1a. Top turf

2 hours and 10 mins per day

A newspaper article stimulates an investigation into the variables required for healthy plant growth (light, temperature, water and air). The investigative focus enables children to work scientifically in a variety of ways.

OBJECTIVES

- Setting up simple practical enquiries, comparative and fair tests
- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant

APPROXIMATE DURATION

90 minutes, split by 3 weeks of 10 minutes daily recording.

RESOURCES

- Activity sheet 1a
- Activity sheets 2-4 (ability-dependent)
- Packets of grass seed
- Data-logging equipment (optional)
- 8 seed trays
- 8 thermometers
- Water
- Coir
- Cooking oil
- Seed compost
- Soil
- Sand

INTRODUCING THE ACTIVITY (30 minutes)

Read the newspaper article on Activity sheet 1a (based on a real article) to introduce the problem. An American company wishes to buy English turf for new housing estates, in both the United States and England. The article should provide some ideas as to what it is about English turf that makes it so desirable. Questions to encourage the children to think about this could include:

- *What might be different about growing grass in England rather than America? (Rainfall? Amount of sunlight? Temperature? Type of soil?)*

- *What might the Americans mean by the quality of the grass growing in England? (Green colour? Thickness of growth? Rate of growth?)*

The children will no doubt suggest some of the important conditions for healthy growth, but probably not all of them. The teacher can introduce the conditions missing from the discussion, and ask the children whether they might be important, and worth testing.

Now share the planned activity with the children, presenting the 8 sets of growing conditions as shown in this table:

Seed tray								
Growing condition	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Soil	✓	✓	×	×	×	✓	✓	✓
Warmth[1]	✓	✓	✓	✓	✓	×	✓	✓
Light	✓	×	✓	✓	✓	✓	✓	✓
Water	✓	✓	✓	✓	✓	✓	×	✓
Air	✓	✓	✓	✓	✓	✓	✓	×

Subsequent discussion can include:

- *How have we made sure that the test is fair?*
  Ensure that all conditions are kept the same, except for the one changed. The teacher can discuss, or decide beforehand, what the quantities should be (e.g. of soil etc., seeds, and water for each watering).
- *How shall we keep the watering the same for all?*
  Use the same measured quantity (this may be in spoonfuls, pipettefuls or millilitres) and water at the same time, not necessarily using the same time interval, but when the soil is feeling dry.
- *How should we measure the growth of the grass? Can we measure just one grass plant? What would be a fair way of measuring?*
  Select a method from the list below, depending on the ability of the children. Measure:
  - the tallest blade each day
  - the tallest and shortest and divide by 2 to find the mean
  - 10 blades of grass and choose the 'common' height
  - several blades of grass e.g. 10, and find the average.
- *What do you think will happen to the seeds in each tray?*
  Ask once trays have been set up. Children can make predictions for up to 8 trays, using drawings, writing or a table.

Activity sheets 2-4 provide recording opportunities for a range of abilities.

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1 Data-logging equipment can be used to measure temperature and light, if desirable. The sensors and computer can be kept running continuously for the 3-week growth period, resulting in a graphical output of any change in temperature, and any effect of changing light levels on temperature. The air temperature should only show significant change in the 'cold' location.

MAIN ACTIVITY (30 minutes)**:**

Children work in 8 groups, each being responsible for one seed tray, and the associated growing conditions. Each group can be given a list of their test's growing conditions and 5 minutes to think about how it might be achieved. Follow the children's ideas, if suitable. If not, suggest those listed below, and ask each group to set up their test.

The seeds can be planted in rows or scattered, or each method used in half the tray (it is easier to measure the height when grown in rows).

Tray 1: Use all conditions for healthy growth.

Tray 2: A black bin liner can be used to provide darkness. Trays 3, 4 and 5: Use sand, seed compost and coir (a coconut derivative, available from garden centres) as alternative growing media.

Tray 6: An outside, protected area is ideal. Do not use a refrigerator, as it will also be dark.

Tray 7: Best kept next to tray 1, but not watered. All other trays should be watered equally as the soil, etc. dries out.

Tray 8: Keep this tray in a transparent plastic bag, with the air removed using a straw (place the straw to the side of the tray, to prevent sucking up the compost). The air will need to be removed after each watering. Water with cooled, boiled water, as this removes dissolved air.

OBSERVATIONAL RECORDING (10 minutes per day)

Carry out observations every 2 to 3 days, at roughly the same time, using the choice of Activity sheets 2-4.

Seed growth will not be observed for several days, and possibly up to a week after planting, but temperature records can still be maintained. However, the apparent lack of growth can be used to reinforce the notion that living things do take time to grow and develop. Some, like humans, take years to reach full size, while others like grass, take just weeks to develop fully.

PLENARY (30 minutes)

Once the results have been recorded, and graphs produced, encourage the children to discuss what they have learned from the investigation. The discussion can begin by considering what is meant by healthy growth, and how the children would recognise a healthy plant. Questions might include:

- *What colour are the leaves of the grass in the tray 1?*
  This tray has all conditions for healthy growth, and tells us what happens to the seeds and plants when nothing is deliberately changed. It is called a 'control' by scientists.
- *Are the blades of grass strong and upright? What about the grass in the other trays?*
- *Is there a difference in the breadth of the blades of grass in the control tray, compared to the others?*
- *Is there evidence of a difference in the rate of growth?*

In contrast, what does an unhealthy plant look like:

- *Have the leaves withered?*
- *Are they yellowing?*
- *Is growth slow or has there been no growth at all?*

Can the children suggest what effect the various changes to conditions have had on the growing grass? They should consider:

- *What has happened to the grass growing without light, or water?* Yellowing leaves, thin and straggling, or even dead.
- *What has happened to the grass growing in the cold conditions?* The grass has probably grown more slowly, and it will be less vigorous, than that in the control tray.
- *What has happened to the grass growing in the sand, compost and coir?* Grass grown in the sand will show signs of unhealthy growth due to the lack of nutrients, whereas the compost and perhaps even the coir will have encouraged strong growth.
- *What has happened to the grass growth away from air?* This will similarly show very unhealthy growth, if there is any sign of growth at all.