What causes plants to change?

Key Stage 3 Science
Teachers' notes

This unit of work relates to the first part of ***QCA Science Unit 7D 'Variation and Classification'.***

Learning Objectives Covered by this Work

- Know that individual members of a species may differ in many ways and that some variations are inherited and others caused by environmental differences.
- Design an investigation, choosing a sufficiently large sample size.
- Use a spreadsheet to store and analyse data, using this to draw graphs from which conclusions are drawn.
- Present ideas about causes of variation.

Before the Visit

Show pupils photographs of a variety of animals of one species and ask them to point out the differences between them. Extend to humans and elicit examples of differences. Collect data about individuals, (e.g. height, hand span) and enter into a spreadsheet. Suggest and investigate correlations, saying how strong they think these are.

In the Woodland

Study one individual of a tree, shrub or plant. Are all of its leaves of the same size and shape? What might account for any variations? Compare two or more individuals of the same species, identifying variations and speculating on possible causes for these.

Select one of the following questions about environmental variation to investigate.

1. Investigate differences in the shape and colour of holly leaves at different heights above the ground and in different locations. Are the leaves low on a tree different from those higher up, and if so, why? A pupil sheet is provided for use in this.
2. Record the surface areas of bramble or nettle leaves under different light conditions. Make this a fair test by choosing an equivalent leaf on each plant e.g. for bramble, the terminal leaf of the third leaflet down.
3. Measure the variation in height and differences in leaves of climbing plants such as honeysuckle and ivy under different lighting conditions. *N.B. Ivy leaves will only mature if there is enough light. Juvenile leaves have lobes and all face in the same direction. Adult leaves are either only slightly lobed or unlobed and spiral around the stem and face in different directions*.

Help pupils with the design of their investigation, including the choice of a suitable sample size. Ensure that the investigation involves the measurement of environmental factors and plant characteristics rather than relying just on observation. Measure light levels using a light meter, humidity using a whirling hygrometer, windspeed using an anemometer, and soil moisture content by weighing before and after oven drying at 105°C.

Follow-up Work

Use a spreadsheet to store and analyse the data obtained. Correlate the measurements of plant characteristics against light levels, height above ground, etc, using scattergraphs. An alternative and simpler method is to compare the area of 30 leaves from one location with that of 30 leaves from a contrasting location.

Ask pupils to produce a report on their investigation, identifying the causes of any variations found and stating how strong a link there is between the plant characteristics measured and environmental conditions.

Study secondary sources illustrating other examples of environmental variation e.g. trees grown in windy and non-windy environments.

Review the work on variation within a species. It is important at this stage to establish that some variation is due to inheritance, some to environmental factors and some to both.

Key Stage 3 Science
Pupil sheet

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Use these boxes to draw Holly leaves from different locations and heights above the ground. For each, record the height above ground (to the nearest metre) and the light level (preferably measured using a lightmeter or data logger). Also, measure the length and width of each leaf.

Length .....cm Length .....cm	Length .....cm Length .....cm
Height above ground . . . . . . Light level	Height above ground . . . . . . Light level . . . . .
Length .....cm Length .....cm	Length .....cm Length .....cm
Height above ground . . . . . . Light level	Height above ground . . . . . . Light level . . . . .
Length .....cm Length .....cm	Length .....cm Length .....cm
Height above ground . . . . . . Light level	Height above ground . . . . . . Light level . . . . .