Nurturing Sustainability with Bioeconomy

6 Lesson Plans for Primary School Teachers

Co-funded by
the European Union

These lesson plans were created by Maynooth University and adapted for the Learning about Ecosystems and Forests (LEAF) programme by the Foundation for Environmental Education (FEE) as part of the BioBeo project.

This guide is suitable for those currently in teacher training and/or participating in the BioBeo projects and/or the Learning about Ecosystems and Forests (LEAF) programme.

BioBeo is a two-and-a-half-year project with 15 partners and co-funded by the European Union. It aims to develop and implement innovative approaches in education on bioeconomy in order to enhance engagement among young people in policy-making and lifestyle choices related to the circular bioeconomy in Europe. BioBeo focuses its activities on five themes; Interconnectedness, Outdoor Learning, Forestry, Life Below Water, and the Food Loop.

Interconnectedness reflects the role of the biosphere and natural environments in human well-being and holistic health and the undisputed ecological interconnectedness of all living things.

Outdoor learning is active learning in the outdoors where participants learn through what they do, through what they encounter and through what they discover.

Food Loop encompasses farming, hospitality, retail, and energy production sectors. In terms of the circular economy, it focuses on the efficient use of by-products, and the overall reduction of food waste.

Whilst **forestry** products are increasingly attractive in terms of sustainability, and are a major part of the circular economy, there are massive global disparities in the governance of forestry activity.

Life below water refers to the conservation and sustainable use of all water bodies (like oceans, and marine resources but also rivers and lakes) for sustainable development.

Promoting Outdoor Learning and Bioeconomy through the Learning about Ecosystems & Forests (LEAF) Programme

FEE's Learning about Ecosystems and Forests (LEAF) programme, advocates for outdoor learning and hands-on experiences, allowing students to connect with nature and develop a deeper understanding of the natural world. While the LEAF programme started with a focus on tree-based ecosystems and sustainable forest use, today it includes a diversity of ecosystems to foster skills and knowledge by exposing learners to outdoor experiences.

LEAF supports the BioBeo theme of Outdoor Learning while the BioBeo project, with its focus on the circular bioeconomy[1], can also be a valuable tool for achieving your school's LEAF goals:

- **Interconnectedness:** BioBeo's theme of interconnectedness aligns with LEAF's emphasis on understanding how different elements within ecosystems rely on each other. Activities exploring how sustainable practices contribute to a healthy bioeconomy can deepen student understanding of these connections and their own connections with nature.

- **Outdoor Learning:** BioBeo encourages nature-based solutions, which complements LEAF's focus on outdoor learning. Schools can utilise BioBeo resources to develop engaging outdoor activities.

- **Forestry:** BioBeo's dedicated forestry theme directly supports LEAF's goal of growing appreciation for forest ecosystems. By exploring sustainable forestry practices that promote a circular bioeconomy, students can see how responsible forest management contributes to a healthy ecosystem.

- **The Food Loop and Life Below Water:** These BioBeo themes can be linked to how healthy ecosystems contribute to ecosystem services like clean water and is critical for a healthy food loop, both crucial aspects for life on Earth. Discussions on how sustainable ecosystem practices both on land and in water can broaden students' understanding of the value of all ecosystems.

How to Use the Nurturing Sustainability with Bioeconomy Lessons in Your LEAF Work

This handout provides you with **six exciting lesson plans** designed to seamlessly integrate the

[1] A circular bioeconomy is an economy powered by nature. It is a new economic model that emphasizes the use of renewable natural capital and focuses on minimizing waste, replacing the wide range of non-renewable, fossil-based products currently in use.

concept of bioeconomy into your existing LEAF Programme work. These lessons are a perfect introduction to bioeconomy for your students, while simultaneously forming the foundation for engaging LEAF activities.

Benefits for Teachers:

- **Effortless Integration:** Simply incorporate these lessons into your LEAF activities to enhance student learning without a need to change your existing curriculum.
- **Aligned Learning:** Each lesson plan is structured to align with the four stages of the LEAF Pedagogical Cycle, ensuring a well-rounded learning experience for your students.
- **Connecting Concepts:** These lessons go beyond introducing bioeconomy. They explicitly highlight connections between the five key themes of bioeconomy and the six core themes of the LEAF programme, creating a unified understanding for students.

What's Included

Six Engaging Lesson Plans: Each plan offers a unique learning experience focused on bioeconomy within the framework of the LEAF programme.

LEAF Pedagogical Cycle Alignment: Clear guidance on how each lesson aligns with the four stages of the LEAF cycle:

Bioeconomy and LEAF Theme Connections: Explicit breakdowns of how the five key themes of bioeconomy connect to the six core themes of the LEAF programme, fostering a deeper understanding of the relationship between the two.

ECOSYSTEMS, FORESTS & BIODIVERSITY

ECOSYSTEMS, FORESTS & CLIMATE

ECOSYSTEMS, FORESTS & PRODUCTS

ECOSYSTEMS, FORESTS & WATER

ECOSYSTEMS, FORESTS & INNOVATION

ECOSYSTEMS, FORESTS & COMMUNITY

Opportunities for Parental Engagement

In each lesson, there are suggested activities that can be done to involve the parents and families of students.

Before conducting one or more of the lessons, we recommend sharing the definition of bioeconomy with the families beforehand so that they are aware of what the programme is about. An information leaflet is sent home to help families understand more and instruct children to show their parents the BioBeo website at https://www.biobeo.eu/ so that the BioBeo definition can be explored more at home from the outset.

Before getting outside, explain the basic rules of a nature walk and encourage them to do it in their own neighbourhood/parks and gardens. Share the website for families and encourage the children to read the '7 Principles of Leave No Trace' with their families: https://www.leavenotraceireland.org/education/education-introduction/

Lastly, explain what a healthy snack is and encourage parents to share recipes/photos with each other using social media (if combined with a calendar there can be a healthy snack for each day). Consult school management for the school's social media and healthy eating policies.

Starting Information

BioBeo Bioeconomy Definition:

"Bioeconomy is a systems-based approach that seeks to replace fossil resources in a sustainable manner with renewable biological resources from terrestrial and marine ecosystems – such as forests, crops, animals, fish, microorganisms, organic waste, and agricultural side streams, to produce food, feed, fibres, energy, bio-based products, and services within a circular economy framework designed to optimise resource use based on a cascading hierarchy of utilisation options. A sustainable and circular bioeconomy requires the application of education and training programmes, scientific research, technology, and innovation with the aim of not only creating economic value, but also regenerating and expanding ecosystems and biodiversity as well as improving the health and the well-being of society. By addressing these systemic changes in the economy, environment, and society, the bioeconomy contributes to achieving a better and more sustainable future where no one is left behind."

Narrative: These 5 learning sessions will be conducted in the outdoor classroom, school environs, garden, or parklands. During these sessions, the teacher will introduce the 5 themes with a special focus on a pedagogy of place. Children and teachers will explore what a bioeconomy looks like in their locality and engage with the surrounding environment.

Age group: Ages 6-11

Methodology/ies: Active Learning, Guided Discovery, Talk and Discussion, Problem Solving, Collaborative Learning, Engaging and Interacting with the Natural Environment, Free Exploration of Materials, Learning through Play, Direct Teaching, Artistic and Musical Expressions and Responses.

Sustainable Development Goals:

Lesson Plan 1: Introduction to the Circular Bioeconomy

Title of Lesson: Introduction to the Circular Bioeconomy **No. of Lesson:** 1 of 6	
Subject(s): Language, Science, Mathematics, Geography, Visual Arts, Music, Education for Sustainable Development, Global Citizenship	
Ages: 6-11	**Duration:** 2.5 hours
BioBeo Theme: Interconnectedness	**LEAF Themes:** Biodiversity, Products, Community
Keywords/Phrases: bioeconomy, natural resource, bio-based resource, habitat, sustainable, ecosystem, ecological, renewable, interconnectedness, biodiversity.	

Ideas for Engaging Parents

Encourage families to expand the concept of interconnectedness to their own family and community. You can play the game of passing the wool thread on a school day where participants can pass the thread to whoever they can find a link with (e.g. parents shopping at the same place or knowing each other from childhood).

Encourage families to create a memory card set together with the phrases/ definitions and the plants/animals and their names learnt. New cards can be added to the set after each lesson.

Create a bioeconomy badge that can be earned by being active in the lessons' activities. Families can nominate other families for the honour and then everybody votes weekly.

Learning Outcomes:

Participants will be enabled to:

1. Explore habitats outdoors.
2. Experience the ecological interconnectedness of all living things.
3. Develop an understanding of new circular bioeconomy terms and vocabulary and to use them in dialogue.
4. Carry out a simple habitat survey and grow an understanding of biodiversity and a circular bioeconomy in the school environment.

Resources/Materials/Equipment:

- Paper
- Pencils/colouring pencils/crayons/charcoal
- Ball of wool/yarn
- Stones
- Twig
- Leaf for each child to use for answering and drawing in clay
- A blackboard (if possible made from a repurposed storage crate)
- Repurposed mini clipboards for children
- Talking stick
- Plastic reusable shopping bags to sit on
- Sound chimes made from repurposed materials

Introduction: (25 mins.)

- Co-create a class outdoor learning contract of respect: We need to show respect to each other and all the other living things. We practise good listening.
- Let's go for our first morning in the outdoor classroom together. Take your time and enjoy all the sights and sounds on the way to our outdoor classroom.
- Assemble and sit in a circle. We start each session each day with nature story, song or poem
- Write the word 'bioeconomy' on the box blackboard. This is a repurposed wooden box painted with sustainable blackboard paint.
- Each student is given a small hand-sized twig as an object to show a response to questions: YES - like thumbs-up, NO - pointed down. The twig can also be used to trace or write words in the earth/ clay where they sit.
- Think–Pair–Share: Discuss this term in pairs now (2–3 mins): Ask children:
  - Have you seen this word before?
  - Can you read it?
  - What do you know about it?
- Invite the pairs to briefly share their discussion. Explain that the 'journey stick' is given to each speaker to receive good listening from others. Write their keywords on the blackboard box.
- The teacher reads out this definition of the circular bioeconomy for the children, based on BioBeo's definition:

A circular bioeconomy is a way of using natural resources to produce food, energy, and products for living while taking care to protect the Earth at the same time.

Using renewable bio-based resources or gifts from the Earth and reducing our waste in the circular bioeconomy supports a sustainable, healthy future for the planet and all living things.

Each and every one of us needs to choose and use resources wisely and gently for the sake of our shared home – The Earth.

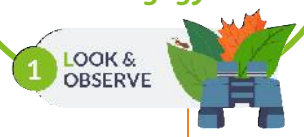
- Ask children if they understand all the terms in this definition and can they think of examples of a circular bioeconomy in the natural world

Part 1: Nature Walk to investigate our local place, our school 'habitat' (35 mins.)

All stand in a large circle, pass the ball of wool around the circle, children take some thread as the ball is unfurled around the full group. The wool makes us connected as a group. We are in a circle so that no one is left out, all of us are here to learn as a team with respect. Walk children through the following activity:

- Find your comfortable space, feel your feet under you rooting you to the ground! Feel how the wool thread sits in your hand.
- Now close your eyes, and let's find some calm out here in nature.
- Take 3 to 5 nice deep breaths in silence.
- Can you hear any sounds of nature?
- Stand still and quietly be aware for yourself of what you can hear.
- Are the leaves rustling in the trees as the breeze blows through them?
- Can you hear the birds singing?
- Are there any other natural sounds? Or some machine sounds?
- Take three more gentle, deep breaths in through your nose, out through the mouth.
- Feel the ground holding you up underfoot.
- We are connected to the planet with our senses; touch in our feet, air touching our skin, hearing sounds of nature, light in our eyes, even when your eyelids are closed, some light gets in!
- Reopen your eyes and slowly move your fingers and toes again.

This activity is a great example of Step 1: Look & Observe of the LEAF Pedagogy!



Now we will go on a ***Nature Walk***.

We are going to explore what is living and growing in our school environment. We will walk around in small groups to observe and record what's growing in our school habitat, our school ecosystem.

Before we go off in our groups to explore the natural world around us, gather around for a moment of poetry (feel free to use a poem in your local context with local species):

When I Am Among the Trees
by
Mary Oliver

When I am among the trees,
especially the willows and the honey locust,
equally the beech, the oaks and the pines,

they give off such hints of gladness.
I would almost say that they save me, and daily.
I am so distant from the hope of myself,
in which I have goodness, and discernment,
and never hurry through the world
but walk slowly, and bow often.

Around me the trees stir in their leaves
and call out, "Stay awhile."
The light flows from their branches.

And they call again, "It's simple," they say,
"and you too have come
into the world to do this, to go easy, to be filled
with light, and to shine."

- Before dividing the class into groups, lead the class to a preselected tree, place a white sheet on the ground under a suitable branch. Give the branch a good shake and everyone can observe what insects fall onto the sheet.
- Let's observe! Does anyone know the insects' names? Collect the various creatures in the bug viewers for identification. Introducing children to the scientific nature code by explaining: "We do no harm as much as is humanly possible when working or walking in nature".
- The children look at the insects in the bug viewers and learn to identify some of the insects using a bug chart provided from the BioBeo box of resources.
- Demonstrate the careful releasing of the insects back to their habitat afterwards.

This activity is a great example of Step 2: Explore of the LEAF Pedagogy!

- Ask the students:
  - **Does anyone know how all our insects *and* minibeasts help the food loop of the bioeconomy?**

Insects, along with all the other minibeasts and invertebrates such as the woodlice and the earthworms, are really the unsung heroes who do all the hard work for the bioeconomy in nature! By eating old leaves and decaying wood and organic matter they are helping it all to break down and return back into soil and start again. As it breaks down it becomes food and new soil for the plants and trees to grow in.

- Divide the class into groups of three and assign each group a unique task of having a walk-about to survey and use their five senses to explore all the various elements of nature and living things around their school environment:

- **Group 1. Trees,**
- **Group 2. Plants,**
- **Groups 3. Birds and Wildlife**

- Each group is equipped with a clipboard, pencil and colouring pencils. When possible, in each school context, children will use phone cameras or iPad to take photos of discoveries in their field work. See if you have a local app to identify biodiversity or use apps like eBird, iNaturalist.

Trees Group: Your task is to explore and identify the different trees in the local habitat. Collect some of the leaves off the ground for later identification. You can draw them, and also take a photo. See if any of your team can name the trees.

Plants Group: You will try to identify the different wildflowers or plants/ grasses/ bushes in your local habitat. You can draw them, and also take a photo. See if any of your team can name the plants.

Birds & Wildlife Group: Your task is to observe, to listen out for, and try to photograph, and also draw the different birds, bugs/ insects, minibeasts or any other creatures you find in your local habitat. Can you name any of the birds, bugs or animals you discover?

Share the jobs fairly in your group and take turns in doing each of the tasks.

This activity is a great example of Step 3: Analyse of the LEAF Pedagogy!

- After 15 minutes, sound the chimes and everyone gathers back.
- Explorers share their findings and show their drawings and photos and experience with the group. Use the 'talking stick'.

Break Time (15 mins.)

Teacher provides a tasty, locally sourced, fruit for each of the students to enjoy with a break. We chat about our experiences so far in the morning. Collect any organic waste for the compost heap.

Part 2: What is Interconnectedness for the circular bioeconomy? (40 mins.)

- Review the morning's work: What have we learnt about the circular bioeconomy? What did you enjoy most in the work? Use the *'talking stick'* for children to share their ideas and responses to the learning.
- Our final activity is the Interconnectedness Game.
- All stand in the circle again. Teacher, with ball of wool in hand, starts the game with the question:
  - **Where do all living things on our planet get their energy ultimately from?**
  - (Clue: It's 93 million miles away (almost 150 million kilometres) from our planet at the centre of our solar system).

- The first child who answers the first question is given the end of the wool thread to hold.
- On to the next question and the child who answers receives the unfurled wool thread from the ball to hold, and becomes connected to the first child, and on we go with questions and answers so that a web of thread is formed between all the children as they answer questions based on the morning's learning and discoveries.

Questions can include:

- What part of the tree takes in the energy from the sun for the tree to grow? (leaf)
- What is this process called? (photosynthesis)
- When do the leaves fall off the trees? (Autumn)
- As the leaves break down and rot, which insects and minibeasts live underground or on the ground and help to break the leaves down? (minibeasts: worms & woodlice)
- Name an insect that we found in our exploration today?
- Which other living things help to break down the old leaves? (the minibeast: woodlice)
- What animal eats insects in our garden? (bird)
- Where do many birds like to build their nests?
- What birds did we identify today?

Add your own specific questions here!

- Questioning continues and illustrates the interconnections of all the living things and natural world discoveries we made during the morning.
- When all children have received the thread to hold from their answering of a question, we pause to look at the zig zag pattern:

This is the web of interconnectedness in the bioeconomy. Draw the children's attention to the fact that there is no waste in nature's food web, or food loop. Everything is used in a circular way in the bioeconomy. There is no throwing away or dumping in nature, no waste, but a circle of life that we can observe in our school habitat. The energy from the sun is always passing along and through the food loop, and this is our circular bioeconomy in action. All of the natural world is interconnected. And that means us too! Humans are very much part of this web.

This activity is a great example of Step 4: Function & Flourish of the LEAF Pedagogy!

• Ask some of the students to drop their end. What do they see? The web loosens. Explain that as some species are lost, the web is disturbed and might collapse.
• Ask the children what they think of the Interconnectedness web that they are connected to in the circle.
• Gather up the woollen thread into a ball again as children share thoughts.

Conclusion: (30 mins.)

Return to sit in a circle and give a bag of pebbles to each of three groups. Each smooth pebble has individual letters written on them and the groups work together to arrange the stones to spell the word 'bioeconomy'. While they do this, read out again the definition of a bioeconomy. For the fast group's spelling, they can play a game to make smaller words out of 'bioeconomy', show them 'biome' for example. Remind children to refer to their dictionaries: "Always check your dictionary to learn new words and terms and grow your knowledge!"

- Did anyone hear or learn anything new today?
- Are you wondering about anything now?

Assessment for Learning:

- Digital photographic evidence/ teacher's iPad and/ or class camera in use.
- Documented information: such as notes, photographs, videos, and learning stories, journal notes written by teacher in lesson flow.
- Art works produced by children (as co-researchers) and photos of processes.
- Pupils' self-assessment: completing their learning surveys and follow on learning with class teacher and parents in the week between each lesson.

Reflection on Teaching & Learning (OPTIONAL):

Reflective journal of teacher: Write down any important statements or key observations of the children's learning as the lesson progresses and the children are in the flow of their tasks and learning experiences. Also reflect on the children's drawings, photos and feedback to teacher questioning/ think-pair-share activities.

Teacher will answer the questions in journalling after: What did the children do? How did they respond? What were the key questions they asked of the lesson? What works did they produce?

Glossary:

Lesson 1: bioeconomy	**Definition**
Bio-based products	Items that are made wholly or partially from renewable biological resources found in nature.
Biodiversity	The variety of plant and animal life in the world or in a particular place or habitat, and all the complex ecosystems that support and give life to all of the organisms on our planet.

Bioeconomy	A way of using natural resources to produce food, energy, and products for living while taking care to protect the Earth at the same time. Using renewable bio-based resources or gifts from the Earth, and reducing our waste in the bioeconomy supports a sustainable, healthy future for the planet and all living things. Each and every one of us needs to choose and use resources wisely and gently for the sake of our shared home – The Earth.
Ecology	The study of the relationships between plants, animals, people, and their environment, and the balances between these relationships.
Ecosystem	Community of living things like plants, animals, or even tiny organisms where living things interact with each other and with the non-living things around them. They rely on each other for things like food, shelter, and even the air they breathe.
Habitat	Home for plants, animals and other living things such as microorganisms, where they interact with each other. Habitat could be forests, oceans, deserts, grasslands, and even school gardens.
Interconnectedness	Everything in the environment is connected to one another. It shows how different living things and non-living things depend on each other and work together.
Renewable	Something that can be replenished naturally, like having a never-ending supply. Renewable resources mean things that we can use over and over again without causing harm to the environment such as sunlight.
Sustainable	Acting sustainably means acting in a way that does not harm the environment and does not use up all of its natural resources. Being sustainable in our actions and in our use of resources means that there will be enough of these essential resources for people living in the future.

Literature & Links

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www.engagewithnature.ie

Lesson Plan 2: A Little Wood

Title of Lesson: A Little Wood **No. of Lesson:** 2 of 6	
Subject(s): Language, Arts Education, Mathematics	
Ages: 6-11	**Duration:** 2.5 hours
BioBeo Theme: Forestry	**LEAF Themes:** Biodiversity, Community
Keywords/Phrases: native forest, symbiosis, environmental awareness, reforestation, soil health, carbon dioxide, oxygen	

Ideas for Engaging Parents

Invite parents to participate in the tree planting lesson or encourage families to plant/adopt trees. If they have space, they can plant a tree in their own garden, if not, they can plant it in communal areas or the school premises (if possible). Encourage them to celebrate the planting of each tree.

Encourage parents and families with diverse cultural backgrounds to present their own myths, music, songs, dance connected to forests. This could all culminate in a school celebration at the end of the programme as part of the children's exhibition of their artworks and garden.

Cooperate with the families and the literature/history/drama/music teachers to create a special Forest art project where various art productions can be presented.

In some communities (villages, towns) the birth of each child is celebrated by the planting of a tree. Discuss with families /school management and local authorities if it is possible to introduce such a tradition.

Learning Outcomes:

Participants will be enabled to:

1. Develop an understanding of new circular bioeconomy terms and vocabulary and to use them in dialogue.
2. Reimagine the concept of the forest and witness natural examples of the circular bioeconomy every day in our school outdoor environment.
3. Collaborate in the design and planting of a mini forest and create their own school's Little Wood,
4. Respond to a selection of woodland folklore and traditional music to create their own Little Wood celebration ceremony.

Resources/Materials/Equipment:

- Journey Stick
- Garden tools for digging and planting: spade, hand tools.
- Tree saplings in pots: Native species only
- Two bags of good compost (40 litre bag/ peat-free).
- Bluetooth speaker/ music

Introduction (25 mins.)

Welcome, remind ourselves of the respect contract and recap on the previous session.

What did we experience and learn last week? The speaker holds the 'journey stick'.

- Who can recall what the term circular bioeconomy means?
- What were those different trees, plants, birds and animals that we encountered?
- What fun facts can you remember?

Today we are going to plant Little Wood. **Let's take our time and take in all the sights and sounds we meet on the way to our outdoor classroom.**

- Begin with a discussion on the importance of forests as ecosystems that support diverse plant and animal life.

A forest or woodland is a place that provides shelter, food and safety to a rich abundance of life.

- Did we encounter many animals and plants in our first lesson? Who can name some woodland animals for us?
- Which insects did we identify last week?
- Link back to previous lesson's new vocabulary: What is meant by the term 'biodiversity'?

The variety of plant and animal life in the world or in a particular place/ habitat, and all the complex ecosystems that support and give life to all of the organisms on our planet.

- Explain that the natural world works in symbiosis. This is where two organisms have a close relationship with one another.
- What have we learnt about the word interconnectedness?

Everything in the environment is connected to one another. It shows how different living things and non-living things depend on each other and work together. They are interconnected.

- The worms and woodlice have a symbiotic relationship with the tree.
- Can you recall what the woodlice and worms do with the leaves when they fall in autumn?

Leaves fall on the ground, making food for the minibeasts. The leaves break down or biodegrade. They become the food for insects and minibeasts like woodlice and worms. This whole process makes the leaves return into the soil which provides nutrients and food for more plants and the tree's growth.

Development: **(25 mins.)**

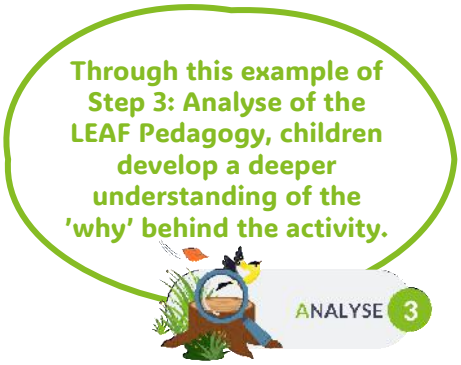
- Begin with a discussion about the natural history of trees and their folklore (stories, legends and music) in your country and how important woodlands were for our ancestors.
- How many trees' names from last week can you recall? Work with your partner now to recall the names.
- Show the collection of leaves (from last week): talk about the varied colours and shapes, try, and identify the leaves in pairs.
- Pass around a bag of items from a native tree you are going to plant (leaves, seeds, twigs, bark etc). Children take one each to examine and describe them.

Everyone is going to know your native tree today! Provide information to the children about your native tree.

Break Time **(15 mins.)**

Time for a BioBeo break! Teacher provides a tasty, locally sourced, snack for each of the students. Collect all the organic waste for the compost heap.

Let us go and plant a little wood together! **(50 mins.)**



Show the children each of the labelled tree saplings in pots. Explain why they were chosen for a Little Wood (**Native variety, substantial size and attractive mix**). Ask children to name the various parts of the trees: hold up a sapling with roots out of the pot: from the ground, up: **roots/ trunk/ branch/ buds/ leaves.** Who can tell me what the roots do for the tree? **Give stability and absorb food and water.**

- Talk about the design of the forest. Which trees will grow the tallest? Where should each tree be planted? Which trees will give most shelter for the smaller trees and plants? If you plant the trees closer together, they will grow faster and taller in competition to get the best light and energy from the sun.
- Demonstrate how to prepare the site. Agree on a planting plan, guided by short instruction on the different height considerations of each tree. Teacher has prepared the site and marked the spaces where holes are to be dug. Each child takes turns to dig and help prepare the site. Teacher supports the safety of all.
- Plant the saplings together according to the plan.

To plant your trees using all recommended procedures for doing so. You may want to invite a local expert to come and help with this to ensure that the trees are planted in the correct place, correct distance apart, depth and support needed.

Conclusion (30 mins.)

- Let us now celebrate and welcome each other to our beautiful, newly planted Little Wood, by listening to traditional folk songs
- Ask the children if there are dancers in class? The teacher divides the group into teams of four to go and create a celebratory short dance for the woodland. They work for five minutes in groups to create and practise a short dance routine for their woodland celebration. Encourage everyone to give it a go.
- We return as a group and the children are given a chance to show their dance ideas first, then everyone is encouraged to do their best. To finish the dance session, the whole group can join hands in a large circle around the mini woodland and we will dance in simple circuits to the left and right, and then in and out in a.

- Reflect on the significance of our actions: discuss how planting trees contributes to our local school and the wider environment. Trees have a positive impact for the whole community, improving the air quality, absorbing carbon dioxide, and giving out oxygen for us all to breathe.
- To conclude the session: Using the 'journey stick' for the speakers:
    - When planting trees, did anything occur to you that you would like to share?
    - Did anyone hear or learn anything new today?
    - Are you wondering about anything now?

- **Challenge for the week ahead:** Work in your classroom together to create a name for our Little Wood. You could work in groups and then vote for your favourite place name.

Assessment for Learning:

- Teacher observation, portfolio, photographs/video, self-assessment.
- Digital photographic evidence/ iPad or class camera in use.
- Documented information: such as notes, photographs, videos, and learning stories, journal written by teacher in lesson flow.
- Dances created by children (co-researchers) and photos of processes.
- Pupils' self-assessment: completing their learning surveys and follow on learning

Reflection on Teaching & Learning:

Reflective journal of teacher: Teacher will write down any important statements or key observations of and by the children, learning as the lesson progresses and as the children are in the flow of their tasks and learning experiences. Teacher also reflects on any works e.g. children's drawings, and feedback to teacher questioning/ think-pair-share activities.

Teacher will answer the questions in journalling after: What did the children do? How did they respond? What were the key questions they asked of the lesson? What works did they produce?

Glossary

Lesson 2: Forestry	Definition
Carbon dioxide	Odourless and colourless gas that is released when we breathe out. It is also produced by engines which burn fossil fuels, by deforestation and industrial processes.

Environmental awareness	Understanding and concern for the natural world and the impact of human activities on the environment.
Native forest	A special kind of forest that is home to many different types of trees, flowers, animals, and insects. It belongs to a particular region or country.
Oxygen	Gas that is essential for all living things, including humans, animals and plants. It is one of the main elements that make up the air we breathe.
Reforestation	Process of planting new trees in an area where there used to be a forest that was cut down, lost or destroyed.
Soil health	How healthy and fertile the soil is for the plants and organisms that live in it. Maintaining good soil health helps plants and animals grow well and helps keep the water and air clean. Healthy soil is the foundation of healthy nutrition.
Symbiosis	Symbiosis is where two organisms have a close, mutually beneficial relationship with each other.

Literature & Links

Bord Bia Irish Food Board (n.d.) Planting a Native Hedgerow or Woodland, available: Planting a Native Hedgerow or Woodland [accessed 15 July 2023].

Ecoliteracy (n.d.) Ecological Education, available: Center for Ecoliteracy [accessed 15 July 2023].

School Earth Education (n.d.) Audit, plan and design school garden & grounds, available: Audit, plan and design school garden & grounds [accessed 15 July 2023].

Lesson Plan 3: Life Below Water: Let's go build a pond!

Title of Lesson: Life Below Water - Let's go build a pond! **No. of Lesson:** 3 of 6	
Subject(s): Language, Arts education, Mathematics	
Ages: 6-11	**Duration:** 2.5 hours
BioBeo Theme: Life Below Water	**LEAF Themes:** Water
Keywords/Phrases: water quality, amphibians, overfishing, marine plastic, coral reefs	

Ideas for Engaging Parents

Encourage families from diverse cultural backgrounds to share their water myths/ introduce their mythical water creatures.

Cooperate with the families and the literature/history/drama/music teachers to create a special water art project where various art productions can be presented, and lectures can be given (e.g. the importance of ports and marine travel in history).

Try to organise a family/school visit to a harbour or a ship or encourage families to do so- why are the oceans important for bioeconomy too?

Encourage families to organise trips to nearby water bodies and explain how/what to observe together.

If any of the family members are good at fishing, invite them to class to show the equipment and talk about why they like it.

Encourage families to share seafood recipes/photos offline/online and discuss the beneficial effect of eating fish (rather than meat). There are good guides for eating fish sustainably online.

Learning Outcomes:

Participants will be enabled to:

1. Ensure the conservation of, and sustainable interactions with, all water bodies in their school environments.
2. Collaborate in the creation of a mini pond in Little Wood.
3. Identify the animals who need our help in the interconnectedness of all life: e.g. toads and common frogs.

4. Develop an understanding of new circular bioeconomy terms and vocabulary and use them in dialogue.

Resources/Materials/Equipment:

- Tools for digging
- Tape measure
- Waterproof pond liner material
- Rocks/stones/gravel
- Native aquatic plants

Introduction: **(35 mins.)**

- Welcome, remind ourselves of the respect contract from Lesson 1 and recap on the previous session.
- What did we experience and learn last week?
- Today we are going to learn how to build a mini pond for a Little Wood. Let us take our time and take in all the sights and sounds we meet on the way to our outdoor classroom.
- Assemble and sit in a circle. Have a recap on the two earlier sessions of learning and refresh new vocabulary:
    - What have we learned so far about a circular bioeconomy?
    - Who can recall what the native trees we planted are called?
    - What fun facts can you remember about your noble native tree?
    - How is our native tree like a circular bioeconomy?

Nothing goes to waste with a tree. It provides a home for insects, birds and even other plants like mosses and lichens. It also lives in harmony in a circular system with its surroundings. The leaves and nutrients go back to enrich the soil for other living things, like mushrooms and fungi. Everything natural around this habitat lives in harmony with the native tree.

Explain that we are going to build a tiny pond to create a mini ecosystem in our Little Wood. Over time we will be able to observe and explore life below water growing and flourishing as the pond habitat becomes established and some interesting creatures will make their homes here.

- Does anybody here live near a water body? Maybe the sea? Or a river? What other water bodies can we find in our country?
- Who can give an actual place name of a water body they know or live beside?

- Children share their ideas using the 'journey stick.' Print the names of water bodies on the BioBeo board (canal, lake, pond, river, stream, fjord, etc.). Discuss place names.
- Why are our water bodies so important? Who lives in our water bodies? There are countless numbers of creatures that live in all the many water habitats, there are fish, insects, and mammals.
- Water covers more than 70 percent of the Earth's surface. Our bodies are about 60% water. It is essential for all life!
- What are the problems we know are happening to the many waters of planet Earth?

Let's do one more 'think-pair-share' to talk about the pressures and problems on water bodies, both at home in our local environment, and in other places on the planet (e.g. pollution/ marine plastics/ coral reefs being lost/ mining/ rising temperatures/ over-fishing).

Development (30 mins.)

Explain that despite all the problems we see with climate change, each and every one of us are able to act and help nature. Instead of getting too sad and hopeless, we can work together at finding the solutions.

Discuss best locations near the Little Wood for a mini pond.

The healthy pond requires a 50/50 balance of light and shade: too bright gives algal bloom, which makes it look gloopy, like a pea soup, and if the location is too dark, it will be stagnant and lifeless.

Break Time (15 mins.)

Time for a BioBeo break! Teacher provides a tasty, locally sourced, fruit for each of the students. Collect all the organic waste for the compost heap.

Construction: (40 mins.)

Discuss and show children the components for the pond and "let's build it!"

Everyone will have a job to do through the whole construction stage. Ask children to stand in a good space back from the area to allow plenty of room for everyone both to see the processes and to walk forward and assist in pairs at each stage of construction.

Water safety is always the top priority so the pond place will be at the lowest area and in full, safe view of the teachers.

- Use our BioBeo wool again to mark the outline of the pond.

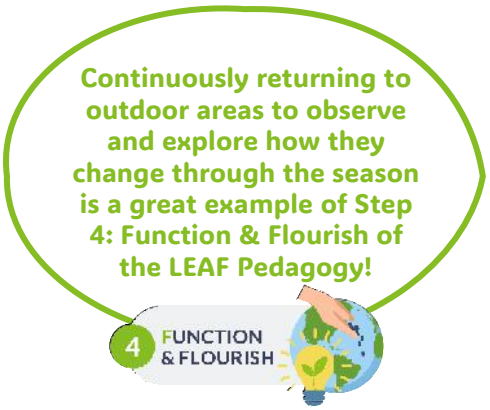
- Dig a stepped hole, 150mm to 200mm with a minimum depth of 450mm.
- Run a measuring tape through the contours and add 1 metre to calculate the size of liner needed. Place some old carpet or cardboard in the hole first to prevent a puncture to the liner.
- Stretch the liner flat across the pond, weigh down with the rocks around the edge then fill with water and allow the water to stretch the special liner material into the shape of the pond.
- Cover the edge of the liner with some rocks, a sod of turf or two, and a branch but ensure easy access for wildlife.
- Add some native pond plants: moss/ rocks/ grasses.
- Ideal is to collect some natural local pond water in the area and bring it to the pond when it is settled after a week and add it to the water. This will kick start the pond, give it a solid foundation for living things to grow.
- Discuss the significance of water quality and encourage children to do research in books or online and to learn how to identify the different pond organisms that might make the freshwater pond their home.

- Discuss safety measures and explain that this pond is only for the wildlife of the Little Wood! For wading, swimming, and playing, humans can go to the swimming pool or beach. Amphibians and insects only in this pond please!

Conclusion: **(30 mins.)**

- Conserving water habitats and protecting the organisms that live under water is an essential action we can all take to help our local and global ecosystem. Some people are organising regular coastal/ canal or river plastic clean ups in their localities. This can be an effective, practical group activity which can make a real difference for the animals and fish that live below the water. It can also be a fun activity to join.

- Frogs and many other amphibians are becoming endangered for a wide range of reasons, such as water pollution, and habitat destruction or loss because of human activities such as construction. Bees and other insects and birds will also be delighted to find a safe drinking place. Our wildlife needs all the help we can give them, and that starts right here today with our new school pond!
- Encourage the children to regularly observe the pond and notice the changes that occur over time: Observe how more living things come to inhabit the pond and how they contribute to enhancing the ecosystem. You could keep a notebook/digital compilation of notes and photos/social media page of observations you make in the pond throughout the year.
- Final point is to remind and guide children to always be vigilant of water safety.



Even a shallow water body needs to be treated with respect. So, our motto is: "**Always be safe around a water body, even the small ponds!"**

To conclude the session: Using the *Journey Stick* for the speakers:

- Did anyone hear or learn anything new today?
- Are you wondering about anything now?

Assessment for Learning:

- Teacher observation, portfolio, photographs/video, self-assessment):
- Digital photographic evidence/ iPad or class camera in use.
- Documented information: such as notes, photographs, videos, and learning stories, journal written by teacher in lesson flow.
- Art works produced by children (co-researchers) and photos of processes.
- Children's self-assessment: completing their learning surveys and follow on learning with class teacher and parents in the week between each lesson.

Reflection on Teaching & Learning:

Reflective journal of teacher: Teacher will write down any important statements or key observations of the children's learning as the lesson progresses and the children are in the flow of their tasks and learning experiences. Teacher also reflects on any works e.g. children's drawings, and feedback to teacher questioning/ think-pair-share activities.

Teacher will answer the questions in journalling after: What did the children do? How did they respond? What were the key questions they asked of the lesson? What works did they produce?

Glossary

Lesson 3: Life Below Water	Definition
Amphibians	These are cold blooded vertebrates (a vertebrate has a backbone, just like humans) and can live part of their life below water and part of it on land e.g. frogs, toads and salamanders or newts. They eat insects and other small creatures, helping to control their populations.
Coral reefs	Coral reefs are underwater structures made up of tiny animals called coral polyps. The animals live in big groups and stick to a hard surface. Together, they create a bright and colourful ecosystem that provides food and shelter for many marine animals, like turtles, fish, sharks, and more. Coral reefs can be found in shallow, warm, clear waters around the world.
Marine plastic	Plastic waste that ends up in the ocean or other water resources. This can be big things like bottles and bags, or really tiny pieces called microplastics. Microplastics are little bits that break off from larger pieces of plastic.
Overfishing	When people catch too many fish from the oceans or other water bodies like rivers. This affects future fish populations and the entire ecosystem.
Water quality	The condition or state of the water, for example, is it unpolluted, healthy and clean? If so, then it is a very good water quality. It tells us if the water is suitable for plants and animals to live in or not, and whether it is suitable as human drinking water.

Literature & Links

The Herpetological Society of Ireland (2022) How To Build A Simple Pond, available: https://thehsi.org/publications-and-resources/how-to-build-a-simple-pond/ [accessed 15 July 2023].

School Earth Education (n.d.) Making a Wildlife Pond, available: https://www.schoolearthed.ie/worksheets/Making-a-wildlife-pond.pdf [accessed 15 July 2023].

United Nations Educational (n.d.) SDG Resources for Educators - Life Below Water, available: https://en.unesco.org/themes/education/sdgs/material/14#primary [accessed 15 July 2023]

Lesson Plan 4: Helping A Little Wood to Grow

Title of Lesson: Helping a Little Wood to Grow **No. of Lesson:** 4 of 6	
Subject(s): Language, Arts education, Mathematics	
Ages: 6-11	**Duration:** 2.5 hours
BioBeo Theme: Food Loop	**LEAF Themes:** Biodiversity, Products, Community
Keywords/Phrases: food loop, local and seasonal food, carbon neutral farming, compost, food waste, carbon footprint, food miles	

Ideas for Engaging Parents

Offer families a short course on composting or encourage them to teach each other. Depending on school garden facilities, many schools have already established links with local community gardens or grandparents. These can be a reliable source of inspiration for families and community knowledge sharing.

Encourage families to write shopping lists before going shopping to avoid food waste. Share the website: https://stopfoodwaste.ie/. There is great potential for curricular integration also here for Mathematics and Home Economics.

Encourage families to plant herbs in pots (if they do not have enough space or a garden). Families might donate pots of herbs to the school that can be placed in the school canteen and children can use them to season their food.

Encourage families to measure their own carbon footprint and produce ideas on how to reduce it. Share website for children to show families and raise awareness at home: https://climatehero.me/calculate/

Encourage families to calculate the food miles of a regular meal. This could be a great mathematics project with many opportunities for parental involvement for exploring the question of food miles at mealtimes. Share website: https://www.foodmiles.com/food/ireland for children to share their new knowledge at home and investigate food miles with their families.

Take the children to a local food or farmers' market to experience the differences from a supermarket and invite families along.

Learning Outcomes:

Participants will be enabled to:

1. Collaborate in the seasonal planting of an edible garden in a Little Wood and find ways to reduce food waste in a circular bioeconomy.
2. Plant some pollinator friendly bulbs and seeds and discuss why bees also need food in the garden.
3. Discuss the interconnectedness of all the different trees, plants, flowers and insects in the newly planted school garden.
4. Develop their own wellbeing practice in nature and be introduced to the concept of a 'Sit Spot'.

Resources/Materials/Equipment:

- Tools for gardening and harvesting
- Compost
- Bulbs
- Seedlings and edible plants
- Watering cans
- Labels for plant identification

Introduction: **(30 mins.)**

- Welcome, remind ourselves of the respect contract and recap on the previous session.
- What did we experience and learn last week?
- Who can recall what kind of creatures in wildlife that like to live in or near a pond? What fun facts can you remember about water bodies?
- Let's go out for our fourth morning in the outdoors classroom together. Let's take our time and take in all the sights and sounds we meet on the way to our outdoor classroom.

- Introduce the concept of a food loop and write the word on the BioBeo board. Ask several children what they think the term food loop means. Use the 'journey stick' for speakers.
- Give the children time to share some of their food growing stories if any.

A sustainable and healthy *food loop* is one where we are sure that the food we eat is healthy and not grown too far away (low in food miles). Some fruits and vegetables in our supermarkets today could come from the other side of the world! You can see the origin of your food on the labels in the shop e.g. New Zealand, Chile, Peru.

Food is at its healthiest when it is grown with care and not sprayed with harmful chemicals. Huge energy, care and time goes into growing good food, and so we in turn must work to cut down the amount of food going to waste. By growing our food with care, then storing it well, and cooking in a way that we get the best out of it, we can make delicious meals that ensure all of the food is eaten. Does anyone here have a food garden at home in their home garden?

Development: **(70 mins.)**

- Explain how planting a food forest or food garden at school and at home is one of the best ways to create a sustainable and circular bioeconomy in our lives.

- Show the children the plants we will grow (*ideally using fully grown products).*
- Ask children to examine each plant and familiarise themselves. Discuss;
    - Who likes different vegetables in their meals?
    - Which fruits are the favourites?
    - Does anyone know a recipe for cooking that uses the plants we will grow?

Instructions for planting and layout of garden:

Everything likes to have enough space to grow. Think about being in a crowded room, jam-packed with noisy people, you can't even hear yourself think! Well, it's like that for plants in the garden. They need space to get enough sunlight for energy and soil/water for growth and stability.

As with earlier sessions, instruct everyone to stand well back so that all can see and walk forward safely to take their turn in the planting tasks. Children observe and actively help the teacher in pairs, and everyone will get to do at least two of the important tasks (digging, adding some compost, planting, and covering over, watering).

- Our final job today is to plant some flower bulbs. **Who or what will the flowers that grow in spring help as a source of food and energy?**

Bees and insects act as pollinators. This means that they go about collecting nectar, their food and energy from the flowers. In this process they are also helping the flowers to pollinate by spreading pollen from flower to flower and this helps the plants to make seeds for more plants to grow.

Show the children some different bulbs and explain that different flowers will prefer to be planted in special places in the Little Wood (some prefer shaded, some prefer full sunlight). The children are asked to guess/ discuss in pairs where they think each bulb will be happiest to be planted, and in pairs they discuss where best to plant each kind of bulb. Teacher presents the bulbs along with a picture of their flower for all to see and discuss.

Every child will have their turn to plant some bulbs with teacher support as needs arise.

When all the gardeners are happy that everything has been successfully planted, guide them in tidying up their tools and work space.

Break Time (15 mins.)

Teacher provides a tasty, locally sourced, snack for each of the students. We chat about our experiences so far in the morning. Collect all the organic waste for the compost heap.

Explain and show how the organic food waste is recycled in the composter or compost heap and how this will biodegrade and become nutrient rich compost which is used to feed the soil and gives new life to the garden for the plants and crops growing there each season. Food waste becomes a valuable resource in the circular bioeconomy when it is turned into good compost for the garden.

Conclusion: (35 mins.)

Return to sit in a circle for a final mindfulness activity to reflect on the lesson. As the students if they know what being mindful, or mindfulness means? After all our hard work planting our food forest, we will now pause and have a mindfulness moment. We are all going to stop and sit and do a short nature meditation, a time to be still, calm and peaceful for a while. Hand up if anyone here has ever meditated? Has anyone ever meditated outdoors in nature?

A 'sit spot' is when you choose a special place in the great outdoors, a place that is special for you personally. Meditating in nature at a 'sit spot' can really help us to feel good and connected again to the Earth and to oneself.

- All return to sit in a large circle for a short meditation exercise together. Teacher leads the meditation like so:

- **Close your eyes everyone.**
- Breathe in through your nose for 4 seconds.
- Let your breath out through your mouth for 5 seconds.
- Let's do that two more times: in through your nose, 4 seconds, out through your mouth, 5 seconds.
- Now breathe in through your nose for 5 seconds.
- Breathe out through your mouth for 7 seconds.
- Let's do that two more times. In for 5, and out for 7.
- Now put one hand over your heart, chest area, and your other hand on your stomach.
- Now breathe in through your nose for 5 seconds.

- Breathe out through your mouth for 7 seconds.
- Let's do that two more times. In for 5, and out for 7.
- **Now let's listen to all the sounds around us.**
    - Can you hear the wind blowing?
    - Can you hear the sound of the leaves in the wind?
    - Can you hear the sound of the birds' singing?
- **Now open your eyes.**
    - What do you see?
    - Do you see the trees moving in the breeze?
    - Do you see a bird flying?
    - Do you see the clouds moving in the sky?
    - What else can you see and hear for yourself?
    - Do you feel still and connected to the ground?
- To finish off now, let's close our eyes and breathe in for 5 seconds through your nose, and out for 7 seconds through your mouth.
- Let's do that two more times.
- Gently open your eyes again. Well done everyone! That was a great meditation you just did.

You can start to move your bodies slowly again and we can stretch out or stand up for a minute if you need to.

To conclude, discuss and recap on the benefits of an edible food forest garden, such as providing fresh and healthy food, supporting local biodiversity, building nice connections and creating community and fostering sustainable practices. Water the plants and wash up the equipment together. Children are given time to conclude and write their reflections using the "3-2-1 Exit Slip" (from GIY.ie).

Assessment for Learning:

In this lesson the children will write their learning reflections using an Exit Slip. They should write down:

- 3 things they learned today
- 2 things they'd like to learn more about
- 1 question they have

Glossary

Lesson 4: Food Loop	Definition
Carbon footprint	A way to measure the amount of carbon dioxide and other greenhouse gases that are released into the atmosphere because of human activities.
Compost	Fertiliser that is made from organic waste that can be used to help plants grow.
Feed	The material or product that is used as food for animals.
Food loop	For humans, the food loop includes all the areas of food such as farming, hospitality, shopping, and the energy that is used in all these areas. In a bioeconomy it's really important to use all the food resources and energy efficiently and to reduce the huge amounts of waste that we see in our world today.
Food loss and waste	Food that is not eaten or used and ends up being thrown away or spoiled. It can happen at different stages from farming and production to distribution, storage, and consumption.
Food miles	The distance that harvested and ready-to-eat food must travel from the farm to the dinner table. The shorter the distance from farm to fork is best because the food will be fresher and less energy will be used in transporting and keeping it fresh.
Local and seasonal foods	Types of food that are grown or produced nearby and are available during specific times of the year.

Literature & Links

3-2-1 Exit Slip: https://giy.ie/grow-at-school-resources/

https://www.farmergracy.co.uk/blogs/farmer-gracys-blog/top-10-flower-bulbs-for-bees

https://mural.maynoothuniversity.ie/16684/1/MaireNicAnBhairdDra%C3%ADocht%20Dara2021.pdf

https://www.irishtimes.com/culture/heritage/uncovering-ireland-s-lost-field-names-before-it-s-too-late-1.4172606

Waters, A. (2008) *Edible Schoolyard, A Universal Idea*. San Francisco: Chronicle.

Lesson Plan 5: An Artistic Adventure with BioBeo

Title of Lesson: An Artistic Adventure with BioBeo **No. of Lesson:** 5 of 6	
Subject(s): Language, Arts Education, Social Environment and Scientific Education, Social Personal and Health Education	
Ages: 6-11	**Duration:** 2.5 hours
BioBeo Theme: Interconnectedness, Outdoor Education,	**LEAF Themes:** Innovation, Products
Keywords/Phrases: bio-based products, recycling, climate change, consumption, resource efficiency	

Ideas for Engaging Parents

Invite families to a presentation of the story/art works. At the end of the BioBeo programme we could hold a special celebration to sing the songs, show our artworks and present our learning for parents and families, to begin with a tour led by the children around the Little Wood

Encourage families to create pebble artworks together.
https://id.pinterest.com/zahfranhamzahal/pebble-art-ideas/

Encourage families to create nature-based artworks together.
https://hu.pinterest.com/naturalearthpaint/nature-art-projects/

Encourage families to check out the works of Giuseppe Arcimboldo:
https://hu.wikipedia.org/wiki/Giuseppe_Arcimboldo

Learning Outcomes:

Participants will be enabled to:

1. Collaborate, create, and compose a story of interconnectedness using Little Wood "Story Stones."
2. Respond to their BioBeo journey through painting and drawing using bio-based resources (make an evergreen paintbrush, make some natural, bio-based paint and use bio-based paper).
3. Exhibit, present, observe and respond to their own and classmates' art works.
4. Develop an understanding of new circular bioeconomy terms and vocabulary and use them in dialogue.

Resources/Materials/Equipment:

- "Story stones" (smooth pebbles), a bag and bio-based coloured pens for writing.
- A set of photographs of ancient cave art from around the world as an art stimulus.
- Examples of pre-made evergreen paint brushes prepared for the children to examine before making one for themselves. Branches for handles, pine tree needles for brush heads (e.g. Lelandia, Scots Pine and Sitka spruce), strong bio-based twine to bind brushes.
- Three different coloured soils with which to mix water to make natural brown paint and mixing bowls, whisks
- Samples of bio-paint
- Bio-based clipboards for artwork
- Ingredients and mixing bowls for making bio-based paints (see below).
- Prepare some bio-based natural paints before the lesson using the following recipes. The children will also create a selection of these bio-based paints for themselves during lesson also.

Ingredients for making natural plant-based paints:

- **Red/pink**: 1/2 teaspoon of beet root powder or 1 to 2 raspberries, strawberries or cherries, or red rose powder, 1/2 teaspoon of arrowroot powder, 1/2 teaspoon of water
- **Yellow:** 1/2 teaspoon of turmeric powder, 1/2 teaspoon of arrowroot powder, 1/2 teaspoon of water
- **Orange:** 1/2 teaspoon paprika powder or chilli powder, 1/2 teaspoon of arrowroot powder, 1/2 teaspoon of water
- **Green**: 1/2 teaspoon of matcha powder, 1/2 teaspoon of arrowroot powder, 1/2 teaspoon of water
- **Blue/purple:** 1 to 2 blueberries, 1/2 teaspoon of arrowroot powder, 1/2 teaspoon of water
- **Brown:** 1/2 teaspoon of cocoa powder, 1/2 teaspoon of arrowroot powder, 1/2 teaspoon of water
- **White:** 1/2 teaspoon of arrowroot powder, 1/2 teaspoon of water
- **Black:** 1/2 teaspoon of charcoal powder, 1/2 teaspoon of arrowroot powder, 1/2 teaspoon of water

Introduction: (20 mins.)

Welcome, remind ourselves of the respect contract and recap on the previous session.

- What did we experience and learn last week?
- What were your learning highlights in planting an edible garden in the Little Wood?
- How will planting the native flowers (Lesson 4) help wildlife in the Little Wood?
- Did anyone create a special name for the Little Wood?
- Let's all go out for our fifth and final morning in the outdoors classroom together.

- Let's take our time and take in all the sights and sounds we meet on the way to our outdoor classroom.

We've been exploring what a circular bioeconomy is and learning all about the 5 BioBeo themes: forestry, life below water, food loop and interconnectedness, all in our outdoor classroom.

We have seen how the natural world is made up of interconnections.

We have helped our school ecosystem and its wildlife by creating a Little Wood and an edible garden for ourselves, the humans and for the bees and pollinators in our school ecosystem. And we built a wildlife pond.

Biodiversity will be greatly enriched and supported by our work. We have made stronger connections with nature in our school environment. We have re-connected with nature which is all around us.

Today we are going to celebrate your brilliant work by going on some artistic adventures together using bio-based art materials. It will be a nice way for you all to reflect on the journey over the last five weeks. The first thing we will do is work together to create a story using the "Story Stones".

Telling a Story with Little Wood "Story Stones" (30 mins.)

- All sit in a circle. We are in a magical storytelling circle that will take us all on a unique and enchanting journey
- Teacher walks around the circle with a bag of smooth pebbles, of several varied sizes, shapes, and colours (one for each student). Each child chooses their own pebble without looking into the bag, but by touch and texture. Give children a few moments of getting to know it by taking note of its shape, colour, texture, and weight.
- Ask children to draw or write an image or word, anything they wish on their pebble, based on some of their favourite moments in the four lessons with BioBeo (an animal, a plant, a tree, water for example). Anything that you felt a connection within our lessons here. Then return the pebble back to the bag. Teacher shows some prepared pebbles for anyone who is not sure how to start.
- To begin the story, each child draws a pebble from the bag and uses it as an inspiration to begin a story, saying a sentence inspired by the image drawn on it. They place the pebble in the middle of the circle. Continue storytelling, passing to the next child around the circle, allowing each to choose a pebble and contribute when they feel ready. All are encouraged to contribute. Teacher supports if anyone is struggling with an idea for the story.

- Once the last person has ended the story, everyone stands up to admire the uniqueness of each pebble and celebrate the magical tale they created. Children are welcome to take their pebbles home if they wish. People can respond in turn to say how they enjoyed the story/ give feedback.
- Invite the children to discuss the significance of each pebble's picture or word and share their favourite parts of the story and explore the role of storytellers in history.

Development: Making Artworks Naturally (65 mins.)

- Present the art activities that we will engage with. Divide the class into groups of four who will discuss their art ideas, examine the pictures of ancient cave paintings and drawings from all over the world and then collaborate in painting activities. How did they create their artworks on the cave walls all those many thousands of years ago, do you think? What instruments do you think they could have created and used for their paintings?
- Suggest that they can focus on one or all of the five BioBeo themes in their artworks (interconnectedness, outdoor learning, forestry, life below water, the food loop).

Task organisation:

Teacher has prepared a set of evergreen paintbrushes to show children and model their construction. Also prepared in advance are some natural pre-mixed paints and a choice of bio-paint and other mark-making materials such as charcoal. While a group works with teacher in a workshop to make their own brush, and mix natural paints, the other groups can begin to engage in making their art with the prepared materials. The groups circulate from teacher support for paint mixing and evergreen paintbrush construction to move on to independent art-making activities with support and guidance from class teacher.

Teachers also circulate to discuss with children how their endeavours are going. Two of the groups can start making drawings or paintings with the bio-based materials straightaway (bio-based paper and bio-paints, charcoal and bio-based writing tools). Children are given as much independence in their work as possible. Assist in a minimal way to foster independence and creativity.

Conclusion: (25 mins.)

Each group or individual presents and describes their artwork.

To conclude the session:

- Are there any leftover materials or elements that could be considered waste?
- What could be done with those leftover materials to minimise waste?
- Did anyone hear or learn anything new today?

- Are you wondering about anything now?

Glossary

Lesson 5: Artistic Adventure	Definition
Bio-based products	Items that are made wholly or partially from renewable biological resources found in nature.
Recycling	Process of transforming used materials into new products. It is a way to give new life to things that would otherwise be thrown away and would end up in landfill dumps.
Climate change	Long-term changes in the Earth's climate patterns, such as higher and lower temperatures and amounts of rainfall.
Consumption	Process of using resources and goods to fulfil our daily needs and demands, like eating, drinking and using energy.
Resource efficiency	Making the most out of the resources we have like finding ways to do things more efficiently and effectively while using fewer resources.

Literature & Links

Jiminy eco-toys (n.d.) Jiminy bio-paint - edible ingredients finger paint for all ages, available:

https://jiminy.ie/products/finger-paint-eco-conscious-packaging-free?variant=36707733897384&currency=EUR&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&gclid=CjwKCAjwzo2mBhAUEiwAf7wjklngiky3zqnejqCQQJQY6c0JoF1TTX_r6CpDYQ9YVatpZopdD3bBSRoCYJkQAvD_BwE [accessed 29 July 2023].

Storniolo A. (2021) How to Make Plant Paints: Zero Waste Art, available: How to Make Plant Paints: Zero Waste Art - Greenify Me [accessed 29 July 2023].

Worroll, J. & Houghton, P. (2018) 'A Year of Forest School, Outdoor Play and Skill Building for Every Season', London: Watkins

Making Natural Paints:

https://www.greenify-me.com/2021/10/plant-paints-zero-waste-art.html

Also: https://jiminy.ie/products/finger-paint-eco-conscious-packaging-free?variant=36707733897384&currency=EUR&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&gclid=CjwKCAjwzo2mBhAUEiwAf7wjklngiky3zqnejqCQQJQY6c0JoF1TTX_r6CpDYQ9YVatpZopdD3bBSRoCYJkQAvD_BwE

Lesson Plan 6: Our BioBeo Learning Journey: Emergent Voice of the Student (Creating a Digital Story in a PowerPoint Presentation)

Title of Lesson: Telling the Story of our BioBeo Learning Journey **No. of Lesson:** 6 of 6	
Subject(s): Information & Communications Technology (ICT), Language, Arts Education, Social Environment and Scientific Education, Social Personal and Health Education	
Ages: 6-11	**Duration:** 2.5 hours
BioBeo Theme: Interconnectedness, Life Below Water, Food Loop, Forestry and Outdoor Learning	**LEAF Themes:** Biodiversity, Products, Community, Innovation, Water
Keywords/Phrases: General revision of all key words and phrases from earlier lessons.	

Learning Outcomes:

Participants will be enabled to:

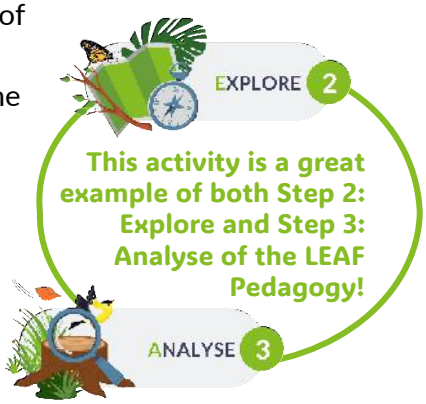
1. Investigate the Little Wood after winter for signs of life and discuss the coming season of Spring.
2. Collaborate, create and compose a digital story as a PowerPoint presentation to narrate their BioBeo learning journey and present their artworks.
3. Consolidate and revise their understanding of new circular bioeconomy terms and vocabulary and to use in dialogue.
4. Investigate and explore the possibilities of working and having a future career in the bioeconomy.

Resources/Materials/Equipment:

- Digital archive of students' artworks and gardening moments photographed by the teacher.
- Laptop and interactive whiteboard where possible, or overhead projector.
- Microphone and good audio recording software for PowerPoint Presentation e.g. Audacity.
- (Note: None of the children's faces will be included in the photographs: only their artworks and gardening moments without their faces shown.)

Introduction: **(30 mins.)**

- Teacher greets the children, ask how has the Little Wood been doing during the two months since the last session?
- Let us go for a walk out in the outdoor classroom together. We will visit the Little Wood and see if there are any signs of life stirring. Take your time and enjoy all the sights and sounds on the way to our outdoor classroom. In Winter we need to wrap up well for the elements!
- We take a good look at all the various living things, most of the garden is now dormant in Winter. There may flowers emerging and in bloom as a nice sign of the new life on the way in Spring. Show the children that the buds are also well formed on the trees and that Spring and new life is not far away. The new season of life being reborn again. We see the circular way of nature, remember how circularity is at the heart of our bioeconomy also. There are several signs that Spring is just around the corner. What has happened to all the old dead leaves that fell to the earth in Autumn?



- Using the 'journey stick' for each speaker, ask the children to recap and recall their favourite moments and learning memories from the earlier sessions.
- Return safely again to the classroom.

Development: **(90 mins.)**

- The class will prepare a PowerPoint presentation to show the work they have carried out over the 5 earlier sessions. We will record a voiceover with it for each person to tell a part of the story for our BioBeo journey of learning all about the bioeconomy and circularity.

Imagine though first that in the future you could find a very enjoyable career for yourself and work in the bioeconomy…

We have done some great work together in our BioBeo journey and explored in great detail the five themes of a circular, sustainable bioeconomy with BioBeo. What are the five themes again? The future holds great possibilities for each and every one of us to imagine a career of working in the bioeconomy.

Think-Pair-Share: In pairs now, I want you to discuss what kind of areas you think you would love to work in for this bioeconomy? Remember, in the circular bioeconomy we only use renewable, biological resources. This sustainable and circular way of living and working in a bioeconomy will really help humanity to take better care of our precious planet Earth and the gifts it provides us for living.

There will be many good teachers needed for educating and training people in many new ways to live and work and make things for the bioeconomy, for example. In pairs now, please discuss what other jobs you think there are for a healthy bioeconomy? And imagine what kinds of careers are you most interested in?

Use the 5 themes as a way to explore possible career paths and jobs that you can do. For example, what jobs do you imagine people can do to help all Life under Water? And the Food Loop etc.

To conclude, use the 'journey stick' for the pairs to then share their ideas for careers they can imagine for themselves in the circular bioeconomy.

Creating the digital story of our BioBeo journey

- The class teacher will have the digital photographs recorded during the five learning sessions and collated on a digital file to display on the whiteboard.
- Each child is now invited to write down 1-2 sentences to describe their artwork, and the processes they followed to create it. They are also invited to reflect upon the 5 themes of the circular bioeconomy and what in the five lessons made an impact on them and their new learning about circularity, interconnectedness and the bioeconomy.
- Teacher walks around the class to chat with individual children about their learning and what they enjoyed most in the learning sessions.
- The teacher now places the digital slides in a coherent order for the start of creating the PowerPoint Presentation. The photographs will be presented in a chronological sequence to show the children's work over the five sessions, with the garden being created and all followed by an exhibition of the splendid artworks by the children. The children are included in the decision-making of curating and ordering the photos for the story. What do they feel is important in ordering certain photos and events etc?
- When the photos are set in sequence for the presentation, the teacher will sit in a quiet space at the back of the classroom to support each child in recording their short-spoken piece for the microphone/ laptop to record. Class teacher and will have done some preparatory work of choosing and collating photos before the session with the class.

Conclusion: **(30 mins.)**

- When all the children have had the chance to record their voice over part for the PowerPoint, it is ready for all to see and enjoy together. Watch the PowerPoint Presentation together to the school community!
- Children are then given a chance to respond to the presentation and offer their feedback.
- Thank and congratulate them all for doing a super job, not only today as the fruits of the BioBeo labours all come to fruition, but also throughout the five outdoor sessions too.
- Briefly explain how and when they will be able to share their presentation and art works to the whole school.

Assessment for Learning:

Assessment of individual and group learning outcomes as evidenced in the PowerPoint presentation, pupil and class teacher feedback.