

Support materials for active learning

Investigate and Discover

Annelie Ehlvest, Helle Kont





EUROPEAN UNION
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INVESTING IN YOUR FUTURE



**CENTRAL BALTIC
INTERREG IV A
PROGRAMME
2007–2013**



**Tartu
Environmental
Education Centre**

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PREFACE

Our learning landscape has constantly been enriched by different active learning methods. There are well-tried traditional teaching and learning methods in use that have justified themselves. In addition, newer or updated, as well as old and rediscovered methods are being tested and implemented.

During the last decade, there has been an increase in the use of curriculum based thematic programmes as one form of active learning. Their diversity has also increased rapidly in Estonia.

The schools are offered study programmes that:

- * **have a different duration**
(from one hour to a whole day)
- * **are meant for different age groups**
- * **use topics integrating different subjects**
- * **take place in different environments** (school yard, nature trails, nature centres, museums, etc.)
- * **are provided to pupils both free and for a charge**
- * **are with and without work sheets**
- * **are conducted in different forms and are supervised to a different extent**
- * **use different strategies and methods**

The activities of a study programme should clearly support the goals of school curricula, providing additional opportunities for teaching the subjects taught at school and diversifying the learning process.

This support material introduces two active learning programmes meant for pre-school children and pupils in the first and second stage of study, which help introduce the sea, rocks and the rock cycle.

Both thematic programmes use the following structure: an overview introducing the activities of the programme, recommendations to the supervisor of the programme,

description of the resources and material used, and some support materials in appendices that can be copied and help prepare and conduct the games and tasks of the programme yourself more easily.

Those, however, who prefer to just participate with their pupils in such learning programmes instead of preparing and supervising the programmes themselves can use the support material as an introduction for planning their study trips.

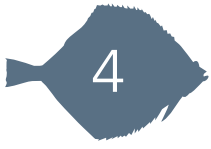
Why “Investigate and Discover”?

Perceiving the surroundings with all of one’s senses, studying the world, discovering and finding meaning are one of the bases of successful learning and coping in life. With a little assistance, the natural and cheerful curiosity of children and the questions asked by kindergarten and primary school children can be supported, encouraged and promoted. Lifelong learning starts from the very beginning. Investigating and discovering belong to the exciting opportunities and necessities of life and have also clearly found their place in the study programmes of pre-school education and schools.

The learning programme about the sea is a follow-up and further development to the programme “Investigate and discover. Nature.” created by the same authors in 2004, which has been actively used with minor improvements in Tartu Environmental Education Centre to date. The predecessors of the stone programme are “Stone Programme” and “Sandbox Games” in Tartu Environmental Education Centre.

We thank all of the investigating and discovering pupils and teachers who have been learning and having fun and have helped us complete and improve the programme and have encouraged us to share our experiences with other people.

Wishing you an interesting time while investigating and discovering, *Annelie Ehlovest* and *Helle Kont*



WHERE TO START?

In order to carry out an active learning programme successfully so that it would be enjoyable for both the supervisor and the children, some preparations have to be made. Some of the tasks here require collecting resources and a little cutting, gluing and laminating. Some things can be prepared with very modest expenses or even completely without costs. Once you have the resources, they can be used several times with some minor changes.

Preparing the programme, especially collecting the resources and copying (as well as laminating, if possible) the support material may take one to three days. Keeping the resources comfortably at hand greatly facilitates the smooth progress of the programme.

However, all resources and activities described below are only one of many options and it is certainly possible to develop and simplify each part further. In addition, each supervisor and teacher can combine and use them in a manner that seems suitable for them and their pupils.

There are appendices at the end of this printed material offering a selection of support materials and resources. The same material and all appendices can be downloaded and printed from the project COBWEB homepage <http://www.hyria.fi/COBWEB> and the homepage of Tartu Environmental Education Centre www.teec.ee.

Both programmes can be conducted in the indoor and the outdoor classroom.

Investigate and Discover. The Sea!

Topics

The sea. Different organisms are connected with each other. What does the sea give us? What do we give to the sea? Senses and cooperation between the senses. Adjectives.

Objectives

When children get to know things connected with the sea, they learn and think about what the sea gives to us and how we influence the sea. Children get to know the connections and relations between different organisms. Children experience the opportunities and limits of the human senses and feel the need for cooperation between their senses; they develop group work, cooperation and communication skills.

Age and number of participants

Meant for pre-school children (children aged 5–6) and for pupils in Grades 1–2 (3–4). Up to 24 participants.

Work area

The programme was initially developed as an indoor activity. The first activity (Find the Pairs) is conducted in small groups around tables, the second activity (Game of the Senses) at the same seats but in a big group and the third game (Me and the Sea) requires a separate room where everyone can form a big circle.

These activities can also be successfully conducted in an outdoor class or by the sea.

Duration

The duration of the full programme is about 1,5 hours:

Introduction, forming the groups – 10 minutes

Find the Pairs – 30 minutes

Game of the Senses – 30 minutes

Me and the Sea – 10 minutes

Summary – 10 minutes

The duration of different tasks and games in the programme can be changed a little, depending on the number of resources used and on the thoroughness of explanations or the number of times the Game of the Senses is being played.





Structure of the programme

Introduction. Pupils are divided into groups and each group is assigned a prepared work station (desk); the supervisor introduces the topic, the activities and the rules.

The main part of the programme consists of three separate parts.

Find the Pairs. The main emphasis is on getting to know objects connected to the sea, forming pairs of them based on certain characteristics or connections, and introducing and justifying the pairs. Each group has the same objects (all of them are connected with the sea some way or another) but the pairs can be formed and will be formed differently by each group according to the connections discovered.

Game of the Senses. The “tools” for perceiving the world – different senses and their possibilities – are investigated. Different senses are used in the game to recognise things. Using adjectives, things to be guessed are described in a manner that would lead the persons guessing to the answer. It is very likely that children will also discover that it is very difficult to describe in words what is being perceived by different senses.

Me and the Sea. The pupils “vote with their feet” on the correspondence between the statements related to the sea and their own opinions. Their attitudes and knowledge about the sea are investigated.

All these games can be used separately, combining both the topics as well as the duration of the work. Some extensions for the tasks and games have also been provided.



Sitting pads and oilcloth are helpful when outdoors

1. FIND THE PAIRS

Resources

- * **Magnifying glasses** for each participant.
- * As many buckets (or boxes, baskets, bags) as there are groups (preferably 5), each of them containing the same **selection of different objects related to the sea**. Some objects require protective boxes or cases to avoid breaking. Some objects (fish, birds) are presented as laminated pictures (Appendix 1), some naturally (sea shells, fish liver oil, limestone, etc.). The bigger the number of natural things, the more interesting it is and the more opportunities of investigating and discovering there are. Instead of pictures of seaweeds, fresh or dried originals could be used, if possible. The present selection of objects is only one of many possibilities. Five to seven pairs of things should be provided depending on the age of the children and what is desired to be introduced.

If the learning programme is conducted outdoors with no tables and chairs, additional resources needed include:

- * Firstly, **outdoor desks** (light coloured **oilcloth or picnic blankets** to be used on the ground) for each group. If you are on the beach, this can also successfully be substituted by a bigger towel;
- * **Sitting pads** for all participants.

Activities

Pupils are divided into groups of 4–5 and are seated around desks, or around work surfaces with sitting pads when outdoors.

Each group is given a bucket (bag, basket) with things inside; they are asked to take the objects out, examine them and form pairs so that they could give an explanation for forming the pair – a relation between or similarity of the objects. Pupils are given time for discussion and consultation, and reaching an agreement. They are encouraged to use magnifying glasses to examine the objects more closely.

When the objects have been put into pairs, the groups take turns to introduce one of the pairs of their own choice and explain why they think these things go together. The groups take turns explaining until all the pairs that the pupils have formed have been introduced. There are no right or wrong answers concerning the pairs, but the explanation has to be comprehensible. After a pair has been introduced, the groups are asked if someone else had the same pair with a similar or also a different explanation.

Once the pairs the pupils have formed have been introduced, the supervisors show their own choice of pairs explaining the relations between the objects. While doing this, the objects are newly introduced. Each pair that has been introduced is placed back in the bucket (bag). This way, all things have already been packed up when the task is completed.

The list below presents examples of possible pairs and relations, which can be used to make a selection depending on the age of children, availability of objects and the time at hand.

Resources for the task
"Find the Pairs"





TURSK



RÄIM



EXAMPLES OF PAIRS AND RELATIONS

Jelly candy + agar-rich red alga *Furcellaria fastigiatata*. Agar is the basic component of jelly candy. Even an insignificant amount of agar (furcellaran, estagar; marked as E406 on packages) with its gelling characteristics, gives jelly candy the necessary thickness and elasticity that feels pleasant in the mouth.

The production of agar from the agar-rich red algae started at the mid-60s in Estonia. Furcellaran is a polysaccharide used in food products to make jelly (e.g. jelly candy, soft merengue, different milk products). The reserves of sea algae in the Baltic Sea allow a sustainable production of about 250 tons of furcellaran a year. In Estonia, the collection of red algae and the production of furcellaran is performed by Est-Agar AS on Saaremaa.

Kalev Chocolate Factory mainly uses carrageenan E407 in their jelly candy, which is obtained from red algae that do not grow in the Baltic Sea.

Shells of the Blue mussel *Mytilus edulis* + a can of marinated mussels. The Blue mussel is used for food by fish, birds, starfish, as well as people.

A shell of the Blue mussel from the coast of Norway or the Danish Straits (big) + a shell of the Blue mussel from the coast of Estonia (small). The Baltic Sea has a low level of salinity. Many species that come from the oceans do not grow big when living in low saline waters. In addition to the Blue mussel, the Baltic herring is also smaller compared to the Atlantic herring, another subspecies of the same species living in more saline water, which is much bigger than the Baltic herring.

Salt + water (in labelled bottles or non-carbonated drinking water bought from a shop and a salt shaker with salt in it). Sea water is salty. The salinity of different parts of the

Baltic Sea is different, ranging from 2 grams per litre (2 ‰ in the mouths of rivers, bays) to 20 grams per litre (2 ‰ in the Danish Straits). The growth and development of many species (the Blue mussel, cod) depends on salinity.

Cod *Gadus morhua* (picture) + fish liver oil in a bottle). Fish liver oil sold in pharmacies has mainly been produced from cod liver. Fish liver oil is also rich in vitamin D and something that the human organism needs. In sunny periods, our body produces enough vitamin D itself, but when there is no sunshine, vitamin D from fish liver oil can be taken to keep our immune system and bones strong.

Bladder wrack *Fucus vesiculosus* + the Baltic herring *Clupea harengus* (picture). The bladder wrack is one of the most important brown algae in the Baltic Sea. Underwater meadows of the bladder wrack are the biocenoses that are most rich species in the Baltic Sea. Up to 30 different species of animals may live there. Bladder wrack thickets are the nurseries and a place to grow for the juveniles of the Baltic herring. The Baltic herring also spawn in the thickets of red algae.

Flounder *Platichthys flesus* (picture) + a piece of fish net. The flounder is an important game fish in the Baltic Sea. It is caught with fish nets (traps). Other important industrial fish are the European sprat, the Baltic herring, the Atlantic salmon and the Atlantic cod.

Common Eider *Somateria mollissima* (picture or feathers) + a small pillowcase. The Common Eider abundantly lines its nest with down feathers. These feathers are very warm and soft and are used to make pillows, blankets, sleeping bags and feather jackets. The Common Eider is under protection and its feathers are harvested from empty



One possible association chain

nests at the end of the nesting season. The Common Eider is the bird in the coat of arms of Vilsandi National Park, the oldest nature reserve in Estonia.

A piece of limestone + Pikk Herman Tower with the Estonian flag (picture). Limestone has mainly been formed during the Ordovician, Silurian and Devonian periods from the settled and fossilised remains of organisms that have lived in the sea, such as the remains of calcareous protists (unicellulars). Fossilised organisms that were once living, can often be seen in limestone. Limestone is the national stone of Estonia and there is an abundance of it in North-Estonia and on the islands. It has been much used in construction.

Amber + a piece of pinewood. The Baltic amber is a fossilised resin from pine trees that grew about 50 million years ago. Sometimes you can find fossilised plants and animals from that distant period in pieces of amber. They are called inclusions. Amber is the most famous treasure of the Baltic Sea region.

Washing powder containing phosphates (package) + swim pants. Washing powder is used to wash clothes. Washing powders contain phosphates that are released in waste water, which will add excess nutrients to natural bodies of water, including the sea. This may promote eutrophication, which again may cause an exuberant growth of blue-green algae in summer months. In such cases, it is said that the water is "in bloom". Among other things, it also prevents swimming, because decaying blue-green algae release toxic substances into water.

Driftwood + pebble from the beach. Water has a strong force that constantly moves stones and other things in it. Over time, stones, pieces of glass and brick, as well as other objects, are washed smooth. Water can be used to produce electrical energy.

ASSOCIATION CHAIN

An extension to the game
"Find the Pairs"

Activities

Using the same objects, the groups may be given an additional task of placing the objects in a row so that each following object is connected to the previous object either by way of its origin, way of life, systematics, shape or even colour. An attempt should be made to use all available objects. The groups then shortly introduce the row they built.

Example. Fish liver oil is connected to the cod because cod liver is used to make fish liver oil. The cod is connected to the Baltic herring because both of them are fish and the Baltic herring is part of cod food. The Baltic herring is connected to the bladder wrack because the thickets of bladder wrack are where the juveniles of the Baltic herring grow. The bladder wrack is connected to the red alga because both of them are algae. The red alga is connected to jelly candy because it is used to produce agar (E406) that gels the candy. Jelly candy is connected to salt because both of them have a strong taste and are edible. Salt is connected to the mussel because the amount of salt in water is what the size of the blue mussel depends on.



2. GAME OF THE SENSES

Resources

- * **Role of the senses flash cards.** You can find role of the senses flash cards in Appendix 2.
- * **Blindfolds or scarves** to cover the eyes.
- * **2–4 objects** (preferably connected to the sea) for guessing: empty sea-shells, smoked fish (smoked Baltic herring), salt, jelly candy, dried or fresh bladder wrack, stones or pieces of glass washed smooth by the sea. If you use smoked fish or anything else that may make the hands dirty, there should be a possibility to wash hands after the game.

Activities

If the activity takes place in a classroom with desks, the participants sit in their seats around the desk of their group. If the activity takes place outdoors, all participants are seated comfortably on sitting pads in a big circle.

In the introduction, it is explained that we perceive the world mainly through our five different senses – sight, hearing, touch, smell and taste. The leading sense for people is sight.

During the game, the group will become one organism with many ears, noses, mouths, hands and 1–2 brains or people who guess and process the data. In each round, the players are given the role of one sense shown on a flash card. Once the flash cards have been handed out, the players put their flash cards, face up, in front of them so that everybody sees the role they have.

1–2 people who guess or are the “brains” go out of the room (or far enough to wait until they are called to “work” or guess).

The persons who got the role of the nose and mouth, ears and hands are blindfolded. The persons who got the role of the eyes are not blindfolded.

When everybody is ready for their roles, they are asked to focus on the sense whose role they have and the leader(s) of the game introduces an object related to the sea so that each person can get to know the object only through their role or the sense on the flash card in front of them. For example, in the case of bladder wrack, the “hands” are allowed to touch it, the persons who got the role of the “nose” and the “mouth” are allowed to smell it, the “eyes” are allowed to see it, and for the “ears”, all kinds of possible sounds are made with the object. The role of the “nose” and the “mouth” are united because most of the things are not suitable to be felt by the mouth, but they can be asked after smelling the object whether the smell makes them want to taste it. It is worth having enough jelly candy, for example, so that a piece of it could be tasted and also given to everyone after the game.

All participants are asked to think about the impression they got and to find as many adjectives as they can to describe the information they received (the eyes: brown, smooth, branched, small, etc.; the hands: soft, slippery, flexible, cold, smooth, wet, etc.; the nose and the mouth: smelly, familiar, weak, odourless, etc.).

Before the game, it is discussed what are adjectives and what kind of adjectives are connected to which sense.

Once everyone has had the opportunity to get to know the object, the ob-



The hands talk

ject is hidden and everyone can take off the blindfolds. Then the “brain” or the persons who are guessing are asked to come and solve the problem. The task of the “brain” is to guess which object was introduced to the “senses”, based on the characteristics described by different “senses”.

The “senses” are to take turns and describe the object with adjectives. The recommended speaking order for the “senses” is the one that moves from the least informative characteristics to the most expressive ones. For example, in the case of bladder wrack (and often most of the other objects as well) the recommended order would be ears – noses and mouths – hands – eyes. However, in case of smoked fish, the “nose” should talk last.

When describing the object, adjectives are used so that the object is not named even when it has been recognised during the process of observation, listening, touching and smelling. Each adjective is a new clue that brings the person(s) guessing closer to the solution. If necessary, the game leaders can provide their assistance by asking guiding questions (about whether the object was sharp, hairy, round, light, soft, etc.).

The “brain” can also ask specifying questions and try and guess the object.

As an extension of the game, the “eyes” and the “hands” could draw what they saw and the “ears” try to imitate the sounds they heard.

If it is not possible to guess the object with the help of adjectives, the “senses” are asked to guess themselves what they think the introduced object was and finally the object is shown to everyone and if anyone wishes, they are allowed to feel it with all their senses.

Then the flash cards are collected, shuffled and handed out again, a new object is selected for guessing and the game is repeated.

At the end of the game, it is discussed, which of the objects were the easiest to guess and why.

Note. The better the children know the object used for guessing and the more common it is (an apple, bread, a stone), the easier it usually is for all “senses” to describe it and to recognise it. However, a thing that is completely strange and unknown (for example, an exotic fruit, an unknown tool, etc.) is more difficult to guess and it is hard or impossible to recognise it if one has never seen it and there is no experience of it.

Extension

If the learning programme can be carried out by the sea, the children may be asked to step to the water, turn themselves to the sea and feel the sea through all their senses one by one at the end of the task. About a minute can be given for each sense.





It is nice to have a holiday by the sea. It is also nice to investigate and discover.

3. ME AND THE SEA

Course of the Game

The game “Me and the Sea” is played together with all pupils.

Everybody stands in a circle and the supervisor presents different statements during the game. After each statement, the pupils consider for a while whether they agree with the statement or not. If they agree, they take a small step forward to the centre of the circle and say “I agree”; if they do not agree, they take a step back and say “I do not agree”.

There are no answers that are absolutely right and wrong; in the case of some statements, some children might take the step forward, some back. The issues partly concern sea life, but also our attitudes and relation to the sea, which can be very different.

Some examples of statements that can be used in the game have been presented below. If there are disagreements or questions about the statements, you could discuss them shortly.



Examples of statements that can be used in the circle

It is nice to swim in a clean sea.
 It is nice to swim in a dirty sea.
 It is nice to swim in a stormy sea.
 It is good to drink sea water.
 Smoked flounder is delicious.
 Seals need to be left some living space in the sea.
 The sea is the only suitable place to live in for many plants and animals.
 Sea water is salty.
 The sound of waves in the sea is very pleasant.
 It is nice to travel by ship and boat.

The sea is home to marine fish.
 The sea is home to seabirds.
 The life and work of fishermen is connected to the fish.
 It is healthy to eat fish.
 It is healthy to eat poisonous fish.
 I have more right to a good life than seals because I am human.
 It is nice to have a holiday by the sea.
 It is sad to see some water birds perish because of oil.
 Jelly candy is delicious.
 The sea is a suitable place for collecting garbage and sewage water.
 We can all damage and pollute the sea.
 We can all protect the sea.

Investigate and Discover. A Stone!

Topics

Estonian natural resources, sediments, sand, gravel, rock, limestone, granite, oil shale, quarry; characterising sediments and rocks. The use of natural resources.

Objectives

Children learn to notice rocks of different sizes, their form and differences in colour at the beach and in the rest of the nature, and know how this diversity has been caused.

Children can find rocks with similar characteristics, sort them according to their size, classify rocks into magmatic, metamorphic and sedimentary rocks, and differentiate between clastic sediments by the different size of their grain: sand, gravel, pebbles.

Children experience auditory rhythm exercises with the help of rocks.

Children learn about (or repeat) ways in which people use rocks and sediments.

Age and number of participants

Meant for pupils in Grades 4–6. Up to 24 participants.

Work area

It is very good to carry out the activity at a beach or in a gravel pit or quarry, which contain both sand as well as rocks. The activities can also be carried out in the school yard or classroom, but in that case, the necessary sediments and rock have to be previously collected by the supervisor. The task “Treasure Hunters in the Sandbox” requires a sandy area on the beach, which is large enough to mark down a separate excavation area. It can also be done in a children’s sandbox. In order to prepare for the task “Treasure Hunters in the Sandbox” the “treasures” to be hunted for have to be buried in the marked sand area or sandbox before the programme starts.

Duration

The duration of the full programme is about 1 hour:

Introduction – 5 minutes

Investigating the Rock Cycle – 20 minutes

Rock Instrument Music – 15 minutes

Treasure Hunters in the Sandbox – 20 minutes

Summary – 5 minutes





Structure of the Programme

Activities are divided into three main parts. In addition, time has to be planned for the introduction and the summary.

Investigating rocks and the cycle of rocks. The aim is to get to know rocks, sediments and the rock cycle in nature by practical activity, searching for them and comparing them.

Rock Instrument Music. Children use stones to make sounds and create stone music.

Treasure Hunters in the Sandbox. Children look for mineral resources in a sandbox – rocks and sediments that are already familiar. Children learn how they can be used.

1. INVESTIGATING THE ROCK CYCLE

Resources

* **Magnifying boxes or transparent jars with lids** (for each child) with pictures of different rocks and sediments at the bottom, see Appendix 3.

Please note! Only such objects should be used for pictures, figures and searching that can really be found outdoors at a specific place (from a quarry, at a beach, etc.) or, in case of an indoors programme, that have been previously collected. There should be enough material for all pupils and it is recommended to have some material in reserve.

* **A work surface** (about 1x1 m but it can also be smaller) with a coloured rock cycle diagram on it, which can be used to measure the size of sediments (sand, gravel, pebbles, cobbles). The dimensions of sediments have been presented in Table on next page.

You can make the work surface yourself by using the diagram in Appendix 4. The work surface can be drawn large with coloured markers on poster paper or white oilcloth. If possible, you can have it printed on a piece of washable PVC material measuring 1x1 m. The print file can be downloaded on the project website at <http://www.hyria.fi/COBWEB> and www.teec.ee. If there are more than 12 participants, there could be 2 work surfaces.

* **Pieces of rocks of different origin** (magmatic, metamorphic and sedimentary rocks).

* **Magnifying glasses**, if there are no magnifying boxes.

* If the programme is conducted outdoors, each participant should have a **sitting pad**.

Activities

Children are given magnifying boxes or transparent jars with lids, with a coloured picture of the thing they have to look for at the bottom of it. The name of the material looked for and, in the case of sediments, the diameter of grains is written on the lower side of the jar.

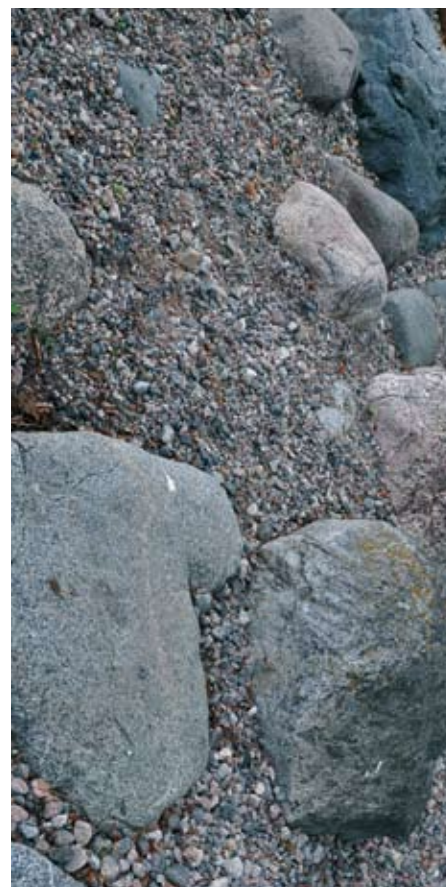
Before starting the search, it is explained that sediments (sand, gravel, pebbles) are distinguished by their **SIZE** but different rocks are distinguished by their **COLOUR**, **PATTERN**, **STRENGTH** (granite, gneiss, sandstone, limestone, oil shale).

Each child will search for and put the right rocks and particles of rocks into their boxes in nature or from the material placed on the desk in the classroom. Several children can collect similar material (sand, granite, etc.). A certain amount of time, about 10 minutes, must be given if you are in nature. It is important that all the materials looked for can really be found. Materials that cannot be found in the surroundings or the supervisors do not have in their collection should not be used.

When collecting is completed, everybody takes their seat around the work surface next to the text about the material they were collecting, so that everyone who collected sand in their boxes are together, etc. There is a diagram of the rock cycle in the middle of the work surface. The supervisor will explain the rock cycle and characterise different sediments and processes that rocks are subjected to in nature. Children place their boxes in the right place on the diagram according to the story/explanation told. Children examine the colour of the material in their boxes through the magnifying glass and each child can say 1–2 adjectives to characterise the material.

To conclude, each child says, which kind of sedimentary material (sand, gravel, pebbles) or rock (magmatic, metamorphic and sedimentary rock) they have in their box and they can also examine the rocks of other people.

If the activity took place at a beach and material that can be found in nature was collected, it can later be taken along to make a little sample collection or to supplement an already existing one.



Rock cycle

In the uppermost layer of the Earth's crust and on the surface of the Earth, the visible mineral material (rocks and sediments) consists of minerals that form rocks when pressed together and porous sediments when the rocks crumble, which again can be formed into rocks by high pressure and temperature (sedimentary rocks). So the mineral material is in a constant cycle on Earth, see Appendix 4.

Rocks become smooth (round,

flat, with holes, etc.) when washed by water or when rubbed against each other, but synthetic materials, such as pieces of glass and brick, can also be worn down to pebbles by the forces of nature.

Magmatic rock (eruptive rock) is formed when the semi-liquid mass of stone freezes in the Earth's crust or on the surface of the Earth (granite, Finnish red granite, etc.).

Sedimentary rock is a type of rock

that has been formed by the compression and hardening of sediments, which are usually layered and contain fossils (limestone, sandstone, oil shale, etc.).

Metamorphic rock is a type of rock formed when magmatic and sedimentary rocks melt and recrystallize (marble, gneiss, magmatite, etc.).

Sediments are weathering products of rocks in water bodies or on land, or a porous substance consisting of the remains of organisms (clay, sand, gravel, moraine, peat, etc.). Sediments are classified by their size. A grain of sand measures 0.1–2 mm in diameter, gravel has a grain size of 2–10 mm and pebbles 10–100 mm. Stones that measure more than 10 cm in diameter are cobbles and even bigger stones are called boulders.

Table 1. Classification of clastic sediments

Table 1. Classification of clastic sediments	Diameter of particles in mm
Sand	0,1 – 2
Gravel	2 – 10
Pebbles	10 – 100
Cobbles	100 – 1000
Boulder	1000 – 10 000



2. ROCK INSTRUMENT MUSIC

Resources

Stones of different size (about 3–5 cm in diameter) either collected by the children themselves (in case of an outdoor activity) or chosen from the teacher's resources. Each child should get two stones.

Activities

As an introduction, the supervisor explains what kind of instruments are percussion instruments and how sounds are formed on different percussion instruments.

Each child picks two stones (3–5 cm in diameter) and tries to make one particular sound that they like by hitting or rubbing the stones against each other. Each child will be one “note” in the game.

Children sit next to each other in a circle, the supervisor or the “musician” will be outside the circle.

Children close their eyes. It very important for all children to be willing to hold their eyes closed during the game because then the auditory sense will be heightened.

The supervisor taps the children one by one on the shoulder and, at each tap, the respective “note” will start resounding, which means that the child will start hitting or rubbing his or her stones against each other. At the next tap, the activity stops.

The children can be given rhythm exercises with a particular measure, for example a comparison of $2/4$ and $3/4$ of a measure.

The children can also make improvised stone music themselves in smaller groups.



The sand is used
to make glass

3. TREASURE HUNTERS IN THE SANDBOX

Resources

- * **Children's sand shovels and/or spades.**
- * **Different rocks and minerals** (limestone, oil shale, granite) and sediments (sand, gravel). There should be at least three pieces (or more) of each material. Materials that can be found in Estonia should be preferred, but more exotic ones can be added, if desired and possible. It is recommendable to put the materials that are more valuable and fragile or hard, to distinguish from the main material of the sandbox (sand, gravel), in cups, empty surprise eggs, jars or boxes so that they can be buried in sand.
- * **A light coloured work surface to lie on the ground** if it is not possible to use outdoor classroom desks. You can also use the other side of the work surface for the rock cycle.
- * **Envelopes to help determine the treasures;** they can be placed on the desk or work surface. There are pictures glued on the envelopes of buried materials (you can find pictures of some of them in Appendix 3). Only such materials which can really be used should be presented as pictures. There is the name of the material in the envelope along with a list of things that can be made of the material or how it is used. The texts with the names and areas of application of natural resources can be cut into pieces and made into a puzzle after printing or parts of the texts can be so small that you can only read them with a magnifying glass.
- * **Magnifying glasses** if the texts in the envelopes use a small text size.





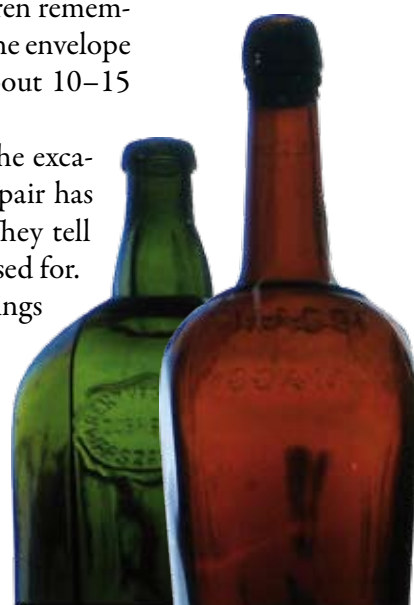
Activities

Children are divided into pairs and equipped with excavation instruments. The rules and borders of the search area (a sandbox or a marked area on a sandy surface) are introduced. Then the task is given to start mining natural resources.

The pairs dig until one of the children finds one of the objects searched for. Then they take the object and go to the desk (or work surface) to determine what kind of natural resource it is and look for an envelope with the most suitable picture on it. The pair of discoverers take out the contents of the envelope, put together the puzzle and find out what the name of the thing they discovered is and how it is used. The children remember what they read, put the pieces back in the envelope and take another round of excavation. About 10–15 minutes is given for the activity.

The discoverers are then asked to stop the excavation and to sit in a big circle, and each pair has to praise the object(s) they have found. They tell what they have found and what it can be used for. The partners can help each other. The findings are also shown to others.

If the activity takes place outdoors and the supervisor has enough oil shale, a demonstration of the way oil shale burns can be carried out in the end.



Possibilities for the use of mineral resources

SAND: construction work (mixtures), raw material for glass, hourglasses, additive in the ceramics and cement industry, cleaning surfaces (sandblaster and sand paper), road construction.

GRAVEL: building material in road construction, railway embankments, landscape architecture.

GRANITE: building material in stone fences, plates, finishing; construction gravel, de-icing stone for roads, material for sculptures and monuments.

LIMESTONE: building material, crushed stone, lime production, raw material for making cement, mineral wool, in the paper industry, metallurgy, for cleaning waste water, neutralising acid soils, food additive for animals and birds, decoration and pavement slabs in garden architecture.

OIL SHALE: raw material for electric power, thermal energy, chemical industry: oils, oil shale gas, road surfacing bitumen.

Appendix 1. Objects for the task "Find the Pairs" ✂



COD



BLADDER WRACK



BALTIC HERRING



RED ALGA
FURCELLARIA FASTIGIATA



FLOUNDER

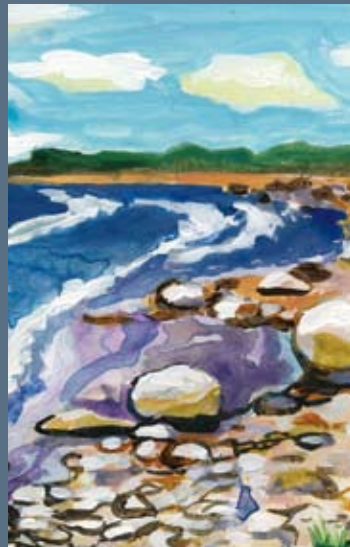
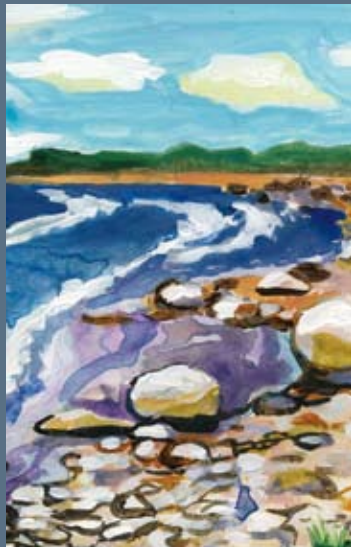
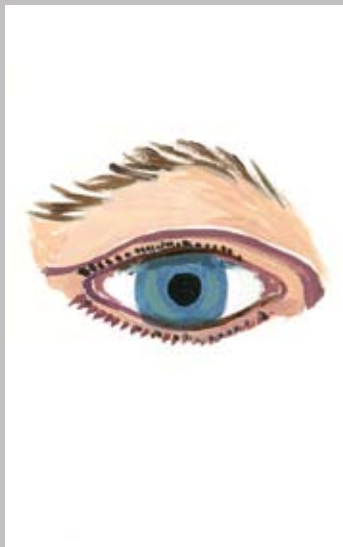
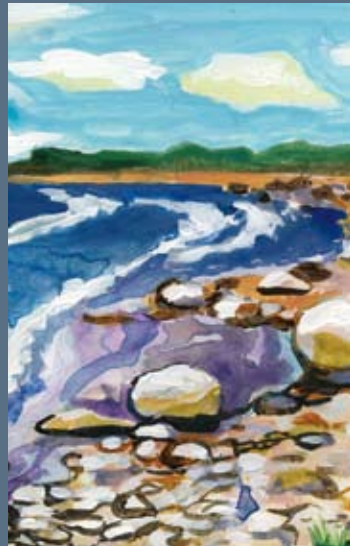
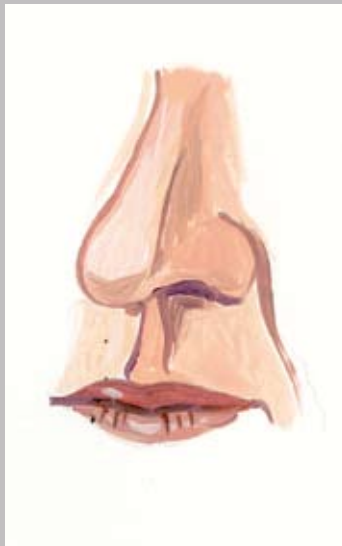
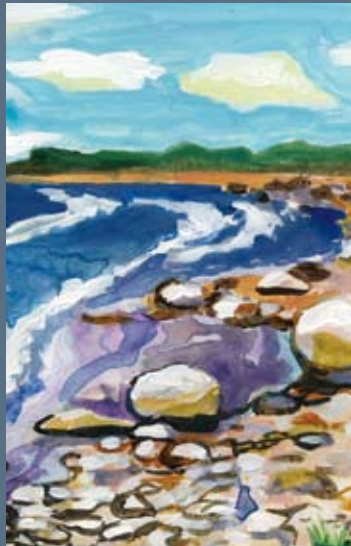
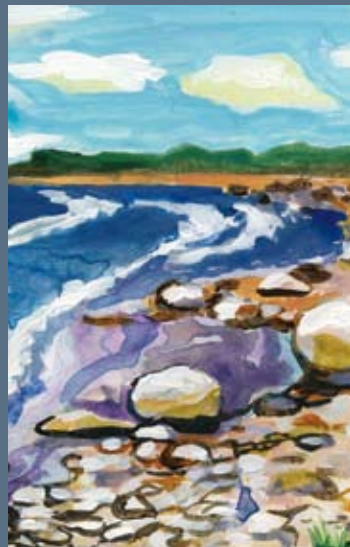
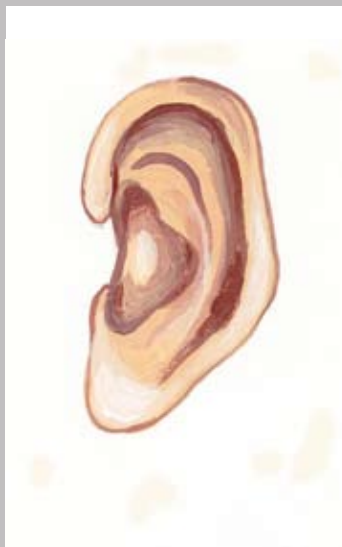
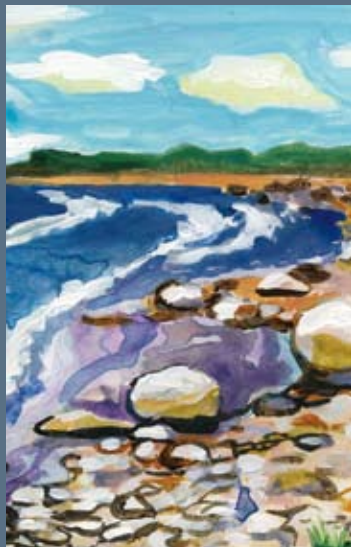


COMMON EIDER

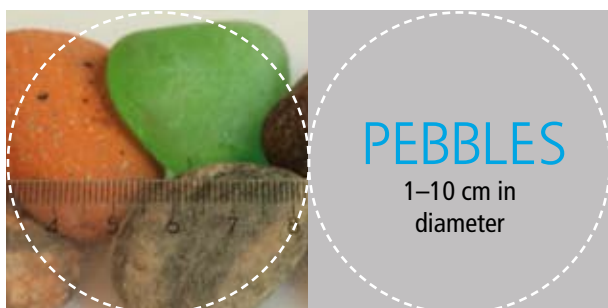
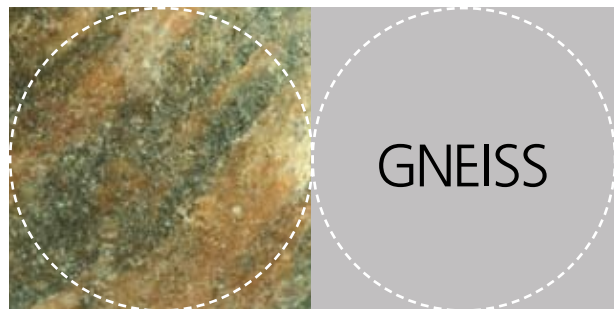


PIKK HERMAN TOWER

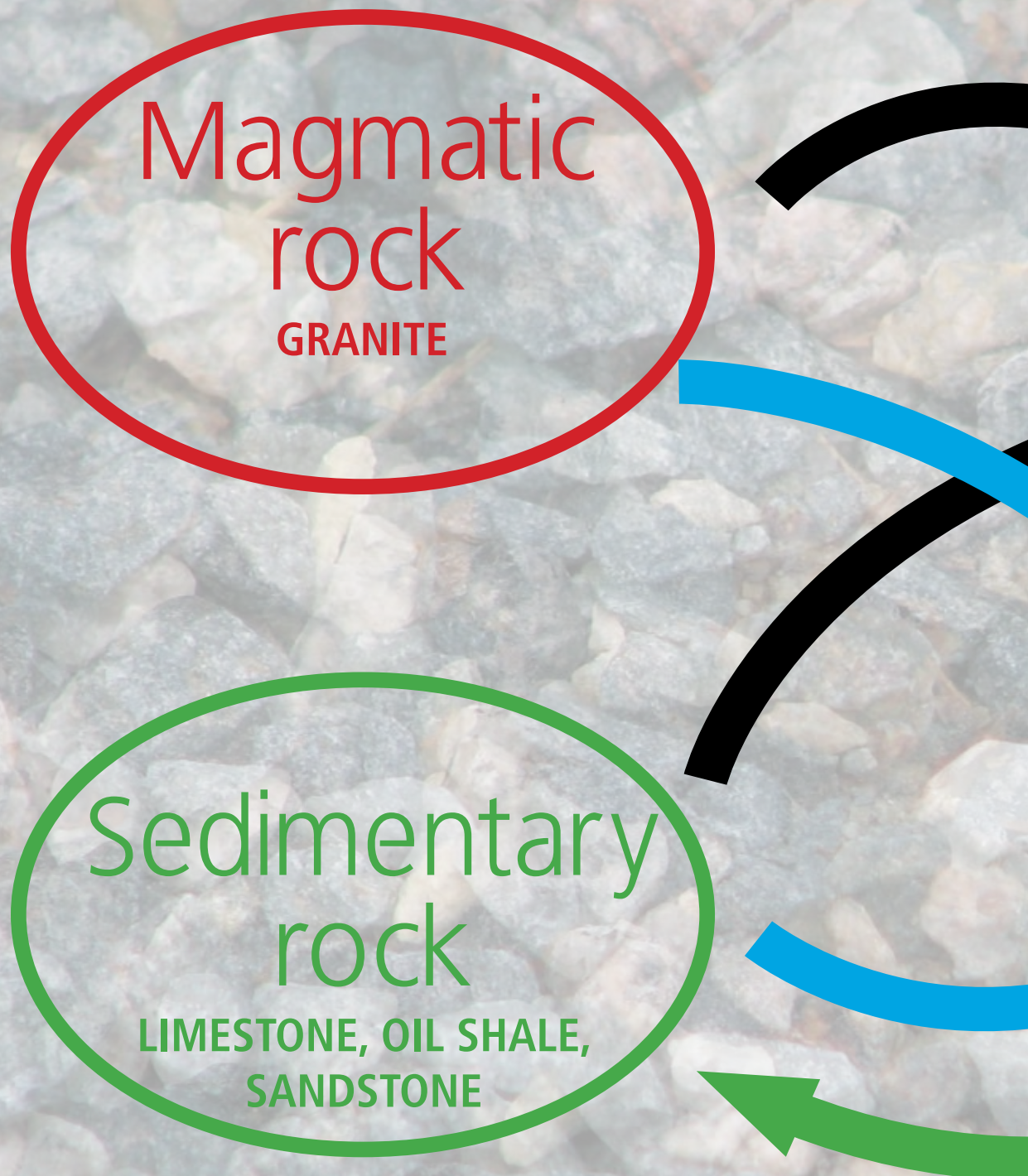
Appendix 2. Role Flash Cards for the Game of the Senses ✂



Appendix 3. Examples of rocks and sediments for magnifying boxes or jars ✂



Appendix 4. Rock Cycle Diagram



Processes
occurring in the
rock cycle:



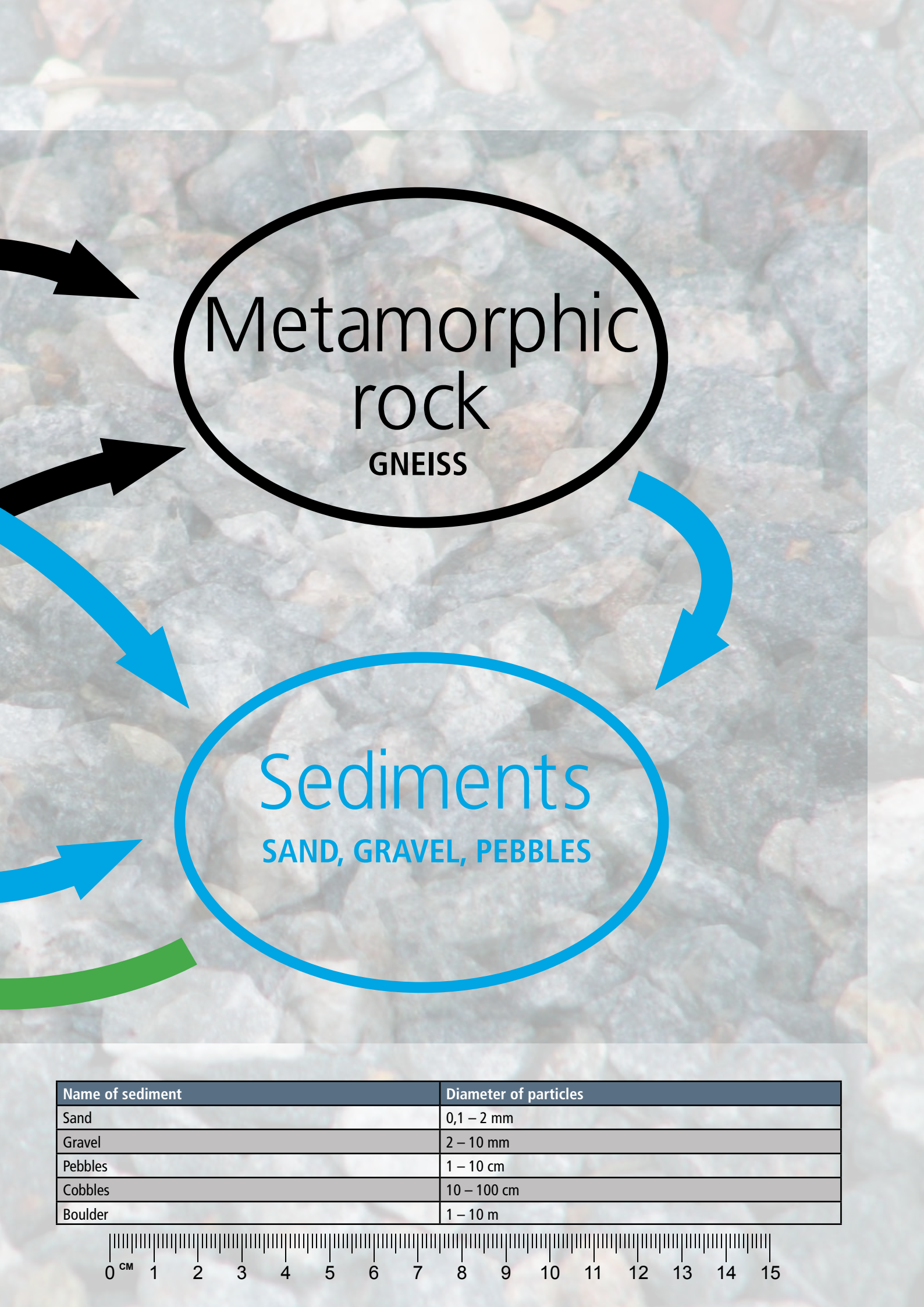
Changing of rocks by high temperature and pressure



Weathering of rocks and sedimentation of porous substance

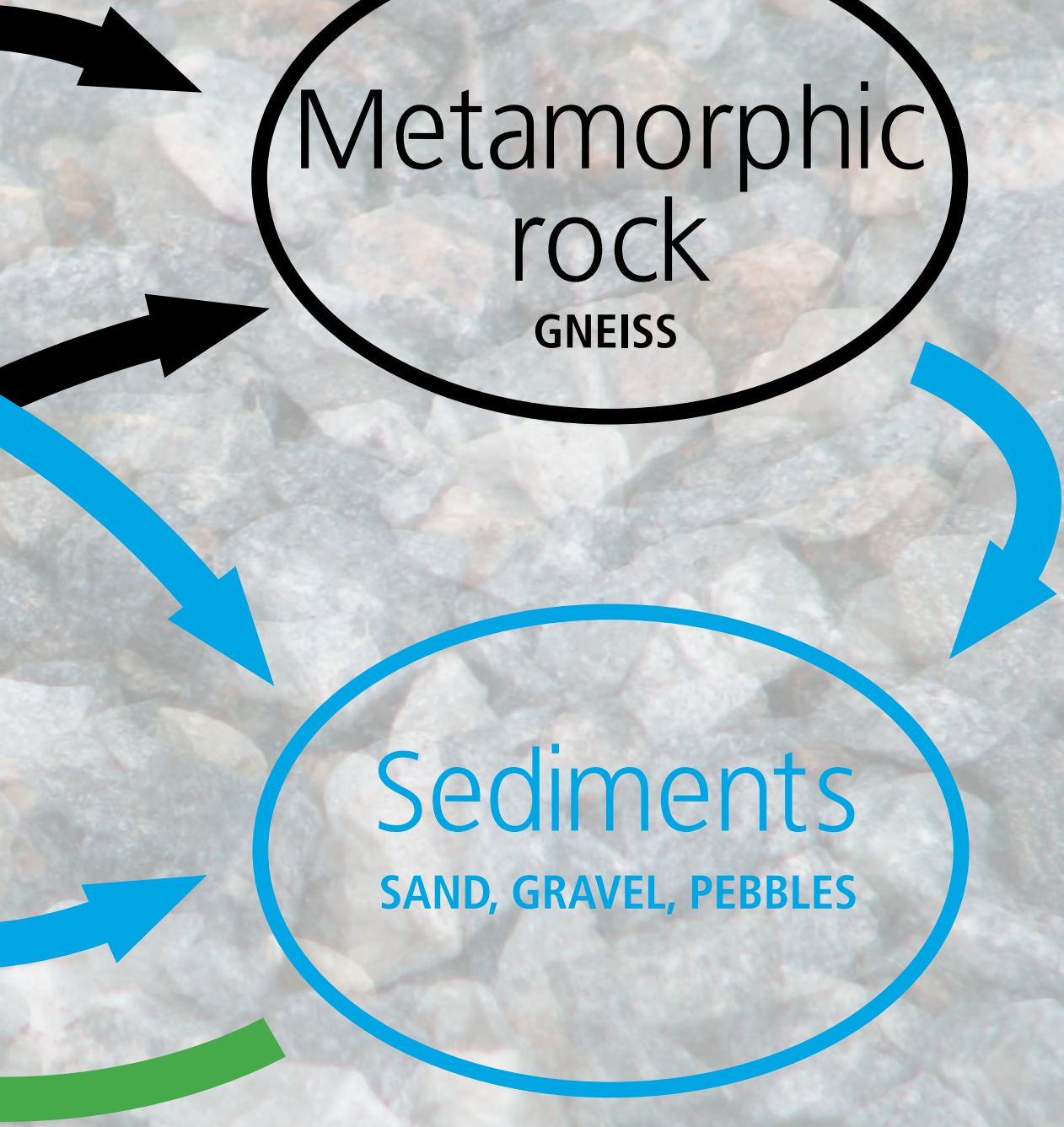


Solidification of sediments

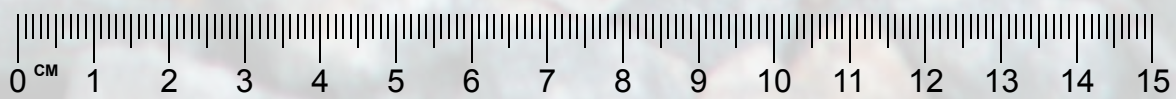


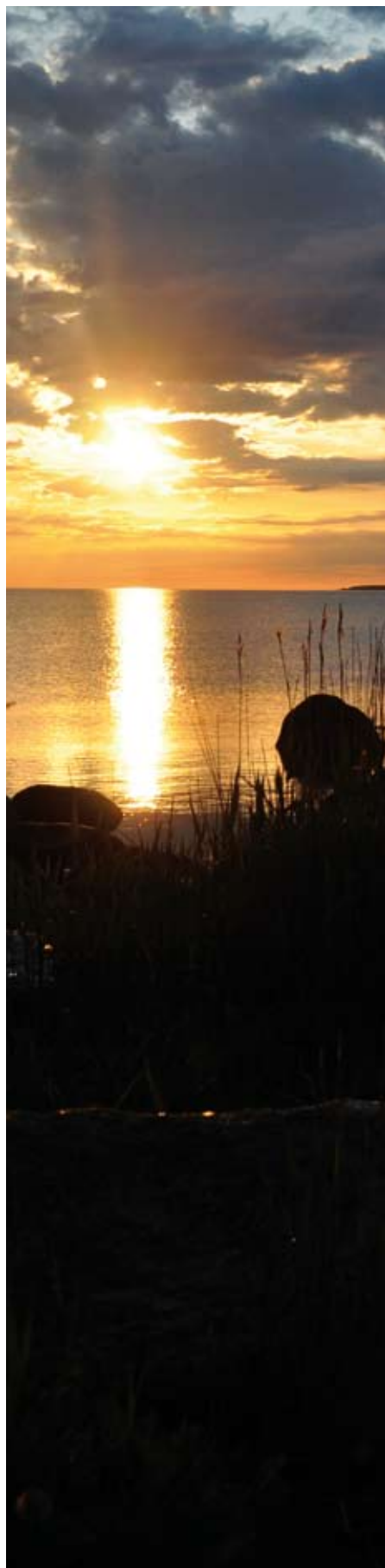
Metamorphic
rock
GNEISS

Sediments
SAND, GRAVEL, PEBBLES



Name of sediment	Diameter of particles
Sand	0,1 – 2 mm
Gravel	2 – 10 mm
Pebbles	1 – 10 cm
Cobbles	10 – 100 cm
Boulder	1 – 10 m





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Project "Communicating the Baltic - COBWEB" combines the scientific approach with concrete awareness raising activity and methodology approach to a joint educational material building process with concrete outputs. We are creating workshops, expert forums, movable exhibitions, museum exhibitions, role taking website, nature and environmental school programs, friendship between different cultures, inspiration and ideas for a more sustainable lifestyle in the Baltic Sea area.

Project Partners: Hyria Education Ltd (Lead partner); City of Helsinki, Harakka Nature Centre; Helsinki Metropolitan area Reuse Centre Ltd, Environmental school; City of Espoo, The Nature House Villa Elfvik; City of Nynäshamn, Nynäshamn Nature School; Tallinn University of Technology, Institute of Geology; Tallinn Environment Department; University of Tartu, Natural History Museum; Tartu Environmental Education Centre; Natural History Museum of Latvia; University of Latvia, Department of Environmental Management.

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Project webpage: <http://hyria.fi/cobweb>

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Tartu Environmental Education Centre includes:

Hobby school for children and young people Tartu Nature House,

Nature and environmental information centre,

Adult training centre.

We organise exhibitions, film and seminar evenings, nature hikes and other public events for the city, and curriculum based nature programmes for schools. Our Nature House hobby groups are a place for interesting activities and exciting discoveries for school children. Come and discover yourself in nature!

