



Food

MODULE 8

Pea life-cycle mystery

TIMING

1 hour + planting peas at various times of the year.

MATERIAL

Examples of questions and answers from a gardening magazine
Photocopies of sheets F25, F26, F27, F28, F29
Overhead projector transparency (OHT)

SKILLS

Reasoning for real life situations

KEYWORDS

Stigma
Pollen
Pollinate
Pollinated
Bumblebee
Environmental factors
Frost
Shade
Grub
Drought
Soil
Compost
Nitrogen-fixing bacteria

CROSS-CURRICULAR ACTIVITY

Literacy – writing genre
ICT

Overview

This activity can be used after the work on life-cycles and pollination to assess whether children can apply their knowledge. There is a differentiated version for children with limited literacy skills.

Aims

To use knowledge and reasoning to understand real life situations.
To consider the checks on plant growth and development.

Teaching sequence

Outdoor activities

The children should have an opportunity to grow peas and observe the environmental factors that affect their growth, including insect damage.

Indoor activities

1. In groups of 3 or 4 the children are given Evidence 1 sheet F25 and all the long strips of environmental factors sheet F27 or the differentiated Pea Mystery (Module 8A). They read the information and decide what the problem is and which piece(s) of evidence support that decision.
2. Cut up the writing frames and give out the Decision 1 writing frame on sheet F28 to all groups. Each group writes its decision and supporting evidence on this frame. There can be a vote on the correct answer at this stage.
3. Give out Evidence 2 sheet F26 and the pea moth life-cycle on sheet F29. (Paler coloured arrows show when there is no problem for pea growing). The diary on F29 can show when the children think there is the most danger of pea moth attack. Children reconsider the evidence.
4. Print the Decision 2 writing frame on sheet F28 on an OHT (or children type in their ideas on a PowerPoint slide to project on a whiteboard). You may need to prompt children to explain their understanding (see argument prompts in the section Background information at the back). Each group writes its decision in the writing frame and adds evidence in support.
5. Class plenary: each group presents its findings. If all of the answers are the same prompt children to think of what they would say if others put a different point of view.
6. Discuss the potential for environmental damage to crops.
7. Formative assessment: written evidence of any misconceptions or lack of understanding that still need to be addressed. Each child writes a short article (3-4 lines) that could be printed in a gardening magazine that would tell anyone with Mr Pringle's problem with pea moth what factors they would have to consider to get a good crop of peas. They should include factors on the environment strips and the result of their discussion, e.g. cover the seeds and young plants until the threat of pea moth has passed in mid summer and then take the fleece off the plants. Alternatively, sow peas so that they will flower earlier or later than June/July.



Teachers' notes

This may be an activity that only the most able children in your class will be able to do. If there are children in the class with good science skills but with poor literacy skills it would be helpful to pair them with better readers.

Alternatively use the sheet with more pictures and less writing and go through the evidence cards with the whole class.

You might like to change the layout to suit the children you are working with.

It may be helpful to do this activity after the life-cycle and the pollination activities.

A sugar-snap pea life-cycle http://www.saps.plantsci.cam.ac.uk/docs/p4pp/ptpts/ptpts_B.pdf can be displayed on a whiteboard or the pea life cycle completed in Module 4 for discussion.

This can be a starting point for considering why and how to set up experiments.

The children will learn new vocabulary.

This is an activity in which evidence is given and children must theorise from that evidence. Deductive reasoning is tested.

To use the activity as shown it would be helpful to print out and cut up the environmental factors into sections.

The evidence strips are colour coded but take off the 'fill colour' if printing in black and white. If possible laminate the strips, the pea moth life-cycle and the 2 main pieces of evidence for robustness in use.

A useful website to show pea moths and their grubs is: <http://www.inra.fr/Internet/Produits/HYPPZ/RAVAGEUR/6cydnig.htm>

Bear in mind that what people say is happening is not necessarily true (Mrs Jones may be experienced but she may also have misconceptions!) Peas can self-pollinate although bees can help to increase the yield. Powdery mildew is caused by lack of airflow and will cause poor crops.

Dry soil can prevent peas developing properly so that they are unlikely to produce a large crop.

Compost here refers to garden compost made from kitchen waste and annual weeds.

You can show children the nodules on pea plant roots when they dig them up once the plants begin to die, see Module 4 & 8 Power-Point in the Media Gallery Food M4 Plant life cycles Peas.

These nodules contain nitrogen-fixing micro-organisms which take nitrogen from the soil atmosphere and make it available to the plant.

Evidence 1

Mr Pringle is a new gardener in the south-west of England. He only had a few pods on his spring sown peas last year.



- **Frost** was not a problem where he lived so he sowed seeds in October and again in May.
- His autumn sown peas grew against a wall for **shelter during winter**.
- He sowed his spring peas in full sun.
- He knew that the **pea moth lays its eggs in the pea flower**.
- **The grubs hatch out inside the pea pod and eat the new peas**.
- His gardening magazine said 'cover spring sown peas with thin fleece that lets light and water through, but keeps out the pea moth'.
- He put the fleece on **before the flower buds opened and made sure it was pegged down completely. He took the fleece off in September and the plants were covered in a grey powder and looked feeble**.
- **The winter was wet**, and the summer was **warm and dry** with heavy **thunderstorms**.
- Mr Pringle has a good crop of peas from his peas sown in October.

He got no crop at all from seed sown in May. What do you think happened?

Evidence 2

He asked his neighbour, Mrs Jones, why his May sown peas had no pods.

- She said that all flowers need bees to visit them.
- Bees carry pollen on their hairy bodies from flower to flower and brush past the stigma of the flower.
- Seeds will only develop when the flowers are **pollinated**.
- The **pea moth** only **lays its eggs** in **June and July**.
- **Dry soil** will weaken plants.
- She also said that **peas like plenty of air-flow around them, otherwise they get powdery mildew and may rot.**

From her suggestions, what do you think Mr Pringle did wrong and what should he do to get a better crop of peas next year?

Environmental factor



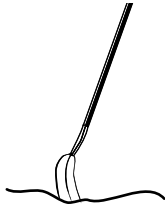
Insects

Pea moths only lay their eggs in pea flowers in spring and early summer.
Peas flower 6-8 weeks after they have been sown.
Bumblebees fly from early spring until mid autumn.



Weather

Shaded places and north-facing parts of the garden will be colder for longer than sunny parts. Don't plant spring peas in parts of the garden where frost is likely because flower buds, flowers or young peas pods (or plants) can be killed by frost.
Plant in a warm sheltered site.



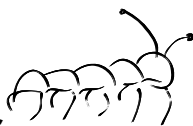
Soil

Peas will not grow well in cold soil, wet soil or dry soil. Plenty of good compost dug into the soil will help to hold water. Peas grow nodules on their roots that contain nitrogen-fixing micro-organisms that trap nitrogen from the air so that it can be taken up by the plant. Peas do not need extra nitrogen fertiliser.



Water

Dry summers will mean smaller crops of peas. Peas can grow well in drought if the soil has plenty of compost in it to hold water and the gardener keeps them well watered.
Good air flow around pea plants prevents mildew developing in wet weather.



Animals

Pea seeds are often eaten by mice or voles as soon as they are sown. Slugs and snails eat growing pea plants. Young plants also need protection from rabbits and wood pigeons because they eat the leaves and young pods.

Decision 1



Our group

has decided that Mr Pringle's peas did not develop because ...

The evidence to support this idea is...

Decision 2



Our group

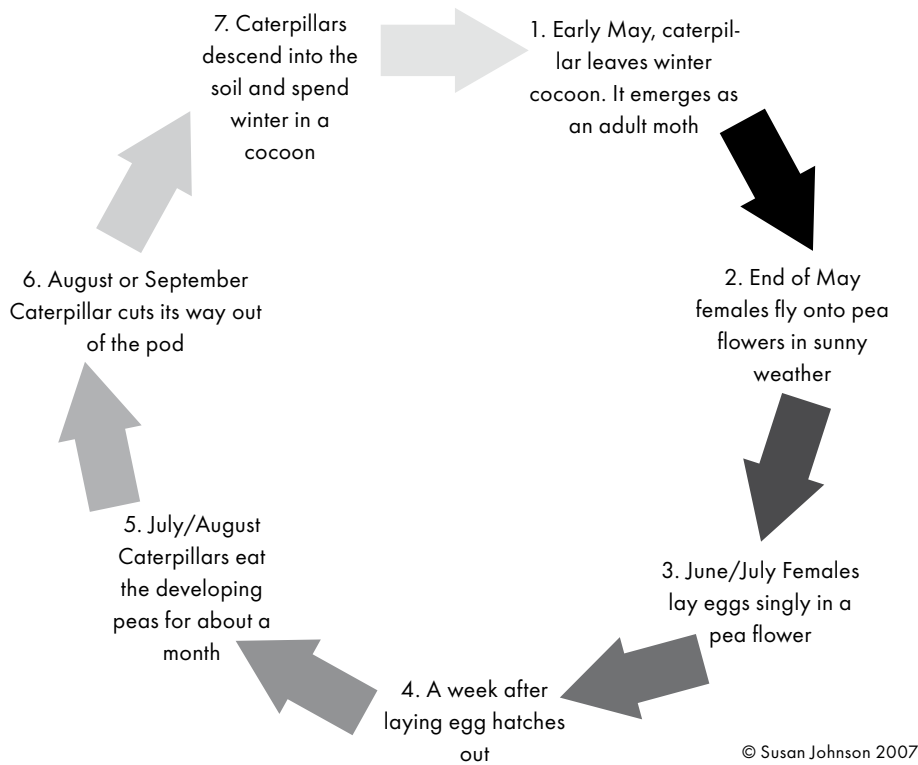
looked at the second piece of evidence and the life-cycle and decided that...

The evidence that supports this is.....

Next year Mr Pringle must...

Pea moth life-cycle

Pea moth caterpillars are up to 6 millimetres long, with pale yellow bodies and black heads



Information from the pack of pea seeds sown in spring

Ready to pick in 75-85 days

Sow 2 or 3 times during the sowing season for a longer harvesting period.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Sow												
Harvest												
Danger from pea moths												

The empty row is for you to add a red timeline for the danger period for pea moths

★ ★ ★ Today I learned



Food

MODULE 8A

Pea life-cycle mystery (differentiated)

TIMING

1 hour + planting peas at various times of the year.

MATERIAL

Examples of questions and answers from a gardening magazine
Photocopies of sheets F28, F29, F30, F31

SKILLS

Reasoning for real life situations

KEYWORDS

Stigma
Pollen
Pollinate
Pollinated
Bumblebee
Environmental factors
Frost
Shade
Grub
Drought
Soil
Compost
Nitrogen-fixing bacteria

CROSS-CURRICULAR ACTIVITY

Literacy – writing genre
ICT

Overview

This activity is written more simply than Module 8 to help those with poor literacy skills to take part.

Aims

To use knowledge and reasoning to understand real life situations.
To consider the checks on plant growth and development.

Teaching sequence

Outdoor activities

The children should have an opportunity to grow peas and observe the environmental factors that affect their growth, including insect damage. Children who will be doing this differentiated activity may need to be given more help in understanding the stages of pea plant growth.

Indoor activities

1. In groups of 3 with an adult. The adult must not give too much help; the idea is the children try to decide what has happened on their own – it is expected that they will get the first decision wrong.
2. They are given Evidence 1 sheet F30 and all the 4 long strips of Environmental factors on sheet F31. Read out all the information together and decide what the problem is and which piece(s) of evidence on the environment strips supports their ideas about what the problem is. The problem is that his peas did not develop at all. There are fewer environmental factors here to make the choice simpler. They write their decision and supporting evidence from the environmental factors – which is the one they think has caused the problem. Use the same Decision 1 sheet F28 if required. There can be a vote on the right answer at this point. Groups that are struggling at this point may need extra assistance.
3. Give out Evidence 2 box on sheet F31 and the pea moth life-cycle from Module 8 on sheet F29. Read the second evidence sheet together. Discuss each piece of evidence. Paler coloured arrows show when there is no problem for pea growing at this point in the pea moth life cycle. Children reconsider the evidence.
4. Use Decision 2 writing frame on sheet F28 from Module 8 if necessary. The peas do not develop because he reduces the airflow by covering them completely during warm damp conditions and they are weakened by powdery mildew.
5. Class plenary: each group presents its findings.
6. Discuss human dependence on pollinators and the potential for environmental damage to crops.
7. The children write a note on what they have found out about the relationship between peas and bees for a gardening magazine. Alternatively they could report their advice on an audio or video recording.

Teachers' note

Revise pea pollination, and the life-cycle of the pea (Module 4) before starting this activity. Use all other information from Module 8.

Evidence 1

Mr Pringle knows that pea moth grubs may eat his peas. **Pea moths lay eggs in the pea flower and the grubs hatch in the pea pod and eat the peas.**



He lives where there is **no frost** and he can sow pea seeds in **October** and in **May**.



He covers his pea plants with thin fleece when the flowers show. **It lets light and water through, but keeps the pea moth out. The fleece is left on until September.**



He got no peas at all from peas seeds he sowed in May. Why do you think this happened?



Evidence 2

Mrs Jones tells him that dry soil could have caused poor growth and that pea plants also need **good air flow** around them **to prevent powdery mildew** causing the **plants to rot**.

What should Mr Pringle do next year?



Environmental factor

Insects

Peas sown in May flower in about 6 to 8 weeks. Bumblebees are flying from early spring until late autumn. Pea moths lay eggs in developing pea pods in June and July, when the pea plant is in flower.



Environmental factor

Weather

Peas will not grow in shady places or cold parts of the garden. Don't plant peas where frost can kill flower buds.



Environmental factor

Water

Dry summers will mean smaller crops of peas. Peas can grow well in drought if the soil has plenty of compost in it to hold water and the gardener keeps them well watered. Good air flow around pea plants prevents mildew developing.



Environmental factor

Animals

Pea seeds are eaten by mice or voles as soon as they are sown. Slugs and snails eat small pea plants. Pea leaves and pods may be eaten by pigeons.

