

# LESSON PLAN

CREATED FOR TEACHERS BY EDEN'S EDUCATION TEAM

## Lesson 2 – The Invisible Underworld

### Summary

In this lesson we continue with the challenge set by the 'Whatifs' – investigate the invisible world of Paradise Pastures and use that information to persuade the 'Justsos' to manage it for the benefit of biodiversity.

In this session the children delve into the 'Invisible Underworld' - the world of soil. The types of enquiry that they predominantly focus on are 'Identification and Classification' as well as 'Pattern Seeking'. They also continue to develop their scientific skills such as 'observing', 'measuring' and 'recording data'.

### Outcomes for Lesson 2

- Investigate the 'Invisible Underworld' recording what the environment is like underground and identifying the living things we find.
- Practise using scientific equipment to take measurements and make observations, recording what you find.
- Search for, and suggest, patterns or relationships between things in nature.

### Key Vocabulary

Biodiversity, habitat, invertebrates, identification, classification, tincture, equipment, observation, patterns, trend, relationship, decomposing, soils, moisture

### General Resources

- Labelled bottles of orange tincture – 'Drink and Blink Juice' (1 per group). This can be a smoothie that contains carrot juice.
- Small drink receptacles (e.g. cleaned /sterilised limpet shells) (1 per pupil)
- Working wall in the classroom - big map of Paradise Pastures upon which to pin their learnings.
- Pins, post-its, pens
- Water spray bottles x 3
- Soil moisture sensors x 2. These can be purchased for under £10 each.

### Research Kits (1 per group)

- Invisible Underworld Recording sheets A4 (1 per pupil)
- hand lenses x 4
- Data logger if available (can be substituted for a thermometer)
- Invertebrate ID key (e.g. [www.field-studies-council.org/shop/publications/garden-bugs-and-beasties/](http://www.field-studies-council.org/shop/publications/garden-bugs-and-beasties/))

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- plant ID key (e.g. [www.field-studies-council.org/shop/publications/playing-field-plants-guide/](http://www.field-studies-council.org/shop/publications/playing-field-plants-guide/) or use 'Playing Field Plants Identification' (1 per group)
- Stereo microscopes (at least 2 per group). The Royal Microscopical Society recommends these for primary schools and we have found them to be great: [www.scichem.com/product/bms-s-05-l-led-stereo-microscope](http://www.scichem.com/product/bms-s-05-l-led-stereo-microscope). However, students can use hand lenses if you don't have any microscopes).
- Clipboards and Pencils
- Trowel
- Petri dishes x 3
- Small soil collection tub (e.g. a takeaway container)
- Metal spoons
- Tray for soil

## Prior to the lesson

Just before the lesson begins scatter the 'Drink and Blink' tinctures within Paradise Pastures for the children to discover when they venture out there.

## Begin the lesson in the classroom

(slide 1) Title Slide

## Introduction

Ask the children what happened in the last lesson. Collect feedback from them and check their understanding of the project. Use slides 2 and 3 to review the overarching plan for the project, the meaning of the term 'biodiversity' and the challenge set by the Whatifs.

## Getting Started – Scavenger Hunt

Before getting stuck into the main part of the lesson get the children reacquainted with the space again by heading outside to Paradise Pastures. As they gather they will stumble across the next tincture given to them from the Whatifs – 'Drink and Blink juice'. They need to hang on to those for later – the Whatifs obviously think it will help with today's challenge. You could ask the children what they think the tincture does.

Give each group a plant ID guide and set a quick scavenger hunt challenge. A plant at a time, ask the students to find plants that you know are present in that area. Give them a short amount of time (e.g. 30 seconds) to find the plant and point to it before setting them off on the next one. You could mix it up with plants that they 'probably' know and are easy to spot with more inconspicuous plants from the I.D guide.

Head back inside, taking the tinctures with them.

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## Today's Session Outcomes

(slide 4) Tell the children that today we will focus on the Invisible Underworld of Paradise Pastures and search for patterns. Share outcomes for today's lesson.

## Pattern Seeking – Getting the children into the habit of searching for patterns

[Pattern Seeking](#) is one of the types of scientific enquiry. Pattern Seeking investigations lend themselves nicely to studying the natural world where you are trying to establish if there is a link or relationship between living things and their environment. It is important to spend some time discussing with the children what we mean when we talk about patterns in nature. The more you can get them noticing/speculating/discussing possible patterns they are seeing the better – these may form the basis of a question to investigate later-on.

(slide 5) Tell the children that part of what we are doing today is about searching for patterns. Ask them if they can give any examples from nature about possible patterns, relationships or links between variable (things) that they have noticed before?

Give them some examples to help them see what you mean before you set them off.

Collect feedback from the children. What patterns or relationships have they noticed?

Stress to the children that it's worth remembering that just because 2 things appear to be linked it doesn't mean that they are (they might not be causal). Could use the example of sun cream use and ice creams eaten. Those things might appear to be linked as both increase in the summer, but one is not causing the other. What is causing more ice creams to be eaten or sun cream to be used? Answer: The sunny weather / warmer temperature

Explain to the children that when they are investigating the 'Invisible Underworld' today you want them to try and look for and notice as many possible patterns as you can.

## Research kits

We have already seen how much there is to see in the Invisible Overworld. Now we are going to dig down into the Invisible Underworld so we can find out more things to tell the Justsos about.

Once again, the Whatifs have left the children some kits. Hand out kit boxes and ask the children to have a look through to see what they have. The children will be drawn to the stereomicroscopes. Explain that when combined with the 'Drink and Blink' juice the Whatifs believe that these microscopes will help you to explore the invisible world of soil – giving your eyes microscopic viewing capabilities, see in the dark and the ability to detect small movements.

As a class drink the tincture and then give the students some time to investigate (gently) how the microscopes work – focusing them on a small object e.g. a coin to achieve a clear

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image. Highlight to the children that for objects which are not flat it will be impossible to have the whole view in focus at any one time, but that if they slowly turn the focusing wheel they will be able to see different features of the object they are looking at. Check that all the students are happy they can achieve a clear image.

## Head Outside

Now they have tuned their eyes in go outside and demonstrate to them what they are going to do.

Tell the children are going to investigate 2 locations in Paradise Pastures. One is the location where you did last week's Microhike and the other should be a location which they feel is very different from the first. They can record their findings on their sheet. They need a new sheet for each location.

Before you demonstrate what to do, as class, agree upon a set of rules which everyone will abide by when handling the living things that they will encounter.

For both locations do the following:

1. Use the soil moisture sensor to measure the water content of the soil. Record the value on your sheet.
2. Measure the temperature at the soil surface using the data logger or thermometer. Record the value on your sheet.
3. Use the guides – what plants are growing there? Can you identify at least 3? (include trees above your heads)
4. How much leaf litter / decaying plant material is rotting down there (scale 1-5)
5. Is it in an area that you think would receive much sunlight or is it a more shaded area? Orientate yourself and think about the path of the sun during the day from east to west to help you consider this.
6. Use the trowel to collect a sample of top 5-10 cm of the soil and any vegetation growing on it or dead plants lying on the ground there. Put the sample into the tub.
7. Come back to the classroom to view your sample using the microscope.
8. Gently break up the sample and transfer a small amount to the petri dish. Spray it with a little water – this helps to activate the living things in the soil.
9. Have a careful look through the sample through the microscope and hand lenses and gently sift through the bulk of the sample in the tub. What can you see?
10. Use the guides to help you Identify / classify / record the numbers of each type of organism you see in the sample. Make notes.
11. Take that sample back where it came from before collecting your second sample and repeating the process.



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## Drawing Comparisons and suggesting patterns

Once the children have put their second soil sample back regroup in the classroom. Remark on just how much life there was to see in the Invisible Underworld once you really start to look carefully with the help of microscopic vision! Ask them if everyone's vision returned to normal yet? The tinctures should be wearing off by now!

(slide 6) Set the children the task of summarising how the 2 locations they investigated compared. In their groups ask them to look through the information they recorded on their sheets from the 2 locations. Ask the children to decide upon 3 things to say about each location, that best sum it up in terms of what it was like there and what they found. For each location they need to record these 3 points on a small piece of paper and get ready to tell the rest of the class.

In turn each group stands up in front of the map of Paradise Pastures and summarises their 2 locations, pinning the note to that place on the map.

The role of the teacher is to facilitate this and try to draw out from them any patterns they might have noticed in terms of what kinds of things they were finding where or key differences between the locations. In addition, the teacher should try to record any questions or 'wonderings' that come up. These could be anything that they have started to think about for example:

- 'What is soil?'
- 'Is soil the same everywhere?'
- 'How do worms burrow?'

Once all the groups have shared their information give the whole class the opportunity to comment on what they have heard, suggest any possible patterns/relationships they think they might have noticed between locations or to share any new ideas for questions that could be investigated. Continue to record these on post-its and pin them to the working wall with any others from the previous lesson. By now you should be developing quite a stack of 'wonderings', 'noticings', possible patterns and questions.

For example, you may get suggestions such as:

- 'The butterflies seemed to love the plant with the purple flowers but not the other plants as much'
- 'Are there more invertebrates in places where there is more rotting leaves?'
- 'It looks like there are no daisies growing in the hedge. Is that right?'
- 'Where does moss grow?'
- 'The plants under the tree look different from out in the open'



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The children are now building a detailed picture of what Paradise Pastures is like! Explain to the class that all their ideas are valuable and that we will be coming back to these when they design their own investigations.

## Summing up

(slide 7) Review the session and the progress they have made.

Ask the children what was the most surprising or interesting thing you learnt today?  
Collect their feedback and consolidate learning.

Next time they will be researching wildflower meadows.

In the mean time encourage the children to continue to think about the things they have seen. They can come back to the map in their own time and have a look at what other groups found and noticed. If they come up with any more things that they are wondering about then encourage them to add a post-it to the stack on the working wall.

## Explorify Extension activity:

Complete this Explorify activity called '[A Sudden Downpour](#)' to spark a conversation about an environment which is very different to their schools grounds – the desert. This activity is great for describing observations and applying ideas in unfamiliar contexts.