knowledge across institutions and subjects" (Participants evaluation, Denmark)

Ad 3: Open questions
It is important to give the participants very open questions, both on practical exercises and on discussions. As we do not know the backgrounds of the participants before the first course, it can be hard to describe and plan all the exercises before the course. E.g. you never know what mathematical questions you can ask, and what qualifications in your subject participants will have before the subject test run. Mikael Skånstrøms essay about how he developed his approach as a mathematic lecturer during the test runs are very descriptive. The themes for discussion could be (examples from the German test run):

- Are the activities related to certain subjects (like maths, or language)? Are we solving problems by using also aspects of maths and language?
- Importance of hands-on-experiences in order to understand (in German "BEGREIFEN")
- Is it an applied didactic approach or is the task coming from the environment (e.g. counting the acorns underneath an oak and measuring the speed of the raft or of the river)?

From the evaluation: "Very good to develop methods in order to solve a problem (in school usually the other way, first the method then the problem)", "The activities had a link to the subjects but they are more related to something else. This is quiet good because the subjects would divide the problem into different parts. Thus it is less understandable." (Participants evaluation, Germany), "Focus on ideas and inspiration" (Participants evaluation, Sweden)

Ad 4: The approach
The approach is a part of the content, as this course is a matter of how to set up situations to learn in, and at. As we chose many different approaches, it was of importance to reflect upon the setup and the derived understanding. This course package should be not only a pocket full of good ideas, but intends to give the participants tools to develop their own classes and courses in many subjects and on all levels.

In the second course, the subject related course, we tried to create a link between places and people.

One of the exercises was about a place – a context – a question – and was a surprise to people that was in the group – to discover the place – we were there to guide and to help the groups in the right direction. This has been described in "The science expedition", were participants have to use their knowledge about their subject and use it at a certain place.

1. See also the paragraph "Themes for discussion"

"It is important to be involved. It is the didactical question of "how the issue is coming into the mind of the participants". When do we as a teacher or a counsellor should intervene?" (DE)" That we made and showed our own working methods" (DK, good things)

Ad 5: Working across curricula
Despite this project`s focus on the subject based curricular content, working across curricula can be useful. To view a place, an object or a phenomenon from different points enhances the experiences and makes the learning more holistic. The use of many experts on each place opens up the eyes of the spectator to learn more about the place – e.g. not only the biology, but also the history, the geology and related artistic expressions. As the participants represented many different subjects, they were all experts in one or another way, as described by the exercise "science expedition" by Katarina Johannson.

Concluding remarks:
The courses were all very successful. The two target groups both stated that it is of importance for their development as educators to work together.
The exercises, combined with theoretical discussions, give the participants backgrounds to work and develop their own courses for pupils.

Using the methods in these courses the participants were able to analyse and build up place based education depending on the different non-formal learning environments in their own vicinity. In this way, the project "In and Out" can be a link for the pupils to use and understand some of their local environment. Today the construction is that a classroom is the symbol of learning. By using the knowledge from "In and Out" this can be a way to create a "wow" situation for the pupils, teachers, museum employees etc. Learning outside the classroom is complementary, or supplementary to the different methods of learning, and can enhance the outcome of the compulsory years in school.

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We have followed the initial evaluation plan, with a mixture of different evaluation methods. The aim of the systematic evaluations was to get a broad and varied insight into to the course, in order to develop and refine it.

We have used several different evaluation strategies:
All participants have filled in an online surveyXact evaluation, based on similar questions in all countries (both open-ended and closed questions). The questions concerned the usability of the course package, the material used (e.g. literature), the workload, the structure and the content of the courses. There has been room left for discussion the methodology, and the cooperation between the two target groups, too. The SurveyXact was sent directly to the mailboxes of the participants just after the test runs.
We have also evaluated the courses with a delta +1 method. That means that the participants told us three good things, and three things that could be improved. These statements have all been collected and used in the refinement process.

BOX 1:
Due to the application of the project, we had to evaluate:

Quality of the course package During test runs (wp 5)	• *Time schedule* • *Learning output* • *Organisation*	*Students and participants evaluation, questionnaire, closed Llikert scale) and open questions (mixed methods).*
Quality of the course package After wp 6	*To what extent are these two courses relevant for the challenges of the European teachers and rangers of today?*	*External experts*
Quality of the course material during wp 5	*How usable are these materials according to content and volume, and how can they be improved?*	*Students evaluation, questionnaire and oral evaluation in groups (mixed methods)*

BOX 2:
Participants of the subject test-runs in the four countries:

Partner country	Formal	Non-formal	Experts	Total
Denmark	*11*	*7*	*3*	*21*
Germany	*1*	*6*	*4*	*11*
Sweden	*3*	*2*	*4*	*9*
Romania	*7*	*7*	*4*	*18*
Total	*22*	*22*	*15*	*59*

4. Example of exercises

For subject courses in all countries several types of exercises were developed or adapted in order to fulfil the objectives of the project of combining formal and non-formal learning for the four selected subjects Language, Mathematics, Physical education and Science subjects in the four countries at selected places. All the exercises could be adapted according to location. The organization of schedules, lunch and coffee breaks was as planned as the exercises to suit the groups and the group's size.

4.1. Language

By Katarina Johansson

Here is a presentation of some exercises that we practiced in the Language subject in the four countries at selected places. All the exercises could be adapted according to location.

A. "Literary books as school books" at Lahn river, Marburg, Germany

A.1 Description
In the landscape of the Lahn river in Marburg, we worked with books of the famous Swedish writer Astrid Lindgren that were known to the participants. The landscape around Lahn was perfect for this exercise as the participants could use their imagination, language and creativity based on the books.

A.2 Subjects aims
The aims were to use the place, build a scene, use objects from the area and be actors in a drama.

A.3 Preparation
The books were originally Swedish but had been translated into German to suit the participants. These were "Ronja the Robber's Daughter", "All the Children in Bullerbyn" and "Pippi Longstocking". There were three groups, each group having their own book. They were supposed to create a drama based on an episode in their respective book, so that three different dramas were presented.

A.4 Time
About 2 hours

A.5 Implementation
It was a good exercise to enter deeply into a book, mimic characters and gain an understanding of the environment and action of the book. It was also a good exercise to interact with others and to see how literary books could be used as school books in language lessons.

A.6 Summary
This exercise can last from 2 hours to up to half a day. It depends on the understanding the pupils already have, if they have read the books on their own or, the best of all, if they have read them together as a class beforehand. The discussion around the books is a good exercise of the mother tongue which includes 5 talking, listening and reading. Never forget the reflection after an exercise: have we got some new experience – knowledge?

B. "Animals in the Lahn river", Marburg, Germany

B.1 Description
At the raft on the Lahn in Marburg we held an exercise where participants had to work out what animal they had on a card around their necks by asking only yes or no questions. When that was completed, participants shared something with the others that they knew about the animal. After that, the participants worked to create groups of four animals in which three animals are logically linked. Other participants had to find out which animal does not belong to each group and why.

B.2 Subject aims
To use the mother tongue to ask questions, listen, remember, get to know something about and describe the animal and to think and discuss logically.

B.3 Preparation
Make animal cards and use clothes pins to fix them.

B.4 Time
2 hours

B.5 Implementation
To achieve the aims in this exercise it is important that all participants/pupils are involved. They have to talk a lot, have fun and get to know the animals a little bit better as they help each other. We used only animals that belong to the river to further the connection to the place.

B.6 Conclusion
These three-part exercises involve a lot of learning through language but also incorporate elements from Science, Art and History. Here we see a natural, interdisciplinary way of working with learning that engages the pupils to think more broadly and in the right context.

In Denmark we visited the Bovbjerg Lighthouse, one of West Jyllands finest destinations. Bovbjerg Lighthouse was built 1877 and is still functioning.

C. "Science expedition" at Bovbjerg Lighthouse, Denmark

C.1 Description
The history of this place is very interesting to work with so one of the exercises was to emulate a science expedition to find out more about the place. The participants worked in five groups: archaeologists, zoologists, botanists, artists and chefs. They had to investigate the history of the place and find evidence for it. The chefs tried to find something in the area for the expedition to eat.

C.2 Subject aims
The aims were to use language in cooperation, discover in groups, discuss and use senses, fantasy as well as imagination to present their discoveries in the area around the Bovbjerg Lighthouse.

C.3 Preparation
White sheets to lay things on

C.4 Time
About 2-3 hours, maybe a half day depends on how many participants for discovering and presentation.

C.5 Implementation
This is a good exercise to perform when the pupils have little previous knowledge of the location. Here, the pupils discover and discuss various hypotheses. Afterwards, there is the opportunity to follow up with more history from books and in practice.

C.6 Conclusion
The focus in this exercise was to get to know the place around the Bovbjerg Lighthouse. The participants found and saw things that they had not otherwise seen. The discussion was clear, they used their experiences but also their fantasy to create new ideas about what may have happened in that place. The place offers dramatic events, security and a wonderment where questions follow answers and have to be followed up by teachers and pupils back in school.

D. "Mandala on the beach" at Bovbjerg Lighthouse, Denmark

D.1 Description
The beach beside the Lighthouse was the best place to carry out this exercise. On the walk down to the beach the participants collected various interesting items to work with. Down at the beach they were given a rope and sheet to make a mandala, an esthetic picture made by Tibetan monks to create patterns, shapes and colors.

D.2 Subject aims
The participants used their creativity to form these creations. They had to cooperate, using the materials and giving a name to the creation whilst discussing and making decisions.

D.3 Preparation
Use ropes of about 150 cm – one for each group. You can have white sheets to lay the Mandala on but it is not necessary.

D.4 Time
2 - 3 hours

D.5 Implementation
This exercise resulted to go back in real history for a lot of the participants. They told stories through their mandalas about relatives, fishermen and friends who went out to sea and never returned. The exercise becomes a tribute to them.

D.6 Conclusion
This is an exercise that has no right or wrong execution. Here, it is fantasy and creativity that is trained and everybody can do this. Language is central in assigning names to materials but this exercise also has an aesthetic aspect as well as using biology, mathematics, physical activities and history. This exercise can also result in different feelings that may be followed up.

In Romania we visited three places: the Botanical Garden, the Village museum and the Geology museum. In the Language subject we worked with:

E. "Drama back in history" at the Village Museum, Bucharest, Romania

E.1 Description
In the Village museum, traditional houses and churches from all regions of Romania are represented. Here, you can see the connection between traditional houses and nature as well as identify materials and styles of buildings.

E.2 Subject aims
The aim was to travel back in time and compare and feel the differences between different houses in different episodes.

E.3 Preparation
Pen and pencils were used to note facts about the houses and to write down keywords about the houses.

E.4 Time
2 – 3 hours

E.5 Implementation
Each group had one house to “get to know”. They discussed, used their imagination, wrote down what they found out, used keywords to make a history and prepared a drama to portray what may have happened in these houses.

E.6 Conclusion
Both written and body language are important for the successful cooperation of this exercise. The pupils could use books in school to find out more about the houses before they came to this place so they had some understanding, or they could have first-hand experience to create a story about them: who the people that lived there were, what they worked with and what clothes they wore, etc. They could follow that up with a drama to show the rest of the class and afterwards they could go back to school and search for data, write down the stories of the houses and reflect over what they had seen and done. There are also other subjects represented in these exercises, such as mathematics, in the architecture, maps, scales, etc. biology different plants, flowers and vegetables that the farmers grew, social science, the municipality and the formation of society, classes, different jobs etc.

F. “Stone as friends” at the Geology Museum, Bucharest, Romania

F.1 Description
Many different stones were represented in the garden of the geology museum. We wanted to use the stones as materials in the training of the Language subject.

F.2 Subject aim
The aim was to work with parts of speech.

F.3 Preparation
Find a place with stones

F.4 Time
Half an hour

F.5 Implementation
The exercise was to choose a stone each and describe the stone with as many adjectives as possible, touch it, feel it, smell it and give the stone a name.

F.6 Conclusion
This is an exercise that trains a lot of language skills and give ideas for follow-up activities, putting adjectives into sentences or writing poems or stories about the stone. Other subjects related to this exercise are mathematics, pupils can work out the circumference or area of the stone and science, they may find out about what stone is made of, where it is commonly found and what time it was formed.

Reflection
In every exercise it is important to reflect over what has been done, why these result and what we have learned etc. New experiences give us knowledge and when we have work in practice things it´s easier to remember.

4.2. Mathematics

By Mikael Skånstrøm

A. Can you find the fractions?

A.1. Description
Background: Participants often have problems with fractions. The main problem is they see the meaning but they don’t relate them to anything - maybe except pizza and layercakes. In this excersise they combine different representations: Photo and algebraic expression.
The participants are working in pairs finding fractions in the surroundings around them. They take a photo of each subject with a camera or with their mobile phone. The photos will be illustrations for a multiple-choice task. As the participants are from both the formal and non-formal sector you may focus on subjects that are related to the place, if possible.

A.2. Subject aim
The aim is to see and understand that fractions express a part of a unified whole.

A.3. Preparations
The partcipants have to know how to express factions and know about numerator or denominator.
Every group must have either a camera or a phone to take photos.

A.4. Time
Two lessons

A.5. Implementation
Show the participants different pictures as examples, use the differences among the participants to make groups and express the amount as fractions of the unified whole. Other subjects could be the lamps, tables or something else in the room. The participants go outside the classroom and ‘collect fractions’ with their cameras.

A.6. Conclusions
Back in the classroom the partipants make a multiple-choice task by using their photos.

They may use an A4 page where they place their photos and possible fractions-names.

See example in the attachment.

Other activities
Maybe they can even write a story about the subject - how did the registrered fraction occur?

Example of a multiple choise task with fractions found at a museum

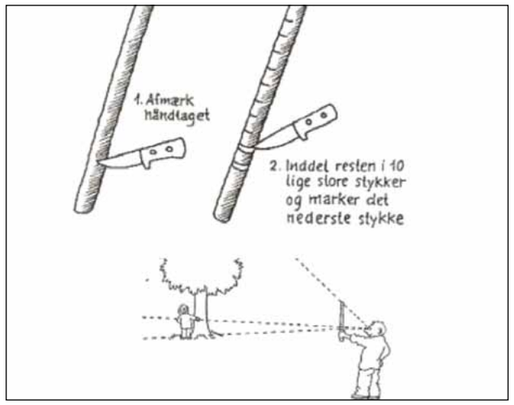
In&Out

Draw lines between pictures and fractions

B. How tall is the tree?

B.1. Description
Background: Working with triangles is a important mathematical discipline on many levels. In this exercise, the participants are working with the mathematical topic 'ratio', which can be a problem for many. The task can be a part of working with trigonometryon a more theoretical way.
"The caretaker of the school has to cut down some trees, but he's afraid that some of them may damage the buildings when they fall". The participants are working in pairs or groups to find the height of a tree by using a 'Swedish measuring rod'.

B.2. Aim
The aim is to see and understand the ratios between similar triangles.



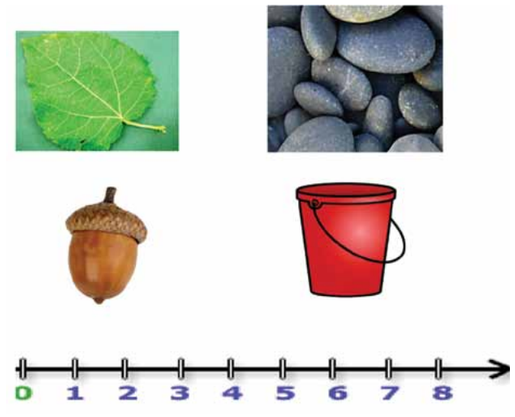
B3. Preparations
The partcipants have to make a measuring rod.
To remember the measuring rod and a (folding) ruler.

B.4. Time
Two lessons

B.5. Implementation
1 - Move away from the subject - so far, that the lowest mark on the stick is in line with the bottom of the subject and the top of the stick is in line with the top of the subject.
2 - Another member of the group places a mark on the subject, where the lowest mark on the stick is in line.
3 - The height of the marked place is now 1/10 of the full height of the subject.
4 - Measure the height from the ground to the marked place - or find it by using an already known height, e.g. your own height.
5 - Multiply the measured height with 10, and you will find the height of the full subject.

B.6. Conclusions
Back in the classroom the participants can make drawings of the situation and use other kinds of calculations, e.g using trigonometric functions and comparing them to each other.

C. Wanna bet?



C.1. Description
We all have the idea that the longer we are away from the basket the more difficult is is to throw a stone into the basket. But is there a certain coherence between distance and hits? And what if we change the subject, we throw?
So - find at basket or another container and some subjects to throw. Decide the field, make a plan and make plenty of attempts. Note the results.

C.2. Aim
The aim is to find coherence and to use the results to set a bet, e.g if you hit the basket 3 times out of 5 at a distance of 7 meters, you double your stake.

C.3. Preparations
The particpants have to know a little about betting and gambling and relations between stakes and winnings.
To remember: You need a basket or another kind of container and maybe a (folding) ruler.

C.4. Time
Two lessons

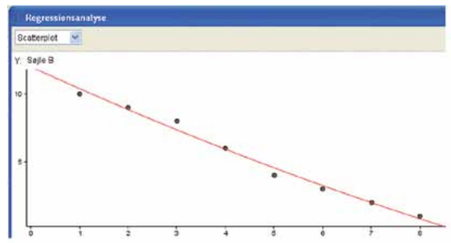
C.5. Implementation
The participants must first decide how to design the game according to choice of container and subject to throw. At the next level, they must try the exercise themselves a lot if times from different distances.
The partcipants must write down the results of all the attempts.

C.6. Conclusions
Back in the classroom the participants systematize their results, e.g using the dynamic geometric-program Geogebra. On the basis of the systematic, the participants decide which kind of bet you can set so the gambler will be interested, but loose in the long run.

D. Examples of other problems that have been worked with in 'Learning outside the classroom':

D.1. How fast does it move?

This Swedish duck moves at a pace of 2 meters in 2.06 seconds



D.2. What is the result?

If the expression is 'double plus one' and he who throws the ball says 4, the result is 9

Where is ϖ?

If you have circles – you have ϖ

D.3. Which licence plate is the best?

No better than MR- PI 314

4.3. Physical education

4.3.1. Games and Sports in historical settings

By Karen Barfod

A.1. Description
Background: In games, the issue is to continue the game and have fun. In sport, we regulate time, place, rules and conditions, in its essence, sport is a competition. The modern sport is connected to the industrial age, and developed through Europe more or less as the railroad came. In the old games, which could be semi-structured, we just play with those and what is around – and stops when it starts to rain, or its time to eat. In this exercise, the participants work with Games in a historical setting. Working with values behind the physical activity, perspectives on competition versus play in modern sports are illustrated.

A.2. Aims
The aims of the exercise is to use the historical setting to throw light on different values in sports as a part of the Physical Education curriculum.

A.3. Preparation
What do participants need to know before?
The participants (in this case, teachers and people from the non-formal learning environments) need to know the curriculum of PE in schools, containing issues concerning the values, history and cultural aspects behind the activities. Historical sources of the development of sports could be read.

What do you need?
Items for competitive sports, e.g. a soccer ball, shirts, or whatever modern sport you choose. Items for play or games, stilts or local setups – maybe you don't need anything, as many historical games don't require any equipment. If possible, a historical area with cobblestones, clogs and historical buildings. The participants should wear clothes suitable for movement.

A.4. Time
Depending on how many games you choose, 1-3 lessons.

A.5. Implementation
First the participants have a competition, e.g. run fastest, or play a soccer game. Here you discuss that we need a winner, that we have international written rules that we try to equalize. Then you play some historical old games, which can be different from country to country. Here you discuss the rules (as they often are local), how long do we continue, how do we make the teams?

After this, the participants in groups make a sport out of the stilts. Which rules do you need? Is there a men`s competition and a women's competition? Who judges?
Discussion about the differences of games and sports, connected to society, industrialization and belonging values.

A.6. Conclusions
Other activities could be games connected to different social levels, e.g. working class power- sports, upper class equipment requiring sports, sports signalling identity and affiliation.

4.3.2. Drawing pictures

By Martin Lindner

A.1 Description
Ask participants to sit down and have a look into the landscape. They should decide on a motive and then start painting the landscape.

A.2 Subjects aims
Aesthetic perception of a specific landscape

A.3 Preparation
Different pencils and white paper

A.4 Time
About 2 hours

A.5 Discussion
Discussion is about the process of painting

4.4. Earth Science

By Alexandru Andrasanu

A. Map the Earth

A.1 Description
In the Botanical Garden in Bucharest, we worked in one place where it was possible to observe a mixture between elements of the previous forest that covered the place 200 years ago, successive trees plantation, a pound and a spring, some discrete alleys and administrative buildings. There is enough diversity of natural and man-made structures. There are some special elements that could be used as landmarks. The exercise was followed by other exercises and could be continued with drama play, storytelling treasure hunting or the exercises could be repeated using a GPS.

A.2 Subjects aims
The aim was to produce a 2D model for a very small part of the Earth system and to identify the components.

A.3 Preparation
There were three groups, each with their own identified territory. They were supposed to identify an area of about 1000 square meters and create a 2D model of it on an A4 paper. Each map had to be drawn according to the same rules (scale, orientation, symbols and names). Each territory was given its own name to be used in other activities.

A.4 Time
About 2 hours

A.5 Implementation
This was a good exercise to make the participant to define the space in an objective way, to define borders, identify key elements of the territory, measure the distances in meters, name them and plot them on an A4 paper according to scale. Each member assumed a certain task. Each map was checked by another team.

A.6 Conclusions
The exercise could last for two hours and could be adapted to the age of the pupils. For younger students the map could be the "treasure map "and one object could be hidden and found by other team. The exercise could be combined with measurements of the heights of tree trees, age and creation of local stories about the land marks. Back in the class they can join their maps and combine them with a Google Earth map of the place (if available) or the official Botanical garden map.

5. Description of a module for out of the classroom activities

By Alexandru Andrasanu

A three day module was designed for the subject course in Romania, each day dedicated to a specific place and main subject. For the first day in the Botanical Garden the main subject was space: its components and representation in simplified models. On the second day in the open-air Village Museum the main subject was the relation between man and space in time. The third day in the Geological Museum was dedicated to outdoor and indoor activities combining visits and hands-on geological activities. All activities were interdisciplinary combining earth science, language and mathematics curriculum issues.

In this module, the participants use their knowledge, senses, imagination, technical skills, and emotions and include opportunities to engage in verbal and visual presentations of information gathered themselves from the places or received from the teachers / non-formal educators. The participants had to see things and places through their own eyes, not those of the trainer / teacher and translate the information into whatever they can refer to their personal knowledge and experience.

Objectives

Conceptual: Participants understood how outdoor classroom settings, such as a botanical garden, open-air village museum or geological museum, can be used for science and interdisciplinary studies.

Procedural: In this module, the participants activities were related to space, time and raw materials in there different places. They used their knowledge, senses, imagination, technical skills, and emotions and included opportunities to engage in verbal and visual presentations of information gathered themselves from the places or received from the teachers / non-formal educators.

Preparation and equipment

The participants (in this case, teachers and people from the non-formal learning environments) need to know the curriculum of earth science (geology / biology) in schools, the values, history and cultural aspects of the three places, educational activities offered by the three institutions, abilities to use basic knowledge in mathematics and ability to understand the meanings of different words or expressions in their mother tongue.

Required materials:

clipboards, pencils, A4 papers, compasses, knives to make measuring rods, measuring tape, five ropes of one meter and of different colours. Participants should wear appropriate clothes for each place.

Day 1 - Botanical Garden

The Botanical Garden is a place of about 17 hectares with a small pond, small hills, of course lot of trees and flowers, located on the right bank of the Dimbovita River. Until the 19th century it was a partly marshy area (for example it was almost destroyed by the big flood of Dimbovita in 1892) and partly a forest (part of a big plain forest mainly of oak trees). The Garden is administrated by University of Bucharest and is one of the typical places for schools and kids to come for out of the classroom activities. The garden could be the equivalent of a semi-natural space like a city park or a place near a village.

Preparation

Before starting the activity a short introductory visit to the botanical garden could be organised, and the participants are encouraged to carefully observe the environment, being scientific information. For exercises a place of about 1500 square meters will be selected, a place with enough natural features like trees of different ages belonging to different species, small hills, ponds, springs, buildings, alleys. In our case the place was the “Old beech”.

Exercise 1

“Name ten items” is based on the knowledge the participants have about the plants and animals that are likely to live in the botanical garden, the plant and animals they observed during the preparatory visit or they have seen on previous visits. The participants are grouped in three teams. Each team has a specific task, one to name ten plants (trees and flowers), one ten vertebrates (birds and mammals) and the last one ten invertebrates (arthropods, gastropods, worms). The aim is to identify the main living components of the place and report their findings to the other teams. The activity took about 45 minutes, including the discussion of their findings and there was space for more in-depth interpretation of the plants and animals they named and even for further activities to identify them in the field. No preparation need.

Exercise 2

“Animal in the garden” is an adaptation of the exercise “Animals in the river” presented in this book by Katarina Johansson. Participants had to work out what animal they had on a card around their necks by asking only yes or no questions. The cards represent animals living in the botanical garden or surrounding areas. When that was completed, participants shared something with the others that they knew about the animal and could make connections with the listed animals in the first exercise. One card could present an exotic / alien animal that could not be found in that place to generate discussions about the animals` habitats. The aim is to describe some anatomical characteristics, way of living and also to use language and logic to ask questions. For preparation there is a need for animal cards and clothes pins. All participants are involved, they have to talk, help each other. The activity took about 45 minutes.

Exercise 3

“How tall is the tree?” is an exercise presented in this book by Mikael Skånstrøm. In parallel with the aim of using mathematical knowledge to solve practical problems the exercise has the aim to develop the depth of the space and increase space perception. Each team can measure three trees. All participants are involved. The activity took about one hour.

Exercise 4

“How old is the tree?” is an exercise aiming to evaluate the age of a tree without cutting it down or taking samples of the trunk. Begin by determining the tree species and taking a circumference measurement using a tape measure at 1.5 meters above the soil. If we multiply the diameter (in centimetres) by a growth ratio we can obtain the age in years. The growth ratio is specific for each species and could be found in specialised books or tables. The aim is to introduce the time in connection with the space and estimate the evolution of the botanical garden. Some species are genuine ones and could be older than the moment the botanical garden was created and other species are younger or exotic and planted after. Each team will measure two trees. The activity took about one hour.

Exercise 5

“Map your land” is based on the idea that each person engages in a personal way with the space and its components. In our case the request for participants is to generate a graphic representation of features on the ground, a model of a real world which is a rough approximation of reality using scientific methods. The exercise is presented in more details in this book. The group is organised in teams and each team has to produce a map of an area of about 3000 square meters, supposed to be their land to live and present to other people. They have to identify natural elements (tress / forest, pounds, relief / local irregularities) and manmade components (alleys, stairs, buildings) and their borders and contacts; measure and calculate distances, surfaces, spaces, trees height and age; identify cardinal directions using the Sun`s position or a compass; identify and name landmarks. The maps could be exchanged among groups and checked for conformity.

The maps could be used in development of further exercises: naming the landmarks using observable features (shape, colours, height or age of trees, land forms); treasure hunting or treasure map; produce drama place – create stories about each territory; correlate the measurements with GPS measurements. The exercise took about two hours.

Assessment

At the end of the day, an assessment is made of the different exercises, methods and techniques used and the different skills and content highlighted by the five exercises. A final evaluation of the day was completed by the participants. Participants said the most helpful things they learned were: how to use exercises to achieve learning objectives, the unique characteristics of the botanical garden, the techniques used in measuring parameters for drawing the map. Participants’ criticisms were that the activities need an interdisciplinary approach that would be difficult for students to realise at gymnasium level. Taking into account these observations the exercises were adapted and implemented later for a group of 14 kids from primary and secondary school students with excellent results.

Day 2 - Village Museum

The Village Museum is an open air museum with representative traditional houses and church from all main regions of Romania. All of them are genuine houses, bought, transported and installed in the museum during the last century. The Village Museum is a good place to connect nature and traditional human settlements and to identify raw materials, style of building according to local resources, occupations, climate / local weather in different parts of Romania. This is also a good place to compare and feel the differences between a city and a “village”, a pretext to travel in time and space. The open-air museum could be the correspondent of an inhabited space where natural raw materials are still present (traditional villages, old town centres).

Exercise 1

“House story” starts from the idea that a traditional house reflects cultural habits but also natural conditions of a place: climate, raw materials, land morphology. Three different houses from three different geographical areas were selected. Three teams were created and each team selected one of the houses to describe it. The aim of the exercise is to make participants identify with themselves the people who built the house and identify the main characteristic of the place the house was built and inhabited. The activity took about two hours, including the discussion of their findings. Differences in architecture and the presence or absence of some raw materials like wood, stone, clay, bricks, metal could be noticed between mountain, hilly and plain houses, also in relation with the local conditions of different geographical places in Romania. Some information could be taken from the museum documents, especially about the age of the house.

Exercise 2
"Time line" is based on the idea that we start the perception of time when some repetitive events occur and we can create a history of our life, of a place or Earth when changes or events could be identified. The exercise has three phases. In phase one four ropes are bound in a rope line. Each rope represents a season of one year comprising the months and days. The participants are asked to identify their season, month and day of birth and to put a hand on that point. A year time line is formed. In the second phase, the five ropes are bound, each one representing a time interval of ten years. Participants are asked to identify a happy personal event along the time line. The result is a fifty years history of the group members. The third stage is to consider the five ropes representing fifty years each. On the time line participants are asked to place the age of the houses, the age of the measured trees in botanical garden and other few known historical events. In the end we can recreate a short history of the last 250 years of local and global human civilisation. When ages of different geological events (e.g. the eruption of Vesuvius (79 AD), Bronze Age, the extinction of dinosaurs (65 million years ago), Phanerozoic and Precambrian events) are projected the time line could be extended to Earth history (geologic time). The activity took about one hour, including the discussions.

Exercise 3
"Drama back in history" is the exercise presented in this book by Katarina Johansson. The aim was to travel back in time and compare and feel the differences between different houses in different episodes. Using pen and pencils participants wrote down ten key words about the houses. Each group had one house to "get to know". They discussed, used their imagination, wrote down what they found out, used the keywords to make a history and prepared a drama to portray what may have happened in these houses. The activity took two - three hours. Both written and body language are important for the successful cooperation of this exercise. There are also other subjects represented in these exercises, such as mathematics, architecture, maps, scales, biology of different plants, flowers and vegetables that the farmers grew, social science, the municipality and the formation of society, classes, different jobs etc.

Exercise 4
"Wanna bet?" is the exercise presented in this book by Mikael Skånstrøm. The aim is to find coherence and to use the results to set a bet, e.g if you hit the basket 3 times out of 5 at a distance of 7 meters, you double your stake. The participants systematize their results, e.g using the dynamic geometric-program Geogebra. On the basis of the systematic, the participants decide which kind of bet you can set so the gambler will be interested, but loose in the long run.

Assessment
At the end of the day or beginning of the next day, an assessment is made of the different exercises, methods and techniques used and the different skills and content highlighted by the three exercises.

Day 3 - Geology Museum
The museum is located near the city centre, in a traditional house hosting collections of rock and fossils from Romania and the World. The rooms are organised to make visitors understand the evolution of Earth and Life. The museum could be a good place to experience the link between raw materials and how they were formed during Earth time. Also an introduction to "deep geologic time" could be used to better understand the time line exercise developed during the second day. A one-hour visit could familiarise the participants with different types of rocks and the rock cycle, fossils and names of geologic time divisions.

Exercise 1
„Stone as friends" is the exercise presented in this book by Katarina Johansson. Different stones (types of rocks) were presented in the garden of the geology museum. We wanted to use the stones as materials in the training of the Language subject and to create a link toward the methodology in macroscopic identification of rocks. Each participant selected a stone and described the stone with as many adjectives as possible, touch it, feel it, smell it and give the stone a name. The activity took half an hour – one hour. This exercise trains language skills and gives ideas for follow-up activities: comparing given names of the rocks with the scientific names, or popular names if they exist); putting adjectives into sentences or writing poems or stories about the stone. Other subjects related to this exercise are mathematics (pupils can work out the circumference or area of the stone) and science (they may find out about what stone is made of, where it is commonly found and what time it was formed).

Exercise 2
"Playing palaeontologists" is an exercise developed by the museum team based on the idea of GEORIUM created by Haute Provence Geological Reserve (http://www.resgeol04.org). Moulds of dinosaur bones are covered by sand in a 3 square meter box, buried in the ground. Participants are encouraged into scientific enquiry by digging for fossils in the georium. Each bone has to be identified and to be placed in the right position of the dinosaur`s skeleton. Team work will lead to the approximate reconstruction of a dinosaur skeleton. Participants are introduced to scientific methods in field and laboratory research in palaeontology, anatomy of dinosaurs and the idea that the dinosaur reconstruction is always a model to be improved. The activity took two hours and is a very good hands-on experience.

Exercise 3
"Build your own flying reptile" is also an exercise developed by the museum team. The aim is to introduce participants to the past worlds populated by totally different animals and plants. The objectives are to present the methods used in paleoenvironment model reconstruction and to introduce the idea of continuous change of the earth system. Participants become familiar with different species of flying reptiles (pterosaurs), their body morphology, possible ways of living and flying. In the second phase each participant used pencils, paper and colours to make a paper model of a shape like dinosaur. The activity took one hour – one and a half hours and helped participants to create connections between the body morphology and functionality, different anatomical elements and their role in supporting the flying, relation organism – environment, scientific methods in reconstructing the shape and functionality of different anatomical elements.

Reflection
After every exercise / day it is important to reflect over what has been done, the result, learning objectives and achievements. New experiences give us knowledge it is easier to remember when we have hands-on experiences. Students' opinions were these activities could be done as a three day module as well as separate one-day activities. Short preparation time is required and close cooperation with educators from non-formal education, from the botanical garden, village museum and geology museum.

The main learning outcome of the module is the shifting in perception of space, time, and the science-real life connection. Students could start to understand that each place is part of some larger territory and, regardless of location, it is possible to identify the continuous interaction between spatial and non-spatial realities (phenomena, process), shaped by its physical structure and human activities during its historic evolution.

6. Themes for discussion and written tasks

By Karen Barfod

The discussions at the courses must be framed to ensure the networking and sharing of knowledge between the two target groups. In between these planned discussions, there will appear a lot of discussions during the course. If the time schedule is rather loose, and the knowledge exchange part has a great priority in this course, there must be room for these spontaneous discussions.

The planned discussions could be:

Day 1:
"Which benefits do you see in a working method in school, including working and learning outside the classroom – and what worries you"
Method: Very early in the course, just after the presentation of the course and the participants, participants are asked to discuss these two themes with the person beside them. In each course folder there are a small "Sticky note", where they could write down their notes.
After app 10-15 min of two-and-two discussions, we had an open discussion in plenum and wrote down the benefits and the worries on the blackboard.
During the day, the lecturers can refer to these benefits and worries expressed by the participants.

Day 2:
As day 1 ended with a visit at the museum, day 2 started with theory about museum analysis:

Theory about the way things are collected at the museum, the way they are exhibited and "who decides what you see at the museum". We worked with the theories of Bamberger and Tal (2007) concerning visit at museums.

- Visits with no freedom (tour by the guide, 45 minutes)
- Visits with some freedom (e.g. with work sheets or other planned tasks)
- Visits with total freedom (laissez-faire – just letting the pupils run around by themselves)

The participants were also introduced to theories (Frøyland et al 2007) concerning "degrees of freedom", e.g.

- Who decides where to go?
- Who decides how long the visit should be?
- Who decides what the pupils should see and work with?
- Who decides what should be done at the museum?
- Who decide the form (e.g. group work) and the possibilities to communicate with other pupils, the teacher and the people at the museum?

After this, the participants had the following tasks and questions:

- Analyse the visit at the museum yesterday – how much "freedom" was there at the visit?
- Could this be a possible way of arranging a visit?
- What does it demand from the people of the museum, the teacher and the pupils (e.g. preparation)?

Method: The participant worked with the questions in groups of 4-5 persons, each group with representatives from both target groups.

After the discussion (approximately 20 minutes) there was a follow up in plenum and plenum discussion.

Day 3:
This day there were 2 main discussions: A discussion of the teacher`s role and a discussion of a personal case.
The first discussion was a plenum discussion of the teacher`s role after theory about teachers role at visits (Hyllested, 2007) and a short movie presenting different teacher types.

The second discussion was a longer session with an "action workshop". The participants had prepared themselves by thinking of a visit – good or bad – that they have had as a teacher, or as a museum pedagogue. They should think of one specific visit and prepare a presentation.

Method:
The whole group made a standing circle after their date of birth (not year, only day and month). From this, the group was divided into groups of 4 people.

The group went out in group rooms.
In each group, one person should talk for 7 minutes without interruption. The other should listen, or only ask clarifying questions – NOT telling, just listening. After each case, the "tellers" and the "listeners" should try to analyze WHY this visit was especially good, bad or special.

After about 40 minutes, the groups came back and there was a short "story" from each group in plenum.

Small written task, In and Out
In relation to the Course in Outdoor learning there should be made a short written task.

This task has the extent of about 5 normal pages.
The task can be done individually or in small groups of up to 3 participants.

The task is a part of the course, as it should increase the students` ability to reflect upon the pedagogical value of outdoor learning and in a written form to relate to the didactics and the literature of the course.

The task can take earlier tasks as starting point, either at this course or from other subjects.

The task must include:
- A preface – with substantiated considerations about the legitimacy of outdoor learning and its possibilities in using the non-formal learning environments in the elementary school from the point of view of the current constitution.
- A short description of a teaching course and its relation to the annual plan for the classes. If you have tried some of it in practice, you can bring in your reflections about it.
- A part with considerations of why you planned the teaching course as you did, substantiated in relevant literature and theories.
- A list of literature and links

The task must use correct academic terminology, technical terms, correct citations, statements of the students` names and numbers etc.

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Bamberger, Y., and Tal, T., (2007): Learning in a Personal Context: Levels of Choice in a Free Choice Learning Environment in Science and Natural History Museums. Science Education, v. 91, p. 75-95.

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