Science & Plants for Schools

# TEACHING AND LEARNING NOTES

| KEY STAGE 3 RESOURCES [TIME REQUIRED = ONE HOUR+] |
|---|
| Starter activity: Career case study and questions |
| Foundation activity: Do organic plants taste better than others? |
| Higher activity: Thanet Earth |
| Extension activity: Plants grown in different conditions |
| Plenary activity: Growing crops to sell |

## AIMS

**Careers education**

Pupils should have opportunities to appreciate that science has a vital role in career opportunities and recognise the importance of understanding the applications of scientific knowledge, understanding and skills outside the classroom.

**How science works**

Pupils should be taught to:

- collect data from primary and secondary sources, including using ICT sources and tools
- evaluate methods of collection of data and consider their validity and reliability as evidence.

**Experimental and investigative science**

Pupils should

- design a fair test:
- understand the need, where appropriate, to repeat observations or measurements
- interpret and evaluate results using, where appropriate, simple calculations.

## KEY VOCABULARY

taste · horticulture · product manager · blind trials

## STARTER ACTIVITY: CAREER CASE STUDY AND QUESTIONS

Ask pupils to read through the career case study in the starter activity worksheet and watch the video. This may be projected to the whole class or students may watch in small groups if PCs are available. They may then discuss the questions in small groups, noting their answers for a brief class discussion. Use this to establish what James does and why he enjoys doing it. Emphasise the importance of a scientific approach to taste in his work.

**Answers**

Students may give various responses depending on what they can remember. Transcript of video:

*"I used to be in the wine industry. So, the sensory side to herbs is very much an area of interest to me. I do a lot of product tasting. Tasting of new varieties. Tasting of new sources of, of raw materials. It tends to be quite customer facing so you tend to go out to, to visit customers as well. So, you can do quite a lot of travelling which is something I really enjoy.*

*"I've always been very passionate about horticulture. I mean, I suppose it all goes back to when I was three years old. I was - lived in Australia for a couple of years. My dad's always told me basically we went to the Brisbane Botanical Gardens and I was actually fascinated with the banana plants there just growing and how the food is really - is being produced like that.*

*"My dad's a GP and it's, it's very much within the family that a lot of people have gone into the - relatives have gone into medicine. But the more I looked at it I was so sort of passionate about plants and the, the scientific*

*side behind plants as well that I thought that was far more my sort of idea of a wonderful job basically.*

*"When I joined the company as New Product Development Officer it, it was very much a starting block and then people recognized my passion, my enthusiasm for what I do.*

*"And then from there it's evolved to be now very much the Product Manager. If you have that passion then people notice that enthusiasm. People comment on it and so you start to build a good name for yourself."*

## FOUNDATION ACTIVITY: DO ORGANIC PLANTS TASTE BETTER THAN OTHERS?

Ask pupils to follow the procedure to compare plant samples for their taste and record their results. Note: A blind trial is used; pupils are not told which samples are organic until after they have obtained their results. Four samples are used for the purpose of comparing like with like, but only one organic and one non-organic source is needed.

Warn pupils to maintain hygienic conditions.

The worksheet may be used to guide students to chart and interpret their results. Each group should attempt to compare the different regions of one plant, but may investigate other plants species if time permits.

The practical could be extended to compare other samples if follow up work is done for homework and/or in other lessons.

## HIGHER ACTIVITY: THANET EARTH

Pupils who complete the practical in good time can be given Worksheet 3 which asks them to find out about the giant greenhouse complex called Thanet earth. They will need internet access for this. This work can be completed for homework.

## EXTENSION ACTIVITY: PLANTS GROWN IN DIFFERENT CONDITIONS

The foundation activity may be followed up by asking pupils to consider the problems of comparing crops grown in conditions with multiple variables. Use the activity to emphasise the need to alter only one variable at a time in a fair test. Pupils could work on the problem in small groups, or individually for homework, reporting back their suggestions.

**Answers**

**a)** Change only one variable at a time. All variables must be kept constant or controlled to determine the effect of a single variable.

**b)** A comparison of the two farms could be made to try to identify the differences in the growing conditions and then to decide which are the most likely to affect the crop. Farmer Jones could try changing one variable at a time, possibly starting with the variety of carrot. Some variables are more difficult to alter, such as soil type. An important factor affecting taste is the ripeness or maturity of the crop at harvest. Fair comparisons are difficult when crops are grown in different areas.

**c)** A fair test would require crops to be grown in identical conditions with only one variable altered, such as a nutrient or rate of watering. Water cultures can be used to assess the effect of different nutrients and could form the basis of a project.

Pupils may have other suggestions which can also be discussed.

## PLENARY ACTIVITY: GROWING CROPS TO SELL

The worksheet can be used for a brain storm and short discussion or for a longer lead in to a lengthier class discussion of those factors which affect the saleability and profitability of crops. Pupils could work in small groups and report their suggestions.

## TECHNICIAN NOTES

### STARTER ACTIVITY: CAREER CASE STUDY AND QUESTIONS

The video is at:

↗ https://www.youtube.com/watch?v=holyMzEqPE0

A longer version and transcript is at:

↗ https://icould.com/stories/james-s-2/

Requires computer with internet connection and data projector for class projection.

Pupils could watch in small groups if devices are available.

### FOUNDATION ACTIVITY: DO ORGANIC PLANTS TASTE BETTER THAN OTHERS?

**Equipment and materials**

For class:

↗ Samples of Plants – entire if possible with flowers and/or fruit, for example herbs such as thyme, parsley, chives, coriander, sage, mustard, cress or radish

For each pair:

Plant food samples prepared suitable for consumption: one organic and one non-organic source divided into four samples labelled 1, 3 and 2, 4 respectively. These may be in clean paper cups or plates.

Various foods can be compared depending on availability, for example carrots, apples, herbs.

There are many online organic food companies that will deliver fresh or dried organic herbs. Some examples of online shops include: http://www.riverford.co.uk/, http://www.abelandcole.co.uk/ or http://www.organicherbtrading.com/. Local suppliers or larger supermarkets are also worth trying although it may be harder to get fresh organic herbs from the large chain supermarkets. However, Waitrose currently (April 2019) sell a range of dried organic herbs and there are lots of other places that sell them online.

**Summary of method**

Pupils record taste preferences for paired samples in a blind trial – they are not told which samples are organic or non-organic until the results have been obtained. Pairings include identical sources and repeats.

**Safety**

↗ Risk assessments should be carried out for all activities: see your local safety guidance, e.g. CLEAPSS or SSERC.

↗ Food and drink should not be consumed in science laboratories but locations such as a food technology department or school canteen could be used.

↗ Check pupils for conditions such as diabetes, food allergies or intolerances.

↗ Good food handling and preparation hygiene measures must be used.

↗ Pupils should wash their hands at the start and end of activities.

See, for example, CLEAPSS guidelines 3.014 (Eating and Tasting), 3.022 (Handling Food), 3.021 (Purchase and Selection of Food) (COSHH Regulations); CLEAPSS laboratory handbook – section 15.3

# James Seymour

## Product Manager



Science &Plants for Schools

## CAREER CASE STUDY

### WHAT DOES JAMES DO?

James Seymour is a Product Manager in a herb growing company, Humber VHB. He uses his knowledge of plant science to choose the plants that they grow and sell.

He told us, "I do a lot of product tasting. Tasting of new varieties. Tasting of new sources of raw materials. I was so passionate about plants and the scientific side behind plants as well that I thought that was my idea of a wonderful job.

"At university I studied horticulture and food at Nottingham and it was an ideal starting block really."

Horticulture is the science of plant cultivation for human use. It is very diverse, involving plants for food (fruits, vegetables, mushrooms, herbs) and non-food crops including plants for medicines and ornamental plants for gardens and parks.

James says, "When I was at school it was quite difficult really to see horticulture as a subject. There's so many different sorts of areas."

**a)** Watch the video in which James explains why he became a plant scientist.

## QUESTIONS

Use the information above and in the video to answer these questions:

**a)** What does James 'do a lot of' in his job?

**b)** What made him passionate about horticulture?

**c)** What helped him gain promotion to his present job?

**d)** What did he find difficult to see as a subject at school?
Why was this?

**e)** Why do you think tasting new varieties is important in James's work?

You will use scientific methods to carry out taste tests of your own in the investigation *Do organic plants taste better than others?*

## DO ORGANIC PLANTS TASTE BETTER THAN OTHERS?

**James told us "I do a lot of product tasting."**

**Organic herbs, fruit and vegetables are grown under strict conditions which prohibit the use of artificial fertilisers and other synthetic chemicals such as insecticides and weed killers.**

**Claims made for organically grown foods include that they are healthier and taste better than those grown using other methods.**

**Use your practical skills to test to see if organic produce really does taste better.**

**SAFETY: maintain hygiene at all times – wash your hands before and after the investigation, do not handle or taste material used by other pupils. Tell your teacher if you have any food allergies or react to any foods.**

### EQUIPMENT

Samples of organic and non-organic foods from plants

### PROCEDURE

If you think organic food will taste better and you know which food is organic, you may show a bias towards judging it to be better tasting even if it doesn't.

To prevent bias you will use a 'single blind' method. The participants (tasters) will not know which foods are organic and which are not.

Work with a partner.

You will taste six pairs of food samples from four sources (numbered 1, 2, 3 or 4).

**01)** Choose who uses which results table (see Results table).

**02)** Hygienically taste a little of each food following the pattern in your selected table. Each time, record the number of the sample from the pair which appears to taste better, or N if no preference.

**03)** Describe any reasons for your choices.

### RESULTS

| Tester 1 | | |
|---|---|---|
| **Trial** | **Pair** | **Number of sample with better taste, or no preference (N)** |
| 1 | 1,2 | |
| 2 | 3,1 | |
| 3 | 4,3 | |
| 4 | 3,2 | |
| 5 | 2,4 | |
| 6 | 4,1 | |

| Tester 2 | | |
|---|---|---|
| **Trial** | **Pair** | **Number of sample with better taste, or no preference (N)** |
| 1 | 2,1 | |
| 2 | 1,3 | |
| 3 | 3,4 | |
| 4 | 2,3 | |
| 5 | 4,2 | |
| 6 | 1,4 | |

## INTERPRETING YOUR RESULTS

Your teacher will tell you which samples were organic and which were not.

Total up the number of times that you showed a preference for organic and for non-organic samples, or showed no preference.

**a)** Are your results consistent? (Did you always show the same preference when comparing tastes?)

**b)** In your results, did you prefer the taste of organic or non-organic samples, or show no preference?

**c)** Do your results show the same pattern as your partner?

**d)** Do you think it would have made a difference if the investigation had not been blind and you had known which samples were organic and non-organic? Explain your answer.

## CLASS RESULTS

Compare and discuss your results with the rest of your class.

**a)** In the class results

- **i)** How many people showed a preference for organic compared to non-organic?
- **ii)** How many showed no preference?
- **iii)** Calculate these results as percentages.

**b)** **i)** In which trials should no preference have been shown? Why not?

- **ii)** Suggest an explanation for including these trials.

**c)** What reasons did people give for their choices?

**d)** Suggest possible explanations for any patterns in the results.

**e)** What are the possible sources of error in the investigation?

**f)** Suggest how the investigation might be improved.

**g)** Write **conclusions** – what do the results of the investigation show?

## THANET EARTH

Thanet Earth is the name that has been given to a giant hi-tech greenhouse complex that has been built on the Isle of Thanet in Kent.

**a)** Use the internet to do some research to find out how plant science is used there to optimise the production of tomatoes, peppers and cucumbers.

**b)** Write a short report to explain how the methods that they use improve on those used in growing crops in an open field.

## PLANTS GROWN IN DIFFERENT CONDITIONS

**In practice it is very hard to establish if organic crops are better than non-organic crops for taste or for any other reason. How could you show if the way that a crop is grown affects its taste?**

**a)** What is the important rule that must be applied if a 'fair test' is to be carried out?

**b)** You might be able to show that most people preferred the taste of the carrots grown by Farmer Giles to those grown by Farmer Jones. Could you help Farmer Jones to grow tastier carrots?

Describe some of the things that you would need to do or to find out before you could give Farmer Jones any good advice.

**c)** Design a fair test to show if one method of growing a crop gives it a better taste than a crop grown using a different method.

Write a short description of the design of your investigation in outline only, describing what you think would be the most important things to include in your method.

**d)** If time permits, finalise your design and carry out your investigation. Can you discover something that affects the taste of a crop?

## GROWING CROPS TO SELL

**James Seymour said that he does a lot of product tasting in his job.**

**a)** List other factors which you think are important in growing a crop for sale.

**b)** What decisions do you think you would have to make if you wanted to maximise your profits? What choices would you need to make?

**Hints: think about what things ...**

- might make a crop attractive to customers, including the shops that might sell your product
- might make your crop cheaper to produce.