

GREEN ENTREPRENEURS EUROPE



MODULE 2: LESSONS FROM NATURE

Option 4 The Plastics Problem (2 day course)



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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 plastics problem. Your other options are: the 'overview module', 'waste = food', 'diversity gives strength' 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

MODULE CONTENT

Welcome to the cycle of activities included in the "Lessons from Nature" module. Complete in: 2 school days 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 the effect plastics waste is having on the environment. By taking part in citizen science project 'Beachwatch', students will gain an understanding of the diversity of rubbish washed up on our beaches and take part in a beach clean to help reduce it.

Students will be introduced to the concepts of cradle to grave and its alternative: cradle to cradle. Students will compare what happens to natural waste on the beach to plastic waste and discuss ways of making the human waste stream more like the natural one.

Students will take a critical look at recycling and investigate alternative methods of reducing plastic waste.

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. Students reflect on how human rubbish is affecting the planet and what we can learn from natural systems. 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 THE PROBLEM: NON-BIODEGRADABLE WASTE

PART 1: INTRODUCTION

If you don't have time to do this before your trip to the beech then this can be done at the end of the introductory section, or links sent to the students and set as homework.



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

10 mins Videos to engage and highlight the problem.



Show one or a few of the following clips from Blue Planet II



1) Plastic pollution awareness

<https://www.youtube.com/watch?v=xLx4fVsYdTI>



2) Clip showing pilot whale mother carrying calf probably killed by plastics



<https://www.youtube.com/watch?v=0a8HGJid-Jo>



3) Clip showing how albatros chicks are eating plastics and it's killing them.



<https://www.youtube.com/watch?v=I4QNoIP7Khc>



10 mins Reflection activity. Ask students to discuss how the clips made them feel then share with the class

Afl: think, pair, share

3- 4 hours Beech clean & activities.

It is anticipated this activity will take up a school day, once travel to and fro the beech is taken into account. If travel time is long then adapt this day by not doing some of the optional activities.



It is essential to visit the beech prior to the trip taking place to do a risk assessment. Tide times should be checked to ensure an outgoing tide, clear boundaries should be set and enough adult helpers brought along. If you would like to join an organised beach clean event rather than arrange your own, you can search for an event near you

on: <https://www.mcsuk.org/beachwatch/events>



BEACH SAFETY

For the beach clean it is recommended to follow the guidelines set out by the Marine Conservation Society. A range of forms, including risk assessments and parental consent are included.

(<https://www.mcsuk.org/beachwatch/sites/mcsuk.org.beachwatch/files/resources/Organiser%20guide%20new.pdf>) . The documents can also be downloaded from the 'resources' section on the GEE website.

20 minutes Introduction Start by introducing the Beachwatch survey and why the students are taking part. Explain that it is a citizen science project and that their data will be used by the Marine Conservation Society to help them work out trends across the UK and lobby politicians etc Therefore it's important they do it properly and take it seriously.

Split class into groups and give out survey sheet. Go through the different categories of rubbish and explain any the students aren't sure of. If you think they might struggle then go through the MCS Beach litter ID guide, or if you have done a pre-visit and picked up some examples of these items then show them. It is important that sub-group leaders (adults) are aware of the different items of rubbish as they will be supporting groups.

5 mins Health & safety: explain the dangers of beach, such as tides, getting swept away, getting cut off and the beach environment in general. (Refer to MCS guidelines).



Photo: Yanika Hennig



BEACHWATCH SURVEY



20 mins practice survey. Use an area of beach not being used for the survey and get groups to practise recording (but not picking up at this stage) the beach rubbish that they find.



10 mins debrief: what did groups find most of (probably plastic)? Discuss any problems/ issues students had.

30 mins Lunch: make sure you have lunch before doing the beach clean for hygiene reasons.



10 mins Beach clean safety brief: Go through the PPE and equipment that students will be using. See the MCS guidelines for recommended PPE. Suggested minimum equipment is: thick gloves for every student picking up rubbish and ideally litter pickers, strong bin bags (e.g. garden waste sack) and hanging weighing scales, like the type used to weigh luggage (can be bought cheaply online). Mention items that shouldn't be picked up e.g. sharp objects if not using litter pickers, items that are very heavy and very large etc



Image: Canva.com

1 hour Beach clean and survey

Take a photo before your beach clean and after to see the difference.



You can either use the official MCS beach clean survey sheet, or if you think your group will struggle, then use the simplified form in the cool seas booklet (see resource section at the end).



Before they start, re-emphasise to students the importance of what they are doing and that they must remember to record everything they find as well as picking it up. It is helpful to assign roles within the groups: e.g. 2 spotters, 2 people to pick up litter and hold bin bag and one person to record.



Measure out the survey area (survey 100 m along the beach from the high tide mark to the back of the beach). Subdivide this into sections (it can be helpful to bring extra tape measure or mark this area out using natural beach debris (don't move anything man-made as you want to record this). Students survey their stretch picking up all the man-made items they come across and



NATURAL BEACH WASTE

recording all of these. Students may want to swap jobs (spotters/ recorders/ picking up and bagging) as they go along. Once a group has finished, the weight of their bags should be recorded using a hanging weighing scales.

If groups finish before others they should hand in their survey sheets, as the surveying should only be done within the 100 m area. However, they can carry on picking up litter in areas outside the survey area, to have even more of an impact on the beach.



10 mins Initial thoughts discussion. Groups discuss what they found most of and where this might have come from. Did anything surprise them? Extend by asking groups to explain why rubbish (and plastic in particular) on beaches is a problem.

Afl: Students fill out the relevant questions in their 'lesson from nature' page in booklets.



20 mins Natural beach waste: Each group is given a copy of the MCS 'seashore safari guide', then given the nutrient cycle labels. Groups are sent off to see how many examples of the labels they can find. No live animals or plants should be removed from their habitats.



An example of a producer would be seaweed (dried seaweed can be picked up), a primary consumer would be a limpet (find a shell) and a secondary consumer would be a crab (again a shell). If students see live animals/ plants they can take a photo, e.g. a shorebird or barnacles clinging to a rock. Students find what they can and bring back to a base. Students arrange the labels in a cycle, adding in their examples found. Those stages of the nutrient cycle they could not find examples of they can write an example in the sand (if on a sandy beach), e.g. detritivores are hard to find (although worm casts can sometimes be seen).

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



Images: Canva.com



If you do not have time to complete this activity at

Photo: Yanika Hennig



BEACH ACTIVITIES

the beach this can be done back at school as part of day 2. Students are given the nutrient cycle labels and given the MCS 'seashore safari guide'. They cut out pictures as examples of each stage rather than using real objects.



10 mins Discussion: does plastic fit into this cycle? Why not?

Optional activities if time at the beach:



10 mins Consequence wheel: start with a scenario, eg if we continue to use single use plastic at the current rate then.....sprial the consequences from this e.g. plastic ends up in the oceans and all it's affects; running out of natural resources (plastic is made fossil fuels)- and the effects of that, landfill/ incineration and the effects of them on health, environment etc.



Afl: questioning



Images: Canva.com



20 mins Treasure hunt/ bingo: A bit of fun at the end, getting students up and moving. Using the MCS treasure hunt sheet, set students the challenge of finding the items on the sheet and taking a photograph. Alternatively, to make it more competitive, turn it into beach bingo: 3 in a row wins.

Afl: photographs of correct items.



30 mins Beach art: another 'fun' activity to finish. Challenge students to create a sculpture out of natural, *non-living* materials (e.g. drift wood, rocks, dried seaweed, shells etc)



DAY 2: PROBLEMS & SOLUTIONS

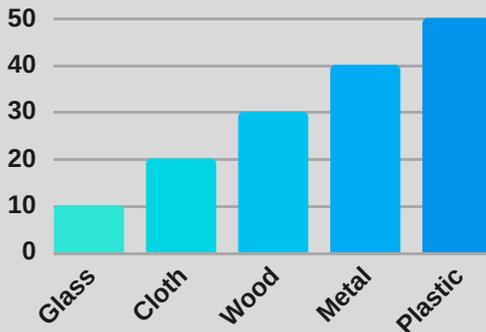
Before the lesson

Set up a simple table on a spreadsheet with column headings of the main categories of rubbish on the survey form (e.g. plastic, metal, paper/ cardboard, rubber, wood metal, cloth, glass) in advance. For the row headings put the student group numbers or names.

20 mins: Analysing the results



Ask one person from each group to fill in the total amount of items they found for each category on the spreadsheet. Calculate class totals and create a simple bar chart from it. This can be displayed to the class to help them visualise the quantity and distribution of their rubbish collected.



While groups are doing this, ask the class to think about the lifecycle of a plastic bottle- i.e. what is the raw material? What happens to this? How does it become a plastic bottle?

Afl: questioning

2 mins How is plastic made video Short minute video showing the lifecycle of a plastic bottle. Stop after 1.23 minutes, as recycling will be discussed next.



<https://www.youtube.com/watch?v=erGnf7ws20E>

15 minutes Plastic bottle lifecycle (i.e. cradle to grave).



Students draw a simple flow diagram in their booklets, to show the cradle to grave analysis of a plastic bottle. e.g. it 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,





RECYCLING: THE ANSWER?

transported to a shop, transported by the customer, ends up in bin.
Afl: students draw/ write flow diagram



5 mins How could we make this linear system more like the circular economy? (i.e. cradle to cradle)? Students are likely to think of recycling, using re-usable bottles, and using alternative materials, e.g. metal). Write class answers on the board and leave up to refer to later.



Afl: Group, pair share



20 mins Problems with recycling activity.

Recycling is often cited as the answer, but it only delays the time it takes the product to go to landfill. Explain that for various reasons plastic isn't 100% recyclable (plastic is often a mixture of different plastics and the process isn't 100% efficient). Demonstrate this to the students with a plastic bottle. Have 2 volunteers hold up a container each: one marked 'landfill' and one marked 'recycling plant'. Imagine that 50% of the bottle can be recycled. Ask a third volunteer to cut the bottle in half and put half in the recycling plant box and half in the landfill box. Take the 'recycled' half out and repeat the process- half can be recycled (now 1/4 of the bottle) and half ends up in landfill. Keep going until the plastic gets small.

Afl: reflect on this activity- how long did this take? Around 4 times? So by recycling this bottle it has lasted 4 times longer than it would have if it had been put in landfill, but ultimately it still ends up in landfill.



2 mins Plastics video. Show either or both of these short videos on plastics to be followed by a quiz (some but not all of the answers are in the video)

Rethinking the future of plastics from 2.45- 3.30

https://www.youtube.com/watch?v=1E_irYHyrGU



The new plastics economy. Scroll down for video. Up to 1.03 min



<https://newplasticseconomy.org>



15 mins: plastics quiz: how much do students know about plastics and recycling? Students work in groups choosing an answer from the options provided.

Afl: self or peer assess- was anything surprising?



10 mins Videos: how can we tackle the plastics problem? Show students the following videos which show different approaches to the plastic problem.

▶ **Seabin:** <https://www.youtube.com/watch?v=tiy7WQYQyhY>

▶ **Ecovative** (mushroom packaging):
<https://www.youtube.com/watch?v=zw2O1PhrzA0>

▶ **Imagine a chair:**
<https://www.youtube.com/watch?v=FKjJyus6WOg>

Lunch now or after case studies.



20 mins Case studies Split the class into groups and give each group a case study of a business which reduces plastic. (See case studies section of website). The best ones to choose to support this topic are: *Splosh*, *Ecovative*, *Oat shoes* and *Encirc*. You might just want to give them the overview and products pages as they are just looking for how the companies are reducing plastic, rather than gaining an in-depth understanding at this stage. Give groups 10 minutes or so to read the case study and summarise. Each group reports back to the class.

Aft: mini presentation (summary) to class.



1.5 - 2 hours Research, poster and presentation.

Students create a poster with a short section about 'the problem' then focusing mostly on plastic alternatives. The aim is educate their peers and other people at school about how to reduce plastic consumption. This can be traditional ideas such as recycle, reuse (e.g. coffee cups, drinking bottles and cotton bags) but encourage students to research and look up innovative alternatives. This research process should also help them with their own ideas creation for their product. Suggested timings are to allow about 30- 45 minutes for research, about 30 minutes to create their posters, then 30mins- 1 hour to present these back to the class. Encourage students to write down any ideas they may have for their own product as they do their research in their booklets.



Recommended websites

The 4 mentioned case study websites:

www.splosh.com

<https://ecovatedesign.com>

www.oatshoes.com

www.encirc360.com

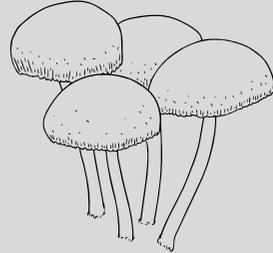


Image: Canva.com

Overview of the problem:

A BBC website aimed at children, explaining some of the issues with plastics and solutions with short videos:

<https://www.bbc.co.uk/newsround/42810179>

The Marine Conservation Society's clean seas page

<https://www.mcsuk.org/clean-seas/>

Alternatives to plastics:

A UK website selling plastic alternatives, such as toothpaste without plastic packing, plastic-free makes up, razors, toothbrushes and any more.

<https://www.anythingbutplastic.co.uk/shop>

A US company turning organic waste into biodegradable plastic:

<http://fullcyclebioplastics.com>

Circular economy take on plastics this is a lesson plan but contains good facts and links.

<https://www.ellenmacarthurfoundation.org/assets/downloads/Redesigning-Plastics.pdf>

Submitting beach clean data: either task one group to do this (higher ability), or take one person from each of the groups to work together on this. They will need to collate the class's data onto this

sheet: <https://www.mcsuk.org/beachwatch/sites/mcsuk.org.beachwatch/files/resources/Beachwatch%20survey%20summary%20form.pdf>



STUDENT PRESENTATIONS



Green products: A nice addition to this task, is if you are able to provide some examples of alternatives to conventional products.



Some you may already have easy access to: eg cotton bags, biodegradable packaging peanuts (many products are now packaged in them 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) and *Grocycle* (a kit for growing mushrooms from coffee grounds).

The time could just be spent researching and creating posters, with students tasked to prepare presenting as homework, then presenting back to the class the following lesson.

Afl: groups present their posters to the class.

Images: Canva.com



10 mins Plenary:

Add any new ideas to the board to help answer the question asked at the start of the lesson: 'how could we make producing and using plastics more circular? '



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'.*

DAY 1: BEACH CLEAN

- **MCS Beach cleaning for schools and groups guide** <https://www.mcsuk.org/beachwatch/groups-and-schools>
- **MCS Survey form** <https://www.mcsuk.org/beachwatch/sites/mcsuk.org.beachwatch/files/resources/Beachwatch%20Volunteer%20form.pdf>
- **MCS Beach clean organiser guide** - if you are not joining an organised beach clean
<https://www.mcsuk.org/beachwatch/sites/mcsuk.org.beachwatch/files/resources/Organiser%20guide%20new.pdf>
- **PPE & equipment:** gloves, litter pickers, bin bags, hanging weighing scales, tape measures to measure 100 metres
- **MCS Beach litter ID guide** of different types of marine litter if needed.
- **MCS seashore safari guide**
https://www.mcsuk.org/media/explore/MCS_seashore_safari_guide.pdf
- **Nutrient cycle cards.**
- **MCS Treasure hunt sheet.** Page 7 in cool seas explorer document.
<https://www.mcsuk.org/coolseas>

DAY 2 PLASTIC PROBLEMS AND SOLUTIONS

- **Problems with recycling:** Plastic bottle and 2 containers labelled 'landfill' and 'recycling plant'. Scissors.
- **Plastics quiz**
- **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.
- **Posters:** paper, pens.



MODULE 2: DIFFERENTIATION

DIFFERENTIATION

DAY 1

Beach Clean

Support: With lower ability students, you can use simplified survey sheet, page 5: <https://www.mcsuk.org/coolseas/>
Adults to help students identify and record their rubbish to ensure accuracy.

Extend: Encourage students to think about where the beach litter might have come from. Just from the UK? Consumers? Industry? 'Answers' are on this resource:

<https://www.mcsuk.org/beachwatch/sites/mcsuk.org.beachwatch/files/resources/Beachwatch%20Litter%20Sources%20.pdf>

Natural beach waste (nutrient cycle):

Support: go through the seashore safari guide with students as a group and get them to identify organisms which may be producers/ primary consumers, secondary consumers etc.

Extend: ask students to show the flow of energy around the cycle using sticks or similar to represent this.

DAY 2

Plastic bottle cradle to grave analysis

Support: if students struggling, then do as a class on the the board and students copy into their booklets as you draw and annotate on the board.

Case studies

Extend: challenge students to think critically about the alternatives to plastics suggested by the case studies. e.g. Splosh: you still start out with a plastic container; glass is heavier to transport (Encirc) so uses more fuel, etc

Research and poster

Support: give students subheadings, e.g. why is plastic a problem for the environment? Name a company that has found an alternative and describe what they do. Give 3 examples of things students can easily do to reduce their plastic use.

Extend: encourage students to apply circular thinking: how is the product transported? packaged? where do the raw materials come from?



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 some of the problems associated with plastic use. Be able to explain some simple and more complex ideas to reduce plastic waste following the principles of the circular economy.



have explored a natural environment and investigated the interactions between the living things in the environment.

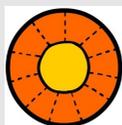


have acquired the skills and be inspired to work on their own business idea.

NATURAL PRINCIPLES



WASTE = FOOD



**RUN ON SOLAR
INCOME**



**MULTIPLE
BENEFITS**