

Relationship are complex

Critical teaching ideas - Science Continuum F to 10

Level: Moving towards level 8

Student everyday experiences

Students are often unaware that on a food web a named organism represents a population rather than a single individual, eg. one rabbit or one fox as opposed to a population of each. It is also common that they do not see food webs as having a complex interconnection of elements but as a series of simple, unconnected food chains. So often when asked to predict the consequences of the removal of one organism from a food web the students consider only the changes that occur along one food chain, not realising the possible impact the removal of the organism could have on multiple pathways in the food web. (Wood – Robinson, 1985)

It is also common for students to believe that if organisms are separated in the food web so they are not directly related in a 'predator-prey' relationship, changes in one population will not affect the other. (Griffiths & Grant, 1985).

Many students also believe that if an organism is positioned higher in the food web it will be a predator of all the organisms positioned below it in the food web and that if the size of one population of organism changes it will have no effect on the size of the population of its predator. (Griffiths & Grant, 1985; Adeniyi, 1985)



The scientific view

Interrelationships between living and non-living things in their environment are complex and interdependent. All organisms are part of complex food webs that include both plants and animals. The predator-prey inter-relationship is common. Some species are highly depended on others (e.g. pandas or koalas can eat only certain species of grasses/trees) while others are so closely linked that their survival may be dependent on just a single specie (e.g., the wasp that nests only in the fruit of the fig tree and is the only insect that can pollinate them). (AAAS Map)

Critical teaching ideas

- All organisms, both land based and aquatic, are interconnected by their need for food
- The network of interactions is referred to and represented as a food web
- Food webs can be used to display the interdependence of organisms in a particular environment
- A food web typically describes the feeding relationships, beginning with species capable of producing 'food' from an energy source and organic materials (i.e. plants) connected to the animals that eat them and then the animals that eat those animals and so on

- Changes in the habitat of an organism can sometimes be beneficial or harmful to the organism
- Models and simulations provide useful visual representations which can be used to build understanding of the various interactions that take place between living things in their environment.

(See the AAAS Map)

The notion of a food web within an ecosystem is a much more difficult concept than a food chain because of its complexity. Students need to be aware that organisms within a food web exist in a hierarchical structure with organisms at lower levels able to produce their own food and organisms at higher levels existing as consumers. It is important to provide students with the opportunity to consider the factors that influence the survival of individual organisms and for them to appreciate that not all plants and animals survive equally as well in all habitats (See AAAS Map).

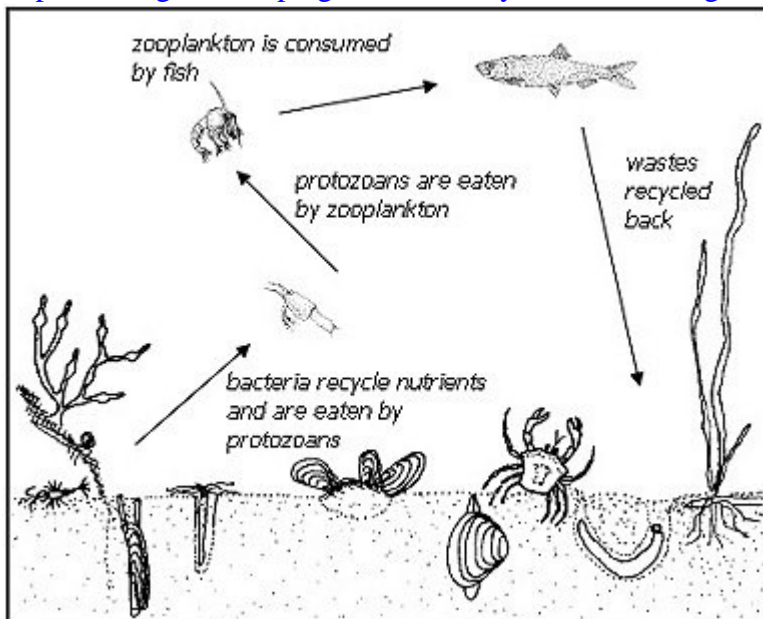
Teaching activities

Open up discussion via a shared experience.

Capture students' interest and provide an interactive experience that represents the types of interactions that take place in a food chain. Create a food chain role play such as 'Balance in a rock pool' You will need to identify the plants and animals involved in the chain and identify each. Mark out a physical area that will be the extent of the environment, e.g. a large circular rock pool (allow plenty of space).

Students are advised to stay within this area. Divide the class group into the various plants and animals identified in the food chain. It may be useful to begin with equal numbers of certain animals but a greater number of plants than animals. During the game each animal must 'collect' (tag) the plant or animal that they need for food.

http://www.glf.dfo-mpo.gc.ca/sci-sci/bysea-enmer/images/img_mod2_p54-e.jpg



Devise a way of showing how they become linked when one has tagged the other e.g. when tagged (eaten) the prey must hang on around the waist of the predator. Make one round of the game last for 5 minutes or until one group of organisms has been eaten. At the end of the round, each of the survivors counts all the animals and plants he/she has eaten (accumulated by tagging). Set food targets for each animals in the food chain e.g. to survive crabs need 10 seaweeds, seagulls & fish need 50 seaweeds in their chain. Animals with less will starve to death. Record numbers of each organism in a table at the end of each round. Discuss with the students how the numbers of each organism varied throughout the game and the reasons why.

Help students work out some of the scientific explanation for themselves.

Discuss with students their understanding of why some organisms survive in this role-play and why others do not. Would the same be true in real life? Encourage students to identify the factors that contribute to the survival of various organisms in the role-play, e.g. initial population influencing the availability of food source. List these ideas and refer to these again to make modifications to the design of the role-play.

Clarify and consolidate ideas for communication to others.

Identify and represent the key interactions in the modelled food chain. Students devise a way of visually representing the connections of the various organisms in the food chain. Share this with peers and critically evaluate the representations. Is it clear how and why the plants/animals are connected?

Focus students' attention on hitherto unconsidered detail.

Encourage students to recognize and articulate further factors that may contribute to survival, e.g. size or removal of specific populations, movement, agility, etc. Return to list from previous activity, invite students to suggest changes to the game that may assist the survival of certain plants/animals, e.g. stagger the release of the organisms so that some have more time to collect food before others enter the game. What difference does this change make to the survival of other animals in the game? What happens to the chain if one population does not survive? What are the advantages/disadvantages to the others in the food chain if these animals survive?

Promote reflection on and clarification of existing ideas.

Challenge students' ideas further by increasing the complexity of a problem: Introduce a poison into the food chain, could be a sticker placed in a secret place on certain animals or plants. At the completion of the game any chain of organisms that have this card will not survive. Students discuss and explore the possible scenarios of the introduction of this card to the game. Carry out the role-play under these new conditions and discuss observations. Could this scenario or something like it happen in real life?

Further Link: PEEL Teaching Procedure: Food Chain Drama.

Further resources

Science related interactive learning objects can be found on the [FUSE Teacher Resources](#) page. To access the interactive learning object below, teachers must login to FUSE and search by Learning Resource ID:

- **Ecosystem balance** – Students explore how plants and animals interact in three Tasmanian ecosystems: a dry forest, rainforest and seaweed community. They view

species descriptions of the plants and animals that live there. They can increase or decrease the population of a species and compare the effects on other species within the ecosystem.

Learning Resource ID: FRZ5RA