



BioBus Teacher Materials
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BiOrbic BioBus Visit – Teacher Information

Max group size: 24 **Duration:** 1 hour **Materials Needed:** Pens

Below is a description of the BioBus exhibit and its learning outcomes, as well as concepts students would benefit from understanding beforehand. Please read ahead to ensure our content is at the right level for your students!

10 minute – Introduction

We will introduce the class to crude oil, fractional distillation and petrochemicals, which are used in an abundance of everyday products. We will also talk about the future bioeconomy and bio-based products, which can provide a sustainable, eco-friendly alternative.

35 minute – Exhibit Time

The class will be split into four groups of 5-6. Each group will have 8 minutes inside the bus and will spend the remaining time working on the outdoor exhibit.

Indoor Exhibit – 8 min

Students will be given a sheet with various household items that are inside the bus. Inside is a mobile home, with audio buttons next to the items explaining what they are made from. Students must explore the inside of the bus and mark off whether the items are petro-based or not. A key learning outcome from this will be the sheer volume of products we use regularly that are petro-based!

Outdoor Exhibit – 25 min

Students will be presented with various bio-based products, some of which are on the market today and some of which are still being developed by scientists. As a group, they must fill in a sheet asking them various questions such as 'which products come from food waste?' or 'which products are compostable?' They will be able to find the answers either by examining the exhibit pieces themselves or reading the accompanying booklet. Through this they should learn about a variety of bio-based alternatives, how they are made and how they reduce negative impacts on the environment.

15 minute – Wrap-Up

Our exhibit explainers will mark the sheets and announce which group has the most correct answers. There will be time for students to ask any questions and then fill in a short survey.

Post-Visit – Optional Homework

After the visit, we can provide materials for an optional piece of homework. Students can pick one of the bio-based products they have learnt about and write a short essay about it. This can include discussing the environmental



impacts of the traditional product, how the bio-based product is made and how it will positively impact our environment.

Prior Knowledge and Learning Outcomes

Recommended Knowledge	Learning Outcomes
Fossil fuels	Bioeconomy
Renewable vs non-renewable	Bio-based
Climate change	Biodegradeable
Carbon dioxide	Compostable
Carbon footprint	Petro-based
Biodiversity	Petro-economy
Pollution	Waste valorisation / circular economy

Attached we have provided a suggested lesson plan to cover some of the concepts we build on in the BioBus exhibit. We hope you find it useful and please feel free to adapt it to your needs!



Lesson Plan Pre-BioBus (approx 60 minutes)

Objectives:

- To introduce students to the concepts of fossil fuels, renewable and non-renewable energy sources, greenhouse gases, climate change, and biodiversity.
- To engage students in a hands-on, interactive activity to reinforce their understanding of these concepts.

Materials Needed:

- Whiteboard and markers or a computer with a projector
- Jenga set (Activity Option 1)
- Poster boards or large sheets of paper (Activity Option 2)
- Markers, coloured pencils, and other art supplies (Activity Option 2)

Introduction (10 minutes):

- Students are about to embark on a journey to learn about Earth's resources and how they are used to sustain and improve our lives.
- This lesson is a lead-in to an upcoming visit to the BiOrbic BioBus, a travelling exhibit about the bioeconomy, where they will explore how nature's resources can be used sustainably.
- Today students will learn about the interplay between nature, energy, and the economy.
- Just as ecosystems are interconnected, so are the resources we use and the impact it has on our world. We will discover how our choices now affect our planet's future.

Discussion (15 minutes):

- Ask the students if they have heard of the terms "fossil fuels," "renewable resource," "greenhouse gases," "climate change," "biodiversity," and "ecosystem." Write these terms on the board.
- Ask students for examples and definitions. Add keywords from their responses to the board.
- Define each term and explain its significance. Points to cover (if the students haven't already added them) are:

Fossil fuels: Non-renewable sources of energy like coal, oil, and natural gas, formed from ancient plants and animals. We rely on fossil fuels for many, many products, such as fuel for cars, anything plastic, clothing, chemical fertilisers...

Greenhouse gases: Describe how certain gases in the atmosphere, like carbon dioxide, trap heat like the glass walls of a greenhouse and contribute to global warming. Burning fossil fuels releases a lot of these gases.

Climate change: More heat in the atmosphere means more energy, which leads to more storms and extreme temperatures.



Biodiversity: The variety of plant and animal species in an area. Biodiversity is at risk from climate change, pollution, and habitat loss, all of which are caused by fossil fuel use. It is important for a healthy planet as it provides:

- Resources (food, building materials, sources of medicines etc);
- “Ecosystem services” (pollination, breaking down waste, cleaning air etc);
- Benefits for human well-being (think of visiting the park or the beach).

Ecosystem: A community of plants, animals, and other life interacting with each other and their environment.

Renewable resources (*Now for something more positive!*): Power or materials that can be replenished naturally. Examples include sources of energy such as solar or wind. These could replace fossil fuels and reduce emissions. However, *it also includes sources of materials*, such as plants, animals and microbes. Renewables are more sustainable and often have fewer environmental impacts.

Interactive Activity Option 1 (20 minutes)

- Set up a game of Jenga
- Tell the students that each block represents an animal (alternatively, some Jenga sets have animals on them already)
- As each student takes a turn, ask them to name the plant or animal they are removing from the “ecosystem”
- Play one or two rounds. See what happens when too many organisms are removed (the ecosystem collapses).

Interactive Activity Option 2 (20 minutes)

Divide the students into small groups.

- Give each group a poster board or sheet of paper.
- Instruct them to create a poster of an ecosystem. They should include drawings of plants, animals, and other elements such as water and sunlight.
- Have each group present their ecosystem posters to the class. Encourage them to explain the relationships between the organisms in their ecosystems.

Group Discussion (10 minutes)

After the activity, start a group discussion about the importance of biodiversity in ecosystems.

- Discuss how changes in the environment, such as climate change and pollution (caused by the burning of fossil fuels and the release of greenhouse gases), can impact these ecosystems.
- Ask what happens when something is removed from the ecosystem.
 - If activity one is used, highlight that the ecosystem can manage some loss, but eventually, it becomes too much (ecosystem collapse)
 - If activity 2 is used, ask what would happen if different parts of the poster were removed



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Conclusion (5 minutes)

- Summarise the key points of the lesson, emphasizing the importance of finding alternatives to fossil fuels so that we reduce greenhouse gas emissions and protect biodiversity.
- Encourage students to think about how their actions can make a positive impact on the environment.

Homework

Ask students to think of 3 examples of things in their home that are not based on fossil fuels before their visit to the BioBus.