learning by doing

# Experiential Learning in Formal School Education

## Project Result 2: Development of Repository with Training Material & Activities of Experiential Learning

## Nature

# Project Information

## Project Acronym

Learning by Doing

## Project Title

Learning by Doing: Experiential Learning in Formal School Education

## Project Reference

2021-1-MT01-KA220-SCH-000032700

## Project Duration

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## Project Website

https://www.learningbydoing-eu.eu/

## Authoring Partner

IEC

## Document Version

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11/2022

# Project Partners

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# Annex 2: General Plan Of Course Thematic

| | |
|---|---|
| **Course thematic** | Nature Education |
| **Type of Activity** | Outdoor Learning |
| **Key Words** | Ecology, ecological literacy, biodiversity, sustainability, climate change, outdoor learning |

## OVERALL DESCRIPTION

Nature education program composed of experiental lesson plans for students to gain insights into the ecological community around them, allowing them to recognise the rich biodiversity and the intrinsic beauty of the natural environment, as well as to appreciate how the environmental sphere is inextricably linked to the economic and social spheres in the greater scheme of things. The nature education program aims to engage students via a hands-on, place-based learning approach that encourages them to head outdoors to explore, question, and think critically, thereby instilling an innate sense of curiosity and wonder. So, students will emerge from this programme as more reflective and introspective learners capable of making informed decisions for a sustainable future.

## OVERALL DURATION

16 teaching hours

## LEARNING OBJECTIVES

This course aims to:
O1. To impart ecological knowledge and promote environmentally conscious behavior toward nature

O2. Experience nature: Touch, smell, and hear the intrinsic beauty of the natural environment they live in
O3. Respect for biodiversity and take responsibility for actions that impact nature
O4. To face new challenges, to develop self-awareness and social skills
O5. To enjoy participation in outdoor learning activities and have the motivation to achieve their best
O6. To be aware of others and their needs
O7. To accept responsibility for their actions
O8. To make a plan to overcome obstacles by breaking a plan into smaller achievable steps, and to deal positively with praise, setbacks, and criticism
O9. To participate in group discussions and to develop interactive presentation skills
O10. To resolve conflict and propose practical ways forwards and influence others by negotiation to reach workable solutions, also to be supportive to others and help others when they want it
O11. To experience adventure in a wild place with a range of new activities to develop a pastime or hobby in their home environment
O12. To put these skills into practice in a real challenging environment and develop confidence

## LEARNING OUTCOMES

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O2, O3 |
| L2. Build confidence and self awareness | L2 to O4, O5 |
| L3. Take responsibility and solve problems creatively | L3 to O6, O7, O8 |
| L4. Communicate effectively and be an effective team member | L4 to O9, O10 |
| L5. To experience new outdoor activities or develop skills | L5 to O11, O12 |

# OVERALL STRUCTURE OF COURSE

## Topic

**Lesson 1**: Meet A Tree

## Description

All trees are perennial plants. Trees cover roughly 30% of the Earth's land surface. Trees are the tallest free-standing organisms in the world. They live longer and grow larger than any other living organism on earth. There are more than 80,000 species growing worldwide. They come in all shapes and sizes; from tiny Arctic Willows a few centimetres high,through to giant Redwoods over 100 metres tall.

## Duration

1 teaching hour (or more. It depends on the teacher)

## Materials

- Paper
- Pencils
- Sticky Labels
- A location where there are plenty of standing trees.
- Enough blindfolds for half the number of students in the class.
- A bag to collect the interesting seeds and leaves students find
- Camera or smartphone
- Tree identification key
- Journal

## Topic

**Lesson 2**: Senses Scavenger Hunt

## Description

We can deepen our relationship with nature by doing some sensation awareness activities. Students engage all their senses – touch, smell, sight, hearing, and taste. Sight is often the least important. They explore biodiversity around them and also positive emotional bonds through nature with experiences that instill calmness and happiness. They look for beauty in things, such as appreciating natural scenery or engaging with nature through art and music. They also look for hidden meanings, and emphasize traditions, localness, seasonality and language – nature is everywhere, from folklore to place names. Finally students show compassion by developing a moral and ethical concern for nature, such as making ethical product choices or helping to make life better for wildlife.

## Duration

90 minutes

## Materials

- A location where there are plenty of natural objects
- Worksheet
- Pencil
- Crayons and coloring pencils
- Cardboard
- Scissors

## Topic

**Lesson 3**: Pollinator Garden

## Description

Pollination is a vital stage in the life cycle of all flowering plants. It occurs when pollen grains are moved between two flowers of the same species by wind, water or animals. Successful pollination, which may require visits from multiple pollinators to a single flower, produces healthy fruit and fertile seeds, allowing plants to reproduce. Without pollinator visits to fruit and vegetable plants in our gardens and fields, we would have no produce!

## Duration

65 minutes (1-2 months for pollinator garden)

## Materials

- Old wooden pallets
- Strips of wood
- Straw
- Moss
- Dry leaves
- Woodchips
- Old terracotta pots
- Old roofing tiles
- Bricks, preferably those with holes through them
- Old logs
- Bark
- Pinecones
- Sand
- Soil
- Hollow bamboo canes
- Pencil
- Handouts
- A plant pot or any container you have on hand (a yogurt container, or used milk jug work well also)
- Soil
- A packet of wildflower or bee friendly seeds

## Topic

**Lesson 4**: Super Sticks

## Description

Art plays a large part in making our lives infinitely rich. Art stimulates different parts of our brains to make us laugh. Art gives us a way to be creative and express ourselves. For some people, art is the entire reason they get out of bed in the morning. You could say "Art is something that makes us more thoughtful and well-rounded humans." On the other hand, art is such a large part of our everyday lives, we hardly even stop to think about it. Look at the desk or table where you are right this minute. Someone designed that. It is art. Your shoes are art. coffee cup is art. All functional design is art. The main inspiration of the art is nature.

## Duration

110 minutes

## Materials

- Sticks (10-15 sticsk for every group)
- Natural materials like cone, acorn, seeds
- String, scissors
- Handout
- Locate an appropriate outdoor spot for the activity. Ideally choose one with an abundance of natural materials that can be rearranged for the activity but resilient enough to withstand the disturbance.
- Unlimited number of 5 to 7 chairs around small tables
- Talking object (e.g., talking stick, stone, or art object)
- Markers and one or two pieces of flip-chart paper per table optional
- Paper
- Pencil

## Topic

**Lesson 5**: Wild Numbers

## Description

How many species live on earth? The answer may come as a shock. We don't know. Current estimates for species on Earth range between 5.3 million and 1 trillion. So why don't we know the answer to this fundamental question? Part of the problem is that we cannot simply count the number of life forms. Many live in inaccessible habitats (such as the deep sea), are too small to see, are hard to find, or live inside other living things. So, instead of counting, scientists try to estimate the total number of species by looking for patterns in biodiversity. In the early 1980s, the American entomologist Terry Erwin famously estimated the number of species on Earth by spraying pesticides into the canopy of tropical rainforest trees in Panama. At least 1,200 species of beetle fell to the ground, of which 163 lived only on a single tree species.

## Duration

95 minutes

## Materials

- Handout
- Pencil
- Smartphone
- Location with plenty of trees
- Local species guide books
- Paper
- Smartphone

## Topic

**Lesson 6:** Biodiversity Survey

## Description

Our home, Earth, is the only known planet with diverse ecosystems in the entire universe. Scientists have formally described approximately 1.4 million species, but we know this number represents a minority of current species. Most estimates of the total number of living species range between 5 and 10 million. Life in this beautiful home has been sustained only because of nature's ecosystem services. Major threats to biodiversity and individual species include habitat degradation, climate change, invasive species, over-exploitation and increased pollution, most of which directly result from human activities. In the Amazon rainforest, deforestation is occurring at an unprecedented rate for agriculture (e.g. soy bean and palm oil plantations and cattle ranching), mining, unsustainable logging and development (e.g. roads and infrastructure). This degradation is also exacerbating climate change since the Amazon retains a large proportion of the world's carbon, which would otherwise be in the atmosphere.

## Duration

160 minutes

## Materials

- A small plastic mirror for each student
- A natural area like a park, a woodland
- Handputs
- Pencil
- A pale-coloured container or s dustpan and brush
- Natural area including hedges
- Smartphone
- iNaturalist app
- A natural area aroun the school and its map
- Birds, insects, plants identificitaion books

## Topic

**Lesson 7:** Hole Homes

## Description

The term “habitat” has several meanings. In ecology it means either the area and resources used by a particular species (the habitat of a species) or an assemblage of animals and plants together with their abiotic environment. A habitat can be a salt marsh, a meadow or a pine forest, but a habitat can also be recognised at the landscape level of a tundra type or a deep-sea mud covering several hundreds of square kilometres. At the other extreme, it may be a microhabitat of less than 1 m², for example decaying wood, or animal dung in grassland environments. A habitat or a group of related habitats can be considered an ecosystem. Ecosystems are dynamic complexes of plant, animal and micro-organism communities and their non-living environment, which interact to form functional units.

## Duration

100 minutes

## Materials

- A location with grassland
- Journal
- Pencil
- Handout
- Smartphone with Google Map app
- Natural materials

## Topic

**Lesson 8:** Building a Greenway

## Description

Humanity is increasingly urban but continues to depend on Nature for its survival. Cities depend on the ecosystems beyond the city limits but also benefit from internal urban ecosystems. the natural urban ecosystems contribute to public health and increase the quality-of-life of urban citizens, e.g. by improving air quality and reduce noise. Urban nature-based solutions are often used to help achieve four main outcomes: Happy and healthy cities: Putting public health and liveability in focus. Water-friendly cities: Putting water security and management in focus. Nature-rich cities: Putting ecosystem services and biodiversity in focus.

## Duration

95 minutes

## Materials

- Pictures of animals or plants
- A tape
- Safety pins
- Handout
- City map

## Topic

**Lesson 9:** Spinningthe Ecoweb

## Description

Human cultures have developed within different ecoregions and have been sustained by them. All of the resources humans have depended on for survival and comfort have come from natural resources. Over time, attitudes and beliefs about the natural world and using natural resources have changed. In the not-too-distant past, the human population could have been more sparse compared to the natural resources available. Human impact on ecoregions was minimal. As human populations have increased, so have demands on various ecoregions. Some parts of the ecosystem are being heavily impacted and some species have become extinct.

## Duration

80 minutes

## Materials

- Handsout
- Pencil
- Paper

## Topic

**Lesson 10:** Eco Check-Up

## Description

The decline of biological diversity continues at speed and the consequent degradation of habitats and ecosystem structures, coupled with climate change, may constitute one of the most significant challenges that human civilization has ever faced. As the United Nations develops a post-2020 global biodiversity framework for the Convention on Biological Diversity, attention is focusing on how new goals and targets for ecosystem conservation might serve its vision of 'living in harmony with nature. Healthy ecosystems prevent, mitigate or regulate droughts, reduce people's exposure to droughts, reduce people's vulnerability to droughts impacts through supporting livelihoods and basic needs – before, during and after hazards.

## Duration

85 minutes

## Materials

- A location (Woodland) where there are plenty of natural objects
- Different coloured wool of about 1m in length
- A small circle (a bit over a 1 meter in diameter) of woodland or forest or steppe area
- Pencil
- Journal
- A natural area
- A 3 m of string
- 5 toothpicks for each pair of students

# ASSESSMENT METHODS

Journal: Write about the question: Do you think you can find your tree if you returned to this forest next month? Next year? What would you look for to identify it?

Self assessment: Students fill out the form: https://docs.google.com/document/preview?hgd=1&id=1fKpn9KcmpLIlrzEbnKxNrK4RjJuQiFpBATL_f0FZM9U

Mind map: Hold a session after the activity for students to reflect on their findings. Make a mind map of the types of plants and pollinator activities that students found the best and the most interesting.

Art project: Prepare an art project by using the ideas created conversation cafe with local artists.

Infographic: Prepare infographic about species on Earth. https://plana.earth/academy/infographic-iucn-endangered-species-red-list

Poster Divide the students to pairs and they prepare a poster to show the importance of the biodiversity. Then organise aan exhibiyt to share them with the school.

Diorama: Using pictures of a grassland and experiences from the field work, have your students make a diorama of a grassland. If making a diorama use a soda pop box/ flat and pipe cleaner or clay animals. Ask them to include at least one nest and one underground home.

Questionnaire: They participate the survey to promote the development of cities towards sustainable use of NBS.https://www.think-nature.eu/highlights/questionnaire/

https://www.epa.gov/sites/default/files/2019-05/documents/enviroatlas_greenway_lesson_plan_additional_activities.pdf

https://unhabitat.org/news/26-nov-2021/biodiversity-resilience-and-quality-of-life-in-cities

Creating a campain: Have students design advertisements to promote the importance of ecosystem management.

Travel Brochure: Have students write a short descriptive paragraph about their park in the style of a travel brochure, commenting on the wonders and special features.

# LIST OF REFERENCES
# ADDITIONAL RECOMMENDED READING


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# 1st Lesson Plan

## Meet A Tree

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## Course Category

Nature Education

## Title of Lesson

Meet A Tree

## Type of Activity

Outdoor Learning

## Key Words

Trees, prennial plants, forest, tree identification, ecosystem services

## Lesson Description

All trees are perennial plants. Trees cover roughly 30% of the Earth's land surface. Trees are the tallest free-standing organisms in the world. They live longer and grow larger than any other living organism on earth. There are more than 80,000 species growing worldwide. They come in all shapes and sizes; from tiny Arctic Willows a few centimetres high through to giant Redwoods over 100 metres tall.

## Lesson Duration

135 minutes

## Learning Objectives

This course aims to:
O1. Explain basic facts about trees
O2. Illustrate and explain the parts of a tree
O3. Understand why we need trees
O4. Demonstrate basic observation and identification skills
O5. Identify trees

## Learning Outcomes

| | |
|---|---|
| By the end of the course, a student will be able to: | Link to Objectives |
| L1. Develop ecological literacy | L1 to O1, O2 & O3 |
| L3. Take responsibility and solve problems | L2 to O3, O4 & O5 |

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## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

**A short video (Meet A Tree)**

- https://www.wechoosenature.org/inspire/trees-are-making-music
- https://agood.com/blogs/stories/10-cool-facts-about-trees

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by asking students how they know about trees. Then, show students a short video of lesson (Meet A Tree).**

Trees are perennial plants with well-defined woody stems, crowns, and roots. Trees compete for nutrients, sunlight, space, and water. Trees have life stages that include germination, growth, maturity,reproduction, decline, and death. As part of the forest community, trees have various roles (e.g., providing habitat, and holding soil). The presence of trees alters the surrounding environment.

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## 2nd Step

# Presentation

## Materials – Face to Face

- **Paper**
- **Pencils**
- **Sticky labels**

## Duration -(minutes)

**15 minutes**

## Notes - Description of step – Explanations

**Explain the different parts of the tree. Divide students into groups of 5 and assigned a different function on a sticky label. The children must work together to each enact their part of the tree. In each group children must then explain their part and function of the tree.**

**Roots**: The roots hold the tree in the ground so the wind cannot blow over it. A tree gets water through its roots.
**Bark**: The bark is the skin of a tree and covers the whole of the trunk.
**Trunk**: The trunk is the strongest part of the tree and holds up the branches. The water from the roots goes up the trunk to the leaves.
**Branches**: A part of a tree that grows out of its trunk with leaves, flowers, or fruit growing on it. A tiny branch is called a twig.
**Leaves**: Leaves are green and make food for the tree and evaporate water, which helps keep the leaf's surface calm.

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## 3rd Step

# Training/Practice

## Materials – Face to Face

- A location where there are plenty of standing trees.
- Enough blindfolds for half the number of students in the class.

## Duration -(minutes)

20 minutes

## Notes - Description of step – Explanations

Explain to students the lesson will continue outside where there are plenty of standing trees. Make students pair off, one student being blindfolded and the other carefully leading the blindfolded student through the forest to any tree that attracts him. Instruct leaders to tell their partners when to lift their feet to step over a log, when they need to duck to avoid branches, etc. Identify a boundary so students do not disappear in the forest!
The leader instructs the blindfoldee to explore his tree and feel its uniqueness - without removing the blindfold! Instruct leaders to be specific:

"Is this tree alive?... Feel the bark with your cheek...How does the tree smell?... Can you put your arms around it?...Are there any plants growing on the tree?...Animal signs?...How does the ground around your tree feel?...How old is the tree?"
After the blindfoldee is done exploring his tree, the leader leads him back to the starting point, taking a roundabout way to further challenge the blindfolded student.

**Remove the blindfold and let the student try to find the tree with his eyes open. The leader can help by responding "yes" or "no" to the other student's choices. When the correct tree is found, students change places and the leader becomes the blindfoldee.**

The health secrets of trees seem to lie in two things—the higher concentration of oxygen that exists in a forest, as compared to an urban setting, and the presence of plant chemicals called phytoncides—natural oils that are part of a plant's defense system against bacteria, insects, and fungi. Exposure to these substances can have measurable health benefits for humans. Physiological stress is reduced for example, and both blood pressure and heart rate are lowered. Evergreens—pine, cedar, spruce, and conifers—are the largest producers of phytoncides, so walking in an evergreen forest seems to have the greatest health benefits.

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## 4th Step

# Application

## Materials – Face to Face

- A bag to collect the interesting seeds and leaves students find
- Camera or smartphone
- Tree identification key

## Materials – Online

https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/Tree-Health-Survey-Tree-ID-guide-WEB.pdf

## Duration -(minutes)

25 minutes

## Notes - Description of step – Explanations

Explain students they will learn identifying trees by using identification key. Make students pair off, then distribute the key sheet (https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/Tree-Health-Survey-Tree-ID-guide-WEB.pdf). After identfiy the tree by observing its leaves they can take some photos and they share their experience at the closure.

All trees have clues and features that can help with identification. There are lots of features that give you clues to what species it is. Look at the leaves or needles. Is it a broadleaf (usually deciduous) or is it a conifer (usually with needles or scales)? Different features will be visible through the seasons. In winter, for broadleaf trees, you'll have to use twigs, leaf buds and bark. Take notice of the surrounding area such as hedgerows, fields, parks, woodland or close to water. Some species are more likely to grow near water, in scrubland, parkland or in woodland. Piece the clues together, including the overall shape and size of the tree, bark, leaves or needles, flowers, fruits, leaf buds and twigs. The more features you can see, the more accurate your identification will be.

## 5th Step

# Closure

## Materials – Face to Face

- **Journal**
- **Pencil**

## Materials – Face to Face

- **https://clearinghouseproject.eu/ecosystem-services-of-a-tree/**
- **https://ed.ted.com/lessons/what-happens-if-you-cut-down-all-of-a-city-s-trees-stefan-al**

## Duration -(minutes)

**15 minutes**

## Notes - Description of step – Explanations

**Start a conservation about the trees, trees ecosystem services and threats to trees. The students share their relationship with trees. Disscuss the answere of the question: Do you think you can find your tree if you returned to this forest next month? Next year? What would you look for to identify it? If you have more time watch the short video: What happens if you cut down all of a city's trees?**

The most obvious benefit of trees for the planet is often identified by their photosynthesizing character. As trees breathe in carbon dioxide, they produce fresh oxygen and convert the captured CO2 to glucose and use it to grow (carbon sequestering) As a by-product, water is released into the atmosphere.

## Assessment Methods

Journal: Write about the question: Do you think you can find your tree if you returned to this forest next month? Next year? What would you look for to identify it?

## List of References/ Additional Recommended Reading


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9. https://www.arborday.org/programs/TreemazeFINAL.pdf
10. https://www.exploringnature.org/graphics/teaching_aids/tree_ID.pdf
11. https://www.nwf.org/~/media/PDFs/Be%20Out%20There/Schoolyard%20Habitats/tree_detectives.pdf
12. https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/british-trees/how-to-identify-trees/
13. https://tree.oplin.org

## Differentiation

Encourage students to join citizen science projects about trees

## What is the worst that could happen with this lesson?

The weather would be rainy or cold to have time outside to do activies knowing and identifiying trees.

## What will you do to correrct it?

Collect and bring leaves to classroom, they do same activities for example the challenge the blindfolded student touch the leaf then remove the blindfold and try to find the leaf with his eyes open.

learning by doing

# 2nd Lesson Plan

# SENSES SCAVENGER HUNT

learning by doing

## Course Category

Nature Education

## Title of Lesson

Senses Scavenger Hunt

## Type of Activity

Outdoor Learning

## Key Words

Sense awareness, senses, biodiversity, positive emetions, outdoor learning

## Lesson Description

We can deepen our relationship with nature by doing some sensation awareness activities. Students engage all their senses – touch, smell, sight, hearing, and taste. Sight is often the least important. They explore biodiversity around them and also positive emotional bonds through nature with experiences that instill calmness and happiness. They look for beauty in things, such as appreciating natural scenery or engaging with nature through art and music. They also look for hidden meanings, and emphasize traditions, localness, seasonality and language – nature is everywhere, from folklore to place names. Finally students show compassion by developing a moral and ethical concern for nature, such as making ethical product choices or helping to make life better for wildlife.

## Lesson Duration

90 minutes

## Learning Objectives

O1. To aware of the sights, sounds, and smells of their local natural areas
O2. Use the five senses to make and interpret observations
O3. Share with others information obtained by observing
O4. Communicate their observations, experiences, and thinking in a variety of ways
Demonstrate the ability to observe their surroundings
O5. Describe features of their immediate environment

## Learning Outcomes

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O2 |
| L5. To experience new outdoor activities or develop skills | L5 to O3, O4, O5 |

learning by doing

## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

A short video (Come Back to Your Senses)

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by asking students how they "plug in" to the natural world through the wonder of their senses. Then, show students a short video of lesson (Come Back to Your Senses).**

Exploring the outdoors through our senses provides an opportunity to rediscover a setting anew. By taking the time to slow down or pause, we create an opening in which to fully immerse ourselves in all the natural wonders that a space has to offer. We learn and discover about a place when we engage our sense of smell, open our auditory awareness and really take the time to see the minute visual details.

learning by doing

## 2nd Step

# Presentation

## Materials – Face to Face

- **A location where there are plenty of natural objects**

## Duration -(minutes)

**20 minutes**

## Notes - Description of step – Explanations

**Explain to students the lesson will continue outside. After walking to natural area, ask students to go and find one (natural) thing that is prickly, and one thing that is tickly. When students come back, pair them up. Invite them to share their prickly thing and their tickly thing with the other person, by touching the things to the palm of a hand and the back of a hand. When done, process the experience: What were the prickly/tickly things? How many of you allowed the other person to touch the prickly/tickly things to your hand? How many chose to prickle/tickle yourselves? Any insights into what was prickly and what was tickly?**

Sensory activities are incredibly useful for managing everyone's energy levels throughout the day. The activities are creative and fun – they feel like play, all while building better neurological systems and essential skills.

learning by doing

## 3rd Step

# Training/Practice

## Materials – Face to Face

- **Worksheet**
- **Pencil**

## Materials – Online

**https://learningzone.wwt.org.uk/wp-content/uploads/2021/02/WWT_senses_scavenger_hunt.pdf**

## Duration -(minutes)

**15 minutes**

## Notes - Description of step – Explanations

**Explain to your students what is the sensory awareness. Distribute the nature scavenger worksheet to students and give them 15 minutes to walk around and complete it.**

Sensory awareness — the direct focus on some specific sen- sory aspect of the body or outer or inner environment — is a fre- quently occurring yet rarely recognized phenomenon of inner experience. It is a distinct, complete phenomenon; it is not merely, for example, an aspect of a perception. Sensory awareness is one of the five most common forms of inner experience, according to our results (the other four: inner speech, inner seeing, feelings, and unsymbolized thinking).

learning by doing

## 4th Step

# Application

## Materials – Face to Face

- Crayons and coloring pencils
- Cardboard
- Scissors

## Materials – Online

https://www.sensorytrust.org.uk/resources/activities/sound-maps

## Duration -(minutes)

25 minutes

## Notes - Description of step – Explanations

Now give some directions to students: Lie on backs. Look up, up, up into infinity. When you find the highest thing visible, stare in that direction without focusing on anything specific. Now start listening to the sounds around you — and the nice thing about listening while lying on your back is that you have a better sense of where things are — you can really hear just where the sounds come from. Try to hear as many different sounds as possible, remembering what direction the sound comes from. After 2-5 minutes, ask students to sit up. Ask them what sounds they heard, and where they come from.

**Now time to make a sound map with your students. Give the directions: Find a spot and stand or sit still. Stay still for a short while (try 5 minutes) and start to listen to what is making sound around you. Mark on the card the sounds you can hear and where they are coming from, for example there may be a stream behind you, sheep in a field in front of you, birds singing above and to your side. Be still and quiet and focus on sounds you can hear. Ask them questions such as these: What sounds were the most familiar to you?**
**What sound had you never heard before? Do you know what made the sound?**
**What sound did you like best? Why?**

**After the activity distribute to cardboards to students they draw, write or colour the sounds they can hear around them.**

There is beauty all around us. Some of the beauty can be seen, but other types of beauty can be heard with our ears. A sound map is a great way to pay attention to the beautiful sounds of nature.
Sound maps are easy to make. Cardboard is good to do this exercise when out and about. You could use any plain cardboard - the inside of a cereal box, a cardboard box, white card - make it big enough to draw and write on. Get a marker or pencil. And that's it! Students record sounds differently - some write the names of what they hear, others draw.

learning by doing

## 5th Step

# Closure

## Materials – Online

1.https://www.exhibitionwalls.co.uk/student-art-display/

2.https://drive.google.com/file/d/1i0nU1v8nKtiTVUkDg3f4rKGBeJbicLRA/view

3.https://www.npg.org.uk/whatson/makingamark/teaching-resources/toolkit/

4.https://www.euronews.com/green/2020/09/24/this-interactive-map-allows-you-to-listen-to-forests-around-the-world

## Duration -(minutes)

20 minutes

## Notes - Description of step – Explanations

Organise an exhibit with the cardboards in your schools invite their parents to visit the exhibit.

Motivate your students and their families to join global sound map projects.

## Assessment Methods

Self assessment: Students fill out the form:
https://docs.google.com/document/preview?hgd=1&id=1fKpn9KcmpLlIrzEbnKxNrK4RjJuQiFpBATL_f0FZM9U

## List of References/ Additional Recommended Reading


1.https://www.sasp.co.uk/uploads/my-five-senses-scavenger-hunt.pdf
2.http://www.lfola.org/sites/default/files/Nature-Scavenger-Hunt_5senses.pdf
3.shorturl.at/bESU1
4.https://www.danielharper.org/
5.https://www.dunami-somatics.com/post/exploring-nature-through-the-senses
6.https://earth.fm
7.https://www.canr.msu.edu/uploads/236/74422/4-H_Science_Blast-Sensory_Awareness_AA.pdf


## Differentiation

You can repeat the sound mapping activity in different locations, at different times of day, or in different seasons.

## What is the worst that could happen with this lesson?

You need to consider outdoor conditions like extreme hot or cold temperatures, animal or insect bites, noxious plants.

## What will you do to correrct it?

Provide information and train students who may be exposed to the conditions and have an outdoor first aid kit bag.

learning by doing

# 3rd Lesson Plan

# POLLINATOR GARDEN

learning by doing

## Course Category

Nature Education

## Title of Lesson

Pollinator Garden

## Type of Activity

Outdoor Learning

## Key Words

Pollination, biodiversity, climate change, sustainability, outdoor learning

## Lesson Description

Pollination is a vital stage in the life cycle of all flowering plants. It occurs when pollen grains are moved between two flowers of the same species by wind, water or animals. Successful pollination, which may require visits from multiple pollinators to a single flower, produces healthy fruit and fertile seeds, allowing plants to reproduce. Without pollinator visits to fruit and vegetable plants in our gardens and fields, we would have no produce!

## Lesson Duration

65 minutes (1-2 months for pollinator garden)

## Learning Objectives

O1. To learn the importance of pollinators
O2. To learn different ways to attract pollinators to a garden
O3. To understand the value of creating pollinator gardens
O4. To protect threatened and endangered species
O5. To participate citizen science project and working as a team to collect the data to help scientists

## Learning Outcomes

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O2, O3 |
| L4. Communicate effectively and be an effective team member | L3 to O4, O5 |

learning by doing

## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

A short video (We Need Pollinators)

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by asking students the relationships between flowerin plants and the insects. Then, show students a short video of lesson (We Need Pollinators)**

Plants have flowers to attract pollinators. Pollinators help plants reproduce by spreading pollen from one flower to another. When plants reproduce, they create fruit and seed. In fact, pollinators help create one in every three bites of food you eat and about one in every four bites of food for birds and mammals! Sadly, the number of pollinators is decreasing but there are many things you can do to help. The first step is to learn about what helps pollinators stay active and healthy and then sharing what you have learned with your friends and family. This workbook will help you on your journey to help save pollinators!

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## 2nd Step

# Presentation

## Materials – Face to Face

- **Handouts**
- **Pencil**

## Materials – Face to Face

- https://www.calacademy.org/sites/default/files/assets/docs/pdf/297_pollinatorprofiles_updated.pdf (Pollinator profile)
- https://www.calacademy.org/sites/default/files/assets/docs/pdf/297_flowersseekingpollinators_imaginarygarden.pdf (Flower trait)

The answere key
A-Butterflies
B-Bird C-Moth
D-Fly
E-Bee F-Bat

## Duration -(minutes)

**15 minutes**

## Notes - Description of step – Explanations

**Arrange students into six groups. Distribute the pollinator profile and flower traits handouts. Explain the task is matching the pollinators with the flower traits that attract them. Than let them make the best guess. Explain the actual results (answere key) and discuss which factors of flowers attract pollinators.**

Pollinators visit flowers to feast on their nectar. There are many different types of pollinators including bees, butterflies, beetles, birds, flies, moths, bats, and wind. Just like us, these pollinators have preferences on what they like to eat. Pollination Syndromes describes the traits a flower has that attract pollinators. Pollination syndromes can be used to predict which pollinators will visit which flowers. Flowers and their pollinators have Mutualistic Relationships. The pollinator gets access to nutrition, while the plant ensures that its pollen is carried to another flower of the same species so it can reproduce.

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## 3rd Step

# Training/Practice

## Materials – Face to Face

- **A plant pot or any container you have on hand (a yogurt container, or used milk jug work well also)**
- **Soil**
- **A packet of wildflower or bee friendly seeds**

## Materials – Online

**https://www.youtube.com/watch?v=aHfr8UxQoj8**
**Watch the video make a recycled container.**
**https://www.youtube.com/watch?v=GLVzOEfcrf8**

## Duration -(minutes)

**1-2 months**

## Notes - Description of step – Explanations

**Research what flowers attract bees in your area. Wildflowers or local flowers are best for local bees. Blue, purple, white and yellow flowers are beautiful to bees. Find your seeds. Find a container or a place outside to plant your seeds. Plant your seeds according to the directions on the packet watch your flowers grow and the bees buzz by**

A pollinator garden is a type of garden designed with the intent of growing specific nectar and polen producing plants, in a way that attracts pollinating insects known as pollinators. Pollinators aid in the production of one out of every three bites of food consumed by humans, and pollinator gardens are a way to offer support for these species. In order for a garden to be considered a pollinator garden, it should provide various nectar producing flowers, shelter or shelter-providing plants for pollinators, and avoid the use of pesticides.

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## 4th Step

# Application

## Materials – Face to Face

- **Handout**
- **Pencil**

## Materials – Online

**https://scistarter.org/go/library-sunflower-multiple-count**

## Duration -(minutes)

**30 minutes**

## Notes - Description of step – Explanations

**Organise a citizen science event to identify and count pollinators as they visit flowering plants. Invite also families to help their children. You can share your datas help scientists understand and respond to changes in pollinator populations and the types of flowering plants that pollinators prefer from wherever they are. Use this link:**
**https://scistarter.org/library-kits/observing-pollinators**

It is the citizen science project including simply observation any flowering plant for less than 15 minutes, counting and identifying the pollinators that visit the plant, then log data online as instructed to participate in the project.

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## 5th Step

# Closure

## Materials – Online

| | | | |
|---|---|---|---|
| Old wooden pallets | Old terracotta pots | Bark | Straw |
| Strips of wood | Old roofing tiles | Pinecones | Moss |
| Dry leaves | Old logs | Woodchips | Soil |
| Bricks, preferably those with holes through them | | | Sand |
| Hollow bamboo canes | | | |

## Materials – Online

https://www.woodlandtrust.org.uk/blog/2019/09/how-to-build-a-bug-hotel/

https://youtu.be/Qpau_m2OCaE

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Discuss with the students how they can help the pollinators. Then propose them to build insect hotel. Explain creating a small home that provides shelter for pollinators, they can make a big difference to those needing somewhere to rest before they look for the next flower!**

Building a bug hotel (also known as a wildlife hotel or stack) in your garden can provide a safe hideaway for wildlife and help make use of your garden waste. A well-built hotel can shelter anything from hedgehogs to toads, solitary bees to bumblebees, and ladybirds to woodlice.

## Assessment Methods

Mind map: Hold a session after the activity for students to reflect on their findings. Make a mind map of the types of plants and pollinator activities that students found the best and the most interesting.

## List of References/ Additional Recommended Reading


1.http://www.bbc.com/future/story/20140502-what-if-bees-went-extinct
2.https://www.thebeecause.org/wp-content/uploads/2020/04/bee-a-friend-to-pollinators-lesson-plan-with-poster.pdf
3.https://www.nature.org/content/dam/tnc/nature/en/documents/nature-lab-lesson-plans/NL-Gardens-Habitat.pdf
4.https://www.keepscotlandbeautiful.org/media/1570822/inviting-pollinators-to-the-schoolyard-portugal.pdf
5.https://www.nps.gov/sagu/learn/kidsyouth/upload/pollinator-activity-booklet.pdf
https://www.berriencd.org/PollinatorGuide_FullColor_02052020.pdf


## Differentiation

Take a field trip to a flower garden. Record your observations on what pollinators you see there. Be sure to include notes about the flowers themselves. Did you find anything surprising?

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| What is the worst that could happen with this lesson? | What will you do to correrct it? |
| --- | --- |
| Stinging by an insect | Apply a cloth dampened with cold water or filled with ice to the area of the bite or sting for 10 to 20 minutes. This helps reduce pain and swelling. If the injury is on an arm or leg, raise it. Apply to the affected area calamine lotion, baking soda paste, or 0.5% or 1% hydrocortisone cream. Seek medical care if the swelling gets worse, the site shows signs of infection or you don't feel well. |

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# 4th Lesson Plan

# SUPER STICKS

learning by doing

## Course Category

Nature Education

## Title of Lesson

Super Sticks

## Type of Activity

Outdoor Learning

## Key Words

Nature, art, ephemeral art, creativity, recycling

## Lesson Description

Art plays a large part in making our lives infinitely rich. Art stimulates different parts of our brains to make us laugh. Art gives us a way to be creative and express ourselves. For some people, art is the entire reason they get out of bed in the morning. You could say "Art is something that makes us more thoughtful and well-rounded humans." On the other hand, art is such a large part of our everyday lives, we hardly even stop to think about it. Look at the desk or table where you are right this minute. Someone designed that. It is art. Your shoes are art. coffee cup is art. All functional design is art. The main inspiration of the art is nature.

## Lesson Duration

110 minutes

## Learning Objectives

O1. To learn the relationship between art and nature and how artists are inspired by nature
O2. To discover Emperal art with nature
O3. To develop creativity via art
O4. To express yourself by using art
O5. To prepare art project to increase awareness on nature
O6. To meet local artists and work with them on a art project

## Learning Outcomes

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O5 |
| L5. To experience new outdoor activities or develop skills | L3 to O2, O3, O4, O6 |

learning by doing

## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

A short video (Art in Nature)

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by asking students about the relationship between art and nature. Then, show students a short video of lesson (Art in Nature)**

Nature is everywhere which means so too can art. Whether you are out in the backyard, the park, the forest, even just the sidewalk waiting for a bus there is nature around us. And with nature, everyone expresses their creativity. A form of art inspired by nature is Ephemeral art. Artistic creations are made from items found in nature including leaves, sticks, bark, pebbles, seedpod, nuts, berries, petals, sand or shells. Options are endless, anything in nature can be used. The artwork is created on the ground, or on the sand at the beach, but can also be 3D in nature through sculpture. No glue, paper, paint, clay or extra tools are needed. It is simply made on the spot wherever you are in nature with whatever natural resources lie before you in the environment.

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## 2nd Step

# Presentation

## Materials – Face to Face

- Sticks (10-15 sticsk for every group)
- Natural materials like cone, acorn, seeds
- String, scissors
- Handout

## Materials – Online

1.https://cdn.oxfordowl.co.uk/2016/07/22/14/43/49/60/super_sticks_activity_sheet.pdf

2.https://www.vincentvangogh.org/van-gogh-paintings.jsp

3.https://www.vangoghmuseum.nl/en/art-and-stories/art/vincent-van-gogh

4.https://www.henrimatisse.org/paintings.jsp

## Duration -(minutes)

10 minutes

## Notes - Description of step – Explanations

Divide students into groups, then distribute the handout and other materials to each group. Give the directions: Your primary material is a stick. You can do many things using it. Each group must choose five things, then create them and one own original thing by using their creativity. After they finish their work every group share them with the class. Finally discuss how great artists like Vincent Van Gogh and Henry Matisse were inspired by nature.

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One of the most remarkable artists to ever live, Henry Matisse once said: "An artist must possess Nature. He must identify himself with her rhythm, by efforts that will prepare the mastery which will later enable him to express himself in his own language." For as long as there has been art, artists have been enthused by nature. Apart from providing endless inspiration, many of the mediums that artists use to create their masterpieces such as wood, charcoal, clay, graphite, and water are all products from nature.

## 3rd Step

# Training/Practice

## Materials – Face to Face

- **Locate an appropriate outdoor spot for the activity. Ideally choose one with an abundance of natural materials that can be rearranged for the activity but resilient enough to withstand the disturbance.**

## Duration -(minutes)

**35 minutes**

## Notes - Description of step – Explanations

**TExplain students you are going to outside to create Ephemeral art. Show some examples to motivate them. When you arrive to the location give the directions: Look for a natural outdoor space that "speaks" to you. This space can be a forest, a stream, a beach, a park or even your own backyard. This location will become the "canvas" (backdrop) for your art. Now look for and collect natural materials.**

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**Remember the rule "if it grows, then no". That means you don't pull plants out of the ground or cut any plant (or part of a plant) that's alive. You collect pieces you find scattered...use things like fallen leaves, twigs, stones, sand, mud, pine cones, acorns, snow, etc. Please bring them back to the site you have chosen as your canvas. Now arrange them in a pattern to make your "art" piece. If you'd like, take a photo of your art piece. You can take a time-lapse photo: one now and then another in 24 hours to see how the art has changed. You can also take a photo from a different angle, such as a worm's eye view or bird's eye view. Or you can take a photo of a foot or a hand with the art – it helps to show its scale.**

Ephemeral Art is a broad and flexible category of art for works that exist only once and survive only in documentary form (such as a photograph). Anyone can create ephemeral art. While nature provides both the landscape and the objects of design, nothing living is taken or used. There 3 is only one rule... "if it grows, then no". Ephemeral art respects our natural environment. The beauty is that your art piece is unique and ephemeral because it won't last. It's not meant to last. That's part of its beauty.

## 4th Step

# Application

## Materials – Face to Face

- **Unlimited number of 5 to 7 chairs around small tables**
- **Talking object (e.g., talking stick, stone, or art object)**
- **Markers and one or two pieces of flip-chart paper per table optional**

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## Materials – Online

https://www.liberatingstructures.com/17-conversation-cafe/

## Duration -(minutes)

**45 minutes**

## Notes - Description of step – Explanations

**Invite local artists to your school and organise "conversation cafe" with them to create an art project on nature conservation. State the theme of the conversation, usually in the form of a question. Explain that there will be four conversation rounds at every table, two first rounds using a talking object, the third as an open conversation, and a final round with the talking object. Give the duration of each round. Distribute the talking objects. Read the six Conversation Café agreements. See the text in the link. Ask for someone at each table to volunteer as the host. The host is a full participant whose role is to gently intervene only when a participant visibly fails to observe one of the six agreements, most frequently talking. First round with the talking object: each person shares what he or she is thinking, feeling, or doing about the theme or topic. 1 min. per person. Second round with the talking object: each person shares thoughts and feelings after listening to everybody at the table. 1 min. per person. Third round: open conversation (option to use talking object). 20–40 min. Fourth round with the talking object: each member shares "takeaways." 5–10 min.**

The format of the Conversation Café helps people have calm and profound conversations in which there is less debating and arguing, and more listening. Sitting in a circle with a simple set of agreements and a talking object, small groups will engage in rounds of dialogue with little or no unproductive conflict. As the meaning of their challenge pops into focus, a consensual hunch is formed that will release their capacity for new action.

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## 5th Step

# Closure

## Materials – Online

- Paper
- Pencil

## Duration -(minutes)

10 minutes

## Notes - Description of step – Explanations

Discuss the details of art project that they will work on it and make a plan.

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## Assessment Methods

Art project: Prepare an art project by using the ideas created conversation cafe with local artists.

## List of References/ Additional Recommended Reading

https://www.childhoodbynature.com/the-beauty-of-ephemeral-nature-art/
https://www.lsrca.on.ca/Shared%20Documents/Nature-Activities/Ephemeral-Art.pdf
https://humansinnature.org/2021/10/14/the-importance-of-nature-in-art/

## Differentiation

For Ephemeral art activity, if students all have their own devices that they used to take pictures, the simplest way may be to have each student pull up an image on the device and set it up on their desk. Students can then move around the room and observe the works that their classmates produced. If the local artist can not visit your school you can organise virtual conservation cafe.

## What is the worst that could happen with this lesson?

Criticism – even well-intentioned criticism – can stifle creativity.

## What will you do to correrct it?

When students show the art of piece they have been working on, resist the urge to point out flaws or offer suggestions for improvement. Instead, express your admiration for the work. You can also ask questions that will help them to think more deeply about their art, such as "What inspired you to create this piece?" or "What do you feel when you look at it?"

learning by doing

# 5th Lesson Plan

# WILD NUMBERS

learning by doing

## Course Category

Nature Education

## Title of Lesson

Wild Numbers

## Type of Activity

Outdoor Learning

## Key Words

Ecology, species, scientific observation

## Lesson Description

How many species live on earth? The answer may come as a shock. We don't know. Current estimates for species on Earth range between 5.3 million and 1 trillion. So why don't we know the answer to this fundamental question? Part of the problem is that we cannot simply count the number of life forms. Many live in inaccessible habitats (such as the deep sea), are too small to see, are hard to find, or live inside other living things. So, instead of counting, scientists try to estimate the total number of species by looking for patterns in biodiversity. In the early 1980s, the American entomologist Terry Erwin famously estimated the number of species on Earth by spraying pesticides into the canopy of tropical rainforest trees in Panama. At least 1,200 species of beetle fell to the ground, of which 163 lived only on a single tree species.

## Lesson Duration

95 minutes

## Learning Objectives

O1. To learn that species can be identified by their characteristics
O2. To practice the classification of species by using a dichotomous key
O2. To identify the species of trees in their community
O4. To present their findings about trees to other groups
O5. To work as a team and express thoughts and feelings productively
O6. To encourage as well mutual aid between group members

## Learning Outcomes

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O2, O3 |
| L2. Build confidence and self awareness | L3 to O4, O5 |

learning by doing

## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

A short video (The catalogue of life)

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by asking students how many species live on Earth. Then, show students a short video of lesson (The catalogue of life)**

Scientific research shows that 86% of land and 91% of marine species remain undiscovered. The unstinting efforts of field taxonomists will only provide the number for a while. In the more than 250 years since Swedish biologist Carl Linnaeus began the science of taxonomy, 1.2 million species have been identified and classified. At this pace, Scientists estimate that it will take another 480 years to record all species. The analysis also reveals that some groups are much better known than others. For example, some 72% of the predicted 298,000 plant species on land have already been documented, compared with only 12% of predicted land animal species and 7% of predicted land fungi species.

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## 2nd Step

# Presentation

## Materials – Face to Face

- Handout
- Pencil

## Materials – Online

https://www.grimsargh-st-michaels.lancs.sch.uk/wp-content/uploads/2021/01/26053-NewlyDiscoveredSpecies-7-11-NewlyDiscoveredAmphibianIdentificationworksheet.pdf

## Duration -(minutes)

15 minutes

## Notes - Description of step – Explanations

Explain how scientists work when they discovered new species. Divide students into groups. Distribute the handout to each group and explain them that they imagine they are scientists that have discovered nine new amphibian species. Students must correctly classify each species by matching its photograph with the correct species name. Inform students that they must look carefully at each photograph to identify key features that might help them identify each species, before working their way through the classification key. Once they have worked out the species' names using the key, they must write the names under the correct photograph.

Sometimes, correctly identifying a species can mean the difference between life and death. For people who like to hunt for edible mushrooms, incorrect identification could lead to accidental poisoning. Similarly, determining if a snake is venomous will impact the treatment method. When scientists need to quickly and accurately identify species based on their characteristics, they often turn to a tool called a dichotomous key. A dichotomous key is a series of descriptions separated into pairs that can be used to identify organisms by their characteristics. The word dichotomous means "something that is made of two parts." These keys are designed to be used with a defined set of specimens by answering a series of simple yes or no questions. It is important to remember that a dichotomous key is not a classification tool but is designed specifically to identify a particular specimen from a defined group of specimens.

## 3rd Step

# Training/Practice

## Materials – Face to Face

- **Handout**
- **Pencil**
- **Smartphone**
- **Location with plenty of trees**

## Materials – Online

**https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/Tree-Identification-guide-8pp-chart_corrected.pdf**

## Duration -(minutes)

**30 minutes**

learning by doing

## Notes - Description of step – Explanations

**Explain students, they are familiar to use dichotomous key, so you can practice it for trees. When you arrive to the location divide students to groups and distribute the handout. Each group collect the leaf sample from as many trees as possible, identify trees by using their leaf key and take it photo. Remind students to be careful not to damage trees and surrounding grounds. When you return the classroom every group share their findings and prepare a report. Discuss their reports by asking some questions: Describe how leaf shapes, sizes, differ from tree to tree. Look for differences in your leaves? How are your leaves the same? Do you see any hairs? Do they feel rough or smooth?**

All trees have clues and features that can help with identification. You need to know what to look out for. This quick guide to tree identification will give you a few basic hints and tips. Leaf type, shape, appearance, texture and colour are all key characteristics when identifying trees. They are also often the most obvious feature, particularly in spring and summer. The needles and scales of conifers are also considered types of leaves. The leaves of broadleaved trees fall into two basic types - simple and compound. Leaves are whole and are not divided right to the central leaf vein, such as apple or birch. The edges of some simple leaves can be indented or lobed, such as sycamore, field maple and hawthorn, so take care not to mistake these for compound leaves. Lime leaves are a simple and heart-shaped leaf with a pointed tip. Compound leaves fall into one of two categories - pinnate and palmate. Pinnate are feather-shaped where leaflets are attached in pairs along the central vein such as rowan, ash and elder. These are palm-shaped, like the outstretched fingers of a hand. Horse chestnut has palmately compound leaves. Be careful not to mistake Acer species such as sycamore and field maple as having palmately compound leaves - they are actually simple with a lobed margin.

learning by doing

4th Step

# Application

## Materials – Face to Face

- Local species guide books
- Pencil
- Paper
- Smartphone

## Materials – Online

https://creately.com/blog/diagrams/what-is-a-dichotomous-key/

https://creately.com/lp/dichotomous-key-maker/

## Duration -(minutes)

30 minutes

## Notes - Description of step – Explanations

Explain students they are going to make their own dichotomous key identify local species. Inivite local scientists to your school and collaborate with them. First find your local species. Tehn pay attention to the species you are trying to identify with your dichotomous key. List down the characteristics that you can notice. Organize the characteristics in order. When creating your dichotomous key, you need to start with the most general characteristics first, before moving to the more specific ones. You can use statements (i.e. has feathers and no feathers) or questions (does it have feathers?) to divide your species into two groups. The first differentiation should be made on the most general characteristic. Based on the next contrasting characteristic, divide the species further.

**For example, first, you may have grouped your animals as having feathers and having no feathers, in which case the ones with feathers can be categorized as birds while you can further subdivide the ones that have no feathers as having fur and having no fur. Continue to subdivide your species by asking enough questions until you have identified and named all of them. Draw a dichotomous key diagram and test it out. Every group present their key at the end of the session.**

There are important clues to create a key: Consider only one characteristic at a time. Use morphological or observable characteristics as much as you can. Use major characteristics when dividing the organisms in the beginning and use lesser or less obvious characteristics to divide them into smaller groups. When writing contrasting statements, rely on similar word formats (i.e. have feathers and don't have feathers). Be specific in your statements and avoid repeating the same characteristics. Use questions that lead to yes or no answers rather than statements

## 5th Step

# Closure

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Discuss their experience as amateur scientists and whatever field of science interests them, at this point there's likely a project they can help with.**

## Assessment Methods

Infographic: Prepare infographic about species on Earth.
https://plana.earth/academy/infographic-iucn-endangered-species-red-list

## List of References/ Additional Recommended Reading


1.https://theconversation.com/how-many-species-on-earth-why-thats-a-simple-question-but-hard-to-answer-114909
2.https://www.nagwa.com/en/explainers/842173734891/
3.https://extension.usu.edu/utahnatureexplorers/files/generalnature/classyclassification/Classy-Classification.pdf
4.https://www.lcps.org/cms/lib/VA01000195/Centricity/Domain/14374/Dichotomous%20Key.pdf
5.https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/british-trees/how-to-identify-trees/
6.https://fpdcc.com/wp-content/uploads/2019/03/FPCC-Tree-Shrub-Guide-101217.pdf
https://creately.com/blog/diagrams/what-is-a-dichotomous-key/


## Differentiation

You can prepare some fun tool to identify species:
https://www.woodlandtrust.org.uk/media/48346/leaf-idial-sheet.pdf

| What is the worst that could happen with this lesson? | What will you do to correrct it? |
| --- | --- |
| Lack of motivation to do group works | Keep groups small. Use group resumes or skills inventories to help teams delegate subtasks. Assign roles (e.g., group leader, scheduler) or encourage students to do so. Warn students about time-consuming stages and tasks. Actively build communication and conflict resolution skills. |

learning by doing

# 6th Lesson Plan

# BIODIVERSITY SURVEY

learning by doing

## Course Category

Nature Education

## Title of Lesson

Biodiversity Survey

## Type of Activity

Outdoor Learning

## Key Words

Biodiversity, ecosytems, nature decline, sustainability

## Lesson Description

Our home, Earth, is the only known planet with diverse ecosystems in the entire universe. Scientists have formally described approximately 1.4 million species, but we know this number represents a minority of current species. Most estimates of the total number of living species range between 5 and 10 million. Life in this beautiful home has been sustained only because of nature's ecosystem services. Major threats to biodiversity and individual species include habitat degradation, climate change, invasive species, over-exploitation and increased pollution, most of which directly result from human activities. In the Amazon rainforest, deforestation is occurring at an unprecedented rate for agriculture (e.g. soy bean and palm oil plantations and cattle ranching), mining, unsustainable logging and development (e.g. roads and infrastructure). This degradation is also exacerbating climate change since the Amazon retains a large proportion of the world's carbon, which would otherwise be in the atmosphere.

## Lesson Duration

160 minutes

## Learning Objectives

O1. To Understand, explain and give examples of local Irish nature, biodiversity, species and habitats
O2. To name and list five species that are living in their local natural area
O4. To participate in citizen science events to help scientists
O5. To spend time in nature is good for mental and physical health
O6. To learn to recognize personal strengths and how this affects self-confidence and self-esteem in the fieldwork
O7. To learn recognizing how personal qualities, attitudes, skills and achievements are evaluated by others, affects confidence and self-esteem in the fieldwork

## Learning Outcomes

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O2, O3 |
| L3. Take responsibility and solve problems creatively | L3 to O4, O5, O6, O7 |

learning by doing

## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

A short video (What is Biodiversity?)

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by asking students what is biodiversity and why it is important? Then, show students a short video of lesson (What is Biodiversity?)**

Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life. Biodiversity supports everything in nature that we need to survive: food, clean water, medicine, and shelter. But as humans put increasing pressure on the planet, using and consuming more resources than ever before, we risk upsetting the balance of ecosystems and losing biodiversity. WWF Report found an average 69% decline in global populations of mammals, fish, birds, reptiles, and amphibians since 1970.

learning by doing

## 2nd Step

# Presentation

## Materials – Face to Face

- A small plastic mirror for each student
- A natural area like a park, a woodland

## Duration -(minutes)

15 minutes

## Notes - Description of step – Explanations

**Explain going to outside and look around with a different perspective. When you arrived a natural area explain to the students how they are going to use a mirror to view the wood through the eyes of different animals. They need to be careful they don't bump into anything because they will be looking through the mirror! Get the students to suggest a bird's name. A bird views the world from above while flying high so hold your mirror high above you and look up into it as you walk around. Do the students know what is special about a rabbit's vision? They have a much larger range in order to spot a predator creeping up on them. If the students hold their mirrors to the side of their nose facing them and they will be able to see both forwards and backwards at the same time. Get them to make a journey across the woodland floor with their mirrors, pretending to be a little wood mouse. What view does a beetle get? Hold the mirror in front of your facing upwards and the students will get an interesting viewpoint of the woodland canopy.**

It is essential to be aware that many different perspectives exist and that learning to understand the world from many points of view enhances our knowledge and skills. It is also essential to realize that our perspectives incorporate all life experiences and draw upon knowledge from many fields of inquiry.

learning by doing

## 3rd Step

# Training/Practice

## Materials – Face to Face

- Handputs
- Pencil
- A pale-coloured container or s dustpan and brush
- Natural area including hedges

## Materials – Online

**Hedge identification:**
https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/BIODIVERSITY-4pp-chart.pdf

**Invertabrate identification:**
https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/Invertebrates-guide--UPDATED-FINAL.pdf

## Duration -(minutes)

30 minutes

## Notes - Description of step – Explanations

**Find a hedge area and choose a 3 metre stretch of hedge. Then identify your hedge area by using the handout.**

**Catch invertebrates in the hedge by gently shaking the branches above your container so that the invertebrates fall in or using a dustpan and brush to gently sweep the outer leaves of the hedge to knock the invertebrates into the dustpan. Take care not to disturb nesting birds. Then identify the invertebrates by using the handout. At the end of the activity discuss your findings and what invertebrates are living in the hedge. The invertebrates you find can be a food source for birds, mammals and other invertebrates.**

Hedges are rows of bushy shrubs or low trees and are a familiar part of our British countryside, acting as field boundaries. You will find them in many streets, parks, school grounds and the countryside. Apart from acting as boundaries and barriers, hedges are important habitats for a wide variety of animals and plants. They are one of the most biodiverse of all the habitats found in Britain. It is estimated that over 125 of our most threatened species are associated with hedges. More than 80% of our farmland birds rely on hedges for protection and food and 10 of the 18 most threatened mammals feed on their fruits and berries.

learning by doing

## 4th Step

# Application

## Materials – Face to Face

- Smartphone
- iNaturalist app
- A natural area aroun the school and its map
- Birds, insects, plants identificitaion books

## Materials – Online

https://youtu.be/PCkqr7MyJFU

## Duration -(minutes)

90 minutes

## Notes - Description of step – Explanations

Tell students that they will explore the diversity of life and prepare for participation in a bioblitz. Set a date (minimum suggested time 1 hour) and location within the schoolyard for your BioBlitz. Consider seasonal weather before choosing a date. Identify a location at your schoolyard for a BioBlitz. This is where your students will make observations. Take time to walk around and find areas with a higher concentration of plants and animals such as a pond, tree covered area, etc. Have your students sketch a map of the area. Organize the participants into groups. Assign a group leader to each group that will collect species recordings and enter them into the iNaturalist app or follow participants and enter observations into app as they go. Ask local scientists that may be able to help students identify species in the field. Every group takes a picture with their smartphone and uploads them by using the iNaturalist app.

**Then identify the species and prepare the bioblitz report by helping of scientists. Practice using the app before the big event. The app may not work in all schoolyards and the observations will have to be entered after the event. There are tutorials on the Alliance website and the iNaturalist website.**

BioBlitz is an excellent opportunity for students to learn more about the environment in their local geography. Students observe their local schoolyard and conduct a biodiversity survey! Students can observe all living things in their schoolyard; plants, animals, microbes, etc. Students will record their observations and geographical location of their findings. Their observations can be entered into iNaturalist, an app and website contributing to a global biodiversity count. One of the world's most popular nature apps, iNaturalist helps you identify the plants and animals around you. The app and website connects users with a community of over 750,000 scientists and naturalists who can help identify observations and provide insight into the significance.

## 5th Step

# Closure

## Materials – Online

https://ed.ted.com/lessons/why-is-biodiversity-so-important-kim-preshoff

## Duration -(minutes)

**15 minutes**

## Notes - Description of step – Explanations

**Watch together a short video with entitled "Why is biodiversity so important" then discuss how can students help to save biodiversity. Then motive them to apply one of their ideas to action.**

## Assessment Methods

Poster Divide the students to pairs and they prepare a poster to show the importance of the biodiversity. Then organise aan exhibiyt to share them with the school.

## List of References/ Additional Recommended Reading


1.https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/BIODIVERSITY-16pp-booklet_legacy.pdf
2.https://d3q9070b7kewus.cloudfront.net/downloads/ourplanetlab_biodiversitysurveying_educatorguide.pdf
3.https://livelearn.org/assets/media/docs/resources/Discovering_Biodiversity.pdf
4.https://www.stem.org.uk/resources/elibrary/resource/32035/biodiversity-survey-what-wildlife-supported-your-hedge
5.https://www.nationalgeographic.org/activity/introducing-biodiversity-and-bioblitz/
6.https://www.inaturalist.org/pages/managing-projects


## Differentiation

You can choose another natural area like a shrub or a woodland instead of a hedge.

## What is the worst that could happen with this lesson?

Field survey problems like the bad weather conditions or unsecure natural area, for example there would be a lot of bee or wasp.

## What will you do to correrct it?

Make sure you are dressed appropriately for the weather and wear appropriate footwear. If surveying near a road wear bright clothing, ideally a reflective vest. Make sure you can reach the chosen area safely, without having to cross deep ditches. If you find broken glass or litter with sharp edges, you might need to choose a different stretch of area. Cover any open cuts before starting and wash your hands thoroughly afterwards and especially before eating. Do not eat fruits and berries unless you are confident of their identification, as many are poisonous to humans. Beware of stinging nettles, prickles and thorns. Bees and wasps may sting. If there is a lot of bee or wasp activity, a wasp nest may be nearby, so survey a different stretch of area. While most stings only result in some pain and swelling, sometimes it can be much more severe. Seek medical advice if stung near the eyes, nose or throat, or if the person has been stung multiple times.

learning by doing

# 7th Lesson Plan

# HOLE HOMES

learning by doing

## Course Category

Nature Education

## Title of Lesson

Hole Homes

## Type of Activity

Outdoor Learning

## Key Words

Habitat, ecology, grasslands, biome

## Lesson Description

The term "habitat" has several meanings. In ecology it means either the area and resources used by a particular species (the habitat of a species) or an assemblage of animals and plants together with their abiotic environment. A habitat can be a salt marsh, a meadow or a pine forest, but a habitat can also be recognised at the landscape level of a tundra type or a deep-sea mud covering several hundreds of square kilometres. At the other extreme, it may be a microhabitat of less than 1 $m^2$, for example decaying wood, or animal dung in grassland environments. A habitat or a group of related habitats can be considered an ecosystem. Ecosystems are dynamic complexes of plant, animal and micro-organism communities and their non-living environment, which interact to form functional units.

## Lesson Duration

100 minutes

## Learning Objectives

O1. To generalize that the common needs for food, water, and shelter are shared needs among all animals, including humans.
O2. To identify basic components of one habitat.
O3. To siscuss the relationship between habitat and adaptations.
O4. To describe why good habitat is necessary for the health, safety, and continued life of all living things.
O5. To collaborate well and work together to reach a common goal more efficiently
O6. To develop skills to give and receive constructive feedback

## Learning Outcomes

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O2, O3, O4 |
| L4. Communicate effectively and be an effective team member | L3 to O5, O6 |

learning by doing

## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

A short video (Habitats Our Homes)

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by asking students to describe their homes. What is basic to each home? Each home has a place to prepare food and eat, a bed to sleep in, and water to drink and clean with.Then, show students a short video of lesson (Habitats Our Homes)**

The plants and animals that have always lived in this land of hot, cold, and wind have adapted to the conditions.
Animals all over the world share the same needs for survival-food, water, shelter, reproduction of their kind, and space to move. Humans are no different and all adapt to survive in the climates and habitats in which they live. Animals that live in forests often build their homes in tree trunks, under the bark of trees, on tree branches, or in the stumps and snags of dead trees.

learning by doing

## 2nd Step

# Presentation

## Materials – Face to Face

- **A location with grassland**
- **Journal**
- **Pencil**

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Explain students you are going to outside discover grassland area. When you arrive to the location give the directions: Sit in the field and describe what everyone sees. Then describe a grassland -- a place where there are few trees, the wind blows a lot, it is usually either very hot or very cold, and it doesn't rain a lot. The land is covered with grass higher than our heads while we are sitting down. When the wind blows, all the grass moves at the same time. Birds fly above the grass, and you can hear insects chirping and frogs croaking during the spring, summer, and fall. The sky has great big, white, fluffy clouds as far as you can see. They keep a journal wtih their observation. End of the session some volunteers share their observations.**

Grasslands are characterized as lands dominated by grasses rather than large shrubs or trees. Savanna, steppe, prairie, or pampas are all grasslands, the globe's most agriculturally useful habitats. grasslands account for between 20 and 40 percent of the world's land area. They are generally open and fairly flat and exist on every continent except Antarctica, making them vulnerable to pressure from human populations. Threats to natural grasslands, as well as the wildlife that live on them, include farming, overgrazing, invasive species, illegal hunting, and climate change.

learning by doing

## 3rd Step

# Training/Practice

## Materials – Face to Face

- A location with grassland
- Journal
- Pencil
- Handout
- Smartphone with Google Map app

## Materials – Online

https://youtu.be/IFew1d5SFA8
https://youtu.be/xeQyq_fsurI
https://www.discoverwildlife.com/how-to/identify-wildlife/how-to-identify-animal-holes/

## Duration -(minutes)

30 minutes

learning by doing

## Notes - Description of step – Explanations

**Disscus which animals are living in grasslands. Watch the grassland videos together then explain animals adapted to living in the grasslands eg. prairie dogs digg small holes, burrows that can be openings to underground tunnels and dens. Explain other mammals live underground by opening holes, ground squirrels, chipmunks, moles, voles, badgers, gophers and groundhogs. Distribute the handout to identify animal holes, then student walk around the field, find holmes and save their location with your smartphone. Determine material the hole is made in such as earth, stump, rock, etc. Determine hole's surroundings (rocks, trees, etc). Take pictures of hole and hole surroundings. End of the session they prepare a hole map and report with their findings.**

A hole is a tunnel or a burrow that an animal digs for habitation (a place to live) or as a temporary refuge (a place of protection). Holes can also be the byproduct of locomotion—moving from one place to another. Some holes function as "larders," where animals keep food. Holes provide shelter from predators and extreme temperatures. For these reasons, animals have used burrowing behavior for a very long time. In fact, a 110-million-year-old dinosaur burrow was recently discovered on the southeastern coast of what is now Australia.

learning by doing

## 4th Step

# Application

## Materials – Face to Face

- **Handout**
- **Natural materials**

## Materials – Online

**https://www.rspb.org.uk/fun-and-learning/for-teachers/lesson-plans-and-supporting-resources/homes-for-nature/**

## Duration -(minutes)

**20 minutes**

## Notes - Description of step – Explanations

**Explain to students they can help nature by constructing animal homes. Divide students into groups and distribute the handout. Every group chooses one of them and makes it by using its guide. After they finish, they ask help from ecologists to put it in the right place.**

As urban areas grow – it is expected that 95% of the population increase over the next decade will be in cities. It becomes even harder to conceive that humans and wildlife could co-exist in urban landscapes. While the diversity was low in most metropolitan areas, there was little difference in the number of species and the habitat use of wild mammals between suburban areas and more natural settings. Most of the animals in the wider region were also found in suburban areas, thus offering new insights into how wildlife can co-exist with humans in an urbanizing world. Therefore, by taking a social and ecological approach to urban planning, we can create environments where people thrive, and wild animals roam. People can develop homes to increase urban biodiversity.

learning by doing

## 5th Step

# Closure

## Materials – Online

https://www.mdpi.com/1424-2818/14/4/263
https://land8.com/5-best-ways-to-increase-biodiversity-in-urban-landscapes/

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Discuss how students can help to works to increase local urban diversity.**

As habitat modification and climate change intensify globally, urban environments are becoming the best or only available habitats for fauna, with wildlife increasingly being found to reside in them. Wildlife diversity and threatened species may be under pressure from rapid urbanization, especially in remnant habitats that are proximal to urban areas. Some species may thrive under urban conditions given the benefits of access to reliable supplementary resources, including water and food, provided by human activities. The 'human shield' effect, in creating a buffer from larger predators for prey, and/or supplementary food resources that reduce predation pressure on smaller animals, can also benefit small prey species in urban habitats. However, some fauna species may not benefit from such rewards or cannot endure the additional risks and stressors that human activities create in urbanized environments, such as pesticides, domestic pets, and introduced light and noise. These negative impacts can result in local extinctions for such species, reducing local wildlife diversity.

## Assessment Methods

Diorama: Using pictures of a grassland and experiences from the field work, have your students make a diorama of a grassland. If making a diorama use a soda pop box/ flat and pipe cleaner or clay animals. Ask them to include at least one nest and one underground home.

## List of References/ Additional Recommended Reading


1.https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5073089.pdf
2.https://www.eea.europa.eu/themes/biodiversity/an-introduction-to-habitats
3.https://www.reconnectwithnature.org/news-events/big-features/life-underground-what-lives-just-underneath-our-feet/
4.https://education.nationalgeographic.org/resource/burrow
5.https://www.treehugger.com/burrowing-animals-5119407
6.https://www.daviddarling.info/encyclopedia/N/Northern_grasslands.html
7.https://georgiawildlife.com/out-my-backdoor-here's-hole-story


## Differentiation

In an open space or natural area that is basically undisturbed by development, search for animal homes and discuss the variety of sites animals find even without trees.

learning by doing

## What is the worst that could happen with this lesson?

When they work in the field they need to know animal rights.

## What will you do to correrct it?

They must avoid contact with animals that might be in the holes being studied, though the chance of meeting one is unlikely. They never disturb animals and can not harm the hole or burrow.

learning by doing

# 8th Lesson Plan

# BUILDING A GREENWAY

learning by doing

## Course Category

Nature Education

## Title of Lesson

Building a Greenway

## Type of Activity

Outdoor Learning

## Key Words

Urban ecology, ecosystem services, nature based solutions, greenways

## Lesson Description

Humanity is increasingly urban but continues to depend on Nature for its survival. Cities depend on the ecosystems beyond the city limits but also benefit from internal urban ecosystems. The natural urban ecosystems contribute to public health and increase the quality-of-life of urban citizens, e.g. by improving air quality and reduce noise. Urban nature-based solutions are often used to help achieve four main outcomes: Happy and healthy cities: Putting public health and liveability in focus. Water-friendly cities: Putting water security and management in focus. Nature-rich cities: Putting ecosystem services and biodiversity in focus.

## Lesson Duration

95 minutes

## Learning Objectives

O1. To realize how urban biodiversity important
O2. To learn the ecosystem services concept
O3. To discover nature-based solutions
O4. To participate team works
O5. To develop self confidence via role playing activity

## Learning Outcomes

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O2, O3 |
| L4. Communicate effectively and be an effective team member | L3 to O4, O5 |

learning by doing

## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

A short video (Nature Based Solutions)

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by asking students are cities considered part of nature or not. Discuss What is the difference between city and nature? Then, explain**

**Cities are in fact ecosystems and Nature-based Solutions (NbS) can help cities address urgent and fundamental environmental challenges by bringing ecosystems services back into cities and rebalancing cities' relationships with their surrounding areas. Finally show students a short video of lesson (Nature Based Solutions)**

Three-quarters of all land on Earth has been significantly affected by human activities. At the same time, cities depend on healthy natural environments to provide benefits, also known as ecosystem services. Ecosystem services include trees producing the oxygen we breathe, bees pollinating the crops we eat and wetlands filtering the water we drink. Restoring nature and enhancing biodiversity is essential to helping our communities and the people and wildlife who live in them become resilient to the climate crisis.

learning by doing

Nature-based solutions are actions to protect, sustainably manage, or restore natural ecosystems, that address societal challenges such as climate change, human health, food and water security, and disaster risk reduction effectively and adaptively, simultaneously providing human well-being and biodiversity benefits

## 2nd Step

# Presentation

## Materials – Face to Face

- **Pictures of animals or plants,**
- **A tape**
- **Safety pins**

## Materials – Online

https://youtu.be/sODnDWTKkZY
https://youtu.be/WU-QhsxXiXI

## Duration -(minutes)

**20 minutes**

learning by doing

## Notes - Description of step – Explanations

**Explain you are going play a fun game to learn which animals and plants living in their local area. Tape or safety pins a picture on each person's back The object is to find out what you are by asking yes or no questions. This is a good game to encourage mingling, so everybody is allowed to ask each other person only one question at a time, then they have to move on to someone else. After everybody found who he/she is discuus where you can see them, on a tree, in a park, in a woodland?**

Urban plants such as trees, shrubs and herbs, can provide food and habitat resources for a range of interesting insects, birds, reptiles and mammals. However, it is often not enough to just fill an urban space with the same plant species because most fauna require a variety of plant species for food and shelter. Unfortunately, the diversity of plants used in urban settings is often much lower than what is found in native vegetation. Therefore, some thought is needed when planning an urban space to help attract a diverse range of native fauna. For example, urban green spaces that are made up of plants of different ages and canopy heights have been shown to attract a greater diversity of native fauna compared with non-diverse plantings. Furthermore, using a diverse set of plants in urban greening projects ensures that food resources such as nectar, pollen and fruits/berries are available for native fauna throughout the year, thus increasing the usability of the urban green space.

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## 3rd Step

# Training/Practice

## Materials – Face to Face

- Handout
- City map

## Materials – Online

https://www.epa.gov/system/files/documents/2022-02/ejgreenwaycasestudy_stakeholder_roles.pdf

## Duration -(minutes)

30 minutes

## Notes - Description of step – Explanations

Explain the children what is greenways. Then you are going role playin activity about greenways. Divide students to groups of 7 students. Give the direction: Imagine city Parks and Recreation Department is meeting and you have a role in this meeting. Distribute to role cards handoutand city map to each group. They read their role and start to discuss to find solutions improve access to and use of parks and green spaces, Enhance habitat for biota, encourage physical activity and recreational opportunities, particularly for young people. Then every group share their solutions to each other.

Greenway is a corridor of undeveloped land preserved for recreational use or environmental protection. Many different types of greenways like parks and open spaces, cultural and historic resources, and the corridors of land and water which connect these other elements together. Greenways protect important habitat and provide corridors for people and wildlife. They also help improve air and water quality. For example, communities with trails provide enjoyable and safe options for transportation, which reduces air pollution.

## 4th Step

# Application

## Materials – Face to Face

- **Hand out**

## Materials – Online

**https://www.pbslearningmedia.org/resource/ecosystem-services/biodiversity-videos/**
**https://ecology.fnal.gov/wp-content/uploads/2017/08/Ecosystem-Services.jpg**

## Duration -(minutes)

**25 minutes**

learning by doing

## Notes - Description of step – Explanations

**Explain ecosystem services via a shorty video. Then divide the class to four group. Distrubute the hand out and every group works on of them: Provisioning services are the material benefits people get from ecosystems for e.g. supply of food, water, fibers, wood and fuels. Supporting services are necessary to produce all other ecosystem services, e.g., providing plants and animals with living spaces, allowing for species diversity, and maintaining genetic diversity. Regulating services are the benefits obtained from the regulation of ecosystem processes, e.g., air quality and soil fertility, control of floods or crop pollination. Cultural services are non-material benefits people gain from ecosystems, e.g. aesthetic and engineering inspiration, cultural identity and spiritual well-being. Each group prepare a presentation and share them it with others.**

Ecosystem services are the benefits nature provides to humans and are often categorized into provisioning, regulating, supporting and cultural. You may be most familiar with provisioning ecosystem services – including food from forests, fields, and oceans; lumber for timber and firewood; drinking water; and even natural gas and oil. Other provisioning services include plants for clothing, materials, and natural medicines. Natural ecosystems' regulatory services include climate regulation, pollination, purification of water, erosion control, flood control, and carbon storage. Supporting services include the processes that often go unseen but are fundamental to human health, such as soil formation, nutrient cycling, and water cycling. Cultural services are the non-material benefits provided by nature through spiritual enrichment, inspiration, recreation, and aesthetic value (as you can see, ecosystem services are vital to our everyday lives!). As with all life, the categories of ecosystem services are interconnected. For example, fruit trees (provisioning service) rely on the soil (supporting service) and pollination (regulating service) to thrive.

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## 5th Step

# Closure

## Materials – Online

https://wwfint.awsassets.panda.org/downloads/exe_wwf_a4_template_sbn_final2.pdf

## Duration -(minutes)

10 minutes

## Notes - Description of step – Explanations

Discuss good examples of urban nature based solutions via WWF booklet.

## Assessment Methods

Questionnaire: They participate the survey to promote the development of cities towards sustainable use of NBS.https://www.think-nature.eu/highlights/questionnaire/

## List of References/ Additional Recommended Reading

https://www.epa.gov/sites/default/files/2019-05/documents/enviroatlas_greenway_lesson_plan_additional_activities.pdf
https://unhabitat.org/news/26-nov-2021/biodiversity-resilience-and-quality-of-life-in-cities

## Differentiation

You can organise a trip to city Parks and Recreation Department to learn more details on greenways.

## What is the worst that could happen with this lesson?

There would be conflict in the team working caused from competition, personality differences, inconsistent expectations and favoritism, and differences in needs and values.

## What will you do to correrct it?

Encourage positive reinforcement among students. Establish clear rules and consequences from the beginning of the school year about conflicts in the classroom. Make sure all students have access to resources and support.

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# 9th Lesson Plan

# SPINNING THE ECOWEB

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## Course Category

Nature Education

## Title of Lesson

Spinningthe Ecoweb

## Type of Activity

Outdoor Learning

## Key Words

Ecosytems, ecoregions, ecosystem management, biodiversity, biosphere

## Lesson Description

Human cultures have developed within different ecoregions and have been sustained by them. All of the resources humans have depended on for survival and comfort have come from natural resources. Over time, attitudes and beliefs about the natural world and using natural resources have changed. In the not-too-distant past, the human population could have been more sparse compared to the natural resources available. Human impact on ecoregions was minimal. As human populations have increased, so have demands on various ecoregions. Some parts of the ecosystem are being heavily impacted and some species have become extinct.

## Lesson Duration

80 minutes

## Learning Objectives

O1. To discover the components and relationships of ecoregions and the role of ecosystem management in these ecoregions.
O2. To describe how different ecoregions are related to each other and how they form a larger ecosystem.
O3. To identify and demonstrate the role of ecosystem managers.
O4. To develop skills of critical thinking, demonstrating, describing, discussing, generalizing, identifying, listening, observing, predicting, role-playing
O5. To work as a team

## Learning Outcomes

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O2, O3 |
| L4. Communicate effectively and be an effective team member | L3 to O4, O5 |

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## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

A short video (Ecological Restoration)

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by asking students which factors determine geographic areas on Earth. Then, show students a short video of lesson (Ecological Restoration)**

Ecosystems are systems formed by the interaction of a group of organisms with each other and their environment. Ecosystems include interdependent plants, animals, the physical environment, and the ecological processes (such as exchange of matter and energy) that connect them. Areas of different sizes can be considered ecosystems, depending upon who is drawing the lines of distinction. A jar of pond water, a rotting log, a grassland, or the entire earth can each be considered an ecosystem. In this activity, the term ecosystem will be used to represent the entire earth. The entire earth's ecosystem is commonly referred to as the biosphere. On earth, there are geographic areas in which the combination of climate, topography (lay of the land), and geology determine what types of plants and animals grow and live there. These areas are called ecoregions.

A desert, with its characteristic dry climate, sandy soils, and unique wildlife is an example of an ecoregion. Other examples include grasslands, rainforests, coniferous and deciduous forests, oceans, arctic areas, fresh water streams, riparian zones, and wetlands. All of the ecoregions on earth interact to form one large ecosystem.

## 2nd Step

# Presentation

## Duration -(minutes)

**15 minutes**

## Notes - Description of step – Explanations

**Explain to students your are going to play a game. After describing and demonstrating the boundaries of the working area to a group divide the group in to two teams. One team are the hiders, the other are the seekers. Ensure there are sufficient adults in each team. The hiders go off in one big group to find one big hiding place.The seekers stay at the base and count to 10. After 10 the seekers shout all together "Where are you?" The hiders then reply "We're over here!""It is important to stress that they must reply! The seekers locate the hiders by repeating these calls and homing in on the hiding place- using their ears. Repeat the game by swapping teams and roles.**

As the group get used to the game you can allow them to hide in smaller groups within the teams or even on their own as long as the boundaries are well defined and recognised.
This enables them to build up confidence and feel secure outside in the woodland/ park etc while having fun and enjoying exploration.

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## 3rd Step

# Training/Practice

## Materials – Face to Face

- Handsout
- Pencil
- Paper

## Duration -(minutes)

20 minutes

## Notes - Description of step – Explanations

Depending on class size, choose eight to ten ecoregions (Use the chart here: https://www.psd1.org/cms/lib/WA01001055/Centricity/Domain/30/Spinning_the_EcoWeb.pdf)

Choose enough ecoregions so there will be 3-5 students involved in each ecoregion group and one student remaining to act as ecosystem manager. Give a piece of paper to students. Students choose and write the name of an organism in their ecoregion. Then they discuss the relationship between these organisms and their environment; how they depend (water, soil, rocks, wind, etc.). Then they discuss the relationship between these organisms and their environment; how they depend (water, soil, rocks, wind, etc.). Introduce the ecosystem managers. Ask students what they think ecosystem managers do. (Ecosystem managers manage the natural resources in ecoregions to maintain biodiversity or variety of life in each ecoregion and to protect the larger ecosystem.

**They assess and evaluate the conditions of an ecoregion, considering both living and nonliving components. Ecosystem managers make and carry out decisions about ecoregions while ensuring people can use necessary natural resources. Choose any organism from any ecoregion and identify that organism as a species in trouble. (Example: toucans in the rainforest are being collected, clams in an estuary are being poisoned by pollution.) Pose the problem to the ecosystem managers. Ask:**
**-What might they do to help the species?**
**-What Information do you need to make a good decision?**
**-What do you need to know about this species and its relationship to other species?**
**-How does knowing that ecoregions are connected influence your decision?**
**-How will your management decision affect other organisms or other ecoregions?**
**-What is the role of ecosystem manager?**
**-What are some other roles humans play in ecoregions besides managers?**
**-In what ways can humans be good caretakers of the ecoregions? The ecosystem?**
**-What can you do to be a good caretaker?**

As people develop a better understanding of ecological functions and their place in the ecosystem, they are incorporating these ideas into the practice of natural resource use and management. A recent philosophy adopted by many natural resource agencies for managing the earth's resources is called ecosystem management. Ecosystem management is the careful and skillful use of ecological, economic, social, and business principles in managing ecoregions as part of the larger ecosystem. This management's goal is to produce, restore, or sustain ecosystem integrity over the long-term. When ecosystem managers talk about maintaining the integrity of ecosystems, they mean retaining the ecosystem's biodiversity (variety of living organisms) and the structure and organization of the ecosystem. The need to conserve biodiversity is at the heart of ecosystem management.

While protection of biodiversity is of great importance, ecosystem managers must also consider human needs. People want ecoregions to be maintained for various uses, experiences, products, and services. Recreation, spiritual renewal, economic growth, timber and minerals for homes and other products, and forage for wildlife and domestic range animals are examples of human needs that may all come from a single ecoregion. The ecosystem manager must take the wide variety of human needs into account, along with the best scientific knowledge about ecosystems, in order to manage natural resources for sustainable use over time.

-What might they do to help the species?
-What Information do you need to make a good decision?
-What do you need to know about this species and its relationship to other species?
-How does knowing that ecoregions are connected influence your decision?
-How will your management decision affect other organisms or other ecoregions?
-What is the role of ecosystem manager?
-What are some other roles humans play in ecoregions besides managers?
-In what ways can humans be good caretakers of the ecoregions? The ecosystem?
-What can you do to be a good caretaker?

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## 4th Step

# Application

## Materials – Face to Face

- **Roll of paper**
- **Crayons**

## Duration -(minutes)

**20 minutes**

## Notes - Description of step – Explanations

**Choose one ecoregion that represents their living place and draw it including both living and non-living components.**

Drawing helps students' brains to be more "in the moment." Drawing and doodling can act as another form of mindfulness meditation and helps make completing one task easier. It can also help to let their minds work through things subconsciously so they can tackle bigger-picture creative problem-solving.

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## 5th Step

# Closure

## Materials – Online

https://www.arcgis.com/apps/View/index.html?appid=d60ec415febb4874ac5e0960a6a2e448

## Duration -(minutes)

15 minutes

## Notes - Description of step – Explanations

Ask students: Which ecoregion is the most important? Is any ecoregion more important than another? Then discuss what would happen if one of the ecoregions disappeared?

## Assessment Methods

Creating a campain: Have students design advertisements to promote the importance of ecosystem management.

## List of References/ Additional Recommended Reading

https://www.psd1.org/cms/lib/WA01001055/Centricity/Domain/30/Spinning_the_EcoWeb.pdf
https://www.worldwildlife.org/publications/terrestrial-ecoregions-of-the-world

## Differentiation

Invite students to photograph local ecoregion to illustrate the non-living and living components.

| What is the worst that could happen with this lesson? | What will you do to correrct it? |
| --- | --- |
| Group conflict | Clarify the rules for team work. Don't ignore conflict. Clarify what the issue is. Bring involved students together to talk. Identify a solution and continue to monitor and follow up on the conflict. |

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# 10th Lesson Plan

# ECO CHECK-UP

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## Course Category

Nature Education

## Title of Lesson

Eco Check-Up

## Type of Activity

Outdoor Learning

## Key Words

Ecosystems, health of ecosystems, nature observation, nature journal

## Lesson Description

The decline of biological diversity continues at speed and the consequent degradation of habitats and ecosystem structures, coupled with climate change, may constitute one of the most significant challenges human civilization has ever faced. As the United Nations develops a post-2020 global biodiversity framework for the Convention on Biological Diversity, attention is focusing on how new goals and targets for ecosystem conservation might serve its vision of 'living in harmony with nature. Healthy ecosystems prevent, mitigate or regulate droughts, reduce people's exposure to droughts, and reduce people's vulnerability to droughts impacts through supporting livelihoods and basic needs – before, during and after hazards.

## Lesson Duration

85 minutes

## Learning Objectives

O1. To describe the different elements of an ecosystem
O2. To discover an ecosystem via nature observation
O3. To determine that all life is interdependent and interacts with the environment.
O4. To learn how to keep a nature journal
O5. To develop students' knowledge of the ecology of their local area.
O6. To gain a deeper awareness and understanding of the environment and actively seek opportunities to reduce the impact they and others have on the environment – locally and globally.

## Learning Outcomes

| By the end of the course, a student will be able to: | Link to objectives |
|---|---|
| L1. Develop ecological literacy | L1 to O1, O2, O3, O5 |
| L5. To experience new outdoor activities or develop skills | L3 to O4, O6 |

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## Structure of lesson

### 1st Step

# Introduction

## Materials – Online

A short video (Ecosystems Around Us)

## Duration -(minutes)

**10 minutes**

## Notes - Description of step – Explanations

**Begin by explain what is ecosystem then ask students how they can understand the healthy ecosystems around them. Then, show students a short video of the lesson (Ecosystems Around Us)**

An ecosystem is a geographic area where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life. The resilience of ecosystems depends on a range of interactions and responses to environmental pressures, such as climate change, damage to soils or pollution. The nature of many of these responses to pressure may be complex. For example, there may be a tipping point where pressure on an ecosystem leads to gradual change up to a threshold beyond which there is a sudden, perhaps irreversible change in its state. In many cases relationships between pressure and response remain poorly understood.

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## 2nd Step

# Presentation

## Materials – Face to Face

- A location (Woodland) where there are plenty of natural objects
- Different coloured wool of about 1m in length

## Duration -(minutes)

20 minutes

## Notes - Description of step – Explanations

Explain to students the lesson will continue outside where there are plenty natural objects like a woodland. Give the direction: Find for themselves a 50cm – 1m long stick. Tell them to collect objects around the wood as you lead them around. These objects will remind them about places in the woodland

Students then collect feathers, dried flower heads, grass bark, leaves etc. attaching them to their stick as they go by using the wool to wrap around them

At the end of the walk, the students use the objects to tell about their journey.

Alternatively, you could encourage them to remember where they found particular objects by getting individuals to lead the rest of the group to the spot.

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Woodlands offer a unique and diverse habitat that thousands of species call home. Mammals, birds, invertebrates, plants, lichens, and fungi rely on a woodland's diverse structure, from the tips of a tree's flourishing canopy all the way down its vast network of underground roots. Trees support wildlife and help sustain healthy ecosystems, maintain climate regulation, and protect soils, playing a significant role in aiding nature's recovery.

## 3rd Step

# Training/Practice

## Materials – Face to Face

- **A small circle (a bit over a 1 meter in diameter) of woodland or forest or steppe area**
- **Pencil**
- **Journal**

## Materials – Online

**https://johnmuirlaws.com/journaling-curriculum/**
**http://gen.uga.edu/documents/eco/activities/Let%27s%20Make%20a%20Nature%20Journal.pdf**

## Duration -(minutes)

**15 minutes for one trial**
**(They continue to keep a journal for a year)**

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## Notes - Description of step – Explanations

**Students will brainstorm reasons for observing a small part of an ecosystem and work in pairs to create a "mandala" that a small circle of woodland or forest or steppe area a bit over a 1 meter in diameter. They visit this place regularly (2-3 times in a week) by keeping a journal. They can point out flowers, salamanders, insects, trees.**

As an artist and educator, John Muir said, "Nature journaling will enrich your experiences and develop observation, curiosity, gratitude, reverence, memory, and the skills of a naturalist." Students should record all the living things in their mandala in their journal. If it is allowable, have them dig in the ground, as well, to discover organisms under the soil. Give the directions on how to keep their journal: Record the date, time, weather, living things found in the plot, how many, and what they are doing. Make a drawing of the organism along with a physical description. Notice interesting physical features on the organism or behaviors. Make hypotheses about the function of the different features – why do they have it? What is the adaptation of that feature? Using a collection jar can be helpful for this step. It will allow your child a close examination of the organism. Make sure to release the organism back where it was found. Classify the organism, if known. Depending on their age, if they do not know what it is, they can use an app like iNaturalist to upload a photo of the organism to identify it. They could also use nature identification books or other apps.

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## 4th Step

# Application

## Materials – Face to Face

- A natural area
- A 3 m of string
- 5 toothpicks for each pair of students

## Duration -(minutes)

25 minutes

## Notes - Description of step – Explanations

Explain to students you are going to otside to create create a "mini-park" for someone the size of their thumb to visit. Each pair of students receives a piece of string which will act as their park boundary, as well as five toothpicks to place at specific spots in their mini-park as "interpretive sign posts" to highlight special features. Students should be prepared to describe why they chose particular areas to protect.

learning by doing

## 5th Step

# Closure

## Duration -(minutes)

**15minutes**

## Notes - Description of step – Explanations

**Once student pairs have completed their park, they should show another pair through it, pointing out the highlights and reasons for protecting certain areas, then reverse roles. Remember to dismantle all the "parks" when you leave!**

## Assessment Methods

Travel Brochure: Have students write a short descriptive paragraph about their park in the style of a travel brochure, commenting on the wonders and special features.

## List of References/ Additional Recommended Reading


1.https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1115557/Biodiversity_fact_sheet_Web_FINAL.pdf
2.https://www.environment.gov.scot/our-environment/state-of-the-environment/ecosystem-health-indicators/explore-ecosystem-health-indicators/
3.https://www.nytimes.com/2012/10/23/science/david-haskell-finds-biology-zen-in-a-patch-of-nature.html
4.https://backyardnaturecenter.org/wp-content/uploads/2018/09/Planned-Activity-Nature-Journaling.pdf
5.https://biology.indiana.edu/documents/outreach/lessons/Backyard_Nature_Notebook.pdf
6.https://nhmu.utah.edu/sites/default/files/attachments/Nature%20Journal.pdf


## Differentiation

They can prepare a campaign to increase awareness about the importance of ecosystems instead of keeping a journal.

### What is the worst that could happen with this lesson?

Becoming lost, running away, isolated or being abducted, leading to harm or fear.

### What will you do to correrct it?

A method of gathering the group and checking numbers, relevant to age of group and area being used. Students are clear about the limits of how far they can travel from a "base".