

GREEN ENTREPRENEURS EUROPE



MODULE 2: LESSONS FROM NATURE

Option 1 Overview



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**BUSINESS
IN THE
COMMUNITY**

This booklet is developed for the project "Green Entrepreneurs Europe".

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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 an overview, covering many key concepts. Your other options are: 'waste = food', 'diversity gives strength', 'plastics (2 day course)' and 'sustainable towns & cities'.

The *Green Entrepreneurs Europe* course will be taught in 5 different European countries. It has been developed to encourage cross- curricula 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: OVERVIEW

MODULE CONTENT

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

In this module, students will build on the skills and concepts covered in the introductory module 'what might change?' Students will go outside to discover how materials cycle through nature. They will be introduced to the concepts of cradle to grave and its alternative: cradle to cradle. They will critically analyse the success of recycling our waste through an interactive game. Students will use scientific equipment to explore and record the benefits of trees and compare these to manufactured products. They will discuss what we can learn from nature to change our manufacturing processes to be more circular. Through a pond dipping investigation, students will explore the many adaptations of pond organisms and how humans have used biomimicry to inspire product design. Students will have the opportunity to look at existing green products for ideas and inspiration.

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: overview): students use the key terms and make comparisons between the natural economy and the human economy. 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 NATURAL CYCLES

PART 1: INTRODUCTION



You will need access to a woodland and ideally a pond. See <https://osmaps.ordnancesurvey.co.uk/> to find your nearest pond. Always check the landowners permission.

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



20 mins Invertebrates: explain that you've come outside to investigate how things are done in nature. Give students nutrient cycle labels and explain that they need to find examples of some of these. Demonstrate how to search for invertebrates safely and ethically. Students can look under logs, on tree trunks and on plants. Students should be able to find examples of: soil, producers, primary and secondary consumers and detritivores.

Afl (observation) students have safely collected invertebrates.



10 mins Nutrient cycles Students create a nutrient cycle out of the laminated cards, adding in any real examples they have found. May need support from teachers.

Afl: students have created a circle and can explain interactions.



Photos: Yanika Hennig



10 mins Cradle to grave analysis Students given an artificial object to do a *cradle to grave* analysis, eg plastic bottle: starts off as fossil fuel in ground, is extracted, transported to a refinery (in vehicles which run on fossil fuels), transported to a production plant, transported to a bottling factory, transported to a distributor, transported to a shop, transported by the customer, ends up in bin. Once students have identified the life cycle of a plastic bottle they draw a simple flow diagram in their booklets to show the process.



Afl students draw/ write flow diagram in their booklets.



RECYCLING- THE ANSWER?



Ask students to think about alternatives to throwing items in the bin...leads onto the topic of recycling.

15 mins Recycling game Context: explain to the students that they are going to play a game to model how recycling works. Explain that no recycling is 100% efficient. We will assume that 50% of the material in a plastic bottle can be recycled.



Recycling game: working in groups of around 5, students split into different roles. Labels/ tabards are provided to groups. Student 1 is the 'consumer', student 2 is the 'recycling plant', student 3 is 'landfill'. These 3 students stand in a line 4-5 paces apart. Student 1, the 'consumer' is given 8 ball-pit balls (or other items that could represent particles). When the teacher says 'go', another student takes half the balls from the 'consumer' and runs to the 'recycling plant' person and gives it to them. Another student takes the remaining 4 balls from the 'consumer' and gives them to the 'landfill' person. This is round one. In round 2, one of the 'runners' takes the 'recycled' particles from the recycling plant person and runs them back to the consumer. Two runners takes 50% of the balls (now 2) to the 'landfill' person and 50% to the recycling plant etc. The cycle continues until the 'consumer' is left with no balls. It is a good idea to do a practice-run with the students walking it through and then when they understand how it works, letting them race each other in teams.



Photo: Yanika Hennig

5 mins Reflection: Students reflect on what this activity demonstrates. As no current fossil fuel recycling is 100% efficient, the process merely delays the time that the material takes to go landfill. So this is the 'doing less bad', rather than 'doing good'.



Afl think, pair share



TREES VS TECHNOLOGY



10 mins Recycling quiz: students answer multiple choice questions related to recycling. They write their answers down on mini-whiteboards, or use technology such as 'plicker' or 'socrates'.



Afl: mini whiteboards/ Plicker/ Socrates



10 mins Consequence wheel (optional activity): start with a scenario, eg if we continue burning fossil fuels then...spiral the consequences from this eg climate change and all it's affects; running out of natural resources- and the effects of that; emissions and the effects of them on health, environment etc.



Afl: students draw consequence spiral in booklets.



Images: Canva.com



20 mins Concrete trees activity: ask students to imagine that they are Ecologists working for their town council. The Council have proposed to chop down all the trees in their local park/ green space and replace them with concrete trees. These concrete trees produce oxygen, are made from 'wind proof concrete' so are safe and won't blow over, don't create a mess in the winter with fallen leaves, and can transmit Wifi. The students are tasked with investigating living trees and making a case for them not to be replaced. Students should focus on one species and use a variety of equipment e.g.: ID keys for trees/ mosses/ invertebrates, light metres, thermometer, compass, hand lenses, ipads, crayons (for bark rubbings) etc.

Afl: practical demonstration; students can demonstrate how to use the equipment to collect data safely.



10 mins Multiple benefits: students are given any artificial object (eg a wrist watch, calculator, plastic bottle etc). They complete the multiple benefits table in their booklets to compare the tree species they investigated to their object.

Afl: completing the table

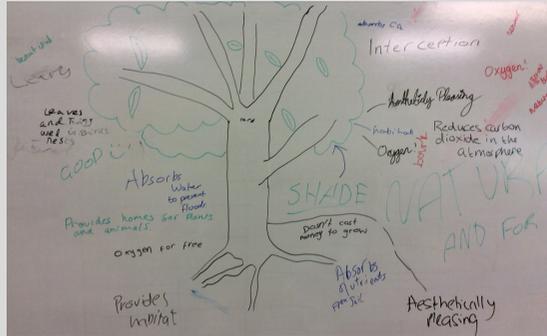


BECOMING INSPIRED BY REAL BUSINESSES

Break for lunch: Lunchtime activity: draw a picture of a tree on the board including roots and leaves. Ask students to write their 'benefits of trees' around the tree as a visual demonstration of the role of trees.

Afl: thought shower

Image: Canva.com
Photo: Yanika Hennig



20 mins Videos and discussion: TED talks William McDonough Cradle to cradle design. https://www.youtube.com/watch?v=Zf95_OTKM10



v=Zf95_OTKM10

Show from 10.40- 11.12

These are all short clips of different organisations demonstrating principles of green entrepreneurship.



1) Seabin <https://www.youtube.com/watch?v=mK1cpkGZsfE&feature=youtu.be>

v=mK1cpkGZsfE&feature=youtu.be



2) Ducks as pest control: <https://www.youtube.com/watch?v=H6Ehoxu9QY8>

v=H6Ehoxu9QY8



3) Leather made from mushrooms:

<https://www.youtube.com/watch?v=9xEJD7YesTY>

Discussion: start a discussion about what we can learn from this morning's activities, using the videos as inspiration. Students should think about how the artificial objects they were given to do their 'multiple benefit' analysis, could be re-designed to make them part of a circular economy. eg they may decide that the plastic ruler should be made out of wood/ biodegradable plastic instead which could be composted once it has reached the end of its useful life. Or it could be carved into something new. Instead of a throw-away drinks bottle, it could be part of drinks dispenser system where you refill your bottle from a machine, etc.





:Photo: Yanika Hennig



5 mins Pond dipping demo: demonstrate how to safely and ethically pond dip.



15 mins Pond dipping activity: students have 10- 15 minutes pond dipping to try and catch as many different species as they can and identify them using a key.

Afl: students can demonstrate how to safely pond dip



10 mins Cycles & adaptations: Stop students to talk about cycles in the pond (life cycles, nutrient cycles). Lead on to adaptations- what kind of adaptations might organisms need to live in water- focus on breathing, moving and eating. Students continue dipping, for another 10 minutes, looking at how their organisms move and interact.



15 mins Adaptation challenge: Students given freshwater invertebrate info cards and adaptation cards. Have 10 minutes to choose an organism that they found and think how it's adaptation could be applied to be useful to humans. Group by group students put their animal in a large tray half filled with water to watch it move, breathe and interact.



Example: dragonfly nymph propels itself by taking in water and squirting it out of its anus. Could spacesuits be designed so that astronauts take in air into their suits, compress it and squirt it out of their feet to propel themselves through space?

Afl: hinge question. Ensure students are able to give an example of an animal adaptation that could be used before moving on.



10 mins Biomimicry activity: students are given cards showing images of natural items and human products inspired by these and have to match them up (eg velcro- burr).

Afl: card sort



10- 20 mins Green product examples: show students examples of real green products. Some you may already have easy access to: eg cotton bags, biodegradable packaging peanuts (many products are now packaged in the way to check is to put them in water: they fully dissolve), pencils/notebooks that used to be a CD case/ car tyres etc, cornstarch compost bin bags. Some companies will also send free samples to schools, we had success with: Vegware (compostable food packaging), Spare fruit (they use deformed fruit that doesn't meet supermarket grade and dry it into fruit crisps), Grocycle (a kit for growing mushrooms from coffee grounds).

Afl: students explain examples they find inspiring and why.



5- 10 mins Plenary: graffiti wall. Give students post-it notes or similar for students to reflect on what they enjoyed the most, something they have learnt and if there are any improvements to the day that they would recommend.

Resources all paper resources are in the Learning materials section of the GEE website, under 'resources'. For ID keys, the FSC ones are recommended- purchase online. See also 'resources'

- **Natural cycles:** Invertebrate collecting equipment: tubs, spoons/ paintbrushes, sweep nets if using, ID keys, nutrient cycle cards
- **Multiple benefits:** artificial items, eg watch, calculator, plastic bottle
- **Recycling game:** Per group: 8 x balls, 3 signs saying consumer/ recycling plant/ landfill
- **Recycling quiz**
- **Concrete trees activity:** tree worksheets and some of: ID keys: trees, moss/ lichen, fungi. crayon (bark rubbing), tape measure, clinometer, iPads or similar for photographs.
- **Pond Dipping:** large bowl for putting the pond net full of stuff into. Small tub for transferring caught animals to, pond nets, identification keys. Big tray/ bucket to watch the organisms moving- nice but not essential.
- **Pond adaptations:** Pond organism adaptation cards
- **Bio-mimicry:** cards
- **Green product examples:** a variety of 'green' products, eg cotton bags, biodegradable packaging peanuts, cornstarch compost bin bags, 'I used to be a CD' type products. Contact companies for freebies.



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.

Thinking activity

Support: if groups/ whole class struggling then this could be done as a class/ group activity, eg everyone uses the same example and talk through together the lifecycle of for example a plastic bottle.

Extend: students can be given an object containing several materials, eg plastics, metal to increase the challenge.

Concrete trees

This activity is designed to work like a bucket experiment: give students a number of resources and let them go and explore, so is in itself self-differentiating.

Support: if students are struggling they can be guided on some of the activities to start with.

Discussion

Support: run this as a group activity so more creative students can support the less creative ones, and everyone can contribute ideas. Groups can be prompted by questioning, eg what other material could the product be made out of? Could the product be re-used?

Extend: students think about the rest of the lifecycle of the product: the packaging/ advertising/ transporting the item to the shop.

Adaptation challenge

Students tend to find this activity a challenge. Encourage them to just throw ideas around, however silly they may seem, to get their creative thinking going.

Support: point students towards invertebrates which have more obvious adaptable features, Mosquito larvae & siphon; water beetles & air bubble, Cased caddisfly larvae spinning silk, bi-valves scraping tongue.

Bio-mimicry

Support: direct student to the easier examples, eg teasel and velcro.



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 how nature creates things, draws energy, and treats waste.



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



be able to describe the difference between conventional recycling, which simply delays the conversion of resources into waste, to natural recycling where that entire resource becomes a new product/ resource with zero waste.



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

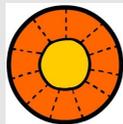


have acquired the skills and be inspired to work on their own business idea.

NATURAL PRINCIPLES



WASTE = FOOD



**RUN ON SOLAR
INCOME**



MULTIPLE BENEFITS