

## GCSE Environmental and Land-Based Science

### Room for Growth

#### ***Instructions and answers for teachers***

*These instructions should accompany the OCR resource 'Room for Growth' activity which supports OCR GCSE Environmental and Land-Based Science.*

GCSE Environmental and Land-Based Science  
Lesson Element

**GCSE Environmental and Land-Based Science**

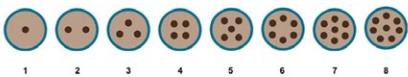
**Room for Growth**

**Investigate the effect of crowding on the growth of seedlings**

In this activity you will be asked to find the best spacing to sow radish seeds. You will allow your radish seeds to germinate and grow. After they have grown, you will record the mass of your radishes.

**Method**

1. Devise a results table to show distances between the seeds in each pot, the mass of each radish in each pot and the mean mass of radish for each pot.
2. You need to sow different numbers of radish seeds in the same size pots. Fill the pots evenly with compost and firm down lightly.
3. In the first pot, use a pencil to make a hole 1 cm deep in the compost.
4. Drop a seed into the hole and cover in compost.
5. Repeat for the other pots, increasing the number of holes each time.
6. Label each pot with the number of seeds planted in it.
7. Carefully measure the spacing between the seeds in each pot and record this in your results table.
8. Water the pots and put in a suitable place to germinate and grow.



Your teacher will tell you when to lift the radishes.  
Carefully keep all the radishes from each pot separately.  
Weigh the radishes from each pot and record their mass in your results table.  
Once you have tidied away all your equipment and washed your hands, answer the following questions.

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#### **The Activity:**



*This activity offers an opportunity for English skills development.*

#### **Associated materials:**

'Room for Growth' Lesson Element learner activity sheet.

### Investigate the effect of crowding on the growth of seedlings

#### Introduction

The aims of this activity are to support the teaching of several learning objectives of the:

- B682 unit, Topic 1: Plant Cultivation, including how growing medium, water, humidity, nutrients, temperature and light can be controlled in crop production (objective 1) and how a named plant is grown from seed to include the process of sowing, thinning, pricking out and potting on (objective 8).

**and**

- B683 unit, Topic 1: Commercial Horticulture and Agriculture, including how growing medium, water, humidity, nutrients, temperature and light can be controlled and how they affect plant growth (objective 1) and how plants are grown from seed to include the process of sowing, thinning, pricking out and potting on (objective 2).

In addition, this activity can be used as a training activity to prepare students for subsequent assessment of Element 1: Practical Skills. This task could potentially be developed into a possible Element 2: Scientific Investigation such as investigating the impact of different spacing on plant growth, or the comparison of growth when seeds are sown spaced out compared with thinning the seedlings out.

This activity involves students finding the best spacing to sow seeds. The seeds chosen for this activity are radish. They are big enough to handle easily, cheap to purchase, grow quickly, germinate reliably and the time from germination to harvesting is about 4 weeks. If the seeds are grown in the lab or greenhouse, they will give measureable results quickly. Time needs to be built into the delivery of lessons for students to care for the germinating seedlings and also to check for growth.

There are two methods that could be used to investigate the effect of crowding on seedling growth depending on whether the radish is to be grown in the lab or in vegetable plots. If growing in the lab, each student or group will need a number of plant pots; 10 – 15 cm diameter would be ideal. By varying the number of seeds in each pot and spacing the seeds out equally, the space between each plant will vary. If working in small groups, each student within the group can grow seeds at different spacing and share the results. Once the radish at the larger spacing reach the normal size for consumption, all the radish should be harvested, weighed and the mean mass of radish at each spacing calculated.

If vegetable plots are used, the seeds can be sown in the traditional way and plants thinned out to different spacing, giving a number of plants at each spacing to allow calculation of a mean mass. The student sheet will need to be amended if this method is used.

Students should see from their results that very close spacing reduces the average size of the radish but, there comes a point where increasing the spacing does not give a significant increase in radish size. From their results they should be able to conclude what the ideal spacing for radish is.

Topics for discussion with students would be the factors which would need to be controlled to make this a fair test, why radish with more space grow better, and why the increase in mass tails off at the highest spacing.

### **Apparatus** (per group or individual)

- 10x 10 – 15cm pots
- compost
- plant labels
- a ruler
- radish seeds
- access to a digital balance

A suitable controlled environment to grow the seeds on will be required.

### **Safety**

Normal laboratory safety should be maintained.

Students must be reminded to wash their hands after doing the task.

### **Extension activities**

The method of sowing in plots and then thinning out would provide the opportunity to discuss whether thinning out is a more reproducible way of investigating crowding than the method of sowing single seeds in spaced out conditions.

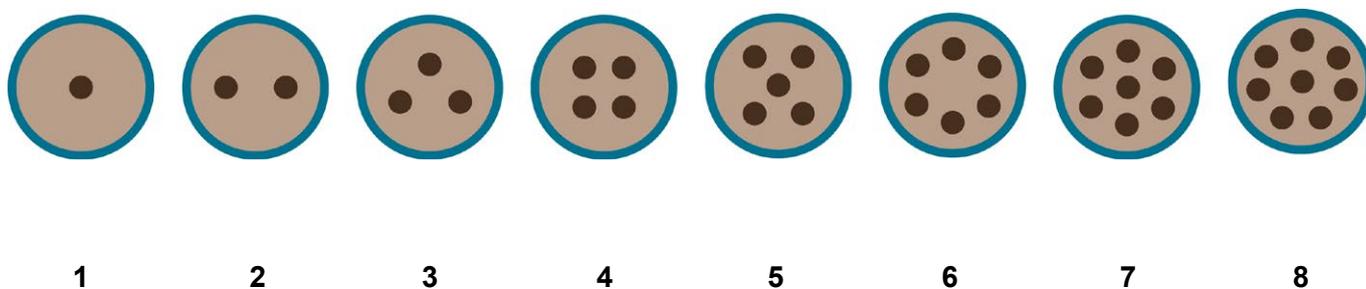
A discussion on the effect of thinning out on seedling growth due to disturbance and the possible ingress of pests could be useful.

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Once you have tidied away all your equipment and washed your hands, answer the following questions.

1. Name the variables you need to control to make this a fair test.

2. Suggest **one** possible risk when carrying out this investigation.

3. How could you reduce this risk?

4. If, when looking at your data, you could see that one of the results was anomalous, what would you do with that result?

5. Why is the mean mass of the radishes in each pot calculated?

6. Look at the data you have collected.

Construct a graph on the graph paper provided to display the data you have collected.

7. Why is it important for growers to know the best spacing to grow their crops?

8. If you were to repeat this activity, suggest some improvements that you would make to the method.



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