LAKE & STREAM OUTDOOR Classroom



TEACHER's Guide





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The purpose of this teaching material is to aid teachers who want to move their teaching outside of the classroom. There are lessons with materials for primary schools, focusing on exploratory teaching in the forest.

We know that students learn in different ways and that through outdoor education under conscious leadership, their knowledge about, in this case, lakes and streams can increase. By engaging all their senses and being in aquatic environments they will gain their own unique knowledge and experiences. Compulsory school students should have a good understanding of aquatic biotopes and ecosystems.

The aim of this box is to improve students' understanding of ecology and the connections within ecosystems. The material is designed to be a foundation that can be adapted to the current learning objectives and students' abilities and prior knowledge. The teacher actively participates as a co-explorer and investigator, sharing their students' curiosity and wonder. Divide the students into pairs or small groups to encourage greater participation. You can read more about outdoor education in tab 2.

The following is a suggested approach to the classroom activities before and after using the material in the field.

Preparatory work in the classroom

- Introduce central concepts in ecology
- Read about lakes and streams
- Show on a map or chart where the field work is taking place

Hands-on exploration outdoors at the shore

• Go through the boxes and select the elements that best support your outdoor teaching. Choose things that complement your teaching and help you achieve your goals.

Follow-up work in the classroom

• Review and let the students tell each other what they did in the field.

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- Process and validate knowledge, impressions and feelings from the excursion through various presentation techniques, games, and creative activities.
- Expand your knowledge about life lakes and streams.
- Encourage students to visit lakes and streams.

This box is about exploring the lakes and streams. There are also boxes for exploring the ecological connections in the sea, meadows and forest. All of these can be borrowed for free from Norrtälje Nature Center for 3 weeks.

The mobile classrooms have been developed by Norrtälje Nature Center in a Nordplus Horizontal project where the nature school in Tartu, Estonia, along with the organization Håll Litauen Rent, Lithuania, have been project partners.

Target audience

The primary target audience for the mobile classrooms is primary school students and teachers. Nonetheless, there are others who can also use and be inspired by the material in the box and the teacher's guide, such as teacher education and nature and environmental organizations. The boxes are also well-suited for activities with the general public aimed at improving understanding of ecology and the connections in nature, so that we can work together for more sustainable systems.

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Definition of outdoor education

Outdoor education is an approach that aims at learning in an interplay between experience and reflection, based on concrete experiences in authentic situations. Outdoor education is also an interdisciplinary field of research and education which, among other things, involves:

• that the learning space is also moved out into social life, natural and cultural landscapes,

• that the interplay between sensual experience and bookish education is emphasized,

• that the importance of the place for learning is highlighted,

to interact between outdoors and indoors in teaching and learning.

(cf. the definition in the National Encyclopedia NE, online version 2021, Dahlgren, and Szczepanski, 1998, Dahlgren et al., 2007, p. 11, Szczepanski, 2008, p. 15, Szczepanski, 2024 under publication at IBL, Linköping University)

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Outdoor education is a teaching approach where the personal experience, active learning and sensory impressions are central. By immersing students in diverse outdoor environments, this approach promotes deeper engagement and helps students remember what they have learned, as the knowledge is anchored in real-world experiences. The location is significant as an educational space from a learning and teaching perspective, and opens up more possibilities for different ways of learning. The didactic question of WHERE the teaching should take place is central. At the same time, it is important that the learning takes place alongside more traditional indoor teaching, in order to connect theory and practice.

Outdoor education is not only about nature, ecology and outdoor recreation, but equally about social studies, history, geography, sustainability and language. Outdoor education aims to highlight connections, making it well-suited for interdisciplinary studies. In an outdoor setting, with mindful leadership, students work toward many learning goals simultaneously. This is essential if schools and students are to achieve the ambitious goals and guidelines set out in the curriculum. However, this requires teachers to collaborate across subjects in order to give students a comprehensive view. Together with other students and the teacher, the students experience first-hand, and experiences form a basis for comparison, analysis, reflection and conclusions. The best learning is that which

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resonates and engages, a learning that is grounded in reality and facilitates the encounter between the student and the real world. It promotes questions about the content and meaning of the material.

The learning occurs in the interaction between the indoor and outdoor environments, the method, the leadership, and the interactions between students. The investigative work outdoors should be followed by a processing phase. How do we manage the students' new knowledge, experiences and insights? The indoor processing phase, which includes seeking new knowledge from books or online sources, reflection and analysis, can take various forms. Reflection is central in the process of learning, and is essential to convert experiences and activities to self-formulated knowledge. There are different ways to describe the learning processes of outdoor education. The following model is inspired by Arne Nikolaisen Jordet, *Klasserommet utenfor tilpasset opplæring i det utvidet læringsrom*¹. The goal of the teaching should always be clear to the student.

A. Introduction phase

Purpose and goal is made clear. The teacher presents the material to the students. Preparations.

B. Practical teaching in groups outdoors

- B1. The students work in groups, in pairs or individually.
- B2. Presentation of the groups' work walking from group to group.

The teacher leads conversations and reflections and concludes by giving an oral summary (auditory structure).

C. Processing phase

Further work indoors in a classroom based on the students' new experiences, knowledge and questions.

¹ Nikolaisen Jordet Arne, Klasserommet utenfor tilpasset opplæring i det utvidet læringsrom, Cappelen Akademisk forlag, 2010

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Reading, writing and in-depth study. Reflection, analysis. Formulate one's knowledge. Presentation/application.

... and then it starts over ...

It is important to make use of the student's earlier experiences and knowledge. The student must be actively involved in their learning. The group is significant in outdoor education. Conversation and communication are central for learning. Especially important are conversations that build chains of knowledge, conversations that train students' ability to reason and argue, as well as exchanges of experience of various kinds. It is important to succeed together, as well as being allowed to fail. The social climate in the group is crucial for a good learning environment. Hattie argues in his study *Visible learning*² that if the classroom environment is not only tolerant of, but also welcomes mistakes, is characterized by challenging tasks and supports engagement and perseverance, then successful learning can be further strengthened. Building an open climate in the classroom requires a conscious effort in leadership. Continuous outdoor education through the school years is a way to build strong relationships between students, as well as between students and teachers. In diverse environments students are provided with good opportunities to demonstrate different abilities and aspects, which builds self-esteem and helps foster a safe environment in the group.

In summary, outdoor education is about learning both indoors and outdoors in interaction, aimed at improving curriculum goal attainment and making teaching more accessible, as outdoor education naturally offers varied teaching in diverse environments. Moreover, outdoor education provides an active education that incorporates physical activity and movement in every subject, which is beneficial for students' health. Spending time in green environments also has a positive impact on students' mental health, which is very important today. Dare to step out of the classroom with your students!

² Hattie John. Visible learning: a synthesis of over 800 meta analyses relation to achievement, Routledge, 2009

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For more information;

Research overview Outdoor Education, Linköping University <u>Teaching with the Sky as a Ceiling (2018)</u>

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Positive effects of outdoor education with students in conscious leadership

Increased knowledge of nature and a greater connection to it

Diverse learning environments

Opportunity to see connections and the bigger picture

Opportunity to connect theory and practice

Personal first-hand experiences

Exercise, fitness, movement and pulse

Physical and mental health

Excitement, adventure and play

Social and emotional competence

Community

Happiness, well-being

Self-esteem through choosing one's own challenges

	3 HELPFUL CONSIDERATIONS			
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Helpful considerations for outdoor education

Here are some tips and support to increase confidence in leadership during outdoor education and ensure successful outdoor lessons.

- Strong subject, nature and outdoor skills increase confidence in leadership.
- The outdoor learning environment should be carefully chosen. If you have not been at the location before, it is always a good idea to go there in advance so you know how you can organize the teaching in relation to the environment. For younger children in preschool or students in the lower grades of primary school, it is beneficial to often return to the same location as it builds a sense of security and makes it easier to focus on the teaching. On the other hand, for older students new and unknown environments can lead to increased focus in investigative work.
- Prepare the students carefully for what you will be doing when you go outside. What rules should apply?
- Respect any fears in the group (for example fire, water or insects).
- The teacher should always be a good role model when it comes to clothes, safety and attitude.
- The teaching should be adapted to the season and weather conditions. Gather the students in a circle for briefings and find shelter so that the voices can be heard clearly. On sunny days it is best to stand so that the students have the sun behind them and do not have to squint.
- Have good safety routines and equipment with you (see the section on Safety in outdoor education)
- Remind the students to wear appropriate clothing and durable shoes/boots.
- Aim for long outdoor sessions to avoid stress. The best approach is to collaborate with other teachers to integrate subjects, allowing you to spend a half day or full day outdoors.

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The work with the mobile outdoors classroom covers multiple different subjects in the curriculum, and subject integration takes place with biology, language, art and physical education. It is beneficial for multiple subjects to collaborate, enabling outdoor education for a full day. The hope is that through outdoor education in different biotopes you will be able to concretize and provide students with first-hand experiences both related to both core content and knowledge requirements.

The following are connections between the mobile classroom and Swedish *the Curriculum for Compulsory School, Preschool Class and School-Age Educare* (lgr22);

2.1 Norms and values

Schools shall actively and consciously influence and stimulate pupils to embrace the common values of our society and express them in practical everyday action in different contexts.

Objectives

The school's objectives are that each pupil

• shows respect and care for the local environment as well as the environment from a broader perspective.

2.2 Knowledge

Schools are responsible for ensuring that pupils acquire and develop the knowledge necessary for each individual and member of society. This knowledge also provides a foundation for further education. Schools shall contribute to the harmonious development of pupils. A sense of discovery, curiosity and the desire to learn shall form the basis of the school's activities.

The natural sciences evolved from people's curiosity and need to know more about themselves and the world around them. Knowledge of biology is of great importance for the development of society in areas as diverse as the use of natural resources, the environment, and health. Knowledge of nature and humans gives people the tools to not only shape their own well-being, but also promote sustainable development.

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Core content f-3

- Animals, plants and fungi in the local environment, how they can be grouped, and the names of some common species. (Biology)
- Simple food chains that describe relationships between organisms in ecosystems. (Biology)
- Simple field studies, observations and experiments. Performing and documenting the investigations with words, images and digital tools. (Biology)
- Oral presentations and oral narration. Objects. (Swedish)
- Active listening and retelling important parts of the content.(Swedish)
- Exploration of possibilities for and realisation of games, physical activities and spending time in nature and other outdoor environments. (Physical education and health)
- The basics of the right of public access. (Physical education and health)

Core content 4-6

- Food chains and cycles in the local environment. The interplay between animals, plants and fungi, and how some environmental factors affect them. Photosynthesis and cellular respiration. (Biology)
- How animals, plants and fungi can be identified and grouped in a systematic way, and the names of some common species. (Biology)
- Human dependence on and impact on nature, with links to the use of natural resources, sustainable development and ecosystem services. Nature as a resource and our responsibilities when using it. (Biology)
- Field studies and experiments using both analogue and digital tools. Planning, performance, evaluation of results and documentation with words, images and tables. (Biology)
- Oral presentations and oral narration for different listeners. Organisation, with introduction, content and conclusion. Key words, images, digital media, tools and other aids for planning and delivering an oral presentation. How gestures and body language can affect a presentation. (Swedish)
- Exploration of possibilities for and realisation of outdoor activities, games and physical activities in various nature and outdoor environments during different seasons. (Physical education and health)
- Rights and obligations in nature according to the right of public access and its application in practice. (Physical education and health)

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Core content 7-9

- Local and global ecosystems. The relationships between populations and available resources. Photosynthesis, cellular respiration, material cycles and energy flows. (Biology)
- Human impact on nature locally and globally, and how to promote sustainable development at the individual and societal level. The importance of biodiversity and ecosystem services.(Biology)
- Field studies and experiments using both analogue and digital tools. Formulation of research questions, planning, performance, evaluation of results and documentation with images, tables, diagrams and reports. (Biology)
- Different forms of dialogue. Active participation; expressing feelings, thoughts and knowledge; listening; asking questions; making inferences; and expressing and responding to arguments.(Swedish)
- Oral presentations and oral narration for different listeners. Adapting language, content and organisation to the purpose, listener and context. Speech scripts and various tools for planning and delivering oral presentations, both with and without digital technology. (Swedish)
- Planning and performing outdoor activities in different environments during different seasons. (*Physical education and health*)
- Rights and obligations in nature according to the right of public access and its application in practice. Cultural traditions in outdoor life and other outdoor activities. (*Physical education and health*)

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Agenda 2030 and the Global Goals were established in 2015 by leaders from around the world. The goals aim to help us achieve social, ecological and economic sustainability. The goals are to be reached by 2030. Agenda 2030 and the Global Goals aim to foster sustainable development. This means we must live in a way today that ensures future generations will have the same opportunities as we do. The Global Goals are indivisible and interconnected. It is best to use the Global Goals as a starting point for learning about sustainable development in schools. Working with sustainable development should not be seen as something separate, but as something that permeates all subjects in school.

According to the curriculum, one of the school's missions is to "provide students with the opportunity to develop knowledge about how the various choices people make can contribute to sustainable development". Everyone knows we face major challenges, and by providing all students with a good education, we contribute to Goal 4. This is the school's primary mission in working towards achieving the Global Goals. The materials in the boxes are a step towards more outdoor education in schools and giving more students knowledge about ecology and science, as well as their own personal experiences of nature and scientific phenomena. All activities are linked to the curriculum and the Global Goals.



Teaching by lakes and streams provides an opportunity to develop awareness and knowledge of ecology. They host a great diversity of life and ecosystems, contributing to various ecosystem services. Among the Global Goals, it is of course Goal 15, *Life on Land*, that is the primary focus here. At the same time, Goal 6, *Clean Water and Sanitation*, is also central. How can we reduce water pollution and take better care of this resource? How does the surrounding nature and landscape influence the water, and what role do humans

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play? In the process, we also create opportunities to reflect on several other goals, such as Goal 3, *Good Health and Well-being*, and Goal 12, *Responsible Consumption and Production*.



Read more about the Global Goals;

https://www.globalgoals.org/goals/

https://www.un.org/sustainabledevelopment/sustainable-development-goals/

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To teach in the local environment and in different biotopes, it is important to think about safety. Thinking through the planned teaching situation and carrying out a risk assessment with associated measures to mitigate risks enables the teacher to teach effectively and be present.

Having a well-prepared backpack specifically for outdoor teaching is highly recommended.

Suggested contents;

- First aid kit
- Bag with hygiene items such as toilet paper, hand sanitizer, and garbage bags
- Water
- Consider creating safety cards with action plans for emergencies, such as accidents, a missing student, or any other potential risks.

Always bring a fully charged phone to use in emergencies. If a child goes missing, immediately call 112. A child can move far in just 15 minutes, and the search radius expands quickly. If a child/student is seriously injured, stung by a wasp, or similar, call 112 or the medical advice line for guidance. If an emergency response is required, the responsibility lies with the emergency operator. Other useful numbers to have include those for the school, students' guardians, the poison information center, and local healthcare clinics.

When conducting outdoor lessons near the shore, water, or natural ice, it is especially important to conduct a thorough risk assessment and prepare as much as possible to prevent accidents.

With these preparations, we hope you have exciting, meaningful and high-quality school days.

Good luck!

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The Right of Public Access ("Allemansrätten") gives us a unique opportunity to experience nature in Sweden. All nature is owned by someone, so we are visitors and must show consideration and respect, both for animals and plants, as well as for other visitors and landowners. The Right of Public Access applies both on land and water. We use the Right of Public Access when we hike in the forest, climb, play in nature, pick berries, kayak, or sit on a rock in the archipelago and watch the sunset. The Right of Public Access is freedom with responsibility. It is not a law, but guidelines for how we should behave in nature. A good summary is "do not disturb, do not destroy". Remember that fishing and hunting are not included in the Right of Public Access, nor is driving motor vehicles off-road. If you're unsure about what you're allowed to do in a specific area, ask the landowner.

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- **Be considerate of those who live or work at a location** you are free to roam in forests and nature. You use the Right of Public Access when you pass houses from a distance and take a detour around fields or newly planted forests. If you're unsure whether you're disturbing someone, feel free to ask. Remember to keep your distance from grazing animals and always close gates.
- **Make safe fires** you can make a fire in nature under safe conditions. It's best to always choose a designated fire site, or select gravel or sand if you need to make a fire in other places. Always keep an eye on the fire and put it out properly. It's your responsibility to check if there's a fire ban in the municipality or county and, if so, bring food that doesn't require a fire.
- **Pick berries, flowers, and mushrooms** the Right of Public Access gives you the opportunity to enjoy what nature offers. You can take branches, pine cones and nuts that are already on the ground. You may pick berries, as well as flowers and mushrooms that are not protected by law.
- **Take your trash home** leave no trace of your presence in nature.
- **Cycling** adjust your riding style to the terrain and avoid areas that are wet or sensitive. If many of you cycle frequently in the same area, remember to talk to the landowners.

The Right of Public Access does not apply in all areas. In nature reserves, parks, golf courses, beaches and national parks, the Right of Public Access is often restricted. You need to find out for yourself what rules apply in these areas. Learn more about the Right of Public Access:

The Swedish Environmental Protection Agency website: https://www.naturvardsverket.se/en/topics/the-right-of-public-access/

Norrtälje Nature Center's website: https://norrtaljenaturcentrum.se/allemansratten/

Do not disturb, do not destroy – go out and enjoy!

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Lakes are bodies of freshwater where temperature, oxygen and light create an environment for organisms to live in. They are full of plants, algae, fish, insects and microorganisms such as bacteria and fungi. All these living and non-living elements in lakes form ecosystems.

Plants and algae produce oxygen and their own food through photosynthesis. Some algae are so small they are practically invisible. They float freely in the water and are called phytoplankton, meaning "wandering plants." Other organisms use oxygen to breathe and eat phytoplankton, plants or other animals. For example, small crustaceans, such as water fleas, eat phytoplankton. These, in turn, become food for fish, and fish can be eaten by birds. In this way, organisms are connected in a food chain, and because different

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organisms eat more than one type of food, everything is linked in a food web. There are also decomposers in the lake that break down dead algae, plants and organisms.

The seasons affect life in lakes. Solar radiation varies greatly throughout the year, which leads to different levels of biological production during different seasons. The difference in water temperature throughout the year is another important factor for organisms in the lake. Water density depends on temperature, and has its highest density at 4°C. This means that the 4°C water ends up at the bottom of the lake, with warmer or colder water above. Therefore, frozen-bottom lakes are rare, and because of this, animal life in the lake can survive the winter.

A stream or other flowing water (brook, river or creek) also contains freshwater, but the species that thrive in flowing water have different traits and needs compared to those living in lakes. Flowing water is rich in oxygen and lacks the stratification that occurs in a relatively still body of water like a lake. Large watercourses rarely freeze completely in the winter, while smaller brooks and streams can be completely frozen at the bottom during winter.

The mobile classroom aims to spark curiosity and inspire students to explore lakes and streams near your school. Through practical investigations involving all the senses, students gain first-hand experiences and deepen their understanding of ecology. It is also important that students develop a connection to the location. By fostering wonder, knowledge, awareness and engagement, we create the conditions for understanding nature, ecological connections and biodiversity.

There is a lot of excellent educational material about water. Read and learn more about:

- Lakes seasonal circulation
- Streams and watercourses adaptations to flowing water

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Below are some websites, links, literature and other resources:

Websites

Skogen i skolan	https://www.skogeniskolan.se/
Swedish Society for Nature Conservation <u>https://www</u>	w.naturskyddsforeningen.se/in-english/
Swedish Environmental Protection Agency	https://www.naturvardsverket.se/en
World Wide Fund for Nature	https://www.worldwildlife.org/
Norrtälje Nature Center	https://norrtaljenaturcentrum.se/

Literature:

Naturskoleföreningens bokserie- Lära in ute <u>https://www.outdoorteaching.com/sv/vara-bocker/serien-att-lara-in-ute/</u>

Mobile-app Seek

	9 EXERCISE 1 NETTING IN A LAKE OR STREAM			
	BOX 4 Lake & Stream			
RATURCENTRUM ekologiskt science center	GRADES	f-3	4-6	7-9
	Purpose: To learn more about life in the lake, as well as			
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MATERIALS Hand nets, aquascope, metal sieve, aquarium, trays, jars and field guides.

INSTRUCTIONS

- Find a location by a shallow lake where you can net from the shore.
- Divide the students into groups and distribute the equipment. Let the students net and search for life in the lake. They can collect their findings in trays and jars. Also, let them investigate the bottom and drag the metal sieve a little way down to see if they discover any life.
- Set up smaller jars in a row on the shore and let the students carefully sort their findings. For example, they can sort them by the number of legs. How many different species do they find? Let the students try to identify the species. It is a good idea to also photograph all the species.
- Gather the students in a circle around the display. Discuss:
 - What different aquatic animals were found? (clams, snails, insects, etc.)
 - Which of the animals do you think eats which?
 - Are any of them in their larval stage?
 - Does the lake appear to be species-rich and healthy?
- Now it's time to clean up and carefully return all life to the lake.
- At the end of the lesson, gather the students in a circle for reflection. The teacher summarizes.

	10 EXERCISE 2 LIFE UNDER A STONE				
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RATURCENTRUM ekologiskt science center	GRADES	f-3	4-6		
	Purpose: To learn more about life by the lake, as well as biodiversity and ecology.				
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MATERIALS Note-taking materials, loupes and jars.

INSTRUCTIONS

- Start the lesson by a lake or stream.
- Divide the students into pairs. Have them turn over stones near the shoreline. There, they may find water lice and other creatures. They feed on decaying dead leaves and other plant material. Let the students draw the environment and the creatures they find under the stones near the water's edge.
- Gather the students in a circle at the end of the lesson and let them share their findings. Encourage reflection: Why do insects like water lice thrive near the shoreline? The teacher summarizes.

Inspired by Lena Kautsky, Professor Emeritus, Stockholm University

	11 EXERC	11 EXERCISE 3 HAND-NET WITH LUMP			
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RAIURCENIRUM ekologiskt science center	GRADES	pre-school	f-3		
	Purpose: To learn more about life in lakes and streams, as well as biological diversity and ecology.				
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MATERIALS The book *Lump*, hand nets, trays, jars, species identification guides and field guides, loupes and aquascope.

INSTRUCTIONS

- Read the book *Lump* in the classroom or by the lake/stream.
- Ask the students to look for stones at the bottom of the stream/lake. What do they think the stone has seen this week? How long has it been there? Now, divide the students into smaller groups and let them search for life in the lake or stream. Distribute the equipment.
- Arrange jars in a row along the edge. Let the students first gather their findings in the large white tray.
- Ask the students to identify the different aquatic animals they found (mussels, snails, insects, etc.) and sort them into the various jars.

Gather the students in a circle at the end of the lesson, let them share their findings, and reflect. Reconnect to *Lump*. Discuss with the students why streams are important. Summarize the lesson.

	12 EXERCISE 4 HOW IS THE WATER?				
	BOX 4 Lake & Stream				
RAIURCENIRUM ekologiskt science center	GRADES		4-6		
	Purpose: To cono biologist.	luct a water surve	y and to try worl	king as a	
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MATERIALS Jars, pH strips, thermometer, protocols, clipboards and pens.

INSTRUCTIONS

- Divide the students into small groups of 3-4 students. Distribute the protocols and equipment. Let the students collect water in jars from various places, about 30 cm deep. Have them document all the measurements. They should measure:
 - Water temperature
 - Air temperature
 - pH level
 - Describe the color
 - Describe the clarity of the water
- Discussion with the students:
 - What is the water's pH level? What does it mean?
 - What do you think a small visibility depth or murky water means for the lake?
 - How is the lake's environment? If everything seems fine, what could be the reason? If it is not good, what could be the cause? What suggestions does the group have for how we can take care of our lakes and the life in them?
- At the end of the lesson, gather the students in a circle, let them share their findings, and reflect. Summarize the lesson.

Inspired by the materials Skogen och Vattnet, GRIP on LIFE, Swedish Forest Agency 2024

	13 EXERC	ISE 5 H	OW IS THE	WATER?
	BOX 4 Lake & Stream			
RAIURCENIRUM ekologiskt science center	GRADES			7-9
	Purpose: To cond	duct a water surve	y and to try work	king as a
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MATERIALS Jars, pH strips, phosphate and nitrate reagents, thermometer, protocols, clipboards and pens.

INSTRUCTIONS

- Divide the students into small groups of 3-4 students. Distribute the protocols and equipment. Let the students collect water in jars from various places, about 30 cm deep. Have them document all the measurements. They should measure:
 - Water temperature
 - Air temperature
 - pH level
 - Nitrate concentration (nitrate levels over 50 mg/liter can indicate fertilizer leakage)
 - Phosphate concentration (phosphate levels over 0.3 mg/liter can indicate pollution)
 - Describe the color
 - Describe the clarity of the water
- Discussion with the students:
 - What is the water's pH level? What does it mean?
 - What is the nitrate concentration? What does it mean?
 - What is the phosphate concentration? What does it mean?
 - What do you think a small visibility depth or murky water means for the lake?
 - How is the lake's environment? If everything seems fine, what could be the reason? If it is not good, what could be the cause? What suggestions does the group have for how we can take care of our lakes and the life in them?

	13 EXERC	ISE 5 H	OW IS THE	WATER?
	BOX 4 Lake & Stream			
RAIURCENIRUM ekologiskt science center	GRADES			7-9
	Purpose: To cono biologist.	duct a water surve	y and to try worl	king as a
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At the end of the lesson, gather the students in a circle, let them share their findings, and reflect. Summarize the lesson.

Inspired by the materials Skogen och Vattnet, GRIP on LIFE, Swedish Forest Agency 2024

	14 EXERCISE 6 FLOW IN THE STREAM				
	BOX 4 Lake & Stream				
RAIURCENIRUM ekologiskt science center	GRADES			7-9	
	Purpose: To inve	stigate streams ai	nd learn about b	uoyancy and	
	flow.				
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MATERIALS Measuring tape, stopwatch and note-taking materials.

INSTRUCTIONS

- Start the lesson outdoors at a flowing stream, such as a river or creek.
- Find a five-meter stretch along the steam where students can easily reach the water. Mark the beginning and end.
- Have students find an object that they think will sink and one that they think will float. Gather the class by the stream and let each student explain why they think their object will sink. Let the student throw the object in. What happens?
- Now it's time to test buoyancy. Have each student explain why they think their other object will float. Stand at the goal (end point) and record the name, object and the time it takes for the object to float 5 meters. Continue until all students have thrown their objects in the stream.
- Gather the class in a circle for a discussion.
 - What makes an object float?
 - What makes an object sink?
 - Which object floated the fastest? Why?
 - If we throw plastic into streams and rivers, where does the plastic eventually end up?
- End the lesson with a reflection on what the students have learned and experienced. Summarize the lesson.

Inspired by the materials Skogen och Vattnet (The Forest and the Water), GRIP on LIFE, Swedish Forest Agency 2024

	15 EXERCISE 7 WHAT HAPPENS BY THE LAKE?			
	BOX 4 Lake & Stream			
RATURCENTRUM ekologiskt science center	GRADES		4-6	7-9
	Purpose: To get a feel for the lake with all the senses.			
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A calm summer day by the lake or a cold winter day with ice can be experienced very differently by different people. There's something truly special about sitting alone by a lake. But what happens when you do that? How does it sound? How does it feel? How does it smell? What do you see?

Let the students listen, look and reflect on their own. This exercise is about pausing to observe, but also allowing the students to experience what they feel with all their senses. Perhaps questions about the lake, the shore, the forest edge, the climate, history or the future will arise. And maybe they will feel wonder and fascination for the lake? These sensory experiences often evoke a feeling for nature and the local environment, engage and inspire deeper knowledge, further studies and a shift towards sustainable choices.



MATERIALS Seat pads.

INSTRUCTIONS

- If students have mobile phones, collect them before starting.
- Provide instructions to the students before they head off and ensure that everyone understands the task. Distribute seat pads. Explain that they will be sitting alone. Younger students should be placed at different spots with enough distance so they can't communicate with each other. Older students can choose their own spots, under the same conditions.
- Instructions for the students:
 - Sit (or stand) completely still and quiet.

	15 EXERCIS	E 7 WHAT HA	PPENS BY 1	THE LAKE?
	BOX 4 Lake & Stream			
RATURCENTRUM ekologiskt science center	GRADES		4-6	7-9
	Purpose: To get a feel for the lake with all the senses.			es.
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- Start by closing your eyes and listening. What sounds do you hear?
- Then open your eyes and look, listen, feel the wind, smell the air and observe your surroundings. Can you see or hear any animals, insects, fishes or plants?
- Allow students to walk to their chosen spots with their sitting pads.
- After some time, the teacher should gather the students one at a time, in silence, and form a circle.
- Let the students share what they saw, heard, felt and smelled. What emotions did they experience? Address any questions.

	16 EXERCISE 8 POETRY BY THE LAKE			
	BOX 4 Lake & Stream			
RATURCENTRUM ekologiskt science center	GRADES		4-6	7-9
	Purpose: To refle understanding o express oneself	ect and dream abo f local and global in writing.	ut the lake. To d marine environi	evelop an ments. To
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Nature and water are important sources of inspiration for many people. Artists, writers, designers and engineers often draw ideas from nature. Students can write any verses or poems that capture what they see, feel, wonder, think or dream.

Haiku is a simple form of poetry from Japan. It consists of seventeen syllables across three lines: five syllables in the first line, seven in the second, and five in the third. However, the exact syllable count isn't the most important aspect—it is about capturing profound beauty and truth in something small. Haikus typically relate to nature, making them particularly fitting for a day by the water. A haiku is a short, unrhymed poem that often captures a moment, emotion or thought. For example:

The pines whisper, The scent of forest and breeze, The lake is grey and secret.



MATERIALS Writing materials with clipboard and seat pads.

INSTRUCTIONS

- Divide the class into small groups of 2–3 students. Hand out clipboards, papers and pens.
- Let the students write verses that describe their feelings in nature, their questions, their dreams and thoughts about nature and the climate. They can write simple

	16 EXERCISE 8 POETRY BY THE LAKE				
	BOX 4 Lake & Stream				
RATURCENTRUM ekologiskt science center	GRADES		4-6	7-9	
	Purpose: To refle understanding o express oneself	ect and dream abo f local and global in writing.	ut the lake. To d marine environi	evelop an ments. To	
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poems, such as haikus. These can rhyme or take other forms. Students decide whether to share their poems with their group or not.

- Gather the students in a circle for reflection. Summarize the lesson.
- Back in the classroom, let the students write out their poems neatly and compile them into a collective poetry collection about the lake and nature.



	18 EXERC	18 EXERCISE 10 THE OLD PIKE				
	BOX 4 Lake & Stream					
RAIURCENIRUM ekologiskt science center	GRADES	f-3	4-6	7-9		
	Purpose: To learn more about ecological connections, participate in physical activity and enjoy movement.					
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On an outdoor school day, it's good to get the body moving and the heart rate up. This ecological game is suitable for all ages and allows students to experience ecology with their whole body.



INSTRUCTIONS

- One participant is chosen to be the "old pike" (gammelgädda). The other students line up; they are either perch or any other fish they choose to be.
- The teacher calls out: "The old pike is coming!" At this point, the perch must swim across to the other side as quickly as possible. When the pike touches a fish, it gets stuck at the bottom of the lake and turns into a water lily. Fish that successfully reach the other side are still free in the sea.
- The teacher calls again: "The old pike is coming!" Now, the perch must not only avoid the pike but also avoid the water lilies floating on the water. Again, if a perch is touched it also becomes stuck and turns into a water lily.
- The game continues until there is only one perch left. This last perch becomes the new "old pike", and the game starts over.
- Gather the students in a circle. Time for reflection. Ask questions like:
 - What did we learn from this activity?
 - How did it feel to be a predator (the old pike)?
 - What happens in an ecosystem if predators increase dramatically?
 - How did the last perch feel at the end? Why did that particular perch survive so long?

	19 EQUIPME	INT INCLUDE	D FOR THE E	XERCISES
	BOX 4 Lake & Stream			
RATURCENTRUM ekologiskt science center	GRADES	f-3	4-6	7-9
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Hand nets
White trays
Jars
Aquarium
Aquascope
Metal sieve
Clipboards
Pens
Litmus paper
Phosphate and nitrate reagents
Species identification key
Field guides
Blue bags

NORRTÄLJE NATURCENTRUM ekologiskt science center	20 ABOUT NNC & NORDPLUS HORIZONTAL			
	BOX 4 Lake & Stream			
	GRADES	f-3	4-6	7-9
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Norrtälje Nature Center is an ecological, outdoor-based science center. We work with knowledge development, experiences and learning through nature conservation, outdoor educational activities and the management of Färsna Gård in Norrtälje. The work is carried out through projects and initiatives at local, regional and national levels. Norrtälje Nature Center has many different collaborations and initiatives with Norrtälje Municipality. This material has been developed by our outdoor education program as a resource for schools and preschools to increase students' interest in science and sustainable development.

The loan boxes have been made possible through a Nordplus Horizontal project, which in 2024 aimed to highlight the unique status and challenges of the Baltic Sea. The project was conducted in partnership with organizations in Norrtälje (Sweden), Tartu (Estonia), and Vilnius (Lithuania). The purpose of the boxes, or "mobile classrooms", is to lower the barriers for teachers and simplify teaching with outdoor teaching methods in the school's local environment, providing more varied instruction.

Nordplus is the Nordic Council of Ministers' program for cooperation between the Nordic and Baltic countries, as well as Åland, the Faroe Islands and Greenland. Through Nordplus, organizations across the educational sector can apply for funding for various types of exchanges and collaborations.

