TEACHING ADAPTATION: some tried and tested activities

Andy Markwick shares approaches to teaching adaptation across the primary age phase

The topic 'Animals including humans' runs through the primary science National Curriculum in England (DfE, 2013). Ideally, topics such as inheritance will lead onto adaptation, natural selection and evolution across key stages 1 to 2 (ages 5–11). This article provides nine engaging activities to support the teaching of adaptation and improve children's skills in observation, discussion and classification (grouping). The activities have not been arranged in any age-related order because they can be adapted and used for children across both key stages 1 and 2. Several additional resources have been listed at the end. Table 1 shows a selection of the key areas on which this article focuses.

The activities described encourage children to observe and make comparisons and support their understanding of classification.

Compare the bark of two trees

Children work in groups or pairs to discuss the characteristics of each bark image (Figure 1A). Encourage them to use adjectives to describe what they see and to write their descriptions in sentences. Once they have completed their descriptions children can be asked to think about the similarities and the differences between the bark images. Other pairs of images can be used, for example of flowers (Figure 1B).

Looking closely at trees, a carnivore and a herbivore

Children can be provided with images of two different trees, their leaves and seeds (Figure 2), but don't miss an opportunity to look at the real thing when you can get outside or if you can bring some parts into the classroom! Ask children to describe what they

Table 1 A selection of national curriculum areas covered in this article (DfE, 2013)

Year 1 (ages 5–6)	Year 4 (ages 8–9)	Working scientifically features
• **Identify and name** a variety of common animals including fish, amphibians, reptiles, birds and mammals. • **Identify and name** a variety of common animals that are carnivores, herbivores and omnivores. • **Describe and compare** the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets).	• **Identify** the different types of teeth in humans and their simple functions. • **Construct and interpret** a variety of food chains, identifying producers, predators and prey.	• **Ask relevant questions.** • **Use observations** and **gathered data** to help **answer questions**. • **Identify and classify** and make **comparisons**. • **Record findings** using simple scientific language, tally charts and tables. • **Report on findings** using written explanations and conclusions.

Key words: Adaptation ■ Enquiry ■ Evolution

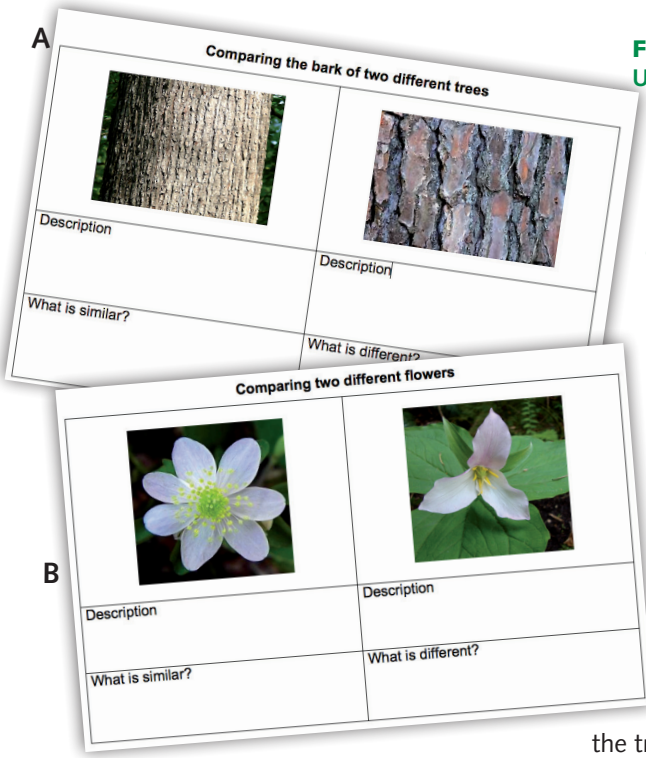

Figure 1 Using images of similar things to focus on similarities and differences

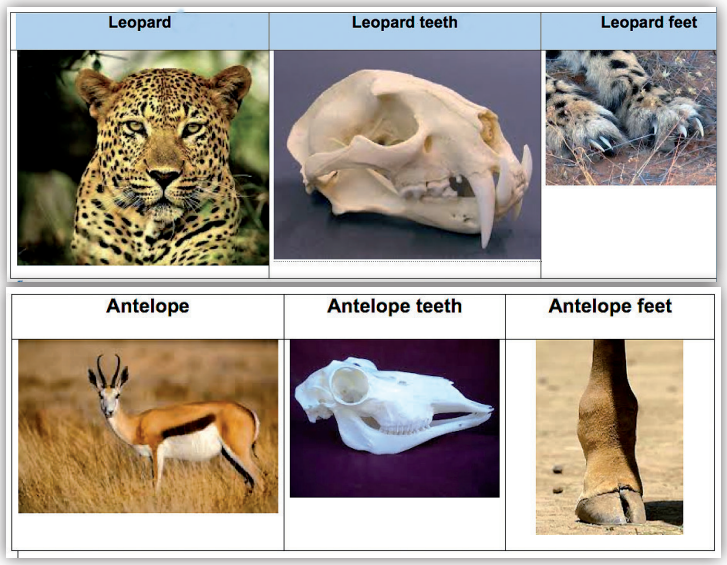

Figure 3 Using images to get a better understanding of animals

see and to discuss the similarities and differences between the trees. To support learning about seasonal changes, select an evergreen and a deciduous tree. It is important that children can

Figure 2 Discussing similarities and differences between trees

observe both trees on a regular basis. Each month, children investigate the trees, draw them or take pictures and record the weather (temperature, cloud cover, wet/dry, etc.). They will see that both trees change over the months, as does the weather, yet the deciduous tree changes most. Children will learn how deciduous trees lose leaves in autumn and new leaves are produced from buds in spring. They might also investigate what lives in, on and near to the trees.

If the school has a spare corridor wall, label it with the months of the year and ask children to attach their images underneath the appropriate month. They may also like to record the averaged weather conditions for each month. Seeing the gradual changes in the images over the year helps children to conceptualise seasonal changes far better than using random snapshots through the year. Children will also be able to link seasons to typical weather conditions. There are other learning opportunities where children can be asked to calculate the differences in temperatures between selected months. They can also be introduced to simple fractions when estimating cloud cover.

To provide children with a better understanding of carnivores and herbivores, images of each animal, its feet and teeth can be used. Using the skill of the animal tends to be less frightening than using a snarling face for some children and provides a better view of their teeth (Figure 3). Children can be asked to discuss the characteristics of each and write these down; for example, position of the eyes, shape of teeth and whether feet have claws or hooves. Other images of animals can then be given to children for them to decide whether they are carnivores or herbivores, with an explanation. Finally, children can be given the images of an omnivore, such as a bear or human. What do they think about this?

Classification game

In groups, children are given a blank table and several photographs representing animals and plants from the following groups: fish, mammal, plant, reptile, amphibian and bird. The images are separated into two piles and turned upside down so that they can't be seen (Figure 4). The game requires children to work in pairs and

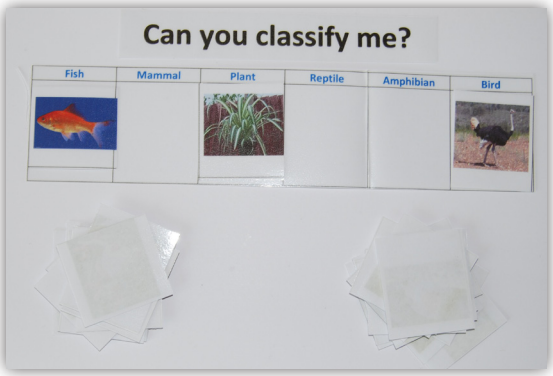

Figure 4 An animal and plant classification game

take turns in placing their cards onto the correct group. Disagreements need to be discussed and evidence used to correctly classify their organism. This activity encourages children to observe and decide on key characteristics that determine the group to which their image belongs. The activity is followed by a discussion of the main characteristics that define each group; for example, mammals have fur, mammary glands, give birth to live young, and so on.

Sort it out

Groups are provided with a wide range of seashells and asked to sort them

Figure 5 Using shells in a sorting exercise

into groups (Figure 5). Once this has been completed, children are asked to explain why they placed the shells in the groups they did. This helps children to observe closely and to consider similarities and differences used in their decisions to group the shells. Children can construct a tally chart to record the numbers of shells in each group.

What am I?

This is a favourite activity for groups or pairs of children. One child can read out information about an animal or plant while the others guess what it is; for example, *I have scales, sharp teeth and my bite is poisonous. I have no legs*. The winner takes over.

Create an organism

A range of homemade spinners using card and butterfly split-pins can be used by children to randomly select characteristics of an organism (Figure 6). Children are encouraged to be as creative as possible in designing their organism with these characteristics. Once they have their organism, they are asked to describe what its habitat and diet might be.

Figure 6 Using spinners to select characteristics for a new organism

Figure 7 Using rice and seeds to stimulate discussion around camouflage

Camouflage

Groups are provided with a stopclock and a container of brown rice into which a selection of seeds (e.g. 10 each of corn, mung bean, haricot, etc.) are added (Figure 7). Taking it in turns, children must take out as many seeds as they can (not rice) in 15 seconds. Children usually select those seeds that are most easily seen. Groups can discuss why they chose the seeds they did. This will lead to discussions about the seed sizes, colours and shapes and how these characteristics are important in camouflage. Children can be asked to construct a tally chart using results from the whole class.

Camouflage and survival

This activity requires some preparation before the lesson. Cut approximately 30 threads of several colours into lengths of 3–5 cm (Figure 8). Place these outside in the playground. Ensure the most visible threads are placed against something of the same colour, that is, they are camouflaged.

Explain to your class that the threads represent worms that birds need to eat to stay alive. Tell them that they will pretend to be the birds and will be given five minutes to find as many worms as they can. If they find no worms, they will not survive, and neither will their young. If they find 1–3 worms, they will survive but their young will not. Finding more than five worms will ensure they and their young will survive for one day.

Before children go worm hunting ask them to predict which colour of worm will be most easily found. They will often say yellow or red. After five minutes, ask children to count how many of each worm they have found. If you camouflaged the yellow worms well, very few will have been found. Ask children to explain this result and then take them outside to show them where you placed the camouflaged worms – if you can find them!

Figure 8 A game to teach the importance of camouflage for survival

This activity helps children to understand the importance of camouflage for survival. To extend the activity ask children what type of animal needs to be camouflaged. Is it prey or predator? There are some excellent images of camouflaged animals (both predator and prey) on the internet.

Quantifying evolution

In year 6 (ages 10–11) children are introduced to evolution, often building upon ideas such as adaptation and natural selection. This activity shows children the random nature of mutations and how successful mutations become known as adaptations that help an organism to survive. It is assumed that children will already have knowledge of inheritance and will have seen examples of adaptations in nature.

The activity is divided into two parts.

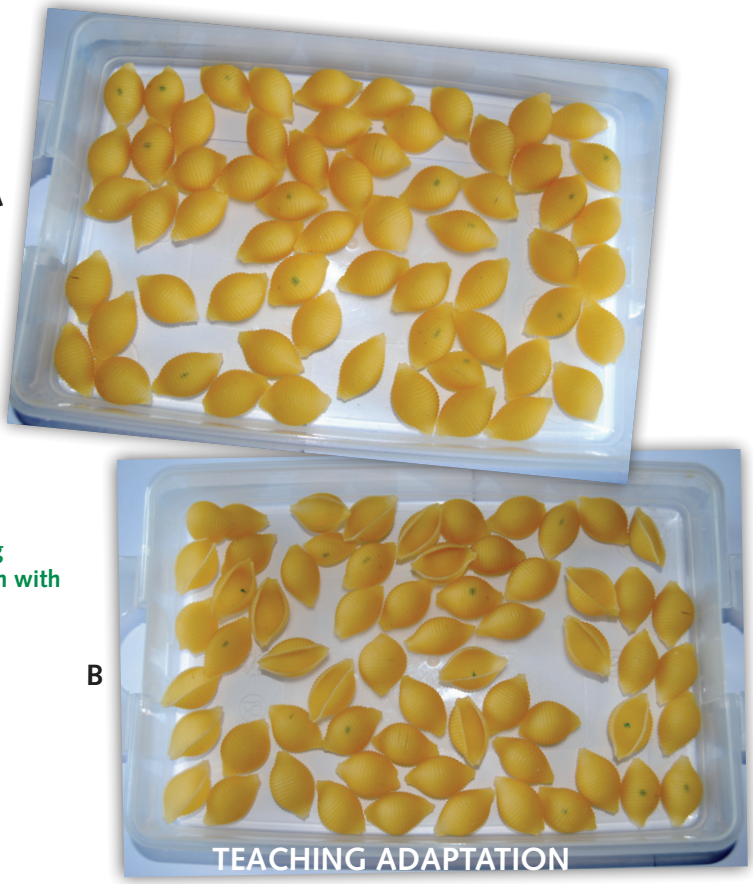

Figure 9 Modelling adaptation with pasta

Mapping malaria and sickle cell

Show children a map of the main areas of the world where malaria is a major concern (over 400,000 people die from malaria each year). Then show children a map of the key areas where the sickle cell trait exists. They will see a remarkable similarity.

Scientists believe that the sickle cell trait is an evolutionary response to malaria. People with the sickle cell trait survive malaria far better than those who do not have this genetic mutation. Over thousands of years, many more people in these areas, who do not have the sickle cell trait, have died from malaria, whereas those with the condition have survived. Offspring of people with the condition have a 75% chance of inheriting the sickle cell trait. Unfortunately, 25% of offspring will develop sickle cell anaemia and may become very ill.

Modelling adaptation

To model the change in population over time the following experiment can be used:

- **Fill a small plastic tub with 50 pieces of shell pasta. Place a green dot on top of 10 of these pasta pieces (Figure 9A). These represent people with the sickle cell trait. The proportion of people with the sickle cell trait is 10 out of 50 or 20%**
- **Turn all pasta pieces with openings facing the base of the container.**
- **Lift the container by 2 cm and drop it. Each drop signifies people being infected by malaria. Pasta pieces will randomly flip (Figure 9B).**
- **Those pieces that have flipped represent people who have been infected with malaria. Those that have not flipped have not been infected.**
- **Remove all pasta pieces that have flipped and that do not have a green dot. These people did not survive.**
- **Count how many people are left, for example 40. This means the proportion of people with the sickle cell trait in the population is now 10 out of 40 or 25%.**
- **Repeat the activity three more times. Children will see that the proportion of people with the sickle cell trait in the population increases every time there is a malaria outbreak.**

Children may challenge this model as it produces no offspring. However, ask children to think about the numbers of offspring being produced. As the numbers of people with the sickle cell trait increase, so too will the number of their offspring. If two pieces of pasta are added for each pair of pasta pieces remaining, numbers will increase. However, because those with the sickle cell trait survive malaria outbreaks in far greater numbers, they will produce more offspring over generations.

Reference

DfE (2013) *National Curriculum in England: Science programmes of study: key stages 1 and 2*. London: Department for Education.

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Weblinks for resources

Camouflaged animal images:
https://allthatsinteresting.com/animal-camouflage-pictures#10
Inheritance/survival game:
www.hamilton-trust.org.uk/science/year-6-science/game-survival
www.tes.com/teaching-resource/cross-breeding-mr-men-3002426
ASE resources: **www.ase.org.uk/resources**
STEM Learning resources:
www.stem.org.uk/resources/community/collection/12648/year-6-evolution-and-inheritance
Sickle cell anaemia:
www.nhs.uk/conditions/sickle-cell-disease
www.sicklecellsociety.org
www.who.int/news-room/fact-sheets/detail/malaria