

<p>Science context Variation Living things are interdependent, interacting with each other and their environment</p> <p>HSW Obtain, record and analyse data from sources, and use findings to provide evidence for scientific explanations</p> <p>Mathematics Make accurate mathematical diagrams, graphs and constructions on paper</p> <p>Where In and around the school grounds and local park</p> <p>Time 2x 60 min</p>	<h2 style="text-align: center;">Turning over a new leaf</h2> <p>Lesson summary In this activity, the students identify variation within a sample of leaves from one particular holly or ivy bush (i.e. leaf colour, surface area, number of prickles, density of parasites). Their challenge is to think about why this variation may occur and what kinds of external factors (variables) might be influencing this difference (e.g. pH, aspect, sunlight).</p> <p>Cognitive potential A key consideration in any ecological investigation is how to differentiate between a 'chance relationship or correlation' between two variables (such as wind speed and stalk size) and a causal relationship (such as light and ivy leaf surface area). This activity gives students the opportunity to use and apply aspects of scientific enquiry, particularly formulating questions for investigations, generating testable hypotheses and designing appropriate sampling techniques to a local, everyday environment. This activity also enables learners to apply and question their own scientific knowledge.</p> <p>Central theme and skills Variation and interdependences of biotic and abiotic factors Observations and inference making</p> <p>Key resources A base map/ plan diagram of the site Scissors or secateurs Plastic bags, labels and pens A3 poster paper Pens Digital camera (optional)</p> <p>Lesson 1: Setting the scene (5mins) Divide the class up into their newly established groups of threes or fours. Think back to the last time you worked as a group. What worked well? What didn't? What kinds of things do you need to do to work well together, as a team?</p> <p>Have you ever done investigation outside the classroom? What did you do? Give the class some 'thinking time' to reflect on this individually and then get them to share their thoughts with each other, either in their group or in pairs. Use the whole class discussion as a way of eliciting their prior experiences of collecting data outside and as the basis for establishing some common ground rules for group work, what to expect, what you might find and what to be mindful of when working outside.</p> <p>Observations outside (15-20 min) Take the class to a local park/green space. In your groups, look carefully at your map and locate where you are. As a group, decide and note any other features that you think are missing. Give the groups about 10 minutes to do this.</p> <p>Now either allocate a particular bush to each group or ask groups to identify a holly/ivy bush. Ask each group to sketch their bush and to record some observations. What colour are they? What size are they? What shapes are they? Is there any evidence of animals 'using' the bush?</p>
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Collect a sample of 15 leaves that you think are representative of the whole bush.

Sharing ideas and provoking conflict (15-20mins)

Back in class, have the class sitting in their groups with their maps, any photographs, their sketch, observations, their sample of leaves and a large piece of sugar paper.

How could you sort the leaves? Give the groups about 5 minutes to think of and try sorting the leaves into groups.

How did you decide to sort the leaves? What did you notice about the leaves?

In this discussion focus your questions on getting the students to be specific about what variable they used to help them classify (size, number of prickles, presence of parasites, size, colour /tone of green). As you gather the different ways of sorting, pulling out these variables, write them down.

I wonder why there are so many differences... Try and encourage the groups to draw on their wider scientific knowledge to suggest reasons for these variations, exploring links with the differences observed within their sample and possible factors.

Explain to the class that they will be going back to their site to jot down their ideas. Give the groups five minutes towards the end of their group discussion to jot down at least four questions that they could test out on their return visit, where each question focuses on just one independent variable (light, wind, height up the tree, aspect).

Gather them back as a whole class and write down some of these questions.

Can you think of how you could test out your questions, if you went back to your site? What would you do? What would you be looking for? Would you need to amend your sampling? How would you select a sample of 30 leaves that is representative?

The purpose of this is to get the students to explore the idea of a scientifically rigorous sampling strategy which is unbiased (i.e. some from the top, bottom, sides, etc). Let them know that they will have an opportunity to collect more leaves for their sample in their next visit.

Lesson 2:

Observations outside (20 min)

Take the class back to the local area, with their maps and photographs. Send the groups back to their original site/bush. Their challenge now is to decide on and collect some evidence that helps to answer one of their questions. Give the groups 10-15 minutes for this.

Gather the groups back and this time pair up groups and give them about five minutes to visit each other's sites and compare their findings and ideas.

Sharing ideas and provoking conflict (15mins)

Can you create a poster that explains where you went, what you did, what you thought and what you found out? This may include the map of the site, photographs, some of the leaves with arrows towards particular questions and suggested factors. Select a few groups to present their posters. Is there any variation which is common to all groups? (For example, everyone has observed that there are differences in leaf colour or leaf surface area or the presence of parasites)

Use this presentation as a way into encouraging the students to reflect on their learning:

Linking ideas together (15mins)

Did you change anything about the way you looked at the site second time around? Why?

If you had a chance to carry out a more rigorous investigation based on this activity, what kinds of things would you do differently? Why?

Ask or put these questions up and give the students some private time to reflect on these first. Then ask them to talk about this in pairs before collecting some of their thoughts as a whole class. In addition to this discussion, you could ask students to respond to these questions in their books, using notes and diagrams to support their thought.

Mathematical plug-ins

The sorting activity found above provides a good opportunity to introduce scatter diagrams in a very visual way.

Students should be provided with a large piece of paper on which there is a large axis. They should also be provided with several possible variables on small pieces of card (e.g. length, area, shade and the other variables you suggest in this activity) or blank card to write their own and share their ideas amongst the groups. They can then choose two of the cards to label their axes with (e.g. length along the x-axis and number of prickles along the y-axis). They can then place their leaves on the graph, as one would position crosses on a scatter diagram.

This activity will enable students to visualise that each cross on a scatter diagram represents an object. Further discussions of correlation could follow and how to plot a scatter graph.