Audit feedback: plants

Task 1

The child has identified water, light, warmth and compost as things to test but this test will not identify which are necessary and which are not. The child does not understand the principles of a fair test.

Commentary on Task 1

The factors required for growth in a plant cannot be identified individually by a process of elimination. They all act in combination and the removal of any one of them will inhibit growth. The child's suggestion to provide all the factors will not show this. Each should be excluded in a separate experiment as part of the whole investigation, and the results brought together to show that all are needed for healthy growth. The child needs to have more support in understanding why identifying and controlling factors (or variables) is necessary in scientific enquiry.

This chart demonstrates how a series of experiments could be set up to isolate one factor at a time.

Factors	Experiment A	Experiment B	Experiment C	Experiment D
water	✔		✔	✔
warmth	✔	✔		✔
light	✔	✔	✔	
soil		✔	✔	✔

Different children or groups of children could be responsible for experiments A to D. Primary school pupils are not usually expected to manipulate more than one variable at a time.

Plants (continued)

Task 2-a
Children A, B and D use "grow" inaccurately.

Task 2-b
Children B and D have misunderstood. They appear to be confusing germination with photosynthesis. Child A may have misunderstood but a further question is needed to establish this.

Task 2-c
Children C and E know two of the conditions necessary for growth.

Commentary on Task 2
Task 2-a
The correct term for a seed turning to a seedling is germination. The word "grow" should refer to the subsequent increase in size of the plant.

Seeds germinate (ie the root and shoot appear) as warmth and water enable enzymes to break down the stored starch within the seed. Broken down starch is one ingredient needed for the growth of root and shoot cells.

Seedlings become plants when they can photosynthesise and then use the products of photosynthesis for growth.

(By Y5 or Y6 accurate use of the terminology will help prevent further misconceptions later.)

Task 2-b
Seeds before germination have no leaves; therefore, they cannot use light energy for photosynthesis. Heat energy (from any source) is needed to initiate germination.

Child A's idea that you can soak up energy from the soil might indicate that they know seeds need both water and warmth from the soil to germinate. It would be useful to ask the child to explain further.

Nutrients in the soil are not required for germination. All necessary nutrients are stored within the seed.

Plants (continued)

Task 2-c

The answers above explain why children C and E are right. Light is not necessary for germination. Both these children understand the need for warmth and water.

The other factor essential for germination is oxygen. You would not expect children in Key Stage 2 to know this.

Plants (continued)

Task 3

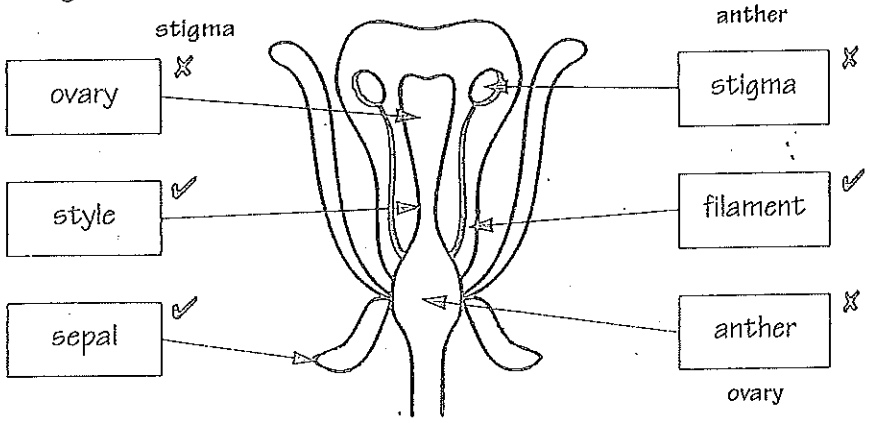
This task will help you to assess your understanding of the structure and function of some major organs in plants. While much of this task is pitched within the Key Stage 2 Programme of Study some aspects extend beyond it.

This is a child's test paper set at the end of a topic on plants.

Mark the child's answers, putting the corrections alongside where necessary.

Task 3-a

Label the diagram.



Task 3-b

Which are the female parts of the flower and which the male?

Male	Female
ovary ✗, style ✗, stigma ✗ anther	anther ✗ ovary, style, stigma

Task 3-c

Which part of the plant meets the following description?

i) Is colourful to attract pollinators — petals ✓

ii) Produces pollen — anther ✓

iii) Has a sticky surface to collect pollen — stigma ✓

iv) Where seeds develop and mature — womb ✗ ovary

v) Grows a tube in order to fertilise the seed — ovary ✗ pollen grain

vi) Helps the plant to use sunlight — leaf ✓

17

Plants (continued)

Commentary on Task 3

Task 3-a

The anther and filament make up the stamen. Stamen is the word included in the level descriptions. This teacher has clearly been more precise in their teaching.

Task 3-b

The child has correctly grouped the parts that should be grouped, but has put them in the wrong box. This may be a simple writing error rather than a misunderstanding. Follow-up questions would be needed to determine this.

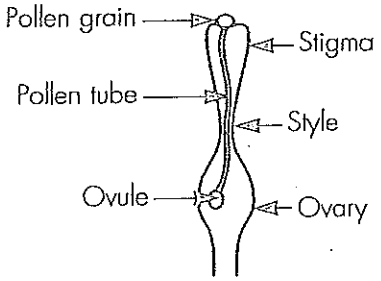
Task 3-c

Plants may be pollinated in different ways. In those cases where insects or birds are the agents of pollination, colourful, scented petals are carried high on the plant. When the agent of pollination is wind, eg hazel catkins and grass, then the plant does not need attractive flowers.

The anthers produce pollen. Each pollen grain contains one male gamete which fertilises the female gamete in the ovum.

The pollen grains are caught on the sticky surface of the stigma.

The ovary wall may develop into a pod or a fleshy fruit as the seeds ripen, to aid dispersal. The child is clearly confused about the sex organs in the plant. He/she seems to know that a womb is connected with female sex organs in mammals, but hasn't used the correct terminology for plants.



The delivery of the pollen grain on to the stigma is pollination.

The pollen grain on the stigma extends a tube carrying the male nucleus down the style into the ovary.

When the nuclei from the male and female gametes fuse, the seed is formed. This is fertilisation.

The main characteristics of the leaf which help it use light in photosynthesis are: the large surface area, the green chlorophyll and the thin flat shape. The large surface area collects the maximum amount of light. The chlorophyll is the chemical which captures the energy from sunlight. The maximum number of cell layers are able to use the light because of the thin, flat shape.

The thin shape allows maximum penetration of carbon dioxide gas into the cell layers of the leaf. The carbon dioxide is built up into sugars using the energy from the sun. These sugars are used for growth.

Plants (continued)

Task 4

The passage should read like this.

> Many plants rely on insects to **pollinate** them while some others are **pollinated** by the wind.
>
> Those **pollinated** by the wind often bloom early in the season before the leaves break so that they do not impede the drift of pollen.
>
> As insects visit the flowers looking for nectar, pollen from the anthers is brushed on to their bodies and then carried to the next flower to **pollinate** it.
>
> The pollen grain then grows a tube down into the ovary carrying the male nucleus to **fertilise** the **ovule**.

Commentary on Task 4

Pollination is the transfer of pollen between flowers. This is usually carried out by an agent such as the wind or an insect.

Fertilisation is the fusion of male and female sex cells (gametes). After landing on the stigma, the pollen grain grows a tube down the style into the ovary where it combines with a female ovule (see Commentary on Task 3).

Plants (continued)

Task 5-a

The child correctly understands:

- the support function of the stem (E);
- that roots anchor the plant (B);
- that leaves absorb sunlight (A);
- that plants make starch (A).

Task 5-b

The child tentatively understands:

- that leaves allow gaseous exchange (D);
- that plants make starch and that sunlight and water are important in the process (A).

Task 5-c

The main misunderstandings and omissions are:

- that roots take in everything the plants need to grow (C);
- that leaves breathe air in and out (D);
- the role of carbon dioxide in making food is not included (D);
- the role of the stem in transporting fluids is not mentioned (E).

Commentary on Task 5

Plants do not gain everything they need through their roots.

The main raw materials that plants need are water and carbon dioxide. Water (with traces of dissolved minerals) is taken in through the roots. Carbon dioxide is taken in through pores in the leaves. The leaves also absorb energy from the sun's light. Within the cells of the leaf, this energy is used to help make the plant's food.

In the presence of energy from sunlight and the green pigment called chlorophyll within the leaf's cells, carbon dioxide and water react together to build up molecules of glucose. Oxygen is a by-product of this process. This is given off through the leaves. Glucose is later converted into starch, which can be accumulated within the plant as a food store.

20

Plants (continued)

Task 6-a
Corn is the producer at the bottom of the food web. All the rest are consumers.

Task 6-b
Fieldmouse, weevil, aphid and rabbit are primary consumers since they are the ones that feed directly on the corn.

Task 6-c
Aphid numbers decrease or are eliminated.

Task 6-d
None of them are unaffected.

Task 6-e
Any three of the following:

Corn → aphid → blue-tit → hawk

Corn → aphid → ladybird → blue-tit → hawk

Corn → fieldmouse → hawk

Corn → weevil → spider → blue-tit → hawk

Corn → aphid → spider → blue-tit → hawk

Commentary on Task 6

Task 6-a
All green plants are producers. Everything else will be a consumer.

Task 6-b
Primary consumers feed directly on plants. They are herbivores.

Plants (continued)

Task 6-c

The use of an insecticide will reduce the numbers of aphids.

Task 6-d

All are affected but not all in the same way; some adversely, and some, at least to begin with, beneficially. Although the fieldmouse and weevil do not rely on the aphids as a food source they will benefit by lack of competition.

Task 6-e

Any three of the food chains will suffice. These all start with corn and end with the hawk.

A food chain illustrates the direct feeding relationship that links a producer to a consumer, whereas a food web shows inter-relationships between many food chains.

6.1

Seeds in the Dark

The fact that green plants need light in order to grow is common knowledge. It therefore might be expected that seeds also need light to begin to grow. This is not the case. Although a small number of seeds (eg lettuce) may need some light to break their dormancy, most seeds do not require any light. If they did need light then there would be problems when seeds are buried underground since none of them would grow.

The influence of light can be tested using a range of seeds. It is necessary to provide the other conditions that they need for germination to occur (air, moisture and warmth). The amount of light can be varied from none to bright light, or light can be provided in small bursts rather than continuously.