Horizon 2020 Programme

Clearing House

Research and Innovation Action (RIA)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821242

Start date : 2019-09-01 Duration : 48 Months
http://clearinghouseproject.eu

Educational package on UF-NBS

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Clearing House - Contract Number: 821242

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Document title	Educational package on UF-NBS
Author(s)	Mrs. Tine DEKEZEL, Katriina KILPI (BOS+), Gabriela RUEDA (EFI), Rosa CASTANEDA (EFI)
Number of pages	198
Document type	Deliverable
Work Package	WP5
Document number	D5.3
Issued by	BOS+
Date of completion	2021-03-04 11:38:08
Dissemination level	Public

Summary

The educational package will be developed for reaching out to school children (10-14 years) and teachers. This package will include adapted versions of the selected content delivered by the project. It will integrate with the citizen science module developed in WP3 and will collaborate with the social media efforts (particularly SnapChat, Instagram, and WeChat stories) to reach the target groups.

Approval

Date	By
2021-03-04 12:27:56	Mrs. Motunrayo SHAFAU (LGI)
2021-03-31 14:58:09	Dr. Rik DE VREESE (EFI)

City of trees

CLEARINGHOUSE
中欧城市森林应对方案

Inspiration and activities to teach about the importance of urban trees and forests

Credits

CLEARINGHOUSE
中欧城市森林应对方案

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This project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 821242.

#1 Noticing trees in the city

Description & background

This lesson is perfect to start with. It touches upon concepts as biodiversity, heat island effect. The students will start noticing different aged tree individuals. In addition, they will visit some of these old trees, get to know them and compete to complete the tasks. This lesson is especially useful as a beginning exercise for other tree related exercises

Keywords

Biodiversity, old tree, ecosystem services, heat island effect, urban pollutant, fine particulate

Goals for student

Develops understanding of importance of different age trees in the city. Builds the ability to notice trees as individual species in the city with specific benefits to human health.
Gains understanding of trees functioning in the city; the different public bodies dealing with trees and green spaces; understanding that trees are vulnerable to people´s choices.

Suitability

Outdoors & indoors-
spring, autumn, summer

Fits in subjects

Biology, geography, ethics, arts, social sciences

What do you need?

Materials: Urban Tree Bingo cards; printer and scissors, or alternatively smartphones

Preparation: Print the Urban Tree Bingo cards. Decide what is the best way to work based on the situation of the group. Do the students use the Bingo during class in little groups? Do they use smartphones, or do they draw? This can also be a task to do at home.

#1 Setting the scene

Unlike people, trees can grow to become as old as hundreds of years to even over a thousand of years old. But trees do not grow fast nor do they grow with all their organs intact. Trees recreate the materials they need for survival every year. Every year they produce seeds and their leaves are created every year, whether they are young or old. It is rare for a tree to die of old age alone. Instead, it is the exposure to the stress of wind, disease, insects, pollution, soil erosion, soil compaction, weather and people that will most likely cause its demise.

The trees surrounding the city help to cool the city down.

#1 Setting the scene

These gentle giants have other special characteristics. Trees in the city sequester carbon, which refers to the long-term removal and capture of carbon dioxide from the atmosphere. This in turn slows or reverse atmospheric CO2 pollution and mitigates global warming. As a byproduct of this sequestering, they produce oxygen in the process called photosynthesis, which we humans need to exist on this planet. This process sustains life on the planet.

Old trees in cities are very important. Large and old trees stock more carbon.
A solitary tree gets to deal with harder circumstances to survive as well.

#1 Setting the scene

Younger forests have been found to be better at storing carbon. These plants can extract carbon from the air and incorporate it into their biomass more quickly than mature trees that must contend with more neighbors and less sunlight. Old trees are often (but not always) larger in size. Large trees are excellent filters for urban pollutants and fine particulates. Mature trees regulate water flow and play a key role in preventing floods and reducing the risk of natural disasters. A mature evergreen tree, for instance, can hold on to more than 15 000 liters of water per year.

Many woodpeckers use dead trees to drill for food and to nest in cavities excavated in snags

#1 Setting the scene

Especially large, old trees also feed and shelter birds and small mammals. Many animals use mature trees for nesting, resting and for places from which to hunt. Even dead trees are useful for e.g., woodpeckers who use dead trees to drill for food and to nest in cavities. Salamanders use rotting logs or stumps as both shelters and food sources. Without big, long-lived trees, these animals could die.

Young trees have fewer dead branches and flowers, and less nectar, peeling bark and woody debris compared with large, established trees. It can take more than 200 years for tree hollows to form naturally.

Though old trees are vitally important to humans and the natural world alike, we keep losing old trees in the cities to make way for urban expansion. When we do not understand the importance of old large trees, we are keen to remove them for making way for younger trees and to be safe from material damage.

#1 Activity

- Every student gets an Urban Tree Bingo Card.
- You will notice that there are three blank squares on the card. In these blank spaces, the teacher can fill in the specifics about trees in your area or you can discuss this with the whole group. Get creative!
- Take your printed Urban Tree Bingo Card with you and place a second version of the Card on the wall, visible for everyone to see.
- Fill out your own Urban Tree Bingo card in your own rhythm. Do this by drawing/taking pictures of the finding, and printing and pasting them on the card.
- Agree on a timeline to fill in the Cards. It is best to choose a timeslot of 2-3 weeks so that all the squares get filled up.
- The first person with a full row, column or diagonal completed, wins.
- Compare the found answers on each other's bingo cards. Discuss the differences.

Find the Urban Tree Bingo Card in the next slide.

#1 Activity

Moss growing on a tree		A tree with more than one colour on its bark	The thinnest tree on your home or school yard (how can you tell?)
	An insect crawling on a tree		A tree with leaves bigger than your palm
A tree that is two persons' wide (you and your friend or sibling or parent join hands around the tree).	A tree with a rough bark	A tree with smooth bark	The number of trees on the yard of your house/apartment/street
The thickest tree on you school or home yard (how can you tell?)	An evergreen tree	A tree with leaves smaller than your palm.	A tree that is three or more friends wide (= you and your friends join hands around the tree).

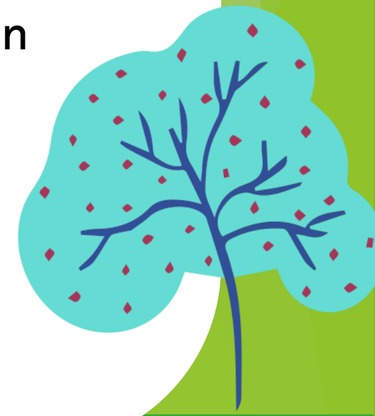
#1 Reflection

Try to answer the questions below through discussion in group.

We have learnt that trees offer us many benefits, including taking up carbon from the atmosphere.
In order to fight climate change, why do we not organize to plant parking lots full of trees?

- Think about the steps you would need to take to turn the parking into a forest (who owns it, who uses it?).
- Rather than covering the entire parking lot, would it be possible to add just a few trees to the parking lot?
- Is it important to pay attention to the types of trees to be planted. An urban forest poor in biodiversity will be more vulnerable for pests and tree damage than an urban forest with diversity in tree species. Where could you get help in choosing the types of trees to plant?

Tip: Which nature/environmental organizations are active in your city? What kind of knowhow does the environmental department of your city have?



#1 Take it a step further

Do you want to do more with this lesson? Take it a step further and get to action!

One step
Get to action with the slightly more difficult version of the Urban Tree Bingo.

Two steps
In this version of the Urban Tree Bingo card, each item can be stretched out to its own topic to cover an entire lesson. All the answers can be found in the teacher's material.

#1 Take it a step further: one step

Do you want to do more with this lesson? Take it a step further and get to action!

A lichen growing on a tree	A seed of a tree	Bring an atleast 10 year old picture of a (semi-)natural landscape. Bring also a picture of the same place now. How have the trees in the landscape changed?	The youngest tree on the schoolyard (how can you tell?)
Signs of an animal using the tree for nesting or resting	Damage on a tree	A fruit of a tree	A tree stomp
A tree that is your height or shorter than you	A tree producing the biggest shade in your school yard	Write a poem about/draw a picture of your favorite type of tree (why is it your favorite?)	How many different types of trees are there on your school yard?
The oldest tree on your school yard (how can you tell?)	An broadleaf tree	A tree with leaves smaller than your palm.	Dead tree

#1 Take it a step further: two steps

• Read about mosses – what are they, what is their function, where do they grow and why. • Do the action (take a picture). • Identify the moss – look for other ones and get informed about their names and specifics as well.	A mother tree (how can you tell it is the mother?) • Read on the internet about the idea of mother tree. • Do the action (Find a mother tree) • Reflect on how you could tell it is a mother tree.	Find an old picture of your city with trees growing in it. Take/find a picture of the same place now (what happened to the trees?). What other changes occurred in the city between now and when the picture was taken. How much has the green coverage I the city changed – more or less green space, more or less trees? Contact your local government to get this information.	The youngest tree on the schoolyard (how can you tell?) • Read about how trees spread themselves.
Find the Sunniest Spot on your school yard. Draw an outline of the sunny spot-on paper; include in the drawing shade trees or other shade-producing features. Observe where the sunlight shines on the area at 8:00 a.m. Draw a circle on the paper that depicts the area in sunshine. Repeat this process again at 12 noon and again at 4:00 p.m. Where the 3 circles intersect is the spot that receives the most direct sunlight. This is the most ideal spot to plant a vegetable garden or a light loving tree.	An insect crawling on a tree. • Identify the insect • What is it insect possibly doing on this tree?	Determine the age of a tree: First find its diameter by measuring the circumference of the trunk in inches and then dividing that number by pi. Once you have the **tree's** diameter, look up the growth factor for the type of **tree** you're measuring, which is how much width it gains annually. How to calculate growth factor: Diameter times **Growth Factor** = Approximate **Tree** Age. E.g., Let's use a red maple to calculate age. A red maple's **growth factor** has been determined to be 4.5 and you have determined that its diameter is 10 inches: 10-inch diameter X 4.5 **growth factor** = 45 years	A tree with leaves bigger than your palm. • Why are some tree leaves big, and others small?
The number of trees on the yard of your house/apartment/street. • Which types of trees are they? • Which ones of them are probably the oldest/youngest? Why do you think so? • Were they planted here? If so, why do you think they chose for these specific species, i.e., what are their specific benefits?	A tree producing the biggest shade in your school yard	Write a poem about/draw a picture of your favorite type of tree (why is it your favorite?)	How many different types of trees are there on your school yard?
The oldest tree on your school yard (how can you tell?)	An evergreen tree • Which tree is it? • Is it a native one? • How has its leaves adapted to the being evergreen?	A tree with leaves smaller than your palm. • Is this a native tree? • If not, is it invasive? .	Dead tree • What do you think caused the tree to die? • How will this tree be utilized now?

#1 References and further inspiration

Sources used for this activity:

Picture 1: Stux- pixabay, https://pixabay.com/photos/historic-center-city-wall-autumn-197368/

Picture 2: Photo by Orijit Chatterjee at Unsplash; https://unsplash.com/photos/EhteEza-XK8

Picture 3: Photo by Felix Mittermeier at pixabay, https://pixabay.com/nl/photos/beierse-woud-bos-bomen-schorskevers-3385966/

Picture 4: Photo by project Clearing House

Picture 5: zoekkaart bomen- IVN natuureducatie,
Picture 6: Regalshave- pixabay, https://winkel.ivn.nl/bomen-blad-fries.html

https://pixabay.com/nl/photos/eik-boom-enorme-oude-charleston-2018822/

Sources used for this activity:

Natural Habitat Adventures: https://www.nathab.com/blog/losing-urban-trees-and-the-wildlife-that-depends-on-them/

Food and Agriculture Organization of United Nations: http://www.fao.org/zhc/detail-events/en/c/454543/

Pinterest: https://www.pinterest.com/pin/528469955597178488/

#2 Resistant trees

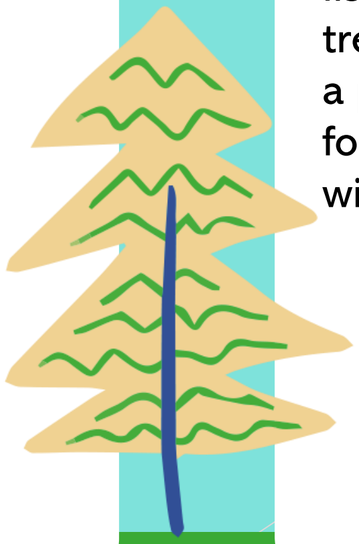
Description & background
Students learn about the importance of trees in fighting climate change and building resilient cities. They discover the benefits of trees and which species are most resistant to climate change in their city.

Fits in subjects
Biology, geography

Keywords
Climate change resistant, urban,resilient, old trees

Goals for student
Gains knowledge on tree species and develops understanding on the importance of (old) trees in a city

Suitability
Outdoors
Summer, spring, autumn

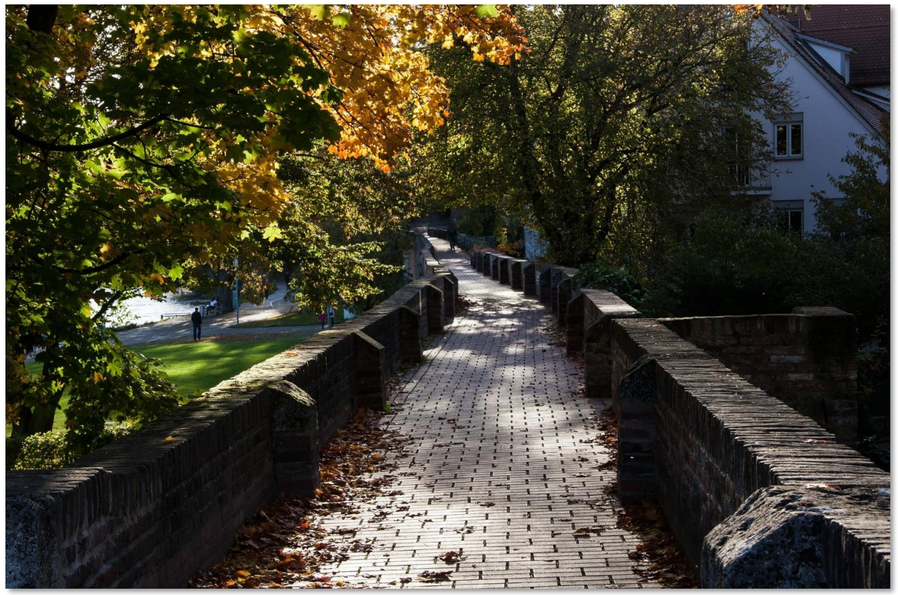


What do you need?
Materials:
Tree identification chart, pen, paper, list of climate resistant trees for your city/region

Preparation:
Ask beforehand at a local conservation centre for a list of climate resistant trees of your region, search a place. This can be a forest or a park closeby with different kinds of trees

#2 Setting the scene

Trees in a city are extremely important for multiple reasons: they tie up carbon dioxide from the atmosphere, act as carbon sinks and use photosynthesis to convert the gas into glucose and oxygen. In this process, chlorophyll gives plants their green color. It channels the energy of sunlight into chemical energy: it absorbs energy to transform carbon dioxide and water into carbohydrates and oxygen.



Trees offer shade to the streets and cool a city

#2 Setting the scene

Trees are essential in the fight against climate change. Due to climate change, trees around the world are experiencing longer growing seasons, which causes trees to grow faster. However, higher temperatures—combined with pollution from auto exhaust and farms—are making their wood weaker as they take up less CO2 from the air, resulting in trees that break more easily and making the lumber less durable.

Not all trees are equally resistant for the changing environment. Some won't survive due to droughts, forest fires…

#2 Setting the scene

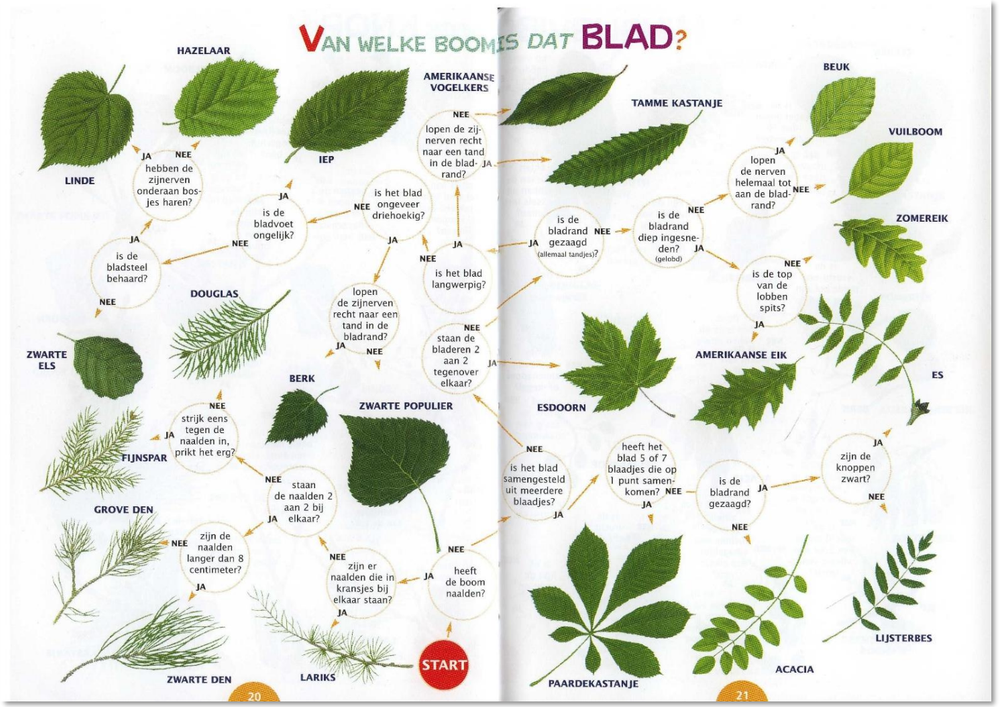
It is important to plant the ‘right’ kind of species to fight climate change. Broadleaved species – such as oak, beech and maple – are effective because they have a larger surface area of leaves. This enables more photosynthesis, whereas conifers absorb more heat as they are darker in colour and emit less water into the atmosphere through evapotranspiration.

Planting a diverse mix of species will provide more diverse habitats for more diverse species. Diversity also ensures that the urban forest is better prepared for pests or diseases which could wipe out an entire species of trees in one area, if there is only one species present.

Large trees offer shade and companionship in the city.

#2 Activity

- All students are divided into groups of 4-5 students and each group gets one or more identification maps.
- Go outside to a place where there are trees. Preferably a place with different kinds of trees (big, small, different kinds,…), e.g. a park. Divide the students in groups of 4-5 students, so that every group ‘has’ one tree.
- Every group picks one tree they want to get to know better. Look up the species on the map as a first thing. Draw your tree and even come up with a name for it.
- Think about what the tree offers you; does it have fruits, does it provide shade, is it beautiful, is it nice to play in/around it? Write this down in a mindmap.



A tree identification chart is easy to determine the kind of tree you’re investigating. To find charts with trees in your area, contact the local department of environment, nature organization or use an app such as Plant Snapp.

#2 Activity

- Everyone gathers again and every group presents its answers to the rest of the group. What are the findings?
- Discuss with the whole group: What trees offer more benefits?
- Every group goes back to ‘their’ tree and thinks about the following questions.
- What does this tree need to grow? And more importantly, does it get enough of what it needs? In this step try to think about it yourselves, and only then search for more help online.
- Write this down in another mindmap
- Everyone gathers again and every group presents its answers to the rest of the group. Is there one tree that is doing better than the others? Why do you think this is? What would need to change for the others to do as well?

This old oak offers a lot of benefits to its environment.

#2 Reflection

Try to answer the questions below through discussion in group.

- Are the trees that are most beneficial to its surroundings the same as the trees that have the best conditions?
- Should we let the non-native trees take over the native ones? What would be the benefits and losses from losing the native species?

#2 Take it a step further

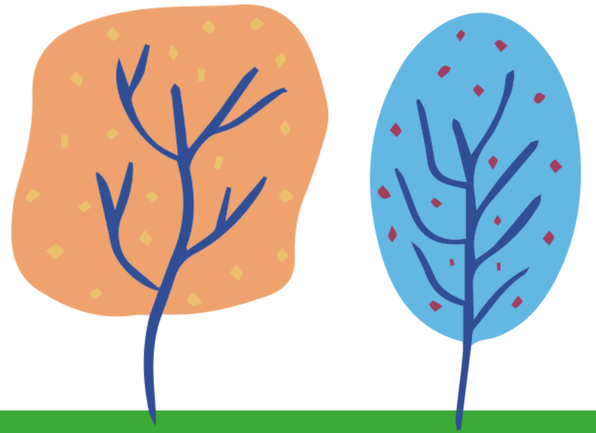
Do you want to do more with this lesson? Take it a step further and get to action!

One step

Compare the findings of your city to another area with a different climate. What kind of trees are most suited for this area?

Two steps

Do a search on climate resistant trees and find out which trees are most suitable for your area. Organize to plant a tree or trees on your school yard or your home garden.



#2 References and further inspiration

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Picture 2: Photo by Orijit Chatterjee at Unsplash; https://unsplash.com/photos/EhteEza-XK8

Picture 3: Photo by project Clearing House

Picture 5: zoekkaart bomen- IVN natuureducatie, https://winkel.ivn.nl/bomen-blad-fries.html

Picture 6: Regalshave- pixabay, https://pixabay.com/nl/photos/eik-boom-enorme-oude-charleston-2018822/

Sources used in this lesson:

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#3 Patterns in nature

Description & background

These activities illustrate and teach how to use natural resources outdoors. It makes use of sensory perception in a natural environment. This type of temporary nature art can teach children and youth that not everything of value has to be material, nor does it have to be taken home or even returned to. Creating short-lived art teaches youth about the impermanence of life. The process and the moment of making the art can be just as fulfilling at times.

Keywords

Fractal, land art, senses, temporary

Goals for student

Develops creativity; Gains sensory experiences, Builds patience and focus, Builds immunity by coming into contact with natural materials in nature; Teaches about impermanence of life and points out that there are values in experiences not only in material things.

Suitability

Spring, summer, autumn, winter- Meant for outdoors, but includes an indoors variant

Fits in subjects

Arts, religion, (basic) math, (art) history, languages

What do you need?

Materials:

All materials you can find in natural environments. Pupils: should wear suitable clothing for safe and comfortable movement.

Preparation:

Teacher should choose and get acquainted with the place (safe and stimulating, enough lose natural materials) and try out the activity to know how much materials are needed. The teacher should collect some items, more for indoor activity.

#3 Setting the scene

Nature is full of numbers and patterns. Mathematicians and poets though centuries have found inspiration and awe in them. You could think of each colour that you see in nature as a number. Light travels as a wave and each colour in the spectrum has a specific wavelength and frequency. For example, Chlorophyll gives plants their green color because it does not absorb the green wavelengths of white light. That particular light wavelength is reflected from the plant, so it appears green.

The fractal structure of the fern

#3 Setting the scene

One amazing and frequently occurring pattern in nature is called the Fibonacci. The Fibonacci sequence starts like this: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55 and so on forever. Each number is the sum of the two numbers that come before it. It's a simple pattern, but it appears to be a kind of built-in numbering system of the cosmos. The numbers in the pattern can be found in our own DNA as well the spirals of the Galaxy. The numbers of the Fibonacci sequence are very commonly seen in petals of flowers. Examples include the lily, which has three petals, buttercups, which have five, the chicory's 21, the daisy's 34.

The Fibonacci sequence comes back in many natural objects

#3 Setting the scene

Another such pattern is the fractal: A fractal is a detailed pattern that looks similar at any scale and repeats itself over time. A fractal's pattern gets more complex as you observe it at larger scales. This example of a fractal shows simple shapes multiplying over time yet maintaining the same pattern. Examples of fractals in nature are snowflakes, tree branching, lightning, and ferns. Furthermore, it has been found that the fractal pattern is connected to a neural mechanism that can explain why simply viewing nature can be beneficial for our health and on our mental capacities.

A snowflake has a fractal structure

#3 Setting the scene

The mandala pattern is used in many religious traditions, such as Hinduism, Buddhism, Jainism or Japanese lifestyle of Shintoism, as a spiritual and/or ritual geometric configuration of symbols that can be used to represent deities, paradises or shrines. Tibetan mandalas are often highly intricate illustrations of religious significance that are used for meditation.

A traditional mandala

#3 Activity

In this exercise we want you to dive deeper into the concept of the different patterns in nature. The patterns can be interpreted as a model for the organizational structure of life, a type of cosmic diagram. It is both the microcosm and the macrocosm, and we are all part of its intricate design. You can begin by looking at a certain artist before you leave for the woods (e.g. Andrew Goldsworthy) or read about patterns in nature on the internet with keywords such as “pattern in nature” or “fractal”.

- What kind of patterns do you recognize in nature?

#3 Activity

Indoors:
The teacher has a variety of natural resources ready in buckets and baskets if the activity is conducted or look at pictures from the internet.

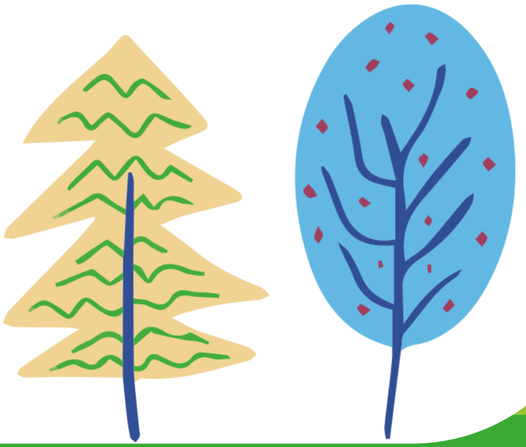
Encourage studying the contents with all senses:
"What is this? How does it feel? How does it smell?" Concentrate on each sense (visual, olfactory, auditory, tactile, but maybe not gustatory) at a time and share your experiences after each sense.
What do you think looks nice and smells strong/smells bad but looks nice/smells good but does not look special/look nice and smells good/…)

#3 Activity

Outdoors:

1.Go explore with all your senses

- At first, listen to the sounds from the surroundings and separate in natural and human made sounds, as well as in near and far sounds.
- In addition to the already collected items, go explore the surroundings further – collect 5 different objects and compare the feeling of those.
- After this, smell the different objects. Look for colors and shapes, for flower petals, blades of grass, pinecones, leaves, pine needles, stones, sticks,… anything else you can find. Look at all this using all your senses; "What is this? How does it feel? How does it smell?" The pupils choose a variety of materials to make pictures of their own design.



#3 Activity

2. Create a mandala with all the material you collected.
Find the center of your mandala and mark it with a special natural object.
Select the first material you'll use to create your first layer.
Build a circular layer around your center item and radiate your design from the inside.
Continue to add on as many layers as you would like!

An example of a ‘natural mandala

#3 Reflection

Try to answer the questions below through discussion in group.

- Does the artwork need to be dispersed into nature when done?
- What is the right of the human being to alter the surroundings?
- How big is the effect of the artwork in its surroundings on micro and macro scale?
- How about collecting materials in the forest?
- What rules are there for collecting (in your city, in your country?)
- What impact is there to the surrounding nature if we remove pinecones, leaves etc.?
- What is the role of e.g., mushrooms, nuts, seeds in the forest for other creatures?
- Should we pick flowers to bring indoors where they will eventually wilt in a vase, what other alternatives might there be?

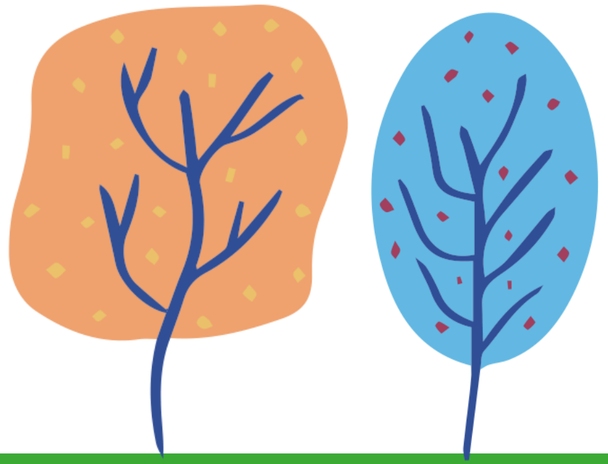
#3 Take it a step further: one step

Do you want to do more with this lesson? Take it a step further and get to action!

One step

Circles in nature: Spot the circles. Count the maximum number of circular objects one can notice in your surrounding nature within a time frame of 5 minutes. If you can, try and measure the circumference and diameter of any circle and divide them to find your own Pi.

Nature Meditation: One pattern in nature is change. Everything in nature is born, maturing and eventually dying. Observe these 3 different stages of life. Find and take pictures of objects in different stages. Reflect on how everything is changing from one stage to another.



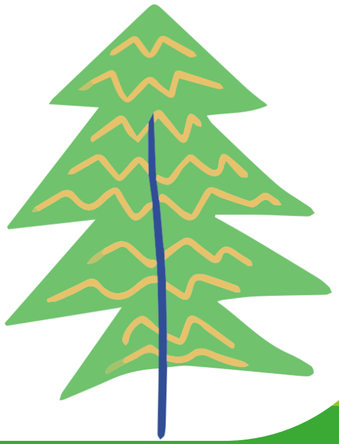
#3 Take it a step further: two steps

Do you want to do more with this lesson? Take it a step further and get to action!

Two steps

Geometry in nature: Have you ever marveled at the beauty and shape of a spiral sea-shell? Geometry is all about shapes and their properties. Lines, curves and shapes that can be drawn on paper make up plane geometry, while 3 dimensional objects are part of solid geometry.

Create a spiral: This can be done individually or in a group. The intention is to create a beautiful spiral with objects found in nature. Make it as big as you can. Each person starts from the same center point and creates one arm of a spiral radiating outwards. After working on it for 10 minutes, the creator stands on the outer edge of their spiral arm and starts to walk back to the center slowly following the path of their spiral.
The last person to reach the center wins.
(You cannot pause and you have to continue walking inwards as slow as you can).



#3 References and further inspiration

Sources used in this lesson:

Picture 1: Geralt on pixabay, https://pixabay.com/nl/illustrations/ijskristal-kristal-sneeuwvlok-kerst-1065155/

Picture 2: Martina Bulkova, on pixabay, https://pixabay.com/nl/photos/mandala-kunst-schilderij-acryl-3138969/

Picture 3: BkrmadtyaKarki, on Unsplash, https://pixabay.com/nl/photos/fern-bladeren-groene-natuur-821293/

Picture 4: Diosming Masendo, on Unsplash, https://unsplash.com/photos/dWxD-5zhqRA

Picture 5: Powerpoint

Picture 6: @GKO2014, on pinterest, https://nl.pinterest.com/pin/99924304047711941/

Sourced used in this lesson:

Sefton Booth Bluebell Park School, United Kingdom, https://www.bosplus.be/nl/educatieve-projecten/green-learning-environments-eng

Healing Forest: https://healingforest.org/tag/nature-by-numbers/

Childhood by Nature: https://childhoodbynature.com/mandalas-a-practically-perfect-form-of-nature-art/

The Franklin Institute: https://www.fi.edu/math-patterns-nature

#3 References and further inspiration

Picture 1: Geralt on pixabay, https://pixabay.com/nl/illustrations/ijskristal-kristal-sneeuwvlok-kerst-1065155/
Picture 2: Martina Bulkova, on pixabay, https://pixabay.com/nl/photos/mandala-kunst-schilderij-acryl-3138969/
Picture 3: BkrmadtyaKarki, on Unsplash, https://pixabay.com/nl/photos/fern-bladeren-groene-natuur-821293/
Picture 4: Diosming Masendo, on Unsplash, https://unsplash.com/photos/dWxD-5zhqRA
Picture 5: powerpoint
Picture 6: @GKO2014, on pinterest, https://nl.pinterest.com/pin/99924304047 71194/

Sources used in this lesson:

Sefton Booth Bluebell Park School, United Kingdom, https://www.bosplus.be/nl/educatieve-projecten/green-learning-environments-eng

Nature by Numbers. Healing Forest: https://healingforest.org/2019/09/25/understanding-self-life-nature-universe/

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The Franklin Institute: https://www.fi.edu/math-patterns-nature

#4 It all starts from a seed

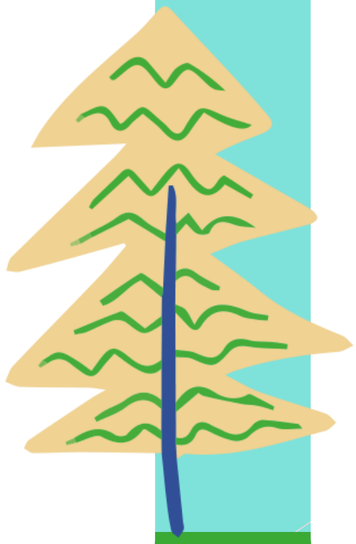
Description & background
You will learn about the different ways in which seeds disperse themselves, what they need in order to start growing, and you will develop an understanding of the interlinkages of things in nature. For this lesson, no prior knowledge of how trees grow is needed

Fits in subjects
Biology, ethics, sports, geography

Keywords
Seeds, embryo, endosperm

Goals for student
Develops understanding of interlinkages in nature. Builds knowledge on types of seed dispersal activities.

Suitability
Autumn
Indoor & outdoor



What do you need?
Materials: Bag to collect the seeds along; potting soil, pots for the seeds; paper towels and a dish to germinate seeds in the refrigerator

Preparation: If there are not enough diverse trees on the school yard, the teacher can map out a route which the group can walk together to collect enough materials. Alternatively, the teacher can ask the students to collect seeds from a minimum of 5 different trees within a week´s time and bring to school.

#4 Setting the scene

Have you ever wondered why a tree starts growing in the most unhospitable – from a human's point of view – place? Think about a pine tree on a rock cliff or crack of a pavement? Why does it grow there? How did the seed end up exactly there?

#4 Setting the scene

Some seeds, such as acorns, have tough, protective shells. Other seeds, such as maple, have light coverings. A tree seed contains an embryo (baby) tree. This embryo already has tiny leaves, a stem, and a point that will become a root. The embryo is surrounded by endosperm—the food supply for the developing tree. Once the seed falls from the tree to the ground, it is covered by leaves and soil. When the ground is warm enough and other conditions are just right, the seed begins to grow, using the endosperm for food.

The endosperm gives the plant the nutrients it needs to grow roots and to sprout

#4 Setting the scene

When the endosperm is consumed the seed must seek other sources of nutrients through anchoring itself to the ground through a root. It draws water and nutrients from the soil through the root. Eventually a tiny tree emerges from the ground and leaves start appearing. The leaves enable the growing tree to produce its own food through photosynthesis. The shell of the embryo tree then falls off.

Chestnut has spikes on its shell and a thick endosperm.

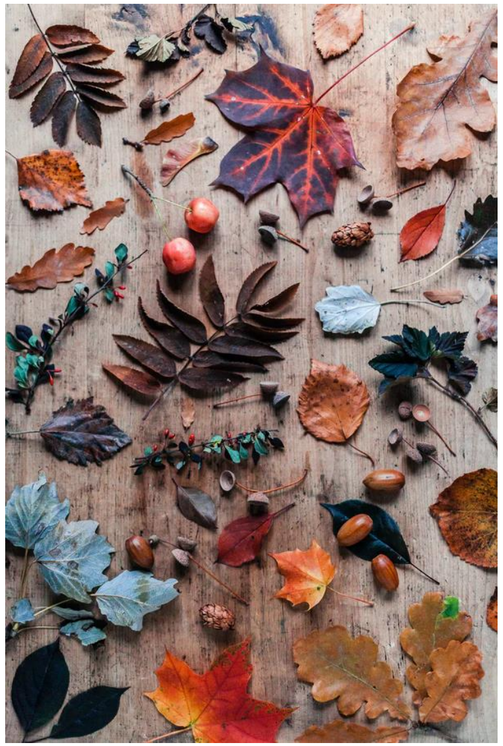
#4 Setting the scene

Seeds are scattered in different ways. Animals eat seedbearing fruit and then deposit the seeds on the soil in their poop completely intact. While the seed passes through animal intestines the coating of the seed gets softened in the bowls of the animal and is ready to start growing when it is out. Wind carries winged and other light seeds while sticky seeds have evolved to cling to an animal's fur (or your sweater!) and ride along to a new location.

#4 Setting the scene

Seeds from most tree species germinate best on bare mineral soil, which has the moisture that they need. Seeds germinating on leaf litter (leaves scattered on the forest floor) often die for lack of water as their roots cannot penetrate the leaf layer to reach the moist soil.

It is important that the seed germinates at the right time. If they sprout too early they could face cold temperatures and potentially freeze to death. If they wait too long, earlier-sprouting plants can outcompete them, i.e. make it that there is no more space or resources for the seeds to establish.



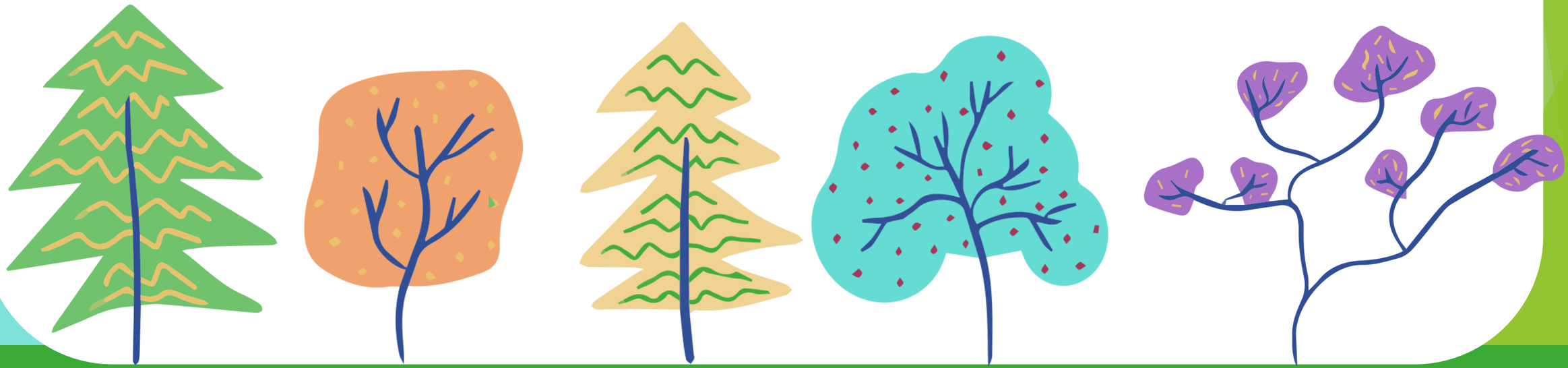
Different seeds have different germination times

Trees are unique: they sprout according to their own internal clock and also lose their leaves according to their internal clock.

#4 Activity

Collect as many different kinds of seeds as you can find at school or/and in your neighborhood (one seed per student). Bring the seeds to the class and try to find an answer on as many questions below as possible (in small groups or on your own).

First familiarize with the seeds with your senses: study its form, its colour, its texture (is it hard, soft, bendy, firm..), its smell.



#4 Activity

•Based on its form, what mechanism does the seed rely on for its dispersal?
• Which plant or tree do they belong to?
• Are the seeds heavy?
• Are the seeds big or small?
• Where did you find these seeds?
• How do you think they got to where you found them?
• Do you think there could be a better place for them?
• Did you see the tree from which the seeds originated?
• How far from the tree was the seed when you found it?
• How did it end up there?
• Which (if any) are seeds that animals might eat? Which animals?
• How does the seed know when it is time to sprout?

#4 Reflection

Try to answer the questions below through discussion in group.

- After this exercise, take the seeds back to where you've found them. It may seem useless to return something so small, but it is not. Why would it matter, you think?
- Have you ever seen a tree growing in an unlikely place? Where was this?
- Why do you think the tree has started growing there? Is it a coincidence?
- Can human beings know where to grow trees?
- Can human beings do as good of a job in making sure that the seed has the best conditions to grow?
- When you eat apples, you are essentially eating that which is supposed to fall on the ground for the tree to be able to grow. Is it okay that you eat the fruit/nut/seed of the tree? Why(not)?

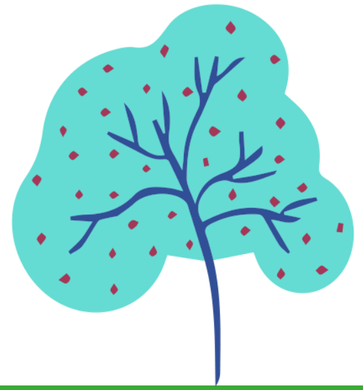
#4 Take it a step further: one step

Do you want to do more with this lesson? Take it a step further and get to action!

One step

Germinate the seeds you have collected. The kind of seed you should use depends on the time of the year, autumn or spring. The cue is in when the seeds are ready in nature.
Plant the seeds in a pot of regular soil. Cover them with soil and keep the soil moist. Keep track of how many days it takes for the seeds to germinate.

Some seeds, however, will need a cold-pretreatment: place a moist paper towel on a small plate with the seeds on the paper towel and cover them with another moist paper towel. Place the whole thing on a dish in the refrigerator. Keep the paper towel moist and change it about once a week. After 2 months, remove the seeds and plant them in a pot one-fourth of an inch deep containing regular soil. Keep the soil moist.

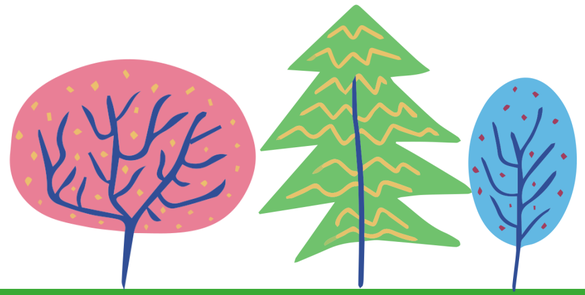


#4 Take it a step further: two steps

Do you want to do more with this lesson? Take it a step further and get to action!

Two steps

Before planting the seedling, pay attention to the type of conditions where the type of tree likes to grow. Get informed on the amount of water, sun light, and the quality of soil the tree needs. Plant the seed in your (school) yard or the city park where it is safe from lawn mowers and monitor its growth. Depending on the season, you might have to water it in the beginning for some weeks.



#4 References and further inspiration

Sources used for this lesson

Picture 1: Powerpoint

Picture 2: Susan Holt Simpson- Unsplash- https://unsplash.com/photos/zHp_umlzhLo

Picture 3: Stephanie Klepacki- unsplash https://unsplash.com/photos/bPP_TDKChEc

Picture 4: Diana Akhmetianova – Unsplash- https://unsplash.com/photos/AowZ2Bt_T50

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Picture 6: Stephanie Klepacki, unsplash

Sources used for this lesson

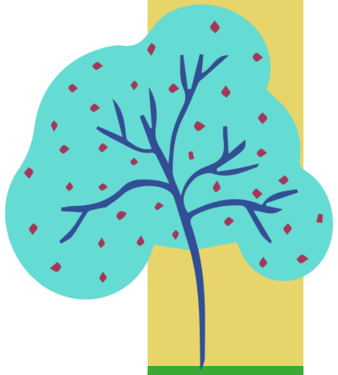
https://www.smithsonianmag.com/smart-news/seeds-use-tiny-brains-decide-when-germinate-180963625/

Fun science demos: Seeds and the Life Cycle of Plants: https://youtu.be/KPKM2uc2VNo

#5 Forest models

Description & background

The students will create five different mini-landscapes with the focus on the influence of water on these landscapes. What are the benefits of more natural landscapes according to water? In what way do both trees and water benefit from each other? How can we adapt this to our daily life?



Fits in subjects

Biology, geography, physics

Keywords

Water, landscape, water cycle, soil, heat, urban heat island, climate change anxiety

Goals for student

Develops group work-skills,
Builds knowledge on the concepts: soil, environmental phenomena in cities such as heat and floods

Suitability

Summer, spring, autumn, winter-
Outdoors or indoors

What do you need?

Materials: Tree identification chart, pen, paper, list of climate resistant trees for your city/region

Preparation: Ask beforehand at local conservation centre for a list of climate resistant trees of your region, search a place. This can be a forest, a park closeby with different kinds of trees.

#5 Setting the scene

The surfaces on our globe are becoming more and more built with buildings and paved with roads and places for parking. Especially in cities, not much space is left unpaved and available for greenery. This causes problems in different areas. The globe is warming, and this has an even bigger impact on paved surfaces.
Stone takes in and holds up a lot of heat. Many urban residents suffer from the city turning into an urban heat island. It means that middle to big cities experience much warmer temperatures than nearby rural areas.

Cities and paved surfaces experience much warmer temperatures than green spaces.

#5 Setting the scene

Next to that, climate change causes periods with a lot of rain next to long, dry periods. Most cities aren't built to deal with this. During periods of heavy rain streets are flooded because the water can't be saved into the soil, stone surfaces can't take in water. This causes dangerous situations. On the other hand, there often is a lack of water for long periods, because the city with paved surfaces can't soak up the water.

This city is flooded, the city can't take in the water

#5 Setting the scene

Green surfaces are part of the solution for this problem. Plants and trees hold water for a long period of time. More greenery equals less floods, less heat and less droughts. A city needs paved surfaces to function, but there are a lot opportunities as well to make a city greener and drought and heatproof. It is a good option for streets and parking lots to build them out of water permeable stones.

Façade gardens are beneficial as they are nice to look at, they provide nutrients and nesting and resting places for insects and might help in coling your home.

#5 Activity

You are divided into 5 groups and every group makes a different landscape in a funnel.

Place the content in a funnel and hang a can under the bottle. This will catch the overflowing water.

Group 1: puts only small stones in the funnel
Group 2: puts sand in the funnel
Group 3: puts clay in the funnel
Group 4: puts potting compost in the funnel
Group 5: puts soil with plants in the funnel

#5 Activity

Group 1: puts only small stones in the funnel
Group 2: puts sand in the funnel
Group 3: puts clay in the funnel

#5 Activity

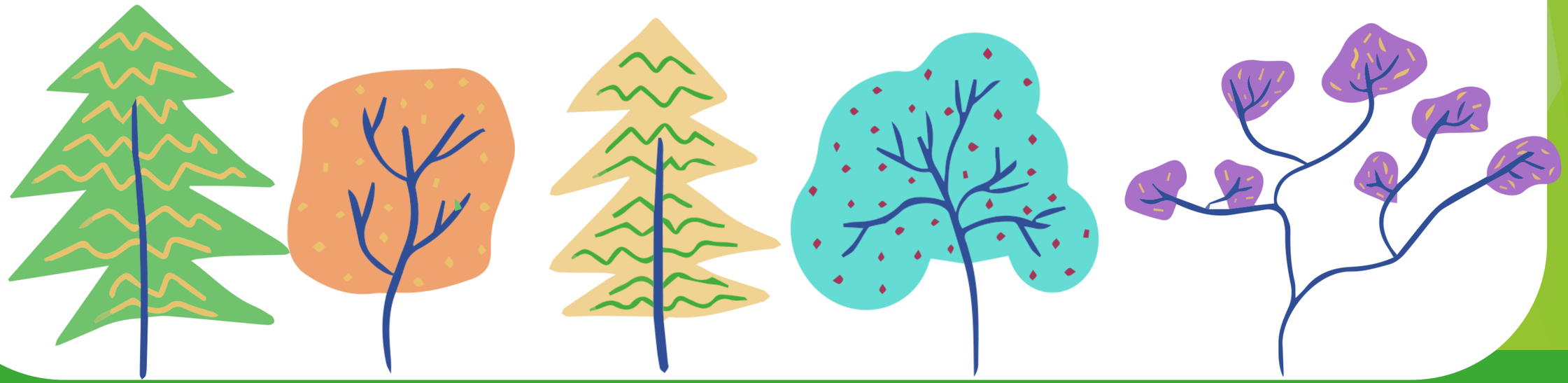
Group 4: puts potting compost in the funnel

Group 5: puts soil with plants in the funnel

#5 Activity

Each group carefully pours water in his funnel, only 150 ml. Each group measures 1 minute of time from the moment you pour the water in the funnel.

Answer the following questions after this.
- How much water got through the substance in one minute.
- How does the water look that flows out of it?



#5 Reflection

Try to discuss the questions below through discussion in group

- What does it mean that one of the materials holds most water?
- What is the effect of the water flowing away on the other surfaces?

- How are the surfaces of our city/school?
- From a human point of view, where is it good to use materials that allow water to flow through easily?
- Where do humans benefit from materials that do not allow water to flow through?
- How about from (different) animals and plants and trees point of view?

- Have we, here in our city, experienced something like a flood or a drought? If so, what were the consequences? If no, why haven´t we experienced such phenomena?

#5 Take it a step further

Do you want to do more with this lesson? Take it a step further and get to action!

One step
Take the "landscapes" outside, leave them in the sun for half a day and measure the temperature. Organize in order from warm to cold. Compare this to real landscapes.

Two steps
Do a search to find out whether your city has experienced a flood (when, what was the damage, were things changed afterward

More
Use your feet as thermometers and try standing barefoot on different surfaces on a warm or cold day and see how the temperature changes between grass, cement, asphalt, gravel, mud, wood..

#5 References and further inspiration

Sources used for this lesson:

Picture 1: Wondr- pixabay, https://pixabay.com/nl/photos/klooster-helfta-saksen-anhalt-huis-3659489/

Picture 2: Trilemedia on pixabay, https://pixabay.com/nl/photos/fietsen-street-overstroming-stad-5680458/

Picture 3: https://huisjetuintjeboompje.be/exterieur-2/tuin/zelf-geveltuin-aanleggen/

Picture 4: https://inhabitat.com/pervious-paving-reduces-stormwater-run-off/

Pictures 5-11: Clearing House

Sources used for this lesson:

Fun science demos: Erosion and Soil https://www.youtube.com/watch?v=im4HVXMGI68

Earthy Perks: How Forests Facilitate The Water Cycle?:https://www.youtube.com/watch?v=UqqEoEsKzPc

NASA Climate Kids: https://climatekids.nasa.gov/heat-islands/

Food- and agriculture organisation of the united nations, Soil experiments for children http://www.fao.org/3/a-i7957e.pdf

#6 Forest for rest

Description & background
This lesson explains the importance of the forest for your wellbeing on a more personal level. The students will dream about their ideal cities and work this out in a creative way.

Fits in subjects
Arts, philosophical subjects

Keywords
Stress relief, dreams, city

Goals for student
Develops a bond with surrounding nature; develops the ability to recognize own moods and feelings, and the impact of nature to their wellbeing. Builds body awareness and feelings of presence. Gains an understanding that in difficult situations in life, nature can help.

Suitability
Autumn, winter, spring, summer; indoor

What do you need?
Materials:
Paper, drawing and/or painting materials (e.g., pencils, crayons, markers, paint and brushes) or any of your chosen handicrafts materials, like clay, paper mache; alternatively, computer based software, lego, etc.

Preparation:
getting materials ready

#6 Setting the scene

If you are feeling nervous, worried or stressed, what helps you to calm down in a situation like that? When thousands of people were asked this, majority of them answered, “spending time in nature”. Research reveals that natural environments - parks, forests, meadows etc – can reduce our stress levels, stop us from thinking the worrisome thoughts and make us better able to focus on our homework and any other tasks at hand. In addition, spending time out in nature, makes us feel like we have more energy in us.

Nature helps us to find rest and gives energy at the same time

#6 Setting the scene

Why do we feel good in nature? Before we built cities, apartment buildings, had TV´s and other comforts, human beings lived very close to nature. You can think of it as birds being able to navigate from Africa to Europe every spring. Because it was once our home, we were attuned to nature and our brain developed to respond to nature.

Even after years of living in cities, our bodies have not changed that much, and our bodies still remember the connection. That is why when we get stressed in a built environment with all the flashing lights, sharp corners and sudden noises, we restore the best in a natural environment. Our bodies relax in nature. It has been noticed that when we look at or enter a natural environment, majority of us starts to calm down right away: our heart rate starts to calm down and our blood pressure starts to stabilize to a more ideal level. The stress hormone that is produced in our blood when we are stressed, starts to decrease and our muscles relax.
Also, natural sounds – live or recorded – will help us to relax.

#6 Setting the scene

After our bodies have calmed down, we can notice that the thoughts no longer race in the same circle, but they have also calmed down. More space and clarity is created in your head. When we have spent time in nature, we tend to be able to focus our attention better. This is true for everyone, but especially for children with ADHD who who will have an increased attention span after spending time in nature. Finally, if we go into nature with an angry mind or sad thoughts, these become milder or fade away.

#6 Setting the scene

There is also an interesting mechanism that they have found to be at work in our brain. The way the tree branches are formed (think of broccoli or cauliflower) they form similar patterns that repeat themselves in different scales from large to small. It is called fractal pattern and our brain enjoys when our eyes view it. In fact, our brain seems to relax when it sees this sort of patterning. This could also be one of the reasons why watching the tree branches or the waves move on the ocean is a relaxing activity. So, it can be said that nature heals as even viewing scenes of nature, reduces stress, anger and increases pleasant feelings.

Exposure to nature not only makes us feel better emotionally, it contributes to our physical wellbeing, because it reduces our blood pressure, heart rate, muscle tension, and the production of stress hormones at entering the green space. In addition, when we do sports in nature, we tend to experience the sports as less effortful and tend to go on longer.
In addition, natural surroundings can alleviate pain because they help to distract us from the pain. Therefore, many people with chronic (i.e. always present) pain can benefit from a walk in their favorite natural environment. Some dentists even use images of nature as well as nature sounds to distract their patients from pain, discomfort and even fear.

#6 Activity

You will create your own dream forest, complete with as many trees, animals, mountains, waterfalls, rivers, and even rainbows as you want it. You can draw, build and use whatever material is available.

As you start with the creation of this exercise, the teacher can play an audio of nature sounds to get the students in the mood (many of such ambient music with nature soundtracks can be found on YouTube).

#6 Activity

You can each create an area of earth which is comparable to your living room. Create your natural environment so that it gives you the best possible wellbeing effect. Without adding any man-made elements into it, what makes your space ideal for you? Be creative!

Once you have completed your creations, discuss with your fellow students and teacher, which elements in that nature spot will serve which purpose, e.g. refreshment, calming down, consolation, lifting mood.. You will see that there are differences but also surprising similarities. Close your eyes and imagine the sights, sounds and smells in that nature spot.

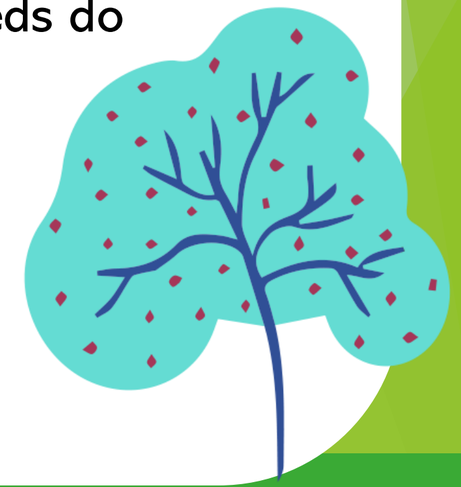
#6 Reflection

Try to answer the questions below through discussion in group.
Write an individual description of your creation to describe what your dream forest is like.

Afterwards the following themes and questions will be discussed in group

- Where do you normally go to when you are stressed/tired/sad/upset?
- Where do you feel safe? What do you need to feel safe?
- Is there a nature spot close to your house where you can go when you feel these feelings? If not, how else can you reach the feeling of calmness?
- What kinds of nature spots do you think are easy to be found in the city? What needs do they answer? Which spots are hardest to find?

Report this information and sent to the department of environment and health of or the department of your city.



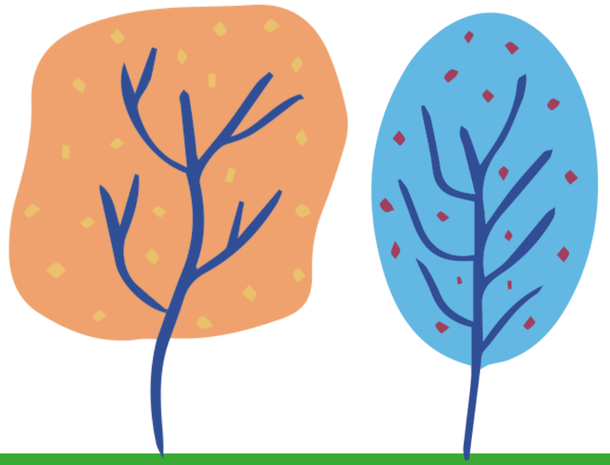
#6 Take it a step further: one step

Do you want to do more with this lesson? Take it a step further and get to action!

One step

In your classroom or school yard, create a calm space where you and other students can go when you are feeling anxious, tired or angry.

Discuss together what things will be needed. Plants? If there are no or only few plants in the classroom, the teacher can ask the students to ask their parents whether they want to bring a cutting or a plant already potted into the school. How about the soundscape? What activities are possible there – listening to nature sounds? Reading books? Watching pictures?



#6 Take it a step further: two steps

Do you want to do more with this lesson? Take it a step further and get to action!

Two steps

If there is a place on the schoolyard, you can ask your teachers to create a calm spot there for the students to recharge in. This can be as easy as putting a bench next to a tree and dedicating that as the place for resting. To make students more aware of the presence of the trees and its beneficial effects for us, consider placing a board or a nameplate on the tree and titling it "Dr. Forest". You can even list some of the benefits that the students get from visiting with the Dr Forest close to the spot.

More

Create a questionnaire with items on energy levels, tiredness, moods, stress levels etc. Fill in the survey and then go outside into your favorite nature place. After spending a minimum of 30 minutes there, take the survey again. See how your feelings changed. Discuss your results with your classmates.

#6 References and further inspiration

Sources used for this lesson:

Picture 1: Asaf R on unsplash, https://unsplash.com/photos/4Ch37gyYAfk
Picture 2: Gaby Orcutt on Unsplash, https://usercontent.one/wp/www.arianegruenler.com/wp-content/uploads/2019/08/gabby-orcutt-7E29j_4GBNI-unsplash.jpg
Picture 3: powerpoint
Picture 4: Daniel Clay on Unsplash, https://unsplash.com/photos/DhcrTD25OqU
Picture 8: https://i.pinimg.com/originals/c8/67/fb/c867fb5427f3e9b6345df224fb0b3897.jpg
Picture 9: https://www.dhresource.com/f2/albu/g4/M00/AA/71/rBVaEFgS0h6AED7sAACnrApuNi0344.jpg

Sources used for this lesson:

FOREST EUROPE, Liaison Unit Bratislava, 2019: Human Health and Sustainable Forest Management by, Marušáková Ľ. and Sallmannshoferet M., et al. FOREST EUROPE Study.

#7 Web of life

Description & background

This activity encourages to think about a natural eco-system. How do the elements in it interact? And how is everything the interconnected in the natural world. It demonstrates the consequences of human actions on the biodiversity of an eco-system. This is a good activity to introduce concepts as biodiversity, resilience, ecosystem.. The ecosystem in question can be that of your own locality (city park, rural forest etc) or a more exotic ecosystem which is a topic of a lesson.

Keywords

Biodiversity, habitat, ecosystem, interconnectedness

Goals for student

Develops understanding about interconnectedness of everything in the natural world; impact of human actions to nature concepts: web of life, food chain, eco-system, biodiversity, ecosystem diversity

Suitability

Spring, summer, autumn, winter- indoors or outdoors

Fits in subjects

Natural sciences, maths

What do you need?

Materials:

- One ball of string or wool (at least 20)
- Approximately 15 labels, each with the name of an organism or element in an eco-system of your choice.

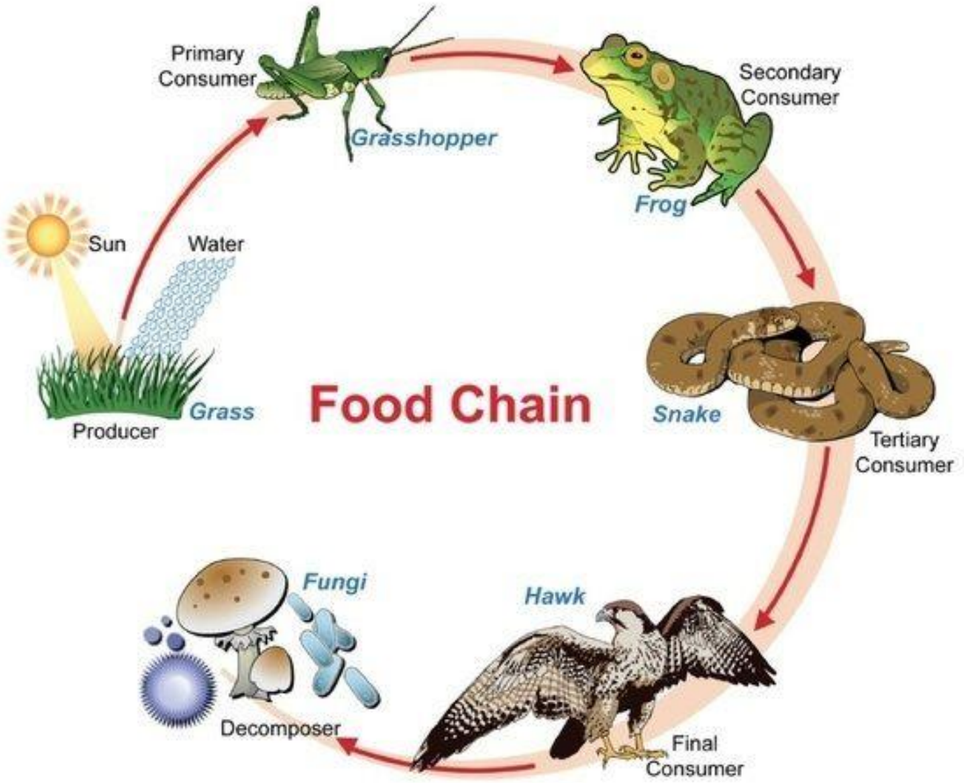
Preparation:

Make labels to attach to the web. Here is an example list from a woodland river ecosystem: *rain, river, oak tree, soil, fish, frog, heron, otter, spider, fly, beetle, bat, bluebell, bee, squirrel.*
Add or leave out labels according to the amount of students

#7 Setting the scene

An (urban) forest is a complex living system and it comprises of many more organisms such as plants and animals that interact with and depend on each other than only trees. A tree is living in a dynamic symbiosis with the fungus network in its roots. The tree is providing nesting area for birds such as the jay who, in return helps spreading the oak nuts to other areas in the forest, thus helping the tree to spread its coverage and establishing at the end of the forest.

A **food chain** is a simplified way of showing the relationships between plants and animals in an ecosystem. For example, a food chain of sun, plant seed, mouse, owl shows that a plant seed that grows from the sun's energy is eaten by a mouse, which in turn is eaten by an owl. However, most animals do eat more than one type of does, especially if the food is hard to come by at times. A food web depicts the interaction of many food chains in an ecosystem.



#7 Setting the scene

These are all particular parts of the foodchain. Also the dead tree below is an optimal ground for fungus to grow. In this picture you see two different fungi, one lighter, one darker.

#7 Activity

• Everyone gets a label with an element (a plant, insect, animal...) of the chain to stick on the front of their jumper.

• Each group is given a fairly large ball of string/wool.

• One student (e.g. the squirrel) holds the end of the string, then hands the ball to another student (e.g. the oak tree), while making a statement about the relationship between the two things on the stickers (e.g. the squirrel eats acorns from the oak tree).

• Now, the "squirrel" is holding the end of the string, and the "oak-tree" is holding the ball.

• Next, the oak-tree passes the ball to a third student, again making a statement, but holding on to the string (e.g. the oak tree needs water from the rain in order to grow).

#7 Activity

• Now two students are holding onto the string at different places and the third is holding the ball. The activity continues like this, with the ball being passed back and forth, but each student holding onto the string.

• Every time the string is passed the student passing it must make a statement. Some elements, such as the river and the rain in the above example, will have multiple connections to other elements. In this case, a student may be holding the string in 3 or 4 different places. Soon a web of string will have been created. You can demonstrate how strong the web is by pushing the middle of it gently. To demonstrate how the web can be disrupted, you can remove one of the key elements from the web.

#7 Reflection

Try to answer the questions below through discussion in group

- Think about what plants and animals you might find in a healthy forest ecosystem? What might happen to the forest ecosystem if we remove an item from this list? What might happen if humans are introduced to this ecosystem?

- Imagine that the river has been polluted; the oak tree has been cut down. Then the child with that sticker lets go of all the bits of string he or she is holding. The web is no longer resilient, but weak and the threads are loose. You can also ask the students to make statements about the consequences of these elements being removed (e.g. without the river, the frogs will disappear from the forest, without the oak trees, there will be no leaf-litter so the soil will not be as rich and the bluebells won't grow etc.) so more and more of the elements are disconnected from each other and the web is weaker and weaker. Reflect on how human behavior affects the web of life. How does that make one feel? Which emoji would you use?

#7 Take it a step further: one step

Do you want to do more with this lesson? Take it a step further and get to action!

One step

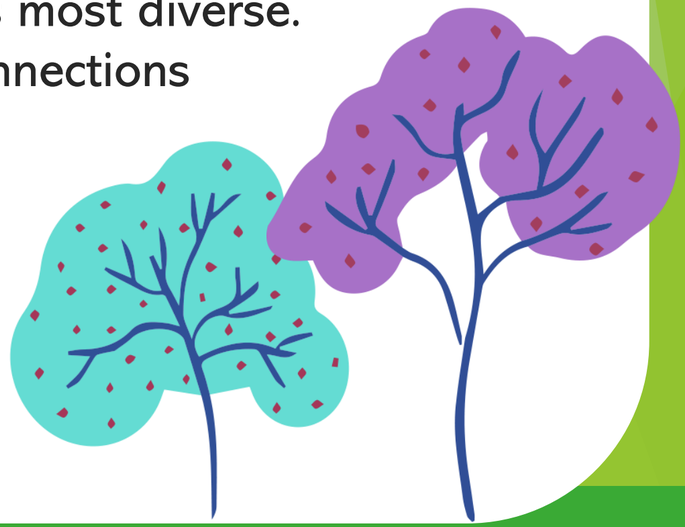
First, take a walk outdoors in your school yard or local community to record some of the species living there and then create the web of life. Create more webs-of-life at a time and record the links on paper. Compare the different ecosystems to each other to really clarify the idea of biodiversity. Which one is more diverse?

#7 Take it a step further: two steps

Do you want to do more with this lesson? Take it a step further and get to action!

Two steps

Create more webs-of-life at a time and compare these to each other to really clarify the idea of biodiversity and resilience. Do the activity with the students and the boll of wool and record the connections on a paper. Do the tests with cutting down some of the connections as a result of pollution, urban development, alien species, and see what it takes to collapse the entire ecosystem. Do the same again with another ecosystem with different labels, record it again and test again the web´s resilience. Compare then these different ecosystem with each other (e.g. diverse deciduous forest versus monoculture forest; swamp versus city park) and see which one is most diverse. Which one is more resilient? What else is there to learn from the interconnections between species?



#7 References and further inspiration

Sources used for this lesson:

Picture1. https://i.pinimg.com/736x/65/ea/b1/65eab1220d21b8f7ccead677f5bc9b24.jpg
Picture 2. Keith Luke- Unsplash, https://unsplash.com/photos/-FrVt6GrCvw
Picture 3. Photo by Geoff Park on Unsplash https://unsplash.com/photos/ywz_3Qc0xdw
Picture 4. Chris- Unsplash; https://unsplash.com/photos/pxiXOtJam9A

Lesson inspired by

Green Schools, An Taisce the National Trust of Ireland. https://www.ecoschools.global/

Similar activities (26. Ecosystem Web): https://files.peacecorps.gov/documents/PC_Environmental_Activities_508_mNd3UVx.pdf

#8 The air we breathe

Description & background

This is a citizen science exercise about trees and how they contribute to better air quality through photosynthesis and capturing fine dust. Students will go out in the city to measure the amount of fine dust at several places with a simple self-created fine dust-sensor. This measurement will tell about an environment and its air pollution. Which factors make an environment polluted and how can you mitigate this?

Fits in subjects

Technology, geography, physics, health

Keywords

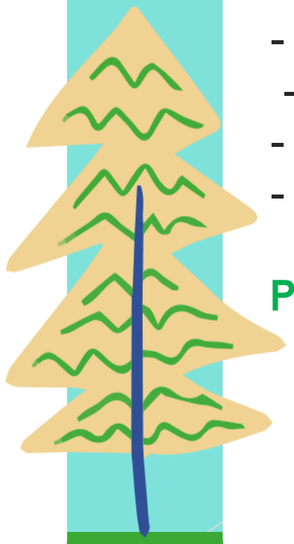
finedust, air, pollution, urban, citizen science, photosynthesis, health effects

Goals for student

Develops groupworking skills, Gains understanding on concepts as photosynthesis, finedust

Suitability

Autumn, winter, spring, summer- indoor & outdoor



What do you need?

Materials:

- Picture that explains fotosynthesis,
- graph paper (x3),
- scissors,
- solid backing for graph paper (for example: cardboard, plywood),
- petroleum jelly,
- plastic knife
- binder clips
- magnifying glass,
- paper
- pens

Preparation: /

#8 Setting the scene

One of the easiest ways to understand the value of trees in the city is imagining how they influence the air quality. In order to live, the trees consume carbon dioxide that is plentiful in the city air, and replenish it with fresh oxygen, which they produce through photosynthesis, in which carbon dioxide is transformed into oxygen and hydrogen. Carbon dioxide is the gas that warms up the air.

When there is a lot of finedust in the air, it seems the city is covered in fog, this phenomenon is called smog.

Climbing plants filter finedust out of the air, as well as trees.

#8 Setting the scene

Another wonderful thing trees do is filter fine dust out of the air. Fine dust is invisible and consists of small particles in the air. You can't see them, but we breathe them into our airways where they cause problems for our health. Fine dust is mainly present in cities as it is produced by cars, factories,… where it does not warm the earth like carbon dioxide but is especially unhealthy.

Large trees are excellent filters for urban pollutants and fine dust. The trees absorb pollutant gases (such as carbon monoxide, nitrogen oxides, ozone and sulfur oxides) and filter fine particulates such as dust, dirt or smoke out of the air by trapping them on leaves and bark. Do you need more proof of old trees importance?

move in the city, otherwise dirty air gets trapped into an area causing health problems.

#8 Setting the scene

Air pollution increases the chance on cardiovascular disease, strokes and certain forms of cancer. It can also cause or worsen asthma and chronic bronchitis. Air pollution causes many premature deaths a year and is called the invisible killer. However, when the fine particle content in the air is especially heavy, it sems as if there is a layer of fog hanging over a city. This fog is called smog and it is most unhealthy to breathe in and most visible too. It is important not to do any sports on a day of smog as this could cause irrevocable damage to your lungs. Similarly, it is important that air can move in the city, otherwise dirty air gets trapped into an area causing health problems.

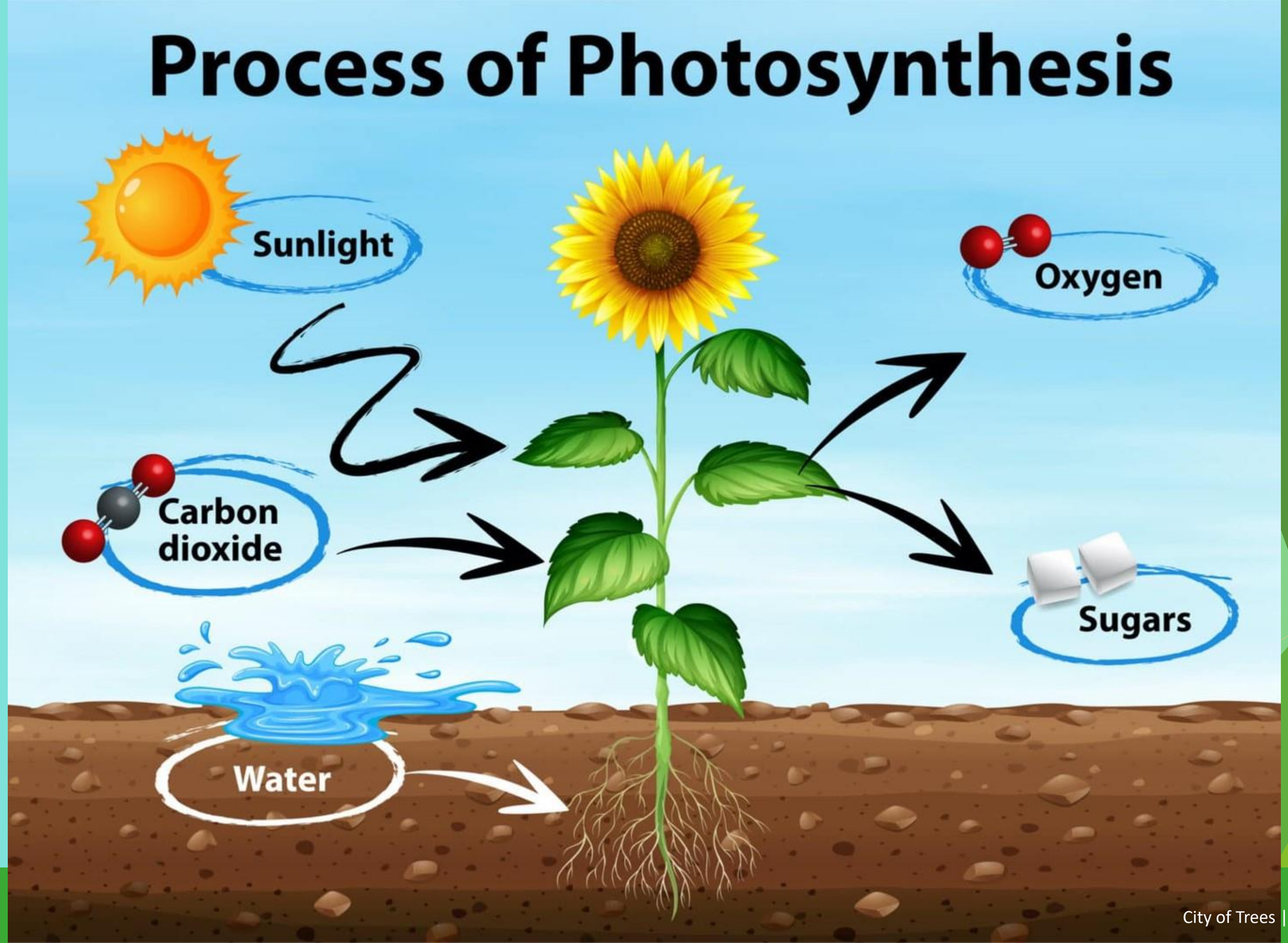
Smoggy sunset creates breathtaking colours.

#8 Activity

Below there's a picture that explains how photosynthesis works (see large on next page). Watch and discuss this in group.

- Discuss photosynthesis in group
- Think of places with a lot of 'oxygen', where it is nice to breathe.
- Is the classroom a place like that? Most classrooms are not places with the cleanest air. What are ways to make the classroom a nicer place to breathe?

Further in the exercise we will focus on fine dust,
which is not the same as carbon dioxide.


Process of Photosynthesis
Sunlight
Oxygen
Carbon dioxide
Sugars
Water

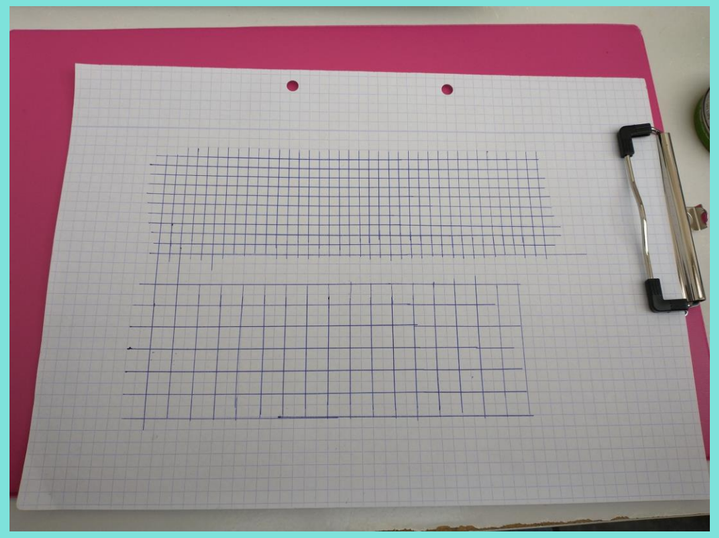
#8 Activity

In a group of 4-5 students, you will make your own air pollution measure-system.

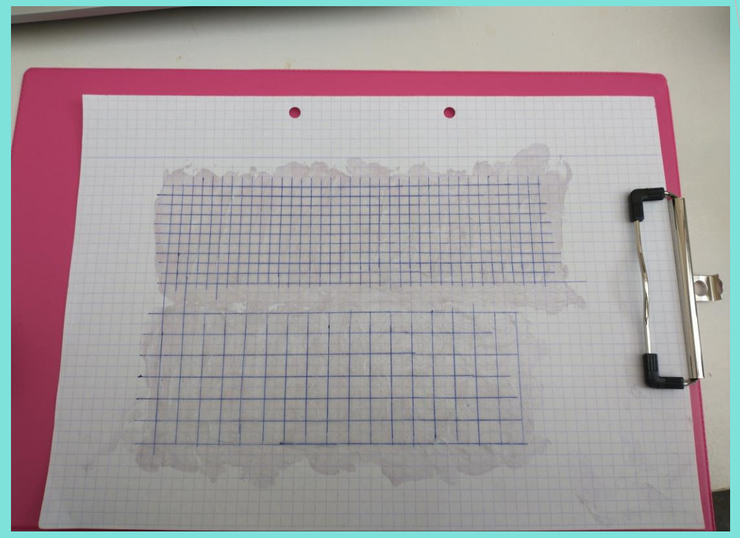
•Cut the graph paper and adjust it to the cardboard, making sure the graphs are not covered
•Cover all the graphs in petroleum jelly, be sure the layer of jelly is thick enough; the thicker the layer, the easier it catches pollutants.
•Decide where the different cards will be put. Look at the map of the city together. Search for places with a different environment (a big park, a large road with a lot of traffic, a place in the city centre with less traffic,…). You can also hang some boards indoors.
•Go out and place the boards, make sure to attach them well outdoors in the busy locations. Place a note next to the cardboards that this is an experiment, so that those passing by won't take the board away.
•Go back to the boards 24 hours later and bring them back to the class.

•Time to analyse! Each group counts the caught particulates. Use the microscope. Count the number of particulates in each square of the graph paper and record them in a table laid out with the same number of squares as the graph paper.

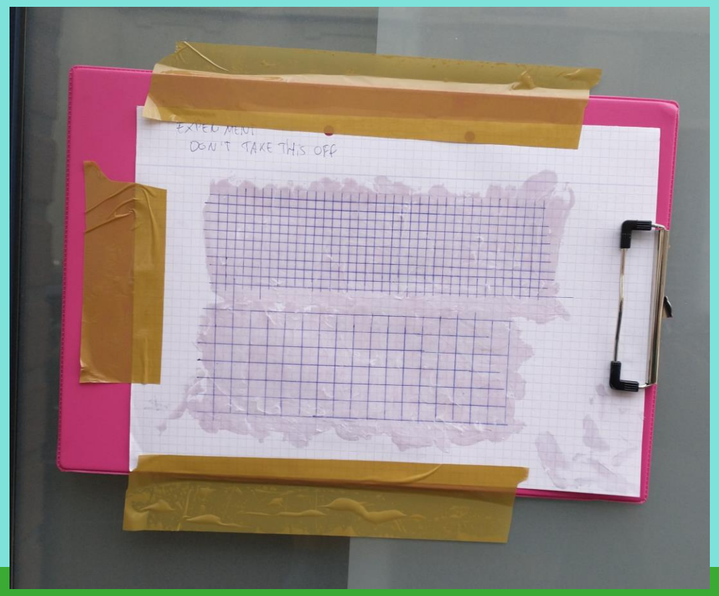
#8 Activity



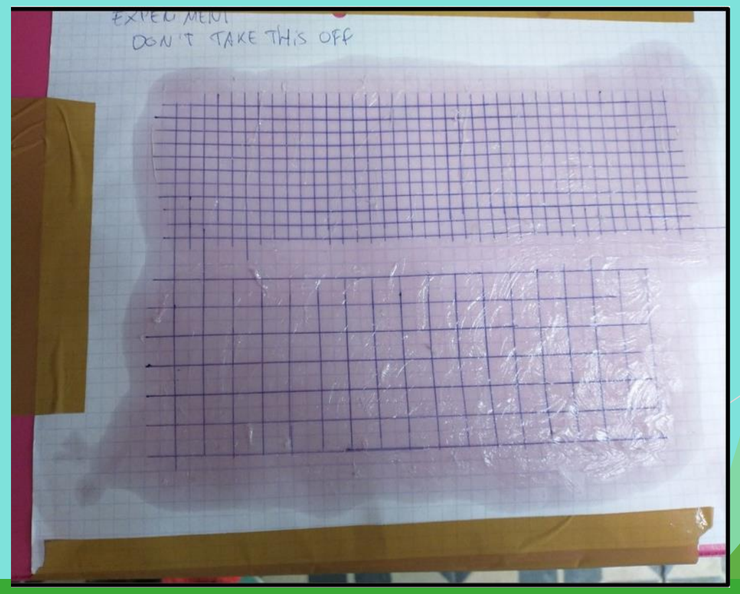
Step 1:
Adjust the graph paper on the cardboard



Step 2:
cover the graphs with petroleum jelly (vaseline)



Step 3:
Hang the board at a certain place



Step 4: Take the board off after 24 hours and count the little black particles

#8 Reflection

Go over the table and talk about the differences.
- Which areas were the most polluted?
- Which other things might have affected the result? Think about the location of the street

Discuss allergies: how many of the people in the class have allergies?
How many family members of the students have allergies?
How does this affect their lives and are there months in which their lives are impacted more ?
In which areas do people with allergies feel better or worse?

#8 Take it a step further

Do you want to do more with this lesson? Take it a step further and get to action!

One step

Go measure further in the city, closer to places where the students live in and indicate these places on a map. Do this for a longer time and see what changes over time. What is the effect of weekends, different seasons?

Two steps

Take the measuring of fine dust a step further and build a finedust- sensor. This is an ideal lesson to incorporate to subjects that teach about technology.
You learn everything on how to do this on this site: https://sensor.community/en/

More steps

Do you have plants in your classroom? Maybe you can take some from home (a cutting from a plant you have at home) to make it a healthier and more comfortable place.
Don't forget to ensure the plants are taken care of
in the classroom, even during holidays.

#8 Take it a step further

References and further inspiration

Sources used for this lesson:

Picture 1: Nick van den Berg on Unsplash, https://unsplash.com/photos/2vb-_3t6YCM
Picture 2: Pelayo Arbués- Unsplash, https://www.files.ly/photos/LLklx_IVDfo
Picture 3: https://www.ck12.org/c/earth-science/effects-of-air-pollution-on-the-environment/rwa/Smoggy-Sunsets/
Picture 4: https://www.science-sparks.com/wp-content/uploads/2020/04/Photosynthesis-Diagram-1024x759.jpg
Picture 5-8: Clearing House

Sources used for this lesson:

Bruzz.be: https://www.bruzz.be/milieu/zelf-fijn-stof-meten-beter-weten-2018-08-22

InfluencAir. Citizens measuring air quality in Brussels:https://influencair.be/;

Sensor Community:

https://deutschland.maps.sensor.community/#6/51.165/10.455

Instructrables:
https://www.instructables.com/id/Air-Quality-Classroom-Experiment/

#9 Food forest

Description & background
This lesson is about the different ways forests can also produce food for people. The different layers of the forest structure will be explained as well as the different functions of the food forest.

Fits in subjects
Arts, biology, maths, societal topics

Keywords
Food forest, biodiversity, food security, understory, overstory, herbaceous layer, root layer, shrub layer, ground cover layer, vine layer

Goals for student
Learning where some foods comes from, learning to value the different products forest produces. Understanding where different forest products grow and what the benefit of a food forst is. Students will learn about the differences between monoculture forest and diverse food forest

Suitability
Spring, summer, autumn, winter- indoors & outdoors

What do you need?
Materials:
Recycled/scrap paper and markers to write the names of the plants on them for students to hold.
Alternatvely, you could draw pictures of the different species for students to hold.

Preparation:
Teacher needs to familiarize where each species should be best placed.

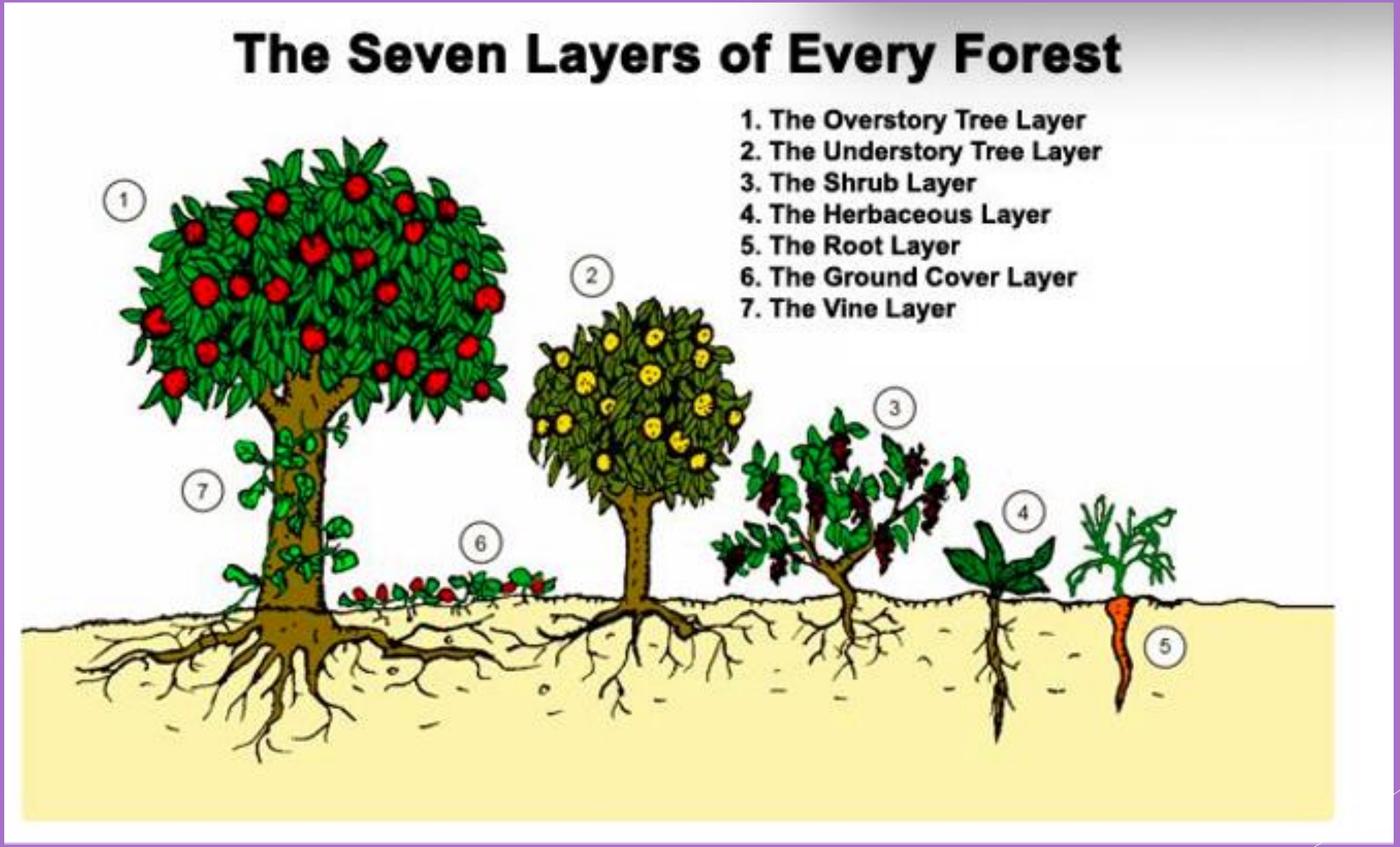
#9 Setting the scene

What is a food forest?

A food forest, or a forest garden, mimics the ecosystems and patterns found in nature in a diverse planting. Unlike in a monoculture where a field consists of only one crop, e.g., corn or oats, in food forests, several different plants, shrubs and trees grow in different ayers, all producing crops for human consumption. This is more ecological, as a diverse planting is more resilient against pests, does not need pesticides, no external nutrients in the form of fertilizers are needed, and it is more favourable to the nature surrounding the forest. Food forests are mostly three-dimensional designs with life extending in all directions – up, down, and out. Generally, we recognize seven layers of a forest garden – the overstory, the understory, the shrub layer, the herbaceous layer, the root layer, the ground cover layer, and the vine layer, plus the mycelial layer, layer eight (mushrooms). Using these layers, we can fit more plants in an area without causing failure due to competition.

A food forest does not have to be re-planted year after year. Once it is established, the plants reproduce their crops annually. Also, a food forest is quite resistant against, e.g., deer and rabbits who will favor some plats while leaving others alone. Because perennials have healthy underground systems, they will be able to bounce back, even if they were destroyed by grazing animals or playing chidlren. Trees, shrubs, and vines mostly go undamaged.

#9 Setting the scene



#9 Activity

Anyone can adapt this to their particular food forest or region.
1. Each student is designated a plant name.

2. Different types of plants, e.g. trees, are asked to step forward first and we talk about spacing them and where they should be placed. Consider the needs for sun, space between individual trees (generally it can be said that a tree´s roots are as wide under the ground as their canopy is above), height of a tree and how it will shade the others.

3. Students take their places and extend their branches (their arms). Students that are shrubs or bushes either squat or sit on the floor. Students that are ground cover species can decide whether they would like to sit or lay on the floor. If it is difficult for any student to participate by sitting, laying, squatting, stretching arms out, etc. there is also a sheet for the important role of being the sign placed in the food forest to let others know how to utilize the space and there are pollinators (can also discuss which pollinators are attracted to which plants).

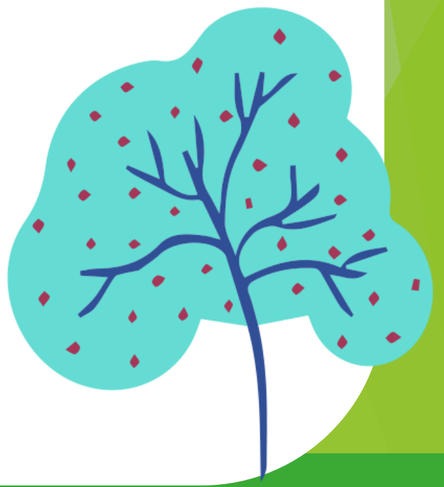
4. After all the students are in their food forest placement, we discuss what it looks like, the different layers, who might have difficulty gathering sunlight, who grows well in the shade, etc.

#9 Reflection

Discuss the following in a group:

What effects would it have if your city or town would have a food forest in it (e.f. a new forest or turning an existing forest into a food forest).
- favorable consequences
- harmful consequences

Who has the right to the harvest of the products of a food forest located on public lands?



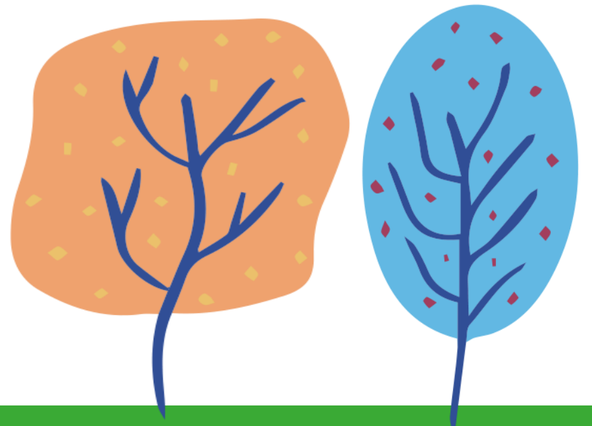
#9 Take it a step further

Do you want to do more with this lesson? Take it a step further and get to action!

One step
Vary with movement and muscle toning in the set-up. e.g; the students in the ground cover plants plank, the shrubs squat, the trees do arm rotations..,

Two steps
Learn about different climatic conditions than your own environment. How would a food forest in the tropic or boreal region look like?

More steps
Think about the actual steps of planting a real food forest, what is the ground structure, when should you plant... And ultimately, plant the food forest!



#9 References and further inspiration

Sources used for this lesson;
Picture 1. Permaculture a beginner´s guide: Graham Burnett

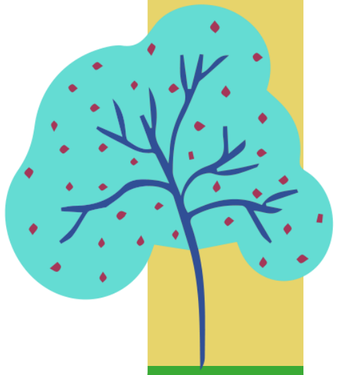
Sources used in this lesson:
Community Food Forests: https://communityfoodforests.com/free-resource-interactive-school-activity/

NEW YORK RESTORATION PROJECT (NYRP). https://www.nyrp.org/15_for_Trees_K-3_FINAL.pdf

#10 Habitat map

Description & background

A habitat map shows the geographic distribution of different habitats and species within a particular area, it is a great starting point to work further on urban green. This exercise introduces concepts like biodiversity, habitat,…



Keywords

Biodiversity, habitat

Goals for student

Develops group work skills, builds awareness on the importance of trees in a city.
Gains knowledge on indigenous species, ecosystem, mapping

Suitability

Summer, autumn, spring
‘this lesson includes indoor and outdoor parts

Fits in subjects

Geography, biology, social sciences

What do you need?

Materials:

printed
maps of the neighbourhood or school, ballpoints, markers, app like plantsnap, search
cards (species map), (smartphones if available)

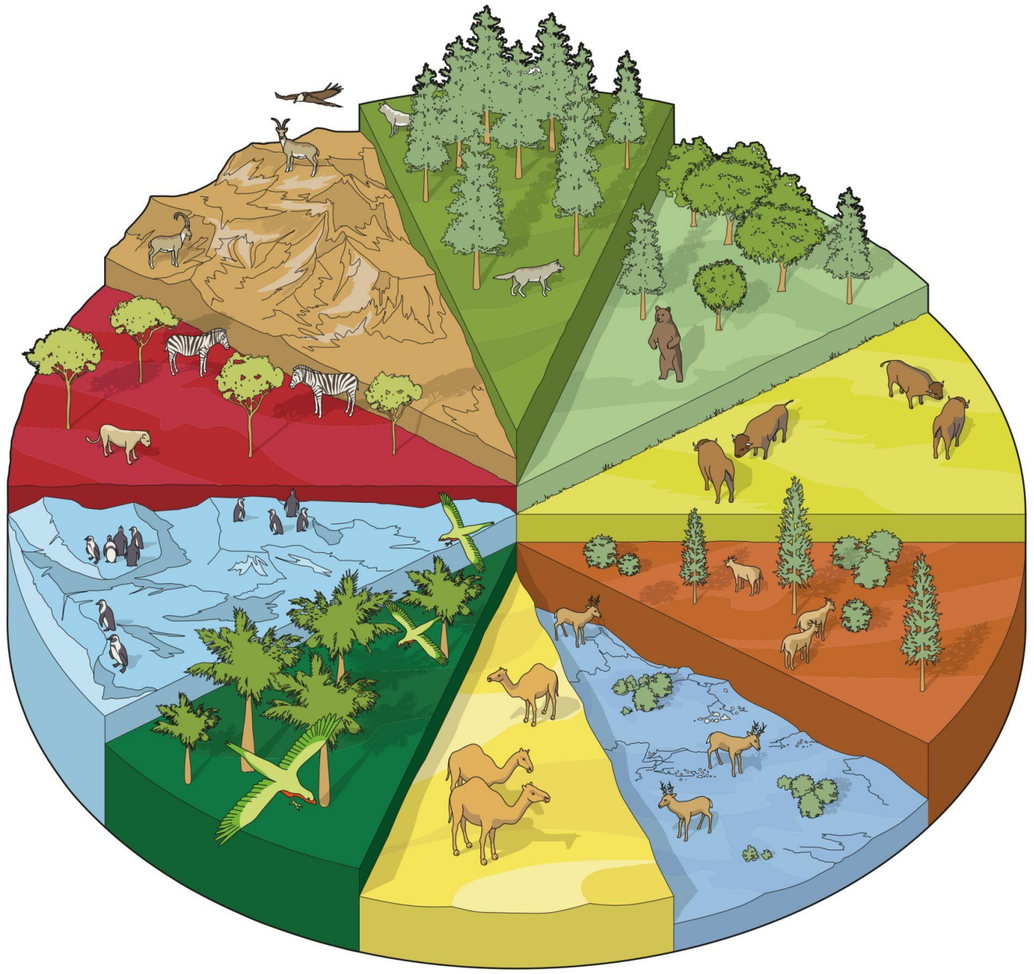
Preparation:

Decide which map will be used for the mapping, how big the researched area will be (depends
on level and age of students). This can be the school itself, the close
neighbourhood or more neighbourhoods in the city. Make this very clear and make sure it is achievable.

#10 Setting the scene

A habitat is the place or environment where a plant or animal naturally or normally lives and grows. It provides the animal with food, water and shelter. There are many different sorts of habitats around the world; from forests to grasslands and from mountain slopes to deserts. Different habitats are a home to different animals.

A city is a habitat that is home to many different animals, plants and people. A lot of them live very close to each other, which makes it a very special, always changing environment.



The different land habitats that exist on our planet

#10 Setting the scene

Biodiversity is the amount of different species, and the variety of different species on a certain surface. It is often used as a criteria to measure the health of a biological system. The more biodiverse an area, the stronger the ecosystem. Biodiversity makes an area stable and healthy; it underpins the health of the planet and has a direct impact on all our lives.
Unfortunately, we are facing a biodiversity crisis at the moment, a lot of species (plants and animals) are becoming extinct. This is a big problem as reduced biodiversity means millions of people face a future where food supplies are more vulnerable to pests and disease, and where fresh water is in irregular or short supply.

This duck and rabbit adapted their life and habitat to the city.

#10 Setting the scene

Biodiversity is threatened, but even in the city different plants and animals are closer and more present than you'd think. Protecting biodiversity starts with knowing what is out there.

Human activity is threatening biodiversity, Doel-Belgium

#10 Activity

Go out in your group to map, equipped with map; markers; tree identification maps; apps to indicate where there are trees, bushes and animals.

Indicate and try to define which ones they are. Here the identification maps or an app like Plant snap can be very useful!

Come back and discuss the results.
- If the groups had to research different area's; every group presents (short) what they have found where. Put the maps together and make it to one definitive map.
- If the groups worked on a big area which you divided into smaller parts, bring the parts together and discuss what you can learn about that habitat. (It has many broadleaf trees, few wildflowers, diversity of nesting birds..)
-If the groups researched the same area: Discuss the findings in group and come to one definitive map.

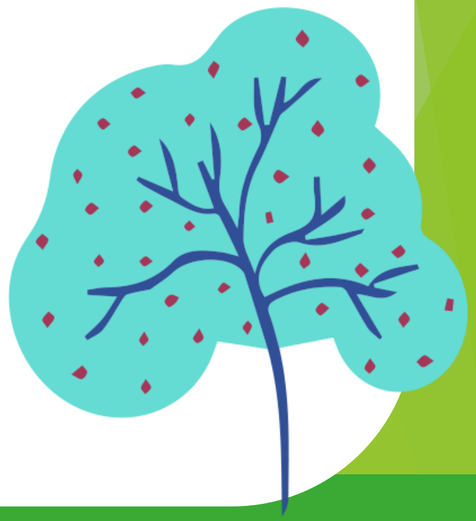
An example of a self-drawn habitat map

#10 Reflection

Try to answer the questions below through discussion in group

- Are the results as expected?

- Do the students think there are a lot of trees and green in the city/school area? (scale too much- too little)
    - In all cases (enough, too little, too much), discuss the opinions and motivate why you feel that way.
    - Think about this from the point of view of:
        - Fauna
        - Flora
        - Yourself



#10 Take it a step further

Do you want to do more with this lesson? Take it a step further and get to action!

One step

Are there spots on the map where the class thinks trees (or green) can or should be added? How about places where trees and greenery should be removed? Indicate these on the map. Discuss why in both cases.

Two steps

Indicate spots on the map where trees can be added. Make an appointment with the school board or municipality to present your plan. Don't forget to motivate why trees are important in that specific spot.

#10 References and further inspiration

Sources used for this lesson:

Photo 1: DK Find out UK; https://www.dkfindout.com/us/animals-and-nature/habitats-and-ecosystems/land-habitats/

Photo 3: Photo by Marcus Bellamy on Unsplash https://unsplash.com/photos/BG3Zz64s0C4

Photo 4: Yves Adams- Vilda, https://vildaphoto.net/nl/combosearch?q=&cats=570#p134326-r1

Photo 5: Yves Adams- Vilda; https://vildaphoto.net/nl/title?q=Konijn+in+de+stad#p140861-r1

Photo 6: Schatkist van de Natuur, BOS+

Lesson inspired by

- Habitat mapping: http://www.leafmexico.org/pdf/B_Biodiversidad/Biodiversity+Worksheet+Habitat+Mapping.pdf
- Biodiversity and You: https://wwf.panda.org/discover/our_focus/biodiversity/biodiversity_and_you/

#11 Finding peace of mind in the city

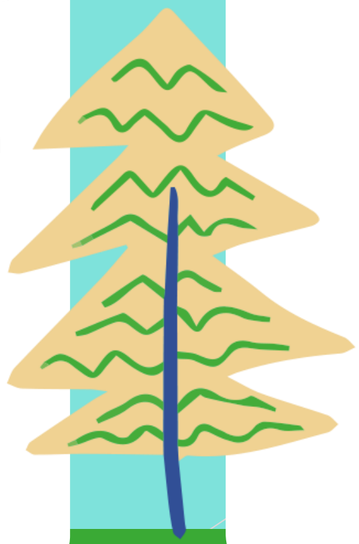
Description & background
This exercise will address anxiety about the events in the world, like climate change, environmental threats and the pandemic. The activities introduce the students to mindfulness in nature as a self-care practice.

Fits in subjects
Arts, ethics, social sciences

Keywords
Climate change, pandemic, environmental problems, threat, fear, anxiety, personal development, mindfulness, self-care

Goals for student
Develops abilities to recognize your own thoughts and introduces the idea of managing one's thoughts.
Encourages to connect with nature in a mindful way.

Suitability
Spring, summer, autumn, winter- outdoors



What do you need?
Materials:
Paper and pen
Read section on Climate change anxiety (in Teachers or students inspirational package)

Preparation: /

#11 Setting the scene

Seeing and hearing about climate change and living in the pandemic has been a lot to cope with. The current corona-crisis has altered our lives and freedoms to a degree we had not yet known before. In some youngsters, the changes around have been enough to cause them anxiety and sleepless nights.

Anxiety due to environmental problems and threats refers to a difficult feeling inside us. Climate anxiety is part of the wider environmental anxiety phenomenon in which the state of the world affects mental health. This is not a strange or unreasonable reaction, as the world is going through some major changes. Climatic or environmental anxiety can however become a problem if it becomes so severe that the person becomes paralyzed.

It is therefore very important to take care of yourself, realize when you are feeling anxious and take stock of what is true and what is something your mind has made up.

#11 Setting the scene

You see, your thoughts are happening in your mind, just like your breath is. Thoughts come and go and impact how our day shapes up to be. If we are thinking sad thoughts, it is hard to find something fun about. If we are thinking happy thoughts, the day will most likely turn out happy. However, thinking only happy thoughts is almost impossible as we cannot control what happens in our lives. While we might think we have little or no control over our throughts, it is not true. We can learn to manage our thoughts, but it takes practice to first notice them and then learn to manage them.

You might have heard about mindfulness. Contrary to what you might think, it is not that difficult or even serious. What is important though, is that you enjoy it, otherwise it is hard to keep up the practice and become good at it. The entertainment we engage in through television or social media may keep our attention focused, but it also over-stimulates our minds. One can see its impact in depleted attention spans, reduced concentration, and poor memory.

As you might have learnt in the lesson **Forest for rest**, spending time in nature is good for our minds. Combining mindfulness to being in nature is a powerful combination as in nature, mindfulness happens almost on its own.

#11 Activity

All the activities mentioned integrate elements of nature, which makes it easy for beginners to access the concept of mindfulness. On top of mindfulness benefit, the participants will be able to enjoy the many health benefits of being outdoors.

Mindful Listening: Language of the Birds

What is the difference between regular bird-watching and mindful birding? While our eyes make up the primary sense for the former, the most important sense for mindful birding is our ears. Rather than counting the number of different birds we can see, our focus is on learning how to create calm with the help of the birds.
We recommend keeping all cameras and phones away. Once you find a space that has sufficient bird activity, ask the group members to find a spot for themselves and sit in silence.

#11 Activity

Mindfulness Activity Prompts

Listen to the closest bird.
Listen to the farthest bird.
Listen to the birds in different directions.
Listen to the silence in between the birdcalls.
Listen for conversations. Follow the sound of a particular species and imagine what the birds are trying to say?
The group can share their stories, insights and learning at the end of the session.

Listen for conversations. Follow the sound of a particular species and imagine what the birds are trying to say?
The group can share their stories,
insights and learning at the end of the session.

#11 Reflection

Spending time with the birds in a mindful way leads to some beautiful insights. Just like the birds, sometimes we have to let our minds soar above our day to day worries and see our lives from a higher perspective. Mindfulness allows us to do that, helping us to discover wiser choices for our future.

After the activity, discuss your experience with your group.

Like a muscle, our brain also responds to training. Try to do this or any of the other exercises once a day or week and see what changes for you and your group.

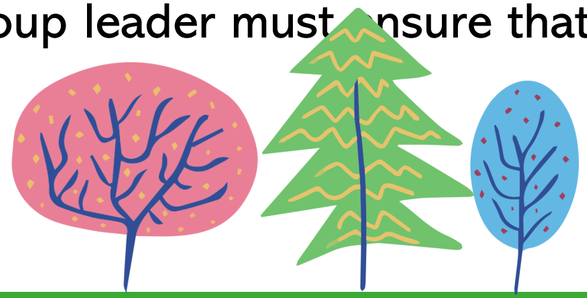
#11 Take it a step further: one step

Do you want to do more with this lesson? Take it a step further and get to action!

One step
Mindful Immersion: Art of Leaves

Here 2 creative mindfulness activities that make use of the leaves for mindful immersion. These activities help you create some unique artworks, especially in Autumn.

Leaf Tracing: Pick any leaf. You choose a simple one or a complex shape. Trace the outline of the leaf with your eyes as slow as you can. Move from one edge of the base, all the way around to the complete the loop. This exercise is an excellent way to slow down your thoughts.
Leaf Collage: Group members work in pairs. Using different leaves they have to create a mythical or magical forest creature. Use the imagination to escape into a hidden world. This simple exercise raises the energy levels of the group. So the group leader must ensure that the silence of the group does not get lost.



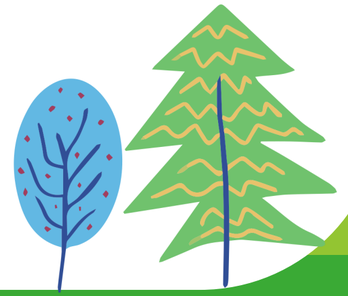
#11 Take it a step further: two steps

Do you want to do more with this lesson? Take it a step further and get to action!

Two steps: Mindful Appreciation: In Search Of Wonder
(on a rainy day, you can also do this indoors using materials that are present in the room)

This Mindfulness exercise involves focusing on a positive thought or emotion. It helps to shift our attention from the negative cycles of our mind that pull us down, to a more positive frame of mind. For this activity we can either use the treasure-hunt model where the group goes out into nature and collects object based on a pre-given list, or we can ask the group members to just take a photograph of the objects. For larger groups it is better to use photographs as it creates a lesser impact on the surrounding. The simple rule all participants need to follow is that you can only take one photograph per item on the list. By restricting the number of photographs, we get the group members to be more mindful of each shot they take. With this single rule we can turn our device of distraction into a mode of meditation.

Here's a list of recommendations. Feel free to create your own.
One thing that makes you smile. One thing that brings you calm.
One that fills you with hope. One thing that makes you curious.
One thing that fills you with awe. One thing that you are thankful for in nature.



#11 References and further inspiration

Sources used for this lesson:
(no pictures)

Sources used for this lesson:
All the activities in this lesson come from Healing Forest: www.healingforest.org

#12 Distribution of greenspaces

Description & background

In this exercise the distribution of greenery in a city is discussed. Not every place in a city is equally green or has accessible greenspaces for its inhabitants. The students learn how green their school area and home area is. We want to focus on the social benefits of green neighborhoods here and make a link with the historical changes in the city according to green. How green is an area? Why is it like that? Was it always like this?

Fits in subjects

social sciences, history, geography

Keywords

City, neighbourhood, accesible green

Goals for student

Develops understanding about interconnectedness of everything in the natural world; impact of human actions to nature
Concepts: web of life, food chain, eco-system, biodiversity, ecosystem diversity

Suitability

summer, spring, autumn-
indoor & outdoor

What do you need?

Materials:
pen & paper

Preparation: good communication skills and inquisitive mind

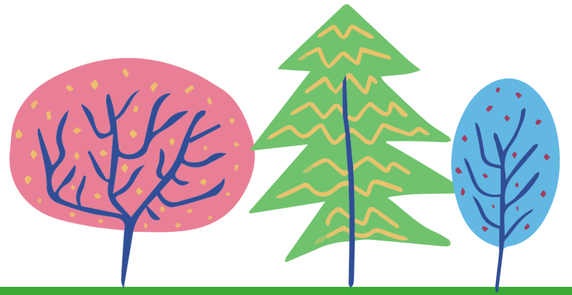
#12 Setting the scene

Cities are continuously changing. Inhabitants come and go, buildings are built, roads are created, and the area of the cities keep growing. Though the importance of nature to our health is starting to be recognized, many cities still lack green oasis and greenspaces that are close enough for every citizen to access. Too often the nature places are tucked away in the edges of the city, where it takes too long to travel, through all the traffic.

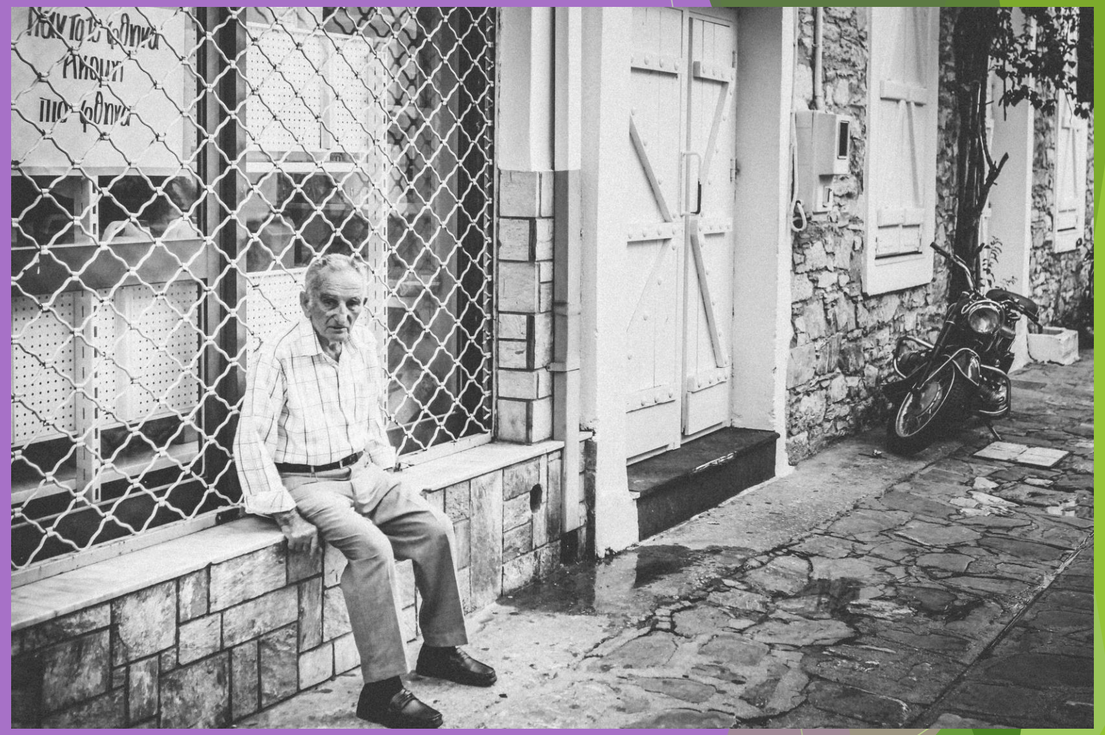
Several studies show that cities benefit of green spaces and nature in several ways. Cities become more resilient against climate change, the greener they are. This is because trees and plants cool a city down and absorb rainwater.
In this exercise we want to focus on the social benefits of green neighborhoods, i.e. how the presence of greenery in your neighborhood affects the human interactions. Research has shown that the presence of green plants and activities in natural surroundings contribute to safer and more cohesive neighborhoods.

#12 Setting the scene

During the Covid pandemic, we have seen even more clearly across the world how people turn to nature in the time of need. Across the world we have witnessed how citizens who were suddenly finding themselves without the usual things to do indoors, flocked outside to keep active, to have something to do, and to work on their overall wellbeing. As a result, in many cities, public parks and playgrounds had to be closed because too many people flocked to them in the hopes of finding some interesting things to do. It is clear that we need to increase the green spaces in our cities!



#12 Setting the scene



These kids will experience the city in a whole different way than the older man

#12 Activity

In this exercise we invite you to think about how green your own neighbourhood is.
This exercise is nicest to do outdoors where you have lot of space. You can also do it in the gym of your school. Start at one end of the school. Students stand in line facing the teacher (or anyone who is reading the sentences out loud). The reader reads out the sentences. If the sentence suits your situation and the answer in your case is yes, you take two steps to the right. If not, you stay put. One student or the teacher keeps track of how many students answer what on which question.

- I don’t have a garden
- I have a large public park with trees close to my house
- There are trees in my street
- I have a garden
- I have a terrace/balcony at my house
- I have a small public park close to my house
- I have three different species of trees in my garden
- I have plants (indoors) at home

#12 Activity

Everyone individually fills in what is applicable. On the next page you find the sentences in a raster. After you indicated this for yourself, take this home and go ask about the same sayings to your parents, grandparents, older neighbours (people that live in your street for a longer time, at least for 10 years). He/She tries to answer these in the context of the place 10 years ago. Write your findings down on the answers of yourself and the older person you interviewed. Focus on what feelings are related to the answers. (e.g.; is it important to have trees in your street? Would you rather have a terrace than a garden?...) Feel free to record the conversation that your questions might inspire.. Especially if the person who you interviewed is from somewhere else originally, you might want to ask about ow this place is different to their home area and how that makes them feel.

#12 Activity

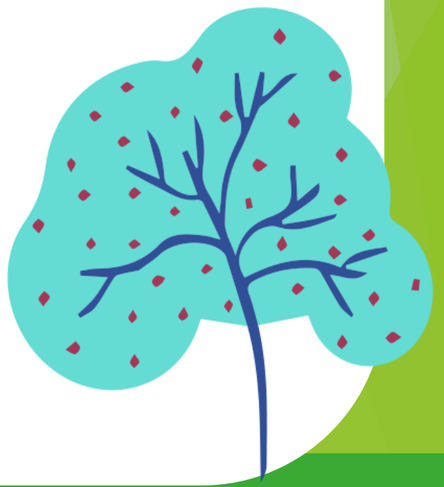
Statement	Yes	No
I don’t have a garden		
I have a large public park with trees close to my house		
There are trees in my street		
I have a garden		
I have a terrace/balcony at my house		
I have a small public park close to my house		
I have three different species of trees in my garden		
I have plants (indoors) at home		

#12 Reflection

How is the difference in greenspaces evaluated by the students and the older persons?

Every student presents in short what the most remarkable differences are between you and the older interviewed person. The answers of the interviewed people are also written down in a table and compared. It is also possible to use the findings to inspire an artwork, a poem, an essay.

Is there an overall conclusion to be made for everyone? Was there more or less greenery in your neighbourhood 10 years ago?



#12 Take it a step further

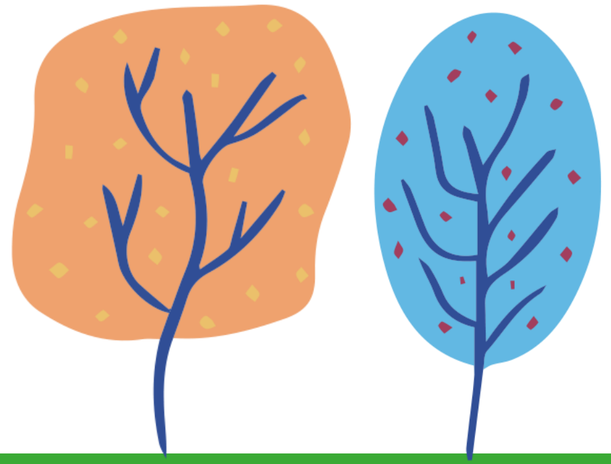
Do you want to do more with this lesson? Take it a step further and get to action!

One step

Based on the findings in the table, would you intervene in your street/neighborhood to make it greener? Indicate on a map the spots where you have concrete ideas. List up all the potential benefits you can identify from adding greenery here (think of people, plants, animals, ecosystem services..)

Two steps

Look up the email of your local government and email your plan to them. Don't forget to call after and make sure they received it.



#12 References and further inspiration

Sources used for this lesson:

Picture 1. Fas Khan on Unsplash, https://unsplash.com/photos/zydtqCd0T3w

Picture 2. Nick Karvounis on Unsplash, https://unsplash.com/photos/qepOTcXIIbw

Sources used for this lesson:

Green cities for a sustainable Europe. SOCIAL COHESION: https://www.thegreencity.eu/themas/social-cohesion/

#13 (non-) native species

Description & background

This exercise learns to recognize different kinds of species in your neighbourhood. The students will learn the concept of native and non-native species for the area where they live and what it means. The problem of invasive species will be touched upon as well. Start this exercise when you've been working on plants already (for example after the 'habitat map' or "resistant trees"). This will make it easier to recognize plants and species.

Keywords

Climate change resistant, urban, resilient

Goals for student

•Develops an understanding of terms as native, non-native, invasive
•Gains insight in consequences of planting certain species, the species in his/her area

Suitability

Summer, spring, autumn, indoor and outdoor

Fits in subjects

Biology, geography, religion

What do you need?

Materials:

list of non-native species for your area and a list of invasive species for your area, plant guide, (app like plant snap, smartphones)

Preparation:

Contact the conservation centrum of your area and ask about the native species of the area for a list of native plants in your area. Ask them to come to the class to provide more information on this subject or ask them for more information so that you can explain this to the class.

#13 Setting the scene

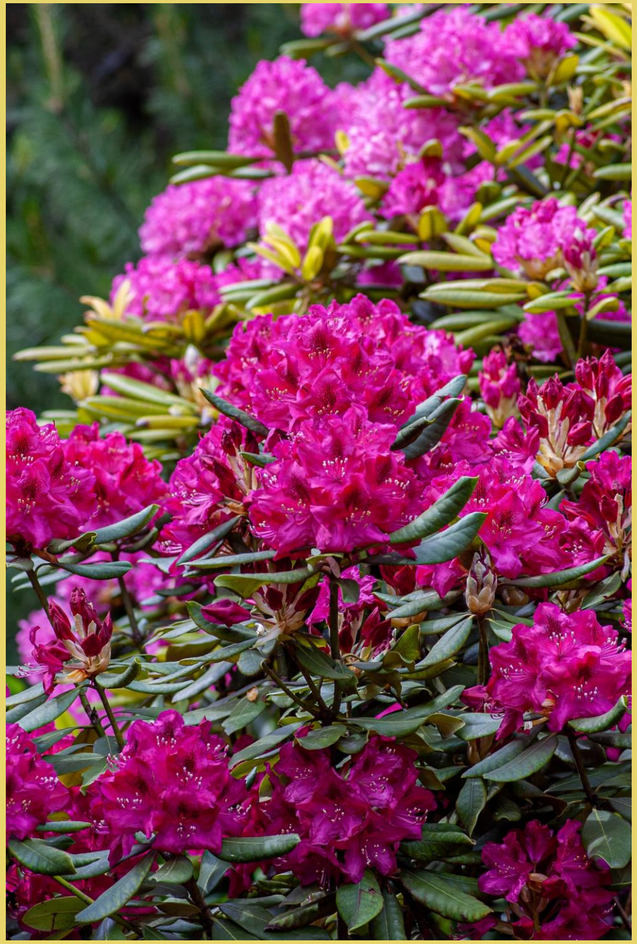
The difference between native and non-native species seems easy to explain but a lot depends on the definitions that are used. In a nutshell, native species are species that are from a particular place without human intervention–humans didn't put them there directly or indirectly. Digging into that a bit means that "native" can vary a lot based on what scale one is considering, and whether there are records of pre-settlement organisms (think fossils). Mostly, thinking about whether or not a species is native in terms of a state, province, or habitat type is most useful, though there are situations where bigger or smaller scales are applicable.

These days it's hard to define which species is native and which isn't. Over the years a lot of species have been dragged around and circulating in different areas.

A lot of species look native but aren't. For example; a Belgian looks at potatoes as the most 'Belgian' thing, but this plant is only truly native in South- America. One way to define if a species is native, is to look at how it fits in the food chain of the location it is growing. Species evolve over the years, so if a species fits in the food chain it can be considered a native species.

#13 Setting the scene

A rhododendron is a beautiful native mountainous shrub from the Himalayas. In Europe it is a popular garden plant that has escaped the gardens and is growing happily in the forests now. However, its role in the forest ecosystem is questionable as it has not evolved in the Europeans forests.



#13 Setting the scene

Is it a problem if a species is new and not native? No, because most of the non-native species cause no harm. But one in thousand non-natives is threatening. These are called invasive species and are a problem because they can cause harm to environmental or human wellbeing by out-competing, i.e. winning in the fight for resources like space, light, resource for the native species. Some non-native species are at the same time useful and harmful.
A native species can never be invasive.

How do non-native species spread? The different plants´ seeds spread through different means. They may be windblown, rain splashed, carried by animals, or moved in soil or water. Almost all short-distance spread is through these natural dispersal mechanisms. However, long distance spread is almost always human assisted. Because long distance spread takes the species a long way from home, the resident plants and animals are not often prepared to cope with their new neighbor. Natural enemies are missing, and host species often lack the natural defenses necessary to survive an attack by the introduced species. Once introduced, aggressive species are free to expand their range using their short distance dispersal mechanisms with a competitive advantage over native plant and animals due to the lack of natural enemies.

#13 Setting the scene

The red oak is native in the East of America, but since years widespread in gardens and forests in Europe. This is a fast-growing tree who conquers a lot of native species in Europe.
In that way this tree is sometimes seen as invasive. But, its autumn foliage is breathtaking.

#13 Setting the scene

Are humans invasive? The shortest answer is “yes, absolutely.” We are extremely mobile and nowadays have an immensely negative impact on our environment and our own health. We are the only species that actively tries to destroy its own habitat. We are a problem, to the point were talking about sustainable development, which means considering nature and the environment in all our activities so it will not get harmed, is an expired way of thinking. We need to restore nature from the degradation we have brought to it.

Luckily, there is one key element of our invasiveness that makes us special: we have problem-solving abilities and have the power to change what we do and how we do it. On small scale, i.e. what one can do personally in their own life, we can clean our boots when leaving one nature area and entering another to spread of “hitchhiking” invasive reproductive parts like seeds and eggs. We can also think about our consumption habits, resources like energy, food and material things and even decide to have fewer children. Thinking big, we can decide to try to influence policy making by following what is being decided in our city and national governments and elect officials who care for the environment. We can get involved in youth politics as well! A lot of other invasive species don’t get to make choices like that.

#13 Activity

Each student collects 4 different plant species on their way from home to school. They can choose which ones they pick. It can be a tree, a flower, a small or big plant.

You don’t have to literally take it with you. You can also draw, note down its name or take a picture of it.

Before you get to work answering the questions, take a moment to study the tree or plant you have chosen, and study its leaves, its trunk or stem, the shape of its leaves, the shade of its colors. Study its scent by smelling it, and feeling how it feels under your fingertips. Though coming into contact is good for our immunity, make sure not to put any pieces of the plant in your mouth in case it is poisonous.

#13 Activity

Everyone indicates their found species on a map and finds out the name of it via an (online) plant guide. Look on the list if your species are native or non-native in your area.

Answer the following questions;

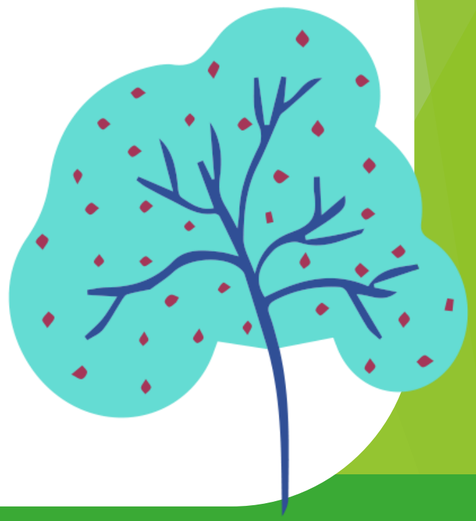
- What kind of species did you identify? How many are plants, how many are trees and how many are shrubs?
- How many of the collected species are (not)-native?
- How many of the species are invasive?
- Indicate where the species were found, define in categories; private garden/park/ along the road.
- Can you make a link between the found places and species?

#13 Reflection

Talk about the following questions and try to find an answer together:

Are humans invasive? Where are humans native?
When students learn about these concepts, it's likely that this question will come up.

Should we let the non-native trees take over the native ones? What would be the benefits and losses from losing the native species



#13 Take it a step further

Do you want to do more with this lesson? Take it a step further and get to action!

One step

Go look in guides and on the internet where the most common non-native species in your area originated from. Think about the similarities and differences of these areas and what makes it that they thrive in your area.

Two steps

Go to the conservation centre or contact a nature organization to explore what is being done in your area to fight the invasive plants.

More

Find out which animal species are native to your area.

#13 References and further inspiration

Sources used for this lesson:

Picture 1: By Yoksel Zok on Unsplash: https://unsplash.com/photos/OakyeSJYrWw

Picture 2: By Hans on Pixabay, https://pixabay.com/nl/photos/red-oak-herfst-bladeren-oranje-61974/

Sources used for this lesson:

Thoughts and Awe: http://www.thoughtandawe.net/biology/native-non-native-invasive/

PlayClearGo: https://www.playcleango.org/how-do-invasive-species-spread

#14 Watercycle of urban forests

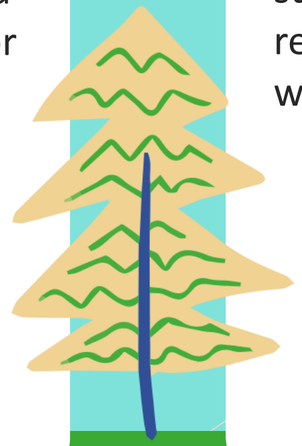
Description & background
This lesson introduces students in a hands-on manner to the value of forests for the Earth's cycle from understanding the path of water in a tree, and the way that trees
and urban forest ecosystems act as water redistribution systems.

Fits in subjects
Natural sciences, maths, physics, chemistry

Keywords
biodiversity, old tree, ecosystem services, carbon sequestration, heat island effect, urban pollutant, fine particulate,

Goals for student
Develops understanding of complex processes and interconnections.
Develops a clear idea that forests redistribute water and are therefore fundamental for human life. Gains an experience in caring for a living being.

Suitability
Indoors, spring, summer



What do you need?
Materials:
Seeds of same species, pots, Soil, plastic bottles
Note taking materials

Preparation:
Make space for planting in different light conditions.
Make sure the plants can be located in places where the students will be able to return to caring for them for weeks at a time.

#14 Setting the scene

In a large city, a single tree captures and redistributes an average 6500 liters of rainwater each year. Without the tree, all of that water would fall to the ground, and much of it would become runoff. During a heavy rainstorm, the sewers could overflow from pollutant carrying water running too fast on the paved streets into nearby waterbodies and overflowing the city. But, with the help of trees, the water is captured, stored and re-used as part of the natural water cycle, soaked up by trees and returned to the atmosphere.

In a large city with estimated 200,000 street trees, 400,000 park trees and hundreds of thousands of privately owned trees, it is an impressive amount of water that gets captured by the urban tree canopy. The more trees we add to our landscape, the less pollution will flow to our waters. And with the threat of climate change and the invasive pests, conserving existing trees and planting new trees is more important now than ever.

#14 Setting the scene

Here's a more detailed explanation of how trees mitigate stormwater runoff in the city:

Interception — Rain falls on the tree's leaves, branches and trunk. Some of it is absorbed by the tree, and some of it evaporates back into the atmosphere. The rest falls through to the ground, but at a much slower rate than it would otherwise. This helps reduce "peak flows" during rain events and also helps prevent soil erosion.

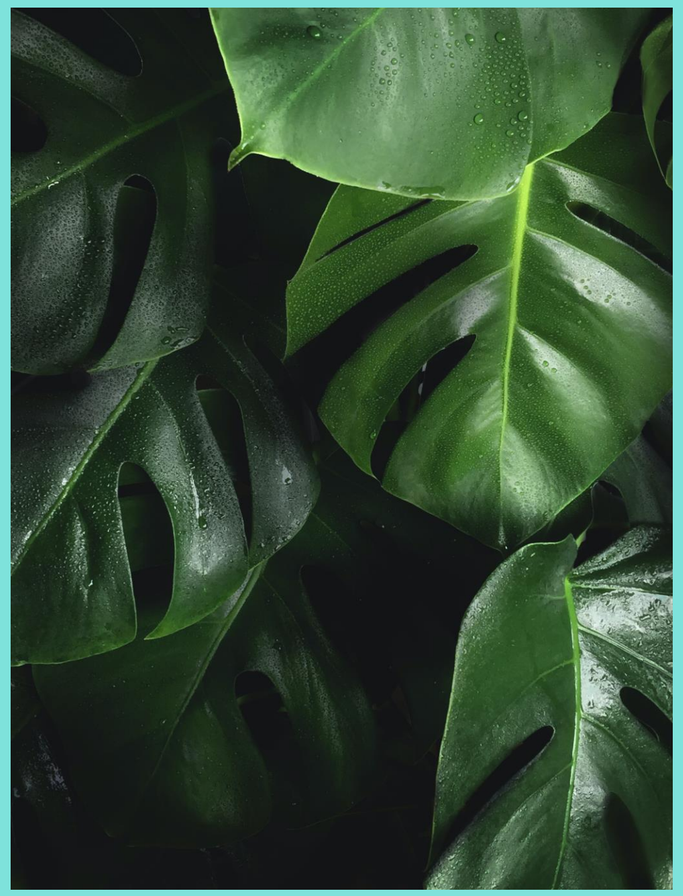
Infiltration — Water that falls through the tree canopy soaks into the ground and gets absorbed by the tree's roots. By soaking up water from the ground, trees add capacity for the soil to store even more stormwater. As they grow, the roots also help break up compacted soil, which allows water to more easily move downward into the groundwater table.

Transpiration — The tree draws water out of the ground to use as fuel for photosynthesis. The water is later released back into the atmosphere as water vapor. This normal part of the water cycle also helps to cool the air and reduce high temperatures in the summer.

Evaporation - Evaporation accounts for the movement of water to the air from sources such as the soil, canopy interception, and waterbodies.

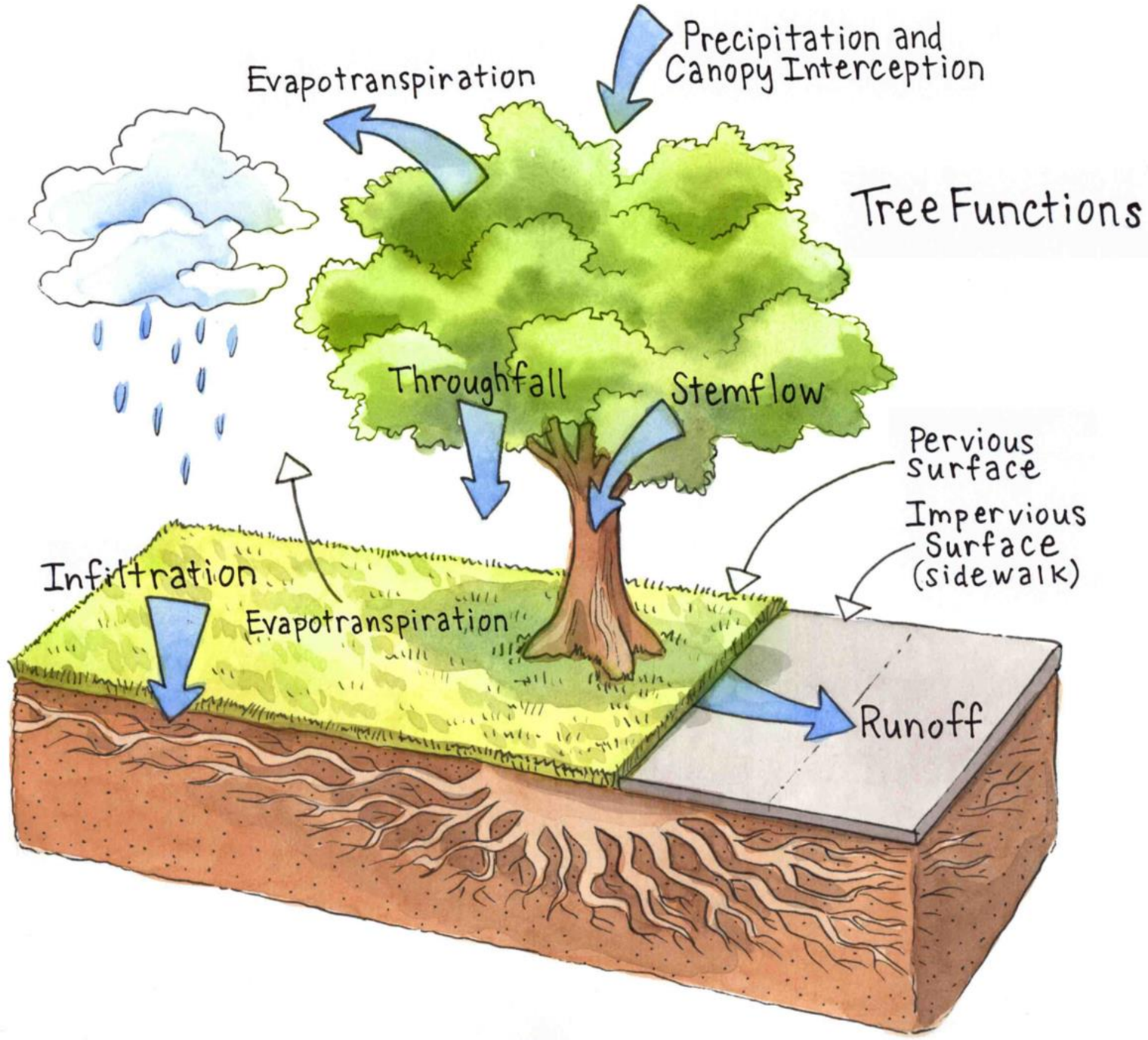
Evapotranspiration - is the sum of evaporation and plant transpiration from the Earth's land and ocean surface to the atmosphere. Evapotranspiration is an important part of the water cycle.

#14 Setting the scene



Transpiration

Evaporisation: water evaporates into the air



Tree and water cycle

#14 Activity

The class is divided in groups of 2-4 students. Each group plants the seedlings of a relatively fast-growing plant in the class, e.g., Jade Plant.(Crassula ovata), spider plant (Chlorophytum comosum), Snake Plant (Chlorophytum comosum)

- Water the seedlings by placing bottles upside down in the soil and record the water intake of each plant.
- You need to record often enough that not all bottles are empty when they record – you should refill as soon as empty to record intake differences; the teacher should thereby follow water levels and adapt the recording schedule.

Each team of students notes the water intake for “their” plant. All students use the same recording table, created in class and copied or glued in your experiment notebook, to note how much water is given and when (the unit used should be standardized, e.g., 1 l for younger students). In addition to water in-take recording, you can also record the height of the plant and the number of leaves appearing.
Practical:
- Do at least 3 recordings (1–2 weeks) for 10 min. each time /whenever plants need watering
- In teams of 2–4 students

#14 Reflection

Try to answer the questions below in group:

- Which plant seems to be growing fastest? Why is that? What internal and external factors impact that?
- Which plants seem to need most water? Why is that? What internal and external factors impact that?
- Which plants use less water? Why is that? What internal and external factors impact that?
- What affects the speed at which the evaporation happens ?
- Where does water go when we water plants? Along with the water intake and growth?
- How does it feel to be taking care of the plant?
- How do you feel when tending to the plants and witnessing their growth or condition (also setbacks).

#14 References and further inspiration

Sources used for this lesson:

Picture 1: Bart Zimny on Unsplash, https://unsplash.com/photos/W5XTTLpk1-I

Picture 2: Jai Sipani on Unsplash, https://unsplash.com/photos/R1jtRLCMyOw

Picture 3: http://www.gicinc.org/trees_stormwater.htm

Sources used for this lesson:

Discovering Forests: http://www.fao.org/3/i6208e/i6208e.pdf

Missisippi Watershed Management Organization: https://www.mwmo.org/news/protect-water-resources-plant-tree/

#15 Colours of the forest

Description & background
You will learn about the processes of changing colours in autumn. You will experience and focus on the beauty and differences in nature by using different senses.

Fits in subjects
Arts, biology

Keywords
Colours, autumn, chlorophyll,

Goals for student
Develops creativity; Gains sensory experiences, knowledge on biological concepts; Builds focus; Builds immunity
by coming into contact with natural materials in nature.

Suitability
autumn- outdoor

What do you need?
Materials:
All materials you can find in natural environments. Pupils should wear
suitable clothing for safe and comfortable movement.

Preparation:
Choose a place to go to with a lot of trees and the right period, when the leaves are coloured.
Print the colour rows and cut them per row. This is easier to work with.

#15 Setting the scene

Many people's favourite season is autumn because of the beautiful colours of the autumn foliage.. But why do the leaves all of a sudden change colours before they fall off?

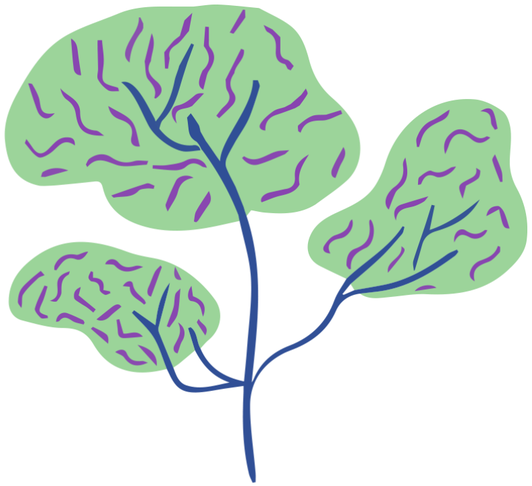
During the summer growing season, leaves are packed with chlorophyll. That is the green, light-absorbing pigment used for photosynthesis. The onset of autumn prompts chemical changes in the leaves of deciduous trees and shrubs. They start to prepare for winter dormancy, when days get shorter and cooler. As the chlorophyll breaks down, the green fades to reveal a bonfire of other colours.

- Yellow and orange: The appearance of yellow and orange shades in autumn leaves indicates the presence of carotenoids, pigments that all summer have been masked by the dominant green chlorophyll and are only revealed as the chlorophyll breaks down. Caretenoid pigments also make carrots orange.

- Reds: Unlike other colours, reds and purples are not always present in autumn leaves. These shades are made from anthocyanins, pigments produced from sugars trapped in the leaves before they fall. Some plants are bred to have red leaves all year round, hiding the green chlorophyll in the leaves

#15 Setting the scene

Different plants have different pigments. Other than being beautiful to look at, they fulfil extra important functions for plants.
They protect them from harmful UV radiation, help to limit the damage caused by stresses such as salt and dryness, and are present in fruit and flowers, to attract specific animals, including humans!



#15 Activity

Choose one of the colour- rows (on the following page) and collect objects in nature with these colour shades. Try to find one from each shade. When you have collected the different shades, try to make a rainbow or a piece of art where the colours flow over in each other.

You can try to do this in the style of artist Andy Goldsworthy. He made some amazing pieces of art only using the objects and colours of nature.

Andy Goldsworthy made some amazing pieces of art only using the colours of nature

#15 Activity

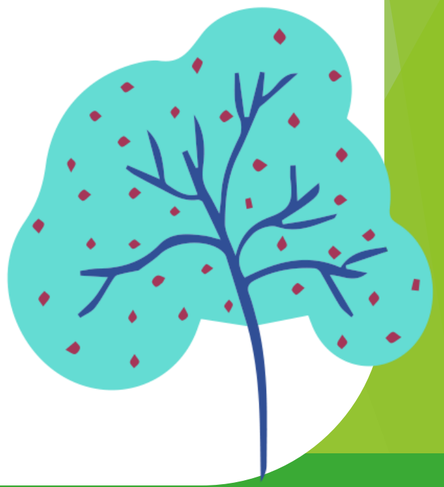
The colour-rows to use in this exercise

#15 Reflection

Try to answer the questions below on your own, then share with the group.

Choose one of the colours you collected.
- Is this a pleasant colour to you?
- What are the memories, people and things you associate with the different colours you collected?
- Create a list of all things that come to your mind when you see that color.

- Is there a colour that is not as pleasant to you?



#15 Take it a step further

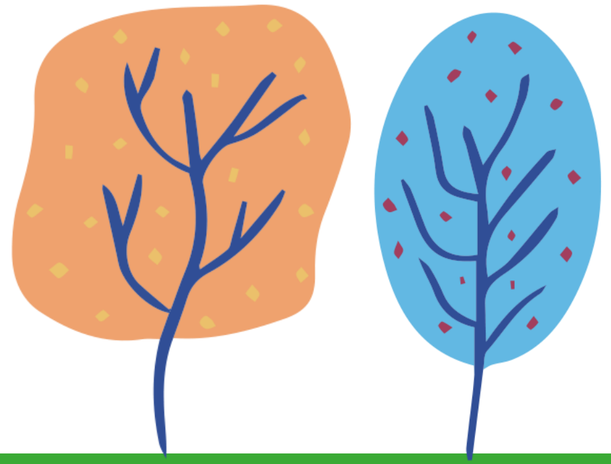
Do you want to do more with this lesson? Take it a step further and get to action!

One step

Look up more art of the artist Andy Goldsworthy when in class/ at home. Choose one of his art pieces and present it in class. You can do this alone or in groups, and choose how you present it to the others.

Two steps

Are there possibilities to build a big natural art work somewhere on the schoolyard?
Make a plan of what this should be and how this would look. Find something to contribute in the art piece for all classes of the school.
See what nature makes of it as time goes by.



#15 References and further inspiration

Sources used for this lesson:

Picture 1. Andy Goldsworthy via Bored Panda, https://www.boredpanda.com/land-art-andy-goldsworthy/?utm_source=ecosia&utm_medium=referral&utm_campaign=organic

Picture 2. Clearing house

Sources used in this lesson:

Cambridge University Botanical Gardens

CLEARINGHOUSE
中欧城市森林应对方案

City of trees

On the importance of urban trees, forests and why we should care for them

Student's manual

CLEARINGHOUSE
中欧城市森林应对方案

EFI

BOS+

Content:
Katriina Kilpi
Tine de Kezel
BOS+

Lay-out:
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This project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 821242.

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Hi!

Ever wonder if
you should learn about
urban trees and forests?

1. Introduction

Majority of the people in the world live in cities, those vibrant hubs of culture, education and industry. Due to climate change, however, our summers continue to reach record temperatures which make the cities uncomfortably hot. The paved surfaces (asphalt covered streets, buildings and parking lots covered in concrete) and high population density (measure of how many people live on a given area) make the situation worse as the paved surfaces store the heat, and further increase the air temperature.

With those paved surfaces, there is a bigger risk of flooding during heavy rains, especially when green surfaces (parks and lawns, trees, plantings and bushes) are lacking. The green and blue surfaces (lakes, ponds, rivers and streams) would allow the water to infiltrate (seep into and slowly move deeper) into the ground, or in the case of rivers and streams, be carried onto larger waterbodies like the lakes or oceans. Not only would the natural surfaces mitigate the extreme weather conditions, it has been proven that people feel better in cities where there are parks, trees and greenery and they suffer from less mental health problems, such as depression and anxiety.

Maybe you noticed at the very beginning of the pandemic, what a difference it made when you could spend some time outdoors. As all other activities were brought to a halt, in many countries it was still allowed to wander around in the parks and urban forests in search for room for physical exercise, a moment of peace and quiet of your own, or simply a change of scenery from inside the four walls. Outside was also the safest place to meet with friends as social distancing was easier to follow there and because there is more fresh oxygen.

Those of us who reside in cities tend to have moved far from the world´s forests and from nature at large. With this we refer to living many kilometers away from forests, but also to the way we see ourselves as separate from nature. Many of us see nature such as birds, worms, trees, plants, rain and wind, separate from us humans. We easily forget how our activities can hurt the environment and the nature we live in. Yes, even in the city we are surrounded by nature!

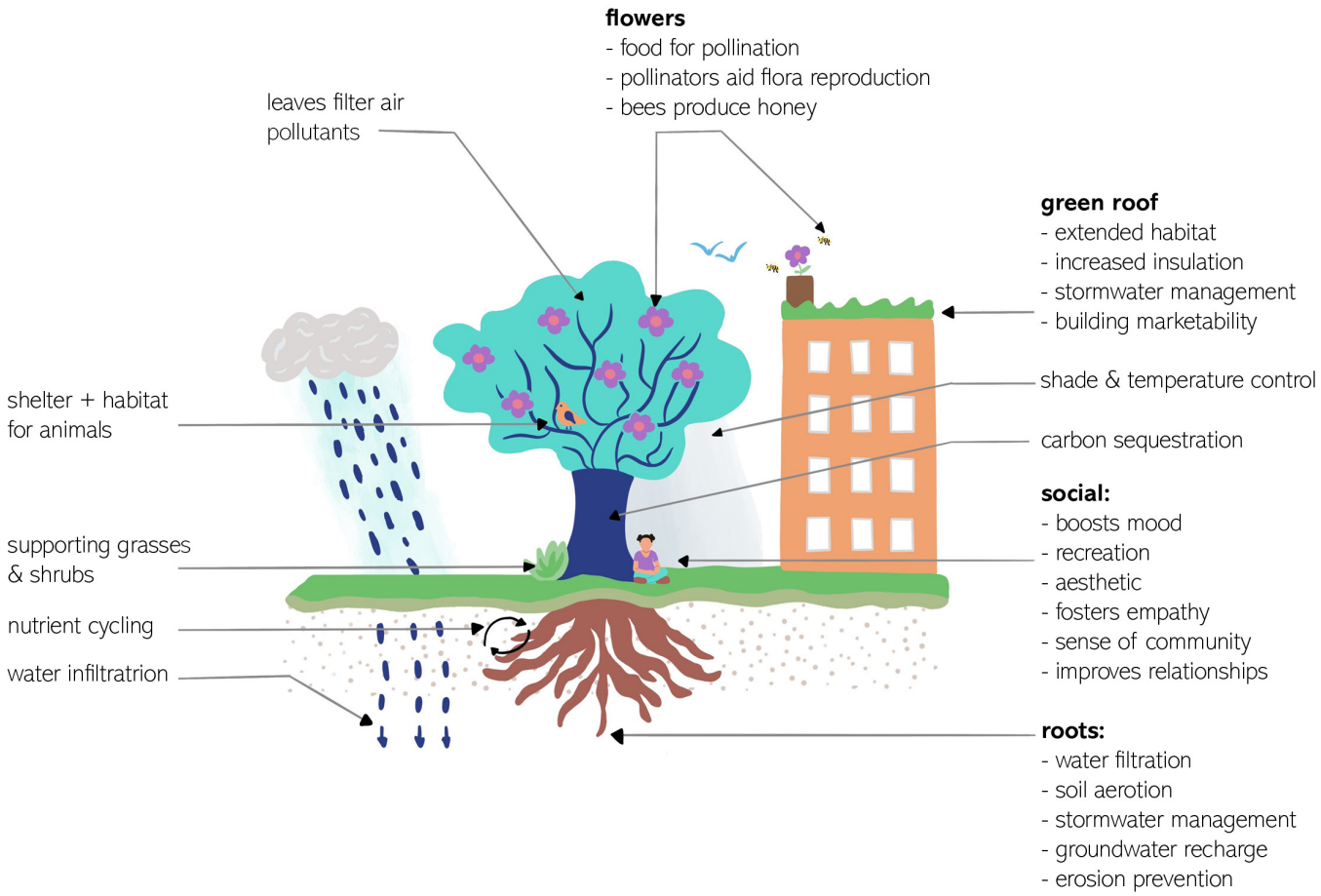
We also do not often realize that we depend on nature, for example for the pollinating bees for many crops we enjoy, the rivers and oceans that provide us with fish, the chlorophyll in plants and trees that provide us oxygen, and of course, all the green and blue spaces for making our living environments livable to begin with.

This educational package wants to remind you of the importance of urban trees and forests and nature at large. It aims to support you in bringing you closer to the nature surrounding you; understanding nature's importance for your wellbeing; and developing the skills that are needed in acting responsibly for local and global nature's sake.

1.1 Importance of trees and urban forests in the city

Urban trees and forests provide the city residents an endless list of benefits. Next to the ecosystem services listed in the graph below, the urban forest is our link to nature, which is our source of health and wellbeing both directly and indirectly.

Ecosystem services of a tree



Ecosystem services, i.e. the services a tree provides to the entire surrounding ecosystem for free:

- Regulate temperature by providing shade in which it is cooler, and through evapotranspiration (2. How trees make our cities livable)
- Filter air pollutants by trapping onto their leaves fine particles from e.g. the traffic (7. Air quality in a green city)
- Sequester carbon (tie up carbon from air for the tree to grow) (1. Ecosystem services of a tree)
- Manage and filter rainwater and stormwater (water gets tied up in the soil and taken up by roots of trees) (3. Water cycle in a city)
- Recharge groundwater (allow the rainwater to infiltrate ground all the way to ground water level) (3. Water cycle in a city)
- Stabilize soils through e.g., soil aeration through root systems
- Prevent erosion by holding ground together with their roots
- Providing food and shelter for living organisms, including humans (6. Mature Trees in the city)
- Improving urban inhabitants' well-being. (8. Dr Forest at your service)

1.2 Trees as guardians of your health

According to studies, many youngsters experience stress due to homework, ambitions of students themselves as well as fear of failure or fear of saying no to the teachers. Disagreements with friends and being (cyber) bullied also contribute to stress, which the youngsters try to fight with the help of solutions like watching TV and surfing the internet. Excessive use of the mobile devices and screen time in general affects our mental energy, our ability to focus and even our eyesight. All these activities keep us sitting still. Lack of movement and no time spent outdoors can make us sick, apathetic and obese in the long run. We need long term solutions instead of these short-term ones!

Luckily, there is a green pill to take, all backed by scientific evidence! Here are some of the main benefits trees and urban forests provide us with:

- Studies have shown that humans can restore from stress and mental exhaustion better in natural surroundings (parks, forests, etc.) than in built environments (e.g. city streets, etc.). Spending time outside unplugged from technology helps your body and mind to calm down even without you knowing it. It is how you have been built!

- Coming in contact with natural materials, such as tree bark, forest soil, stones, leaves, moss... is good for our physical health. In natural environments, such as the forest, there exist several microbes that are absolutely not dangerous to us. On the contrary, our system should be exposed to these microbes to know the difference between what it should armor up against, and what is safe to be in contact with. That is how we keep our immune system army well trained and functioning.

- Nature lifts our moods when we are feeling down. Also, our feelings of positivity and wonder increase when we spend time outside. Just think of an afternoon at the beach, a walk in the park, or a beautiful view out the window. Indeed, even a view out of the window to nature can help you to feel better!

- Imagine a view over a scenic mountain landscape. Looking far can induce a feeling of awe which has been discovered to generate more generous, more friendly behaviors in us. This feeling of awe relates to gratitude which increases our satisfaction in life.

- Nature affects out creativity: when our brains have had the time to rest - which it does automatically in a green environment - creative and abstract thinking can flourish again. During recess and exams, it is especially important to schedule some time of doing nothing and just looking at some trees, flowers or birds on the sky.

- It is not only the sights of nature but also sounds and pleasant smells of nature that our brain recognizes and that help to produce the same wellbeing effects of of lowered stress and better moods.

- In case you or someone you know has ADHD, time in nature can also can significantly help by reducing ADHD symptoms as the volume of stimuli is less and the nature of the stimuli is softer. Imagine the difference between car horns and bird song... There is nature at work!

- Finally, being outdoors in nature influences our physical body and immunity when we are exposed to sunlight. Our skin absorbs the vitamin D from the sun light which is good for our immunity in reasonable doses. Furthermore, the air is normally cleaner in natural environments where the sources of pollution are further and the trees help to filter out air pollutants, and there is more oxygen which refreshes us in comparison to a stuffy room. Doing sports outdoors, builds our condition faster, because movement outdoors feels more effortless because nature has many sights and sounds to pay attention to.

1.3 Importance of green school yards

Due to our sedentary lifestyles, commuting in cars, trains and busses and increased screen-time most of us tend to move less nowadays. Movement is important, not only to stay fit and lose weight, but because movement can protect your life-long illnesses caused by sitting too much.

Green school yards, i.e. school yards where instead of asphalt, there are grass lawns, gravel roads, plantings of flowers, shrubs, and trees, offer an important resource for us, as they enable us to be exposed to nature possibly the only tie during a regular school day. Getting to school either by foot or by bike can constitute over half of our daily recommended brisk exercise and nature exposure. Especially biking to school is connected being overall fit.

Remember the positive effects of nature on our wellbeing? Green school yards help you to experience less stress. It has even been found that on green school yards, students have less arguments and bullying.

Maybe your school yard could benefit from a few more trees, bushes, plantings of vegetables, fruit and blooming flowers?

2. Our connection to nature

What does nature mean to you? What is nature after all?

It is likely that the answers to these questions vary between you and your classmates. Feeling connected to nature is a concept from psychology and it can be measured. It is measured using a questionnaire with questions like “I always think about how my actions affect the environment” or “My ideal vacation spot would be a remote, wilderness area”. The result of this test tells you how connected to nature you feel.

Why is this important? It has been found that an individual’s actual nature connection is related to their mental well-being as well as how pro-environmental (i.e. consider environment in their daily decisions) behavior. The more connected to nature you feel, the ore likely you are to consider it in your everyday decisions and the better you are feeling emotionally. You will also likely spend more time in nature, which is good for your health in general.

Recent studies have found five pathways that can lead to increased nature connection. These 5 pathways (Meaning, Compassion, Senses, Emotion and Beauty) are listed below.

MEANING - nature bringing meaning to our lives, e.g. the first migratory birds in the spring, a sunset or sunrise…

COMPASSION - caring and taking action for nature, e.g. collecting trash in nature, helping a wounded animal..

SENSES - tuning in to nature through the senses, e.g. listening, enjoying the scents, feeling the textures, ..

EMOTION - feeling alive through the emotions & feelings nature brings, e.g. hearing the increased birdsong in the spring, experiencing a thunder storm or a blizzard,

BEAUTY - noticing nature's beauty, e.g. enjoying a breathtaking landscape, rainbow, a detail, scent, sound, music or piece of art depicting or inspired by nature…

We invite you to reflect on what sort of beauty, emotion, compassion, meaning you can identify in nature when engaged in the lessons and which senses have you been using during the lesson?

3. Coping with worries about the future

The Global School Strike lead by Swedish teenager Greta Thunberg has mobilised millions of youngsters worldwide. This movement is very encouraging as it shows politicians that young people are taking their future seriously and that it is time to take the state of the environment seriously.

Opportunities to take action make it easier to cope with the worries one might have about the future and to be able to express one's feelings. If you or any of your friends have had "negative" feelings such as worry or grief for the planet, or anger against the lack of measures being taken, these feelings could be channeled into action and motivation.

Here are some central coping mechanisms that can be of help if you or someone you know is suffering from negative feelings caused by climate change, the pandemic or environmental problems.

Behavioral strategies:

- **Having fun, feeling good:** remembering the positive angles, working out the positive aspects of sustainability
- **Maintaining healthy routines:** physical exercise; healthy food; enough sleep; time in nature; permission to good around
- **Taking action:** participate in climate action groups; lobby politicians & industry leaders; change your behavior
- **Take a break from being too focused on the problem:** turn off the 24/7 news feed; dedicate a 'do nothing day'
- **Focus on one issue to lower stress levels:** prioritize the activities you chose to invest your energy into, you don't have to do it all.

Relational strategies:

- **Seek social support:** share concerns, thoughts & feelings about climate change with trusted friends & colleagues

Cognitive strategies:

- **Drop the judgements:** 'shoulds' & assumptions: difficult life experiences are painful enough without criticism
- **Balance action with reflection:** Read, write a journal or a blog, talk with kindred spirits about how they cope.
- **Cultivate hope:** transforming fear about the fate of the planet into a positive experience. Fear can fuel action.
- **Restore yourself psychologically:** spend time in (green) environments that match your aims to restore yourself.

Source: Australian Psychology for Safe Climate (PSA)

4. How does this package work?

In this section we describe how the lessons are built, so that it easy for you to follow the lessons on your own.

There are 5 lessons that you can follow on your own. These are:
#1 It all starts from a seed
#2 Noticing trees in cities
#7 Forest for rest
#10 Finding peace of mind in the city
#11 (non)- native species

Setting the scene
Setting the scene to the topic means providing you with the background information you need to have to be able to understand the concepts introduced in this lesson.

Activity
The activity is described in its most basic form. Please consult your teacher to decide how you will deliver the lesson (mindmap, journalling, artwork..) If you would like to dig deeper in the same topic, you can continue with Taking a step further.

Reflections
At the end of an activity, we suggest some reflective questions to make sure you have understood what was taught and can find a place for this new information in your past experiences and existing knowledge. For the reflective questions there often is no one right answer but more than one answer is correct.

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CLEARINGHOUSE
中欧城市森林应对方案

City of Trees

Inspirational package for teachers on the importance of urban trees, urban forests and why we should care for trees in the city.

Teacher's manual

CLEARINGHOUSE
中欧城市森林应对方案

EFI

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This project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 821242.

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1. Introduction

Forests importance as the lungs of the world, the great carbon sink (1.Ecosystem services of a tree) of our planet, cradle for biodiversity (4. Web of life) and the protector of human health (8. Dr Forest at your service) has never been as clear as it is today. This holds true for forests in the tropics, the small forests between agricultural lands, the fragmented forests in and between cities as well as the few trees in the city center. The benefits that forests and trees offer to humans are so bountiful, ingenious, adaptive and effective, it is hard (and needless) to look for another solution that would work as well.

"Someone's sitting in the shade today because someone planted a tree a long time ago." -Warren Buffett

The UN estimates that by 2050 about 70% of the world's population will be living in cities. With high population density and most of the energy consumed in the world, cities also produce most of the pollution in the world. Due to the lack of green surfaces, cities have become hot spots during heatwaves (6. Mature trees in the city) and unbearable to not only their most vulnerable inhabitants. Urbanites are also more prone to face mental health problems, such as depression and anxiety, sometime in their lives, compared to their rural counterparts.

During the ongoing pandemic COVID-19, the importance of forests for yet another reason has become painfully clear to many urban citizens around the world. As other activities have come to a halt, people have found themselves wondering into the parks and urban forests in search for room for physical exercise, a moment of peace and quiet of your own, or simply a change of scenery from inside the four walls. There is an increasing need for green spaces as more people find the benefits of nature.

For the preparation of this Inspirational Package, we conducted a survey and collected over 130 responses from across Europe. Many respondents reported about the lack of materials to teach about forests and trees. One of the respondents mentioned the need for "..resources on how to take advantage of the forests on the outskirts or the trees of the city as a tool for direct learning". It was also mentioned how " devoting an excursion to studying only the trees is always unjustified and difficult to carry on". We are still long way from prioritizing the education about our natural ecosystems that share the space with us in the city.

The importance of forests and the benefits of single trees in the cities are still too vaguely understood by the urban inhabitants, students and teachers alike. It is unfortunate to continuously witness urban residents and even city officials opt for cutting down a row of trees, seeing them as risks of material

damage or simply as non- productive empty space. Fortunately, sometimes active citizens are quick to act and stop these efforts of urban tree destruction, but just as often such destruction goes without notice.

How then do we make sure we manage to raise the awareness on the importance of urban trees and forests for our own survival and life quality? How do we bring up children and youth to grow up to be active citizens who conserve and increase trees in the city?

Increasing knowledge is not enough in this endeavor that often takes more than fact or value-based arguments. An inner motivation is needed to keep people standing up for the things they believe in. A number of studies have consistently shown that an individual's level of connection with nature may not only increase their mental wellbeing, but it can also influence their level of engagement in pro-environmental behaviors. In addition, cultivating a sense of place, i.e. the connection to a place, will help to increase the need to protect and conserve the environment of the place one identifies with. Furthermore, while the looming climate change and eco-anxiety (7. Worries about the future) caused by it has got many teens suffering from anxiety, strengthening their bond with nature can only empower when coupled with tools and tactics that can mobilize the student to work towards fighting climate change.

This Inspiration Package has been written in a manner that influences the nature connection. Though there are tremendous differences in the level of forest cover in the countries across the world, and even in the countries collaborating on the Clearing House project, the material that is provided here is developed for ANY city environment with some trees. This Inspiration Package aims at increasing the knowledge of the importance of urban trees and forests; supporting in developing the skills that are needed in acting responsibly in one´s community and strengthening the connectedness to nature through making the urban nature come to life by the activities in this package. It is of central importance that students find a place to the information they have been exposed to in this package, not only on a cognitive level but also on an emotional level. Therefore, we underline the importance of connecting these lessons to wider context as well as reflecting on how each lesson makes the people feel.

We have aimed to create material for teachers with different levels of interest and affinity for the topic, with as little extra resources needed as possible. We hope the compilation of this material lowers the threshold to make trees and
forests part of your teaching, across subject lines.

2. How does this package work?

This Inspirational Package aims at increasing students´ (and teachers´) knowledge of the importance of urban trees and forest for our wellbeing; strengthening their connectedness to nature; supporting them in developing the skills that are needed in acting responsibly in their urban natural environment; and making nature in the city come to life.

Our starting point is the teacher who has little prior knowledge and little experience in outdoor teaching, or perhaps a bit of apprehension for teaching outdoors. The activities are aimed to be manageable with minimum resources needed and time spent in planning. For those teachers who already have found their way to the plentiful relevant resources that do exist online, this material aims to add an angle that has not yet been covered in length but that is crucial for our and the planet´s wellbeing: interconnectedness of urban forests and human health. The urban forests and health linkage relates directly to decreased biodiversity and city livability due to climate change.

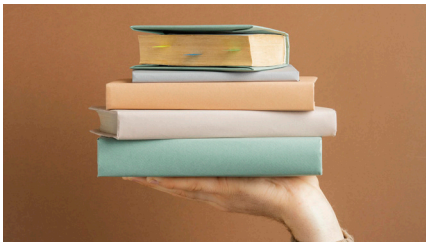
Because cities, countries, curricula, school culture and climatic conditions differ, the material remains on a general level. Simultaneously, the material is designed flexible enough to allow the adapting of it to different conditions. For example, the species of trees are left open, and where possible, activities are planned to be possible in any season or alternatively to be conducted indoors.

The flexibility is also intended to leave the ways in which a teacher chooses to use the material more open. Though we would hope for the teacher to cover all the material during one semester or year, it might not be possible. We have added a separate section introducing this package to students. This section is meant for students who can engage in some of the lessons on their own. This teacher package can be used in different ways, e.g. as extracurricular activities for students with much motivation and interest in the topic.

Because the topics fit in many different subjects, we encourage teachers to coordinate among each other to cover different lessons during the same semester, as it enhances students learning when related topics are handled in different subjects.

2.1 Build-up & structure

Each exercise is put together in the steps you find below, always in the same order.



Setting the scene

Setting the scene to the topic means providing you with the background information you need to introduce the topic to students.

Activity

The activity is described in its most basic form. For those teachers who would like to increase the challenge, they can continue with section Taking it a step further 1 and 2, or look for the extra inspiration on the last page of each lesson.

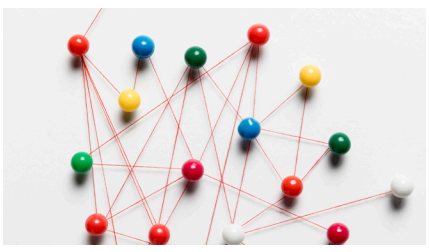
Reflections

At the end of an activity, you will find some reflective questions. These aim to make sure the pupils have understood the lesson goals on more than just on the rational level. We hope to engage them also in thinking how what they have learned, fits with their values. Each reflection section has been paired with symbols of Nature Connection Pathways to help the teacher to encourage reflecting on the pathway aspects (e.g. Compassion: How can we make sure the trees have enough space...Beauty: which one of the seeds do you think was most beautiful and why, Senses: How did you find the smell of the leaves you collected?) The reflection questions can be discussed in a group or dealt with individually, using e.g. mind mapping as a reflective tool. The mind map can be then posted on the classroom wall. Often the reflective questions are bordering on ethics, and there exists no one right answer, but multiple views. If the reflections lead the teacher and/or the students to more questions, that is even better. The matter you are working on is complicated.

Themes

The package has been divided into three overlapping and interconnected themes: climate change (orange), biodiversity (green) and health (blue). Though we have dedicated one major theme for each lesson, you will see that the themes are so connected, they could include all the exercises. You will see the templates in green, orange and blue. The first lessons of the package are supposed to be easiest to start with.

Links



Trees, urban forests and their importance to planetary wellbeing is a complex entity and we do not assume to cover every aspect of this complexity. However, to be able to understand the context behind some topics, we have linked information throughout the document so that you can easily find background information and context online. Remember to also check the links at the back of each lesson for more in depth information on the topic. You are also welcome to study or duplicate (parts of) the text for your students.

Exercise pairing and keywords

If a teacher would like to continue on the topic, we have indicated other sources that continue on the same topic. We have also added keywords to help you navigate to other lessons that talk about the same topic but from a different angle. These will give you a quick overview on what the lesson touches upon as well.

Students materials

Next to this document you will also find a package for Students Materials. This document consists of an introduction to the material to raise awareness on the importance of this material to students. This package of Students Materials can be given to the students before starting with one of the lessons.

Alternatively, this material is meant for students who can engage in individual work without teacher guidance, as e.g. extracurricular activity. This can be done in class, or individually at home. Just leave out the first page (description, student goals etc) of the lesson and provide the student with the pages from Setting the scene onward.

The lessons that can be followed individually are the following:
#1 It all starts from a seed
#2 Noticing trees in cities
#7 Forest for rest
#10 Finding peace of mind in the city
#11 (non)- native species

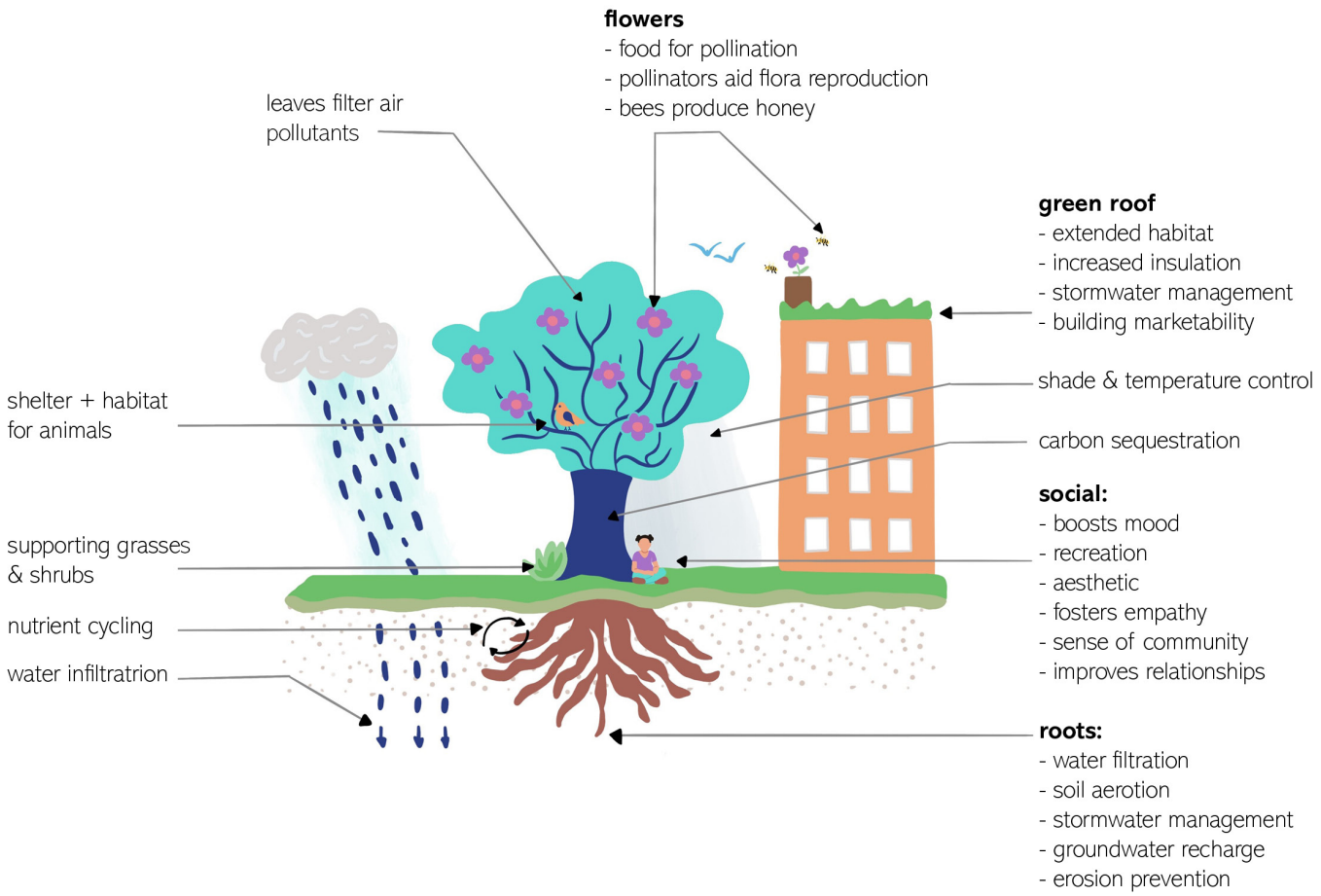
Please note that the above listed lessons require that the students do some observations or material collection in their living surroundings. Use your own discernment to substitute group work prompts for other ways of reporting, e.g. video diary, journaling, or artwork.

3. Why should you teach about urban trees and forests?

3.1 Importance of trees and urban forests

Urban trees and forests provide the city residents an endless list of benefits. Next to ecosystem services listed in the graph below, the urban forest is a link to nature, which is our source of health and wellbeing both directly and indirectly. All of the benefits are explained in much detail in the chapter 10. Introduction to urban trees and forests.

Ecosystem services of a tree



In the following list, we summarize some of the most striking direct benefits to our wellbeing from getting in contact with nature.

- Studies have shown that humans can restore from stress and mental exhaustion better in natural surroundings (parks, forests, etc.) than in built environments (e.g. city streets, etc.) Spending time outside unplugged from technology helps our bodies and minds calm down even without us knowing it. It is how we have been built!

- Coming in contact with natural materials, such as tree bark, forest soil, stones, leaves, moss...is good for our physical health. In natural environments, such as the forest, there exist a number of microbes that are absolutely not dangerous to us. On the contrary, our system should be exposed to these microbes to know the difference between what it should armor up against, and what is safe to be in contact with. That is how we keep our immune system army well trained and functioning.

- Nature lifts our moods when we are feeling down. Also, our feelings of positivity and wonder increase when we spend time outside. Just think of an afternoon at the beach, a walk in the park, or a beautiful view out the window. Indeed, even a view out of the window to nature can help us feel better!

- Imagine a view over a scenic mountain landscape. Looking far can induce a feeling of awe which has been discovered to generate more generous, more friendly behaviors in us. This feeling of awe relates to gratitude which has been shown to increase our satisfaction in life.

- Nature affects our creativity: when our brains have had the time to rest - which it does automatically in a green environment because this is how we and our nervous systems have been wired - creative and abstract thinking can flourish again. Therefore, during recess it is important to also have a moment to do nothing and just look at some trees, flowers or birds in the sky.

- It is not only the sights of nature but also sounds and pleasant smells of nature that our brain recognizes and that help to produce the same wellbeing effects of stress reduction and mood enhancement.

- Time in nature can also significantly help by reducing ADHD symptoms as the volume of stimuli is less and the nature of the stimuli is softer. Imagine the difference between car horns and bird song... There is nature at work!

- Finally, being outdoors in nature influences our physical body and immunity when we are exposed to sunlight. Our skin absorbs the vitamin D from the sun light which is good for our immunity in reasonable doses. Furthermore, the air is normally cleaner in natural environments where the sources of pollution are further and the trees help to filter out air pollutants, and there is more oxygen which refreshers us in comparison to a stuffy room. Movement outdoors feels more effortless because nature has many sights and sounds to pay attention to.

In the following sections, we will introduce the specific benefits that trees and green spaces provide to pre-teens and teens. Next to that, we motivate the building blocks of this Inspirational package and why certain aspects are important when learning about urban trees and forests.

3.2 Importance of trees for pre-teens

Urban green spaces provide the youth places to spend time being physically active, to socialize or to enjoy a quiet moment on one´s own. As digitalization is more and more part of the youth´s lives, urban greenspaces invite youth to break through the sedentary behavior and move for their overall health. Many youngsters nowadays have been removed from daily interactions with the natural world and forests in particular, which weakens their inherent knowledge about nature and forests, the phenomena and interdependencies, the use of the natural resources etc. Nevertheless, urban green spaces are important for pre-teens who are entering a challenging time in their lives. Next to the physical and mental development, the formation of identity are important phases in the young person´s life, during which time friends becomes more important than parents. Many young people experience stress due to homework, their own ambitions, as well as fear of failure or of saying no to the teachers. Disagreements with those important friends and being (cyber) bullied all needlessly contribute to stress in young people. Many youngsters try to fight this with the help of short-term solutions like watching TV, surfing the internet or taking a bath and seem to need more guidance in how to cope with stress.

Though nature seems of secondary important in the adolescent´s life, nevertheless, natural areas and contact with nature provides a wide range of cognitive, emotional, and social benefits (8. Dr. Forest at your service) for youngsters. Green spaces , such as green school yards or other public spaces with greenery, can provide the space where adolescents can escape stress through leisurely or active movement. They get the possibility to (re)focus, build competences and self-confidence, and form supportive social groups.

Children and youth from minority groups tend to have poorer access to high quality natural environments than their majority culture counterparts, though the direct benefits from nature are as vital for immigrant children and youth, if not even greater, than for majority population. In addition, contact with nature can help immigrant youth cope with their stress and feelings of sadness, as the outdoors in the new country always includes some elements to identify with.

3.3 Importance of green school yards

Natural environments can mitigate the symptoms of a number of ailments. Therefore, green school yards offer an important resource for student also on higher levels, as they enable nature exposure that the children and youngsters might not otherwise get to outside of school hours.

Research has proven that spending time in nature can reduce the tendency for violence and stress in youngsters and help them cope with symptoms of ADD and ADHD. Nevertheless, due to our sedentary lifestyles and increased screen-time, which has been estimated to be at least 2 hours a day for young people, youngsters and adults and children alike tend to move less nowadays. Encouraging movement throughout the day can protect the youth from life-long illnesses caused by sedentary behavior. Supporting movement outdoors during recess is an incentive to adopt a life-long, physically active lifestyle.

In addition, getting to school either by foot or by bike can constitute over half of children and youth´s daily recommended brisk exercise. Especially biking to school has been found to be positively correlated to overall fitness. If, during this bicycle ride on his/her way to school, the teenager is exposed to green space, this can also make up a significant part of the young person´s nature exposure within the day.

4. Trees and forests as school subjects

This weakened link to nature also means a weakened position for the urban greenery as the youth won´t grow up understanding their inherent value and therefore will not be there as citizens demanding more livable cities and protecting the existing natural environments in the cities. In order for the average citizen to understand the importance of the urban forests, some basic knowledge has to be introduced into education to facilitate the raising of citizens who understand, value and want to safeguard healthy urban forest ecosystems in the future.

Due to their broad impact on our survival but also quality of life, single street trees and forest ecosystems can be found to fit in a number of subjects on top of the traditional natural sciences and mathematics. When reading about the history of cities and economic development, trees as a resource will play a role. Learning about art forms and what has inspired artists throughout the world, forested landscapes will play a role. Tree and nature related vocabulary in different languages conveys surprisingly more information about species and in societal topics, forests health impacts, access to forests and greenery in urban neighborhoods teaches about the importance of urban trees and forests in a holistic manner.

Furthermore, a common theme that crosses through subject lines brings together diverse disciplines in a comprehensive manner rather than keeping subjects strictly separated. The benefits of this approach to teaching - integrating either horizontally or vertically - is that it enables the development of meaningful understanding of the complex associations and influences within a topic. The great and complex questions of our time, both in education and in society, do not respect the boundaries of disciplines but require thinking that is broader and more general.

4.1 What keeps teachers from teaching about urban forests?

Though materials exist in a variety of topics and levels of complexity, the need for extra time to prepare the activity which requires additional hours, can often keep the most motivated teacher for carrying out their best intentions. Next to lack of time, also teachers own lack of interest, motivation and familiarity with the subject play a role, as do reporting pressure that teachers experience, class sizes, the rigidness of the curriculum, lack of or distance to green spaces from and around school, as well as lack of resources (lack of finances, lack of supervisors).

There is a broad consensus that we need to move towards active, participative, and experiential learning methods that engage the learner and make a real difference to their understanding, thinking and ability to act. Only through broadening the perspective of environmental education onto capacity building, communication and creating public awareness, can the adults of the future have any chance to tackle the world's most serious environmental problems through collective public change. These have also been seen as key strategies for achieving the UN Sustainable Development Goals.

4.2 Characteristics of the most effective environmental programs

All too often educational activities in nature are limited to a few, even one outing per year. Activities that take time once a year are positive bonus but do not enable spontaneous and frequent contact with nearby nature which is needed, preferably in familiar settings. Though students will benefit from inspiring visits to more exotic venues (e.g. the seaside, a botanical garden), frequent real life and long-lasting contact with familiar nature seems to be more effective. In these activities, and action component is necessary for the students to engage.

Another important component in most effective environmental programs is that young people see that their efforts are taken seriously, and that they are able to realise at least some of their ideas. In this package, we have highlighted ways in several lessons where students can engage their communities and take their lessons learnt to the local government.

The most effective programs in schools, after-school programs and nature centers, measured in terms of young people's increased environmental concern and action, have been found to embody the following characteristics:

- provide opportunities to gain knowledge
- provide opportunities to form positive attitudes about the environment
- provide opportunities to learn and practice action skills
- activities should take place in extended duration of time, fed with sporadic outings
- aim to succeed in achieving some valued goals

5. Importance of feeling connected to nature

The increased time that children and youth spend indoors and in man-made surroundings and not in direct exposure to nature and natural elements contributes to the disconnectedness from nature. This disconnect also refers to the alienation that humans have come to experience with regards to nature. Therefore, when we witness the loss of interactions with nature, we do not only witness the diminishing of a wide range of health and well-being advantages. What is perhaps even more alarming, disconnect from nature also discourages people's positive emotions, attitudes, and behavior with regard to the environment which can lead to a cycle of dysfunctional relationships with nature in the following generations.

Nature connectedness (or nature relatedness), is a measurable psychological construct that deals with an individual's sense of their relationship with the natural world. This concept is measurable using a questionnaire with questions like "*I always think about how my actions affect the environment*" and "*My ideal vacation spot would be a remote, wilderness area*". The result of this test tells you how connected to nature you experience yourself to be.

It has been found that an individual's actual nature relatedness is an excellent predictor of greater psychological well-being and pro-environmental behavior.

Recently studies have revealed that it is needed to go beyond activities that simply engage people with nature through knowledge and identification to pathways that develop a more meaningful and emotional relationship with nature. Five pathways to increased nature connection have been established and these pathways provide a route for people to develop a new relationship with the natural world, one which can move beyond utility and control.

The 5 pathways (Meaning, Compassion, Senses, Emotion and Beauty) are illustrated below and are used in the Inspirational Package to highlight which pathways are used to support connectedness with nature in each lesson. We invite you to reflect upon them at the end of each lesson together with students.

5.1 Pathways to nature connectedness

MEANING - nature bringing meaning to our lives, e.g. the first migratory birds in the spring, a sunset or sunrise…

COMPASSION - caring and taking action for nature, e.g. collecting trash in nature, helping a wounded animal..

SENSES - tuning in to nature through the senses, e.g. listening, enjoying the scents, feeling the textures, ..

EMOTION - feeling alive through the emotions & feelings nature brings, e.g. hearing the increased birdsong in the spring, experiencing a thunder storm or a blizzard,

BEAUTY - noticing nature's beauty, e.g. enjoying a breathtaking landscape, rainbow, a detail, scent, sound, music or piece of art depicting or inspired by nature…

5.2 Practices associated with gains in nature connection among young people

Additionally, some practices have been identified that are associated with strenghtening especially young people's connection with nature. These are listed in the table below.

- Provide time for direct engagement with nature and immersion in natural areas
- Focus on experiences that define nature connection:
  - Affiliation, a sense of belonging, a sense of oneness
  - Enjoyment
  - Comfort and confidence in nature
  - Curiosity, interest, exploration
  - Challenge and achievement
  - Understanding human interdependence with nature
  - Empathy and concern for other living things
  - Caring for wildlife and natural habitats
- Give young people time to encounter nature at their own pace, following their own interests
- Let them know that there are many ways to be a 'nature person', including play and recreation in nature, working the land sustainably, gardening, studying natural history, caring for animals, making art in nature
- Make young people partners in collective efforts to study and protect the natural world
- Ground experiences in the local culture and ecology
- Share examples of people's enthusiasm and care for nature
- Make sure young people see others who look like them engaged with nature
- Enable young people to record their observations and experiences through writing, scientific record keeping and the arts
- Start young, but provide access to nature for all ages
- Aim for extended engagement, but even short-term experiences in nature can lead to gains in nature connection
- Allow young people to overcome fears in nature or fears of particular species through gradual interactions at their level of comfort

From Chawla, 2020.

5.3 Reflection as a process that strenghtens learning

As mentioned in the previous page, recording ones observations and experiences, a student is pushed to reflect on the experience and material he or she has just learned. Reflection allows the learner to integrate the understanding she or he has gained into one's experience. This new insight will enable them to make better choices in the future as well as enhance one's overall effectiveness.
In this material package, every lessons ends with a reflection moment. This reflection moment can be done in a group or individually. However, it is important to engage all students into the reflection.

The benefits of reflection include:

- promotes independent learning and critical thinking
- teaches organising and expressing one´s thoughts
- increases confidence and selfawareness
- develops interpersonal skills
- motivation for their studies increases as students monitor and take responsibility for their own development

Teachers should be supported in engaging students in reflection. Many students do not initially understand how reflection may help them and feel that reflection is over-emphasised. It has been demonstrated that technology (audiovisual formats, such as video and multimedia web applications) can be used effectively to support reflection. However, the use of audio-visual formats should not substitute all written reflection. For example, mind maps/concept maps, 'spider' diagrams or simply arranging post-it notes according to themes, are useful creative tools that help to structure, categorize and make connections between ideas. Mind maps provide the student with an overview of key concepts and their connections, and help reflective learning become visually engaging, dynamic and memorable. Mind maps can help to summarise and reflect on the gained knowledge and understanding on a particular topic.

6. Environmental anxiety

Climate anxiety among the youth is part of the wider environmental anxiety phenomenon. Environmental anxiety refers to a difficult feeling that is to a large extent due to environmental problems and threats. Both environmental and climate anxiety, as well as the anxiety caused by the pandemic, are part of the phenomenon in which the state of the world starts affecting mental health (Pihkala, 2019).

Anxiety is a reasonable reaction to the magnitude of the world's environmental problems, not to mention the pandemic. Anxiety can however become a problem if it becomes so severe that the person becomes paralysed. There are two fundamental challenges and tasks in dealing with the mental aspects of any of these environnmental problems: maintaining capacity by adapting to changing conditions, and the ability to live with the ambivalence.

The global School Strike lead by Swedish teenager Greta Thunberg has mobilised millions of youngsters worldwide. This movement should be seen as encouraging as it touches upon the central coping mechanisms of climate anxiety and environmental problems at large, namely expressing one's feelings and taking action.

Opportunities for action help with mental coping with global problems on one hand, but at the same time overemphasising action can lead to avoidance of emotions fueled by the environmental problems and even underestimating the risks of these global problems. However, "negative" feelings such as grief and anger could be channeled into action and motivation.

Many people have turned to mindfulness for calm and happiness in their lives. Research shows that mindfulness helps to reduce anxiety as it allows us to notice our thoughts and respond to stress with awareness of what is happening in the present moment. Rather than simply acting instinctively, unaware of what emotions or motives may be driving our actions, we become more mindfull of what is going on between our ears and in our bodies. Mindfulness group activities in nature offer a simple and effective way of creating enriching experiences in life that support our coping skills in challenging times. The mindfulness exercises added to this Inspirational Package are also a way to nurture strong, caring groups that support each other in the time of need – just like an urban forest supports its individual trees.

6.1 Coping with environmental, climatic and pandemic anxiety

Australian Psychology for Safe Climate (PSA) organisation´s strategies for "Coping with Climate Change Distress" summarising central psychological coping mechanisms for self-regulation. With a little adaptation and certainly paying attention to the social distancing rules, these can also help in the pandemic anxiety.

Behavioral strategies:

- **Having fun, feeling good:** Working out the positive aspects of sustainability, and talking about these;
- **Maintain healthy routines:** physical exercise; healthy food; enough sleep; time in nature; permission to good around
- **Take action:** participate in climate action groups; lobby politicians & industry leaders; change behaviours
- **Take a break from being too focused on the problem:** turn off the 24/7 news feed; dedicate a 'do nothing day'
- **Focus on one issue to lower stress levels:** prioritise the activities you chose to invest your energy into.

Relational strategies:

- **Seek social support:** Share concerns, thoughts & feelings with trusted friends & colleagues
- **Drop the judgements:** 'shoulds' & assumptions: difficult life experiences are painful enough without criticism
- **Balance action with reflection:** Read, write a journal or blog, talk with kindred spirits about how they cope.
- **Cultivate hope:** transforming fear into a something positive. Fear can fuel action.
- **Restore yourself psychologically:** spend time in (green) environments that match your aims to restore yourself.

Teachers and parents should address environmental problems in an age-appropriate way to reduce the potential stress it causes to the children and youth. Positive actions should be encouraged as an alternative and allow the children and youth to participate and contribute to e.g. the global climate change protests and creative projects in which they can express their concerns. This Inspirational Package is doing its part in teaching children why trees and forests are key in protecting the livability of our planet in the changing climate.

Additional strategies to help cope with environmental change are listed in the table below. (Chawla, 2020)

Strategy	Application of the strategy in practice
Combine the science of environmental change with information about how to make a difference	Young people need to understand physical and social causes of environmental changes in order to identify effective solutions. It is equally important for them to know what they can do to address problems, what others are doing, and how decisions made today have the potential for positive impacts tomorrow
Create a receptive space where young people can share emotions	Let young people know that they can safely share their feelings about the environment. Take time to listen receptively. Be supportive and solutions oriented
Encourage the positive reappraisal of problems	Help young people find meaning in addressing environmental challenges and see positive possibilities in the changes societies need to make to preserve the natural world
Engage in visioning	With a focus on local areas, engage young people in visioning futures they would like to see unfold and identifying realistic steps to move in the desired direction
Provide young people with opportunities to experience agency	Enable young people to investigate environmental problems that concern them, determine personally meaningful actions to address the problems, and implement practical ideas that they can accomplish individually or in partnership with others
Foster social trust	Bring young people together with others who are working to protect and restore the natural world, enabling them to see that they are not alone but allied with others who are working on nature's behalf
Show that voluntary simplicity can be a fulfilling way of life	Introduce young people to examples of individuals and groups who find happiness in community, creativity, service and nature, instead of the accumulation of more and more material things
Connect young people with nature	Give young people time to become comfortable and competent in nature and feel kinship with other living things

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This list of references applies for the student's manual as well.

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