Classifying living organisms and identification keys
SORTING LEAVES FROM TREES AND SHRUBS INTO GROUPS

TEACHER GUIDANCE (PAGE 1 OF 4)

Learning outcomes

- to use keys based on observable external features of living organisms to help identify and group things systematically
- to understand the importance of classification

National curriculum links

NC Sc2 4b
QCA 7D

Introduction

In this level 4/5 activity pupils sort a set of leaves from different tree and shrub species into successively smaller groups based on characteristics which they can readily see. They learn the principles of producing a dichotomous key and at the end of the activity should be able to recognise 8-12 common tree species.

The activity also provides an opportunity to consider the importance of naming and classifying living organisms.

Preparation

Using secateurs collect leaves from each of 8 different common trees and shrubs. Ideally these should be in the school grounds or in the close vicinity of the school so that pupils have the opportunity to see the whole trees and shrubs. You will need enough leaves for each of your groups / pairs of pupils to have a set of leaves. Make sure that you have the permission of the landowner before collecting specimens.

In this example, the trees chosen are ash, beech, birch, cherry, horse chestnut, lime, oak and rowan.

Equipment

- polythene bags for specimens
- 30cm rulers or graph paper for measuring
- clipboards, paper and pencils

Starter activity

This activity is designed to introduce pupils to the terminology used to describe leaves. Give each pupil a Leaf Fact File (Pupil Sheet 1) and Pupil Sheet 2.

Main activity
Sorting leaves into groups

Divide students into small groups and give each group a complete set of the leaves. Ask them to sort (classify) them into 2 sets, each of which has a common characteristic (the sets do not have to be even sized). Next ask them to sort these two sets into 2 further sets and continue to do this until they have separated all the leaves. As they go along ask them to write down the characters they have chosen to separate the groups in a 'tree diagram' (Pupil Sheet 4). Pupils may find this sheet easier to use if it is enlarged to A3 size.

Where possible encourage pupils to write down opposite characters rather than just negatives e.g. leaf simple / leaf compound rather than leaf simple / leaf not simple. An example of a completed tree diagram is show in Fig 1. Branches can be added and not all the branches need to be used.

Explain that this diagram forms a simple identification key. At the end of the exercise each group can pass their 'key' to an adjacent group who try it out. Pupils can use the table in Pupil Sheet 5 to help support their evaluation of the usefulness of each character.

Follow up activities

When pupils have had an opportunity to test each others' keys consider the following points with them

1. Which characters do they think are the best ones to use to separate the leaves into groups?

Put a list of the characters used by the groups on the board and discuss:

- which of these characters were easiest to see?

- which characters were the most variable in leaves of the same type? (very variable characters are not reliable for sorting)

- which were the characters easiest to describe or define? Point out that descriptions need to be objective e.g. large/small is not sufficient - a size range needs to be given. Explore ideas for describing leaf shape.

Based on these discussions work with the pupils to draw up a list of the best characters to use in sorting the set of leaves. The following characters are often the most useful for dividing the leaves into major groups:

- leaf arrangement; opposite or alternate
- basic structure; simple or compound
- the type of venation; pinnate or palmate
- margin; toothed, lobed or entire (not toothed or lobed)

Other characters include hairiness and the presence or absence of stipules or glands. Colour, shape and size may also be useful but need to be carefully defined and size ranges given where necessary.

2. Size of the subsets

Ask the pupils to think about the advantages / disadvantages of having subsets unequal in size. Generally if the sub-sets are all equal in size the key is shorter – it has fewer steps. Separating all the species off one at a time is not a good idea. It makes the key long and sub-sets with common characteristics are not highlighted. However, a ‘user friendly’ key may use a very distinctive character to separate a small sub-set or even an individual at the beginning of the key.

3. Why a single classification system for living organisms does not exist

Different groups of pupils in this exercise will have sorted the leaves in different ways. Point out that all classification systems are human-made. Scientists have different views or views may change as new information is discovered. You can use as an example the change from a two kingdom classification of living organisms to the current five kingdom classification. There is also an opportunity here to consider the importance of naming and grouping living organisms and the history of the classification of living organisms.

FIGURE 1