

GREEN ENTREPRENEURS EUROPE



MODULE 2: LESSONS FROM NATURE Option 3 Diversity gives Strength



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**BUSINESS
IN THE
COMMUNITY**

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WELCOME!

This 'Green Entrepreneurs Europe' 'Lessons from Nature' module is designed to help prepare today's young people to take responsibility for the life choices they make. We believe that taking responsibility for our surroundings, for who we are and what we are going to do will help us to discover the possibilities for personal and professional development. A willingness to engage in activities and new ventures is a defining factor of what we call "green entrepreneurship."

For teaching the 'Lessons from nature' part of the GEE course, you have a choice of modules. This module is based around the concept of 'diversity gives strength'. Your other options are: the 'overview' module, 'waste = food', 'plastics' (2 day course) and 'sustainable towns and cities'.

The Green Entrepreneurs Europe course will be taught in 5 different European countries. It has been developed to encourage crosscurricula links, allowing teachers from different subject areas and indeed cultures to collaborate. It is aimed at Secondary Schools. It is pitched at KS3 but could be adapted to KS4/ KS5.

Over the next few pages you can find the lesson plan for this 'Lessons from nature' module. Assessment for learning techniques are integrated into the learning pack. Required resources and ideas for differentiation can be found at the end of the booklet.

Legend



Students guided by teacher



Students working independently.



Reflection



Exploration through senses/ feelings



Video



Research



Safety



Knowledge



Skills



Competencies



MODULE 2: LESSONS FROM NATURE

MODULE CONTENT

Welcome to the cycle of activities included in the "Lessons from Nature" module. Complete in: 1 school day or equivalent (plus homework).

In this module, students will build on the skills and concepts covered in the introductory module 'what might change?' Students will discuss the topic of biodiversity, what it means and why it is important: in nature and for the economy. They will use a scientific methodology and equipment to estimate the biodiversity of a grassland. Through a case study they will become aware how green design can encourage biodiversity, while fixing man-made problems. Students will take part in a citizen science project to assess an area of land for its value to pollinators. They will record this data and submit it to the OPAL project (an autumn/ winter alternative is available). Students will then think about how they could design a product that improves biodiversity, using the concepts of the green economy.

CONNECTIONS WITH OTHER MODULES

Previous module (1-What might change?): students reflected on their own ecological footprint and learnt the key terms: entrepreneur, linear economy, circular economy.

This module (2- Lessons from nature): students use the key terms and make comparisons between the natural economy and the human economy through the topic of biodiversity. Students reflect on what we can learn from nature. Students start to learn about circular products in existence and think about how they can make existing products more 'circular'.

Next module (3-Changing perspectives): students learn how to create a business plan and apply this to analysing existing green companies and their products.



INTRODUCING BIODIVERSITY



10 minutes Re-cap key words. Write 'entrepreneur' 'linear economy' and 'circular economy' on the board. Students write definitions on post- its in small groups/ pairs and stick on board.
Afl: sensible definitions on post its



5 mins What is biodiversity? Students discuss in small groups. Give textbook definition (species richness & evenness).



10- 15 mins Why is biodiversity important? Can keep general, or give groups a different area to consider, e.g. to people, to wildlife, to business. Do any of these overlap/ link?
Afl: groups can identify and explain why biodiversity is important.



Biodiversity card-sort if your class would struggle with an open discussion as above, then start with this to give them ideas and discuss further, can they add to it?
Afl: number of correct matches.



1.5- 2 hours How can we measure biodiversity?

Introduce students to the Simpson's Index of biodiversity, including the difference between species richness and evenness.

Download the wildflower ID sheet and random number co-ordinates from the GEE website or purchase FSC Grassland plants ID keys. Ensure students have their booklets with them.



20 mins Practise ID Take students outside to an area of grassland. Start by practising plant ID skills.



Encourage students to look at the leaves and stem as many pupils will just go by the flower (or assume a lack of flower means it's not that plant). Students write down the plants they ID on mini white-boards. They chose one to sketch in their booklets (Lessons from nature mind map).



Afl: one student chooses a plant and describes it. The rest of the group have to guess what it is.



Image: Canva.com



MEASURING BIODIVERSITY



30 mins Measurements of abundance. Turn to the 'measuring abundance of plants' part of the booklet. Chose which measurement(s) of abundance to work with depending on age and ability of students. Practise some measurements of abundance using the booklet. You will need gridded quadrats and ideally frame quadrants if doing DAFOR and density.



Afl: students have the correct answer for each of the examples in the booklet.

1 hour Investigating plant abundance. Set up the sample area using 2 tape measures to create axes. Students choose the appropriate random number table, depending on their sample area, e.g. 10m x 10m. They then close their eyes and pick a random co-ordinate (eg 8.2). They would then find 8.2 metres on the tape measure acting as an x axis. They repeat this with the 'y axis' tape measure. They place their quadrat where these 2 points meet. Students collect data on species' abundance. If time, it is worth sampling in a different area, e.g. comparing the playing field to an area with a less used area to see if there is a difference in abundance.



Afl: students successfully complete practical activity. Students are able to identify some common grassland species.

30 mins (Optional) Diversity gives strength game. Give most students the picture of an elm leaf. Most of the class are elm trees. One or 2 students get a bark beetle card- the insect responsible for the spread of Dutch elm disease. These student run around tagging as many Elm trees as they can. These then die a dramatic death and fall to the ground. Play until most/ all students are caught.



Repeat the game, but give half the class other native tree leaves (oak and silver birch). This time when the bark beetle tags trees, only the elm trees die a dramatic death- the other survive.

Afl: which lessons from nature principle does this relate to? Diversity gives strength- in a monoculture the whole woodland could be wiped out, whereas in a diverse environment, some species survive.



30/ 10 mins Data analysis: Put all the data together to calculate the Simpson Index of Diversity (see booklet). The closer the value is to 1, the higher the diversity. If students are younger/ lower ability, they can instead just look at their results and see what it tells them about the biodiversity in the area(s) investigated.



AFL: students have calculated D correctly/ drawn conclusions



5 mins Watch Biomatrix video which highlights how increasing biodiversity can improve water quality while also increasing the amenity value of an area. (<http://www.biomatrixwater.com> scroll down to see the video).

Lunch

2 hours OPAL (Open air laboratory) project: Polli:nation

An OPAL citizen science investigation into pollinating insects and their habitats. A great way to highlight the importance of biodiversity. You need an area which contains some of the target common grassland/ hedgerow/ garden flowers (see Pollination chart for list). Students fill out a recording sheet identifying and describing the habitat and spend time observing which pollinators land on the flowers.



Students should submit their data online (allow time for this or set as homework). See website (<http://www.polli-nation.co.uk/activity/survey/>) for details.



If no flowering plants present, you can do the opal hedgerow survey instead.

(<https://www.opalexplornature.org/BiodiversitySurvey>).

AFL: students are able to complete survey. Students recognise key plant species and can use the information to identify pollinators.

Images: Carva.com



Plenary Discussion: how could biodiversity be improved around their school? Things such as planting flowers, planting hedges, creating ponds, making use of dead spaces, such as in car parks,





at the edge of fields. Leaving a field margin around the school playing field etc.



Homework: turning ideas into products. Design brief: design a product that would increase biodiversity around the school using the principles of the circular economy: e.g. selling plants in planters made from re-used materials (food cans, plastic bottles, wellies etc), creating a plastic bottle greenhouse, designing a pond that runs on rainwater with a solar powered pump, creating a sculpture of a bee out of recycled material to raise awareness of the plight of pollinators, making a bug hotel etc. Students create a poster to explain their design. Searching online for urban gardening/ eco gardening and vertical gardening, brings up lots of ideas. Show students some of these images, perhaps on a powerpoint to give them ideas.



AFL: students present their ideas back to the rest of the class.

Resources: all paper resources are in the 'resources' section of the website. For ID keys, the FSC ones are the best- purchase online. See also resources.

- **Biodiversity card sort:** download from resources area
- **How can we measure biodiversity?** Booklet, wildflower ID guide, random number table, gridded and frame quadrats, tape measures.
- **Diversity gives strength game:** images of leaves and beetle
- **Data analysis:** calculator & booklet
- **Polli:nation:** tape measures, thermometer, Pollination booklet, pollination recording sheets, pollination chart
- **Homework task:** find images on eco/ vertical/ urban gardening (not provided).

Images: Canva.com





MODULE 2: DIFFERENTIATION

DIFFERENTIATION

Key words recap

Support: students work in groups and support each other to decide on the definitions. Refer students back to their booklets and the diagrams of the circular/ linear economy.

Why is biodiversity important

Extend: encourage students to make links between the different areas of biodiversity, e.g. biodiverse native forests are better for wildlife than plantations and also help humans in terms of natural flood defences.

How can we measure biodiversity?

Support: encourage students to focus on identifying a few common easy species such as dandelion, dock, grass and clover. Other species can be called 'species A, B' etc. For calculating diversity, they only need to know that there are definite species, not what they are called. Density is the easiest measurement of abundance to use, but you would need to discount grass or other very common species.

Extend: practise all the measurements of abundance (density, local frequency, percentage cover). Use percentage cover as the final measurement of abundance. Discuss the limitations of each of the measurements in estimating abundance.

OPAL polli:nation project

Support: spend some time before the investigation going through the different types of pollinators and how to recognise them, e.g. the difference between bees and hoverflies.

Homework: turning ideas into products

Support: this can be done in small groups so students can support each other. The design brief could be narrowed, e.g. design an eco-friendly plant pot, or design a piece of artwork out of reused/ compostable materials that highlights the importance of biodiversity.

Extend: leave the brief open. Encourage students to start thinking about some of the logistics of their design and annotating their poster accordingly; e.g. who is the target audience, where would the product be sold, how would it packaged, marketed etc.



MODULE 2 EVALUATION & REFLECTION

REFLECTIONS

At the end of this module, students should make sure that they have added new vocabulary and terms to their glossary page.

Encourage students to start writing down any ideas or inspirations they have for their own businesses in their booklets.

LEARNING OBJECTIVES

By the end of the module 2, students will:



explore, identify and explain patterns in nature and how natural systems are connected.



start to make comparisons between systems in the living world and how industry can be redesigned following natural principles.



be able to describe what biodiversity is, how it can be measured, how it benefits people and why it is important.



have explored a variety of environments and investigated the interactions between the living things in the environment.

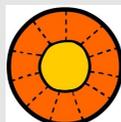


have acquired the skills and be inspired to work on their own business idea.

NATURAL PRINCIPLES



**DIVERSITY GIVES
STRENGTH**



**RUN ON SOLAR
INCOME**



MULTIPLE BENEFITS