GRADE 8: Life science 5

Feeding relationships

UNIT 8L.5
7 hours

About this unit

This unit is the fifth of six units on life science for Grade 8.

This unit is designed to guide your planning and teaching of lessons on life science. It provides a link between the standards for science and your lesson plans.

The teaching and learning activities should help you to plan the content and pace of lessons. Adapt the ideas to meet your students' needs. For extension or consolidation activities, look at the scheme of work for Grade 10F and Grade 7.

You can also supplement the activities with appropriate tasks and exercises from your school's textbooks and other resources.

Introduce the unit to students by summarising what they will learn and how this builds on earlier work. Review the unit at the end, drawing out the main learning points, links to other work and 'real life' applications.

Previous learning

To meet the expectations of this unit, students should already be able to construct food chains and food webs and should already know why human and environmental change can alter a food web. They should already be able to manipulate observations and data and use tables and graphs.

Expectations

By the end of the unit, students construct and interpret a pyramid of numbers and biomass. They understand why toxins increase in concentration along a food chain. They express qualitative and quantitative information through a range of techniques, including graphs and scale diagrams.

Students who progress further understand how energy flows through an ecosystem. They relate pyramids of numbers, biomass and energy to food chains and food webs. They communicate their results using a variety of techniques.

Resources

The main resources needed for this unit are:

- data on the populations of a predator and prey over time (e.g. snowshoe hare and lynx at www.bbc.co.uk/schools/gcsebitesize/biology/livingthingsenvironment/0habitatsandpopsrev8.shtml)
- video clip of snowshoe hare and lynx
- data on the effect of DDT on population of a bird of prey

Key vocabulary and technical terms

Students should understand, use and spell correctly:

- *pyramid of numbers*, *pyramid of biomass*
- *pesticide*, *insecticide*, *toxin*, *mercury*, *DDT*, *accumulate*, *biodegrade*

Standards for the unit

Unit 8L.5

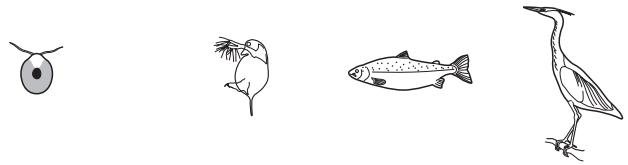
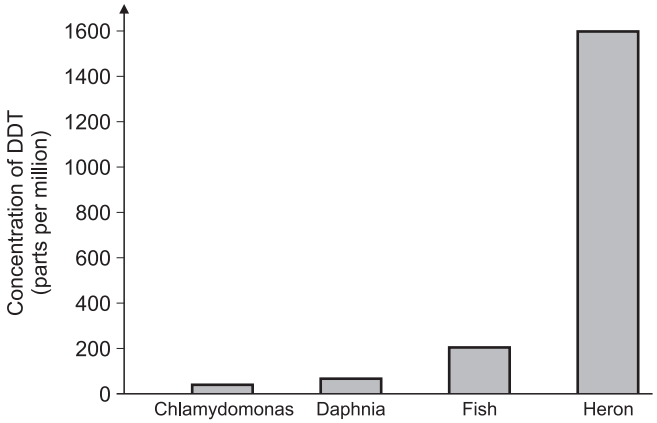
7 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 8 standards	EXTENSION STANDARDS
3 hours **Changing populations in feeding relationships**	7.6.1 Construct food chains and food webs.	8.5.1 Relate changes in numbers of organisms in a habitat to their feeding relationships.	10F.13.1 Describe how the organisms in a pyramid of numbers relate to their biomass and to energy flow through food chains and food webs. 10F.13.2 Draw energy-flow diagrams to illustrate how energy flows through an ecosystem.
2 hours **Pyramids of number and biomass**	7.6.2 Know why human action and environmental change can alter a food web.	8.5.2 Interpret pyramids of numbers and biomass representing the organisms linked in a food chain. 8.5.3 Explain why toxins increase in concentration along a food chain.	
2 hours **How toxins build up in a food chain**	7.3.1 Use a range of methods, such as description, diagrams, pictures, tables, graphs and calculations, using ICT methods where appropriate, to communicate observations, data, results and conclusions.	8.3.1 Present qualitative and quantitative data using a range of methods, such as descriptions and tables and through pictures, graphs and diagrams, using ICT methods where appropriate, and draw conclusions from them.	

Activities

Unit 8L.5

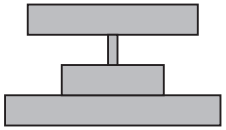
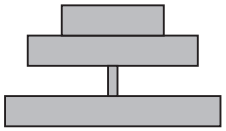
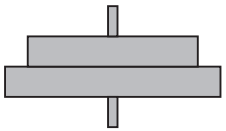
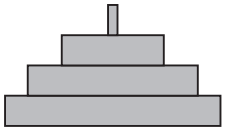
Objectives	Possible teaching activities	Notes	School resources
3 hours **Changing populations in feeding relationships** Relate changes in numbers of organisms in a habitat to their feeding relationships.	Review students' understanding of food chains and food webs from Grade 7 by providing them with some examples of food webs to study. Ask them to identify producers and consumers, and predators and prey, and to draw food chains from the food web. Ask students to predict what would happen to the populations of other organisms if one organism were removed from the food web.		Use this column to note your own school's resources, e.g. textbooks, worksheets.
	Introduce students to a simple food chain (e.g. snowshoe hare eats plant leaves in the conifer forests of Canada). Snowshoe hares can produce three litters of eight young on average per year. Ask students what will happen as the population of hares increases; can the population continue to increase indefinitely or will it reach a maximum? Ask students to list the factors that could stop the population rising (e.g. shortage of food or nesting sites, or disease). Extensive data shows that the hare population rises and falls in a 10-year cycle. Now introduce a predator into this food chain (e.g. lynx). If possible, show students a video clip of these animals in their habitat. Provide information about the population size of each animal. Ask what will happen to the population of predators as the population of prey increases. Ask if the population of predators can keep increasing; if not, what will limit their population growth?		
	Show students a predator–prey graph in which populations rise and fall over and over again. Ask students to explain the pattern of the graph, including why the prey's population changes happen after those of the predator.	You can find data for populations of hare and lynx on the Internet, e.g. www.bbc.co.uk/schools/gcsebitesize/biology/livingthingsenvironment/0habitatsandpopsrev8.shtml	
2 hours **Pyramids of number and biomass** Interpret pyramids of numbers and biomass representing the organisms linked in a food chain. Present qualitative and quantitative data using a range of methods, such as descriptions and tables and through pictures, graphs and diagrams, using ICT methods where appropriate, and draw conclusions from them.	Provide students with a simple food chain (e.g. grass, grasshoppers, toads) and the numbers of each type of organism in 5 m^2 (e.g. 1000 grass plants, 20 grasshoppers and 2 toads). Explain that this is very simplified data and does not take into account other feeding relationships. Ask students to represent the data as a pyramid of numbers in which the size of each block represents the number of organisms. Students could draw a sketch of this pyramid or make a scale diagram using squared paper. Ask students why there are fewer grasshoppers than grass plants and why there are fewer toads than grasshoppers. Repeat this activity for a number of different food chains so that students can see the pattern is repeated. Ask them to explain another general pattern of food chains – the size of animals increases as you go up a food chain.	**Mathematics:** Drawing scale diagrams. Enquiry skill 8.3.1	
	Provide data on two food chains whose pyramid of numbers is not pyramid shaped (e.g. 1 Acacia tree, 20 caterpillars, 2 robins, or 1000 grass plants, 10 rabbits, 100 fleas). Ask students why some pyramids of numbers are not pyramid shaped. Introduce students to pyramids of biomass for these unusual food chains. Explain that biomass is the mass of living matter, and that it is estimated for an ecosystem by taking small samples rather than trying to weigh everything! Ask students why pyramids of biomass are always pyramid shaped.		
	Extension activity Ask students to find data about a food web on the Internet and to add up the total number of all producers, herbivores and carnivores to produce a food web pyramid of numbers.	**ICT opportunity:** Use of the Internet. Suitable data can be found at coexploration.org/bbsr/coral/lessons/lyndsey1.html	

Objectives	Possible teaching activities	Notes	School resources
2 hours **How toxins build up in a food chain** Explain why toxins increase in concentration along a food chain.	Explain to students that some substances (toxins) are not broken down in the body and so the more you eat them, the more they accumulate in your body. Use the example of mercury, which can damage the developing nervous system of babies and young children. Show students the food chain for tuna in the sea and discuss the fact that tuna is a tertiary consumer and at the top of the food chain. Now show them a health warning that we should not eat too much tuna because of the risk that it contains mercury. Explain that mercury is released into the environment from burning fossil fuels, industrial processes, waste disposal and mining. Ask students to explain why tuna may contain an unsafe amount of mercury and why other fish like sardines or anchovies do not. Ask students to draw a diagram to show accumulation of mercury in tuna – tell them to draw the food chain of plants and animals and add red dots to represent the mercury. Plant and animal plankton have just one or two dots, small fish have a few more, then tuna have lots of dots.		
	Explain to students that pesticides and insecticides are used worldwide to kill insects that destroy crops or carry disease. Some of these insecticides cannot be broken down in the body and accumulate in the same way that mercury does. At a high dose, insecticides can cause health problems for top consumers, including humans. Provide students with data about the effect of the insecticide DDT on birds of prey and ask them to interpret this data. Discuss why many parts of the world have banned the use of DDT but some still use DDT to kill the mosquitoes that carry malaria, despite the health risks. Also explain that not all toxins used as herbicides or pesticides are passed onto animals that feed on them. Many biodegrade over very short periods; it is only those containing persistent substances that accumulate. Encourage students to find out more about accumulation of toxins from the Internet.	**ICT opportunity:** Use of the Internet. Several websites have useful information (e.g. an activity on the loss of Indian vultures can be downloaded from www.upd8.org.uk/activity.php?actid=66)	

	Examples of assessment tasks and questions	Notes	School resources
Assessment Set up activities that allow students to demonstrate what they have learned in this unit. The activities can be provided informally or formally during and at the end of the unit, or for homework. They can be selected from the teaching activities or can be new experiences. Choose tasks and questions from the examples to incorporate in the activities.	*Scientists measured the concentration of the insecticide DDT in three animals and a microscopic plant called chlamydomonas.* a. *The food chain for these four organisms is shown below.* chlamydomonas → daphnia → fish → heron  (*not to scale*) *Draw a pyramid of numbers for this food chain.* b. *The bar chart shows the concentration of DDT in the four organisms.*  *Give **one** reason for the difference in the concentration of DDT in these organisms.* **Adapted from QCA Year 9 science test, 2004**		

Examples of assessment tasks and questions	Notes	School resources

In the left-hand column there are descriptions of four food chains. In the right-hand column there are four pyramids of numbers, which are not drawn to scale. Draw a line from each description to the correct pyramid of numbers.

description of food chain	pyramid of numbers
Arthropods feed on tiny algae. Sardines feed on tiny arthropods. Dolphins feed on sardines.	
Antelope feed on grass. Lions feed on antelope. Fles live on lions and suck their blood.	
Greenflies feed on rose bushes. Ladybirds feed on greenflies. Swallows feed on ladybirds.	
Zebras feed on long grass. Ticks suck the blood of zebras. Birds sit on the zebras' backs and eat the ticks.	

Adapted from QCA Year 9 science test, 1999