

# Strengthening teaching and learning of interdependence in Key Stage 3 science

## Main messages

- Interdependence is a key scientific idea which is first taught in the primary curriculum and which therefore needs to be built upon rather than started afresh.
- Pupils learn in Key Stage 2 that there are lots of different plants and animals in the world and that these are adapted to the environment they live in.
- In Key Stage 2 these aspects of interdependence are generally taught through well-known and local examples.
- In Key Stage 3 pupils should learn about less obvious ways in which plants and animals are adapted to their environment, e.g. daily or seasonal adaptation, etc.
- It is important that pupils encounter various aspects of interdependence throughout Key Stage 3 if expected progress in understanding is to be made.
- The yearly teaching objectives (Framework, page 27) set out the progression of what should be taught in Year 7, Year 8 and Year 9.

## Identifying pupils' misconceptions – classification and adaptation: Year 7

- Classification of living organisms helps to identify links between organisms and understand better how they live and inter-relate.
- There are a number of relatively common misconceptions that pupils can hold about interdependence. An awareness of these, exploration of pupils' ideas and appropriate use of models in teaching, can help overcome them.

## Following energy transfers in food chains and food webs: Year 8

- Pupils should encounter models to aid their learning of the abstract concepts encountered in this key idea, and be helped to use these to explain phenomena they observe.
- Pupils should encounter models within the study of interdependence to explain events that they are currently studying, but when that model no longer explains more complex events a more sophisticated model should be taught.
- Pupils should be taught that the models used in interdependence simplify the complexities encountered in habitats.
- In teaching about energy transfer through living systems it is helpful to use a variety of teaching models to develop pupils' understanding (e.g. constructing food chains, using a physical model of a food web).
- Pupils' understanding of food chains and webs needs to be developed alongside their understanding of energy and energy transfers.

- Pupils should learn that food webs give a more realistic picture than food chains of feeding relationships in a habitat.
- Food chains and webs illustrate the energy transfer between and nutrient flow through organisms in a habitat.
- The transfer of energy at each trophic level is the reason why food chains and webs rarely extend beyond four or five organisms.
- Pyramids of numbers or of biomass provide useful models of the relative quantities of organisms in a food chain or web.

### **Humans and their impact on the environment: Year 9**

- Teaching through case studies about human impact on the environment can allow contemporary issues in science to be included in lessons.

### **Scientific enquiry into local ecological relationships**

- The relationships between organisms in a habitat and the effects of abiotic (physical and chemical) factors on that habitat are complex. Changes in any of these can significantly alter the balance of organisms.
- Fieldwork and other forms of practical work assist in achieving the yearly teaching objectives.

### **Implications for the science department**

- The department's scheme of work should continue to build the progressive understanding of the key scientific idea of interdependence, building on pupils' experiences at Key Stage 2. This should be based on the yearly teaching objectives.
- There should be a collaborative approach to developing the resources and knowledge required to run fieldwork investigations.
- Advice about pupils' common misconceptions about interdependence, and how to deal with these, should be built into the department's planning.
- The scheme of work should incorporate a variety of practical work that enables pupils to develop the skills to carry out fieldwork investigations.

### **Implications for individual teachers**

- Teaching about interdependence should follow the department's planning for progression and the agreed approach to fieldwork.
- This teaching should involve the use of a range of teaching styles that includes the use of contemporary science examples.
- Teaching should develop pupils' abilities to carry out investigations other than fair tests.
- An awareness of pupils' common misconceptions about interdependence leads to more efficient teaching and learning.