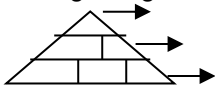


Feeding relationships: What happened to the holly leaf-miner?

Session 1: Introductory activities at school (1 hour)

Aim: To understand that organisms are dependent on each other and they compete for resources within shared habitats.

Time	Teacher Activity	Student Activity / Differentiation	Resources
Starter (10 min)	<p>Heading on board: <i>Why are plants and other animals so important to us, even those we do not eat?</i></p> <p>In pairs students to discuss a food chain and any related vocab. they know. Several students state their food chains to class. Note down any vocab on board.</p> <p>On White Board have some pictures of organisms, arrows and key words that can be arranged made into a food chain by students. Q; What do these words mean? What does the arrow represent? What can we see from the size of the organisms along this chain – give reasons? (general ideas for now)</p> <p>Learning objectives: agree these with the student (have on board) and related relevance to the heading on the board and extending KS3 work</p>	<p>Student pair work. Students state known food chains. <i>Ask from a range of ability students.</i> A student builds a food chain. Students may discuss in pairs first – depending on ability.</p> <p>Listen to student objectives. Related to KS3 work</p>	<p>Tables arranged for group work.</p> <p>White Board</p> <p>Interactive board – organism pic. arrows and keywords.</p> <p>Objectives on board.</p>
Activity One (15 min) Presenting New information	<p>Talk – there is an amazing organism called the holly leaf-miner (show photo) that gains its energy from one organism but passes it on to many others; and so has many possible interesting deaths. We are going to study through field work this organism and the food chains that it gets involved with. We will see if we can find out how many die in similar ways and therefore where energy is moving to.</p> <p>Before this we need to understand know about this organism the holly leaf-miner... Give out Sheet 1.</p> <p>Complete life cycle on board. Relate to butterfly or human life cycle. Check understanding of term “parasite”</p>	<p>Listen</p> <p>Read sheet on holly leaf-miner. Fill in cycle information and answer questions. <i>Questions can be adapted depending on ability. More info can be added on other parasites that feed on miner and miner’s own parasites.</i></p>	<p>Show photo of mined holly leaf</p> <p>Sheet 1: Newspaper article style with questions</p> <p>Interactive board – holly leaf miner life cycle.</p>
Activity Two (20min) Constructing and using keys	<p>Give out key. In groups look at key - Q: Why do we use keys? What is this key useful for? How should we use it? Feedback answers.</p> <p>Go outside to a holly tree – introduce class to it! This is the niche of a holly leaf-miner. Q; What does the term ‘niche’ mean? Ask a few students to look around the tree and find a ‘mined leaf’. Sort groups into 4s and ask each group to find 2 mined leaves. State the leaf gives you clues on the cause of death (or life) of your miner.</p>	<p>Students work in groups and study key</p> <p>Students form groups of 4. Each group have 2 mined leaves.</p>	<p>Sheet 2: Holly leaf-miner keys</p> <p>A holly tree (which will not be used for practical next lesson); scissors</p>

<p>(Activity 2 continued)</p>	<p>Observe what you can see. Return to classroom. In groups record in books observations of what is seen on both sides of the leaf before dissecting. Clearly state to carefully cut around the mine; being careful not to cut into it. Gentle pull epidermises apart. Look closely with what you see. Record these notes. Now use key to work out what happened to the holly leaf miner.</p> <p>Bring class together to ask groups to describe what their leaf showed them and how they used the key to discover the fate of the miner.</p>	<p>State observations <i>depending on ability you may need to sharpen observation skills so the key will be simpler to use.</i></p> <p>Explain key use to class. <i>Ask groups of different ability</i></p>	<p>Sheet 3: Observation sheet</p>
<p>Activity 3 (10 min)</p> <p>Applying knowledge</p>	<p>These are all individual deaths. If we wanted to find out what was the main killer of people 100 years ago in England – what would we do? But time is limited so we can not look up all the records – what else could you suggest? Q: So to find out the main fates of the holly leaf miner, and remember time is limited, and where their energy flows to what could we do? (Push students to extend on answers; question them on how and what if?) Taking a sample will eventually materialise as a solution. Covered at KS3. For homework answer – <i>Plan a method that enables you to sample a holly tree to get a fair overview of the fate of the holly leaf miner. Think about the advantages and disadvantages of your method.</i></p>	<p>Answer question. A:-Look up in books. A:- Sampling Homework will need to be written for some of the less able or should be on sheets already. Constructing a table will support the less able to think about both pros and cons.</p>	
<p>Plenary (5 min)</p> <p>Student review</p>	<p>1) Review the objectives and ask students to answer question on PowerPoint – such as what is a herbivore? Why do we sample? What is a niche? What could happen to a pupa? Or 2) Ask students to review learning using follow pyramid-</p>  <p>Look at pyramids of students to get a feel for next lesson.</p>	<p>Answer questions; use a range of questions depending on ability. Or Students to record 3 pieces of information; 2 new things learnt and 1 item need help on.</p>	

Homework - Plan a method that enables you to sample a holly tree to get a fair overview of the fate of the holly leaf miner. Think about the advantages and disadvantages of your method.

Session 2: Data collection (1 hour)

Aim: To understand that organisms are dependent on each other and they compete for resources within shared habitats.

Time	Teacher Activity	Student Activity / <i>Differentiation</i>	Resources
Starter (10 min) Review	Heading on board: <i>Why are plants and other animals so important to us; even those we do not eat?</i> Review cycle of holly leaf miner – ask students to do this on the board. Q: So what food chains does the holly leaf miner find themselves in? Students to draw in books. Students should have at least 2. Agree lesson objectives with students; connecting with those that they have already achieved.	Look at review work from previous lesson Student to review cycle – <i>language use will depend on ability</i> Draw food chain for the miner. <i>For higher students discussion on the different parasites could be drawn out here.</i>	Books and Homework. Interactive wipe board. Holly leaf miner. Objectives on interactive board.
Activity 1 (10 min) Construct	Ask students to work in pairs. Swap homework and read. Think of 2 positive points about the work on sampling methods, compare with your work – how does it differ? Ask pairs to join up with another pair and share the best of their methods. Now ask groups to inform class of methods and why they felt they were good or less good. Draw out advantages and disadvantages of each as this will enable fuller criticism in the evaluation. Either one of these methods, parts of a few, or your own could be used as the class method to sample the holly tree for the [bush] miner. See sheet 1 for a method.	Pair work. Swap books. Read partner's work – tell them two good things about their work. <i>Perhaps write this down under work.</i> Join with another group and discuss methods. Feedback to class. Write down method to use. <i>This will either be a class one or a group one, depending on class</i>	Homework Method sheet 1
Activity 2 (10 min) Construct	Sample tree – see method sheet 1. Organise groups in the lab. Give out resources. Go out to tree. Return to class with mined holly leaves in bag.	Sample holly bushes in groups. Record information on surrounding area	Clipboards, Sheet 4: Recording sheet, scissors, plastic bags
Activity 3 (20 min) Apply new information	Students should cut open the leaves (being careful not to cut into the mine). Lift of top layer of the mine, examine. Giving it a corresponding letter (using the key). The results should be recorded in the table (Worksheet 2). Pull together class set of data using a projector.	Examine each mine using key to give each a letter Give teacher results for spreadsheet/ board	Hand lens, key, leaves with mine, Spreadsheet and projector

	<p>Using class data draw out one energy flows diagram and then several pyramid of number diagrams.</p> <p>Give out worksheet 5 with scenario questions on. Students complete on their own.</p>	<p><i>For the less able a flow diagram may be drawn with boxes left blank</i> Students complete questions. <i>More able should be pushed to draw population graph diagrams; this will need to be explained</i></p>	Worksheet 5: Analysis
Plenary (10 min)	<p>Set homework – evaluation worksheet 6 - what gaps in our knowledge does this method leave?</p> <p>Use 2 scenarios and ask individuals to think about what would be the outcome Example – What may occur to the number of blue tits if a chemical spray was placed on to the holly bushes?</p> <p>Review learning objectives Q – Is this food web important to us? Why?</p>	<p>Write down homework</p> <p>Think and answer teacher about the scenarios. <i>More able can be pushed to predict and draw the population graph they would expect.</i></p>	Worksheet 6: Evaluation

Homework - Complete evaluation worksheet.

This should be used next lesson as a tool to help construct better evaluation skills. Use AKSIS materials to enable students to understand what makes a good evaluation and how with these skills can they improve their own. Show official Strand E mark scheme.

Methods for sampling holly for the holly leaf-miner

Equipment required;

- polythene bags
- secateurs/ scissors
- hand lenses
- recording sheet/ clipboard

Fieldwork

One method of sampling that we have found advantageous is recorded below:

- Record results on the observation sheet.
- To sample 600 leaves; split class into 6 groups.
- Each group should sample 10 randomly chosen branches.
- For each branch ignore the first few young leaves and recorded the number of leaves with and without mines for the next 10 leaves along the branch.
- Cut off the holly leaves that have mines and place in a plastic bag.
- Take notes of any problems, or changes that had to be made during the practical.

Safety

Caution should be exercised when collecting holly leaves. Gloves and eye protection may need to be worn.

Care with secateurs. Wash hands after collecting leaves