FOUNDATION – YEAR 2

Seasons and Seeds Investigation

Hands-on Horticulture

In collaboration with Hort Innovation, Primary Industries Education Foundation Australia (PIEFA) has developed a series of practical scientific investigations exploring Australian grown fruit and vegetables.

The **Hands-on Horticulture** resources have been designed to engage students in hands-on Australian Curriculum aligned investigations that explore Australian grown fruit and vegetables. The resources incorporate science understanding and science inquiry skills to provide meaningful learning experiences for primary-aged students. Each resource contains guidance for a teacher-led lesson to be completed in the classroom, along with a '**Take me Home!**' extension activity for students to consolidate their scientific investigation and explore the production of fruits and vegetables.

During this practical activity, students will have the opportunity to perform an experiment investigating the effect of temperature on seed germination.

This resource has been developed by:

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Hort Innovation

Background information

For successful growth, plants require sunlight, warmth, nutrients (soil), water and air, however, not all of these components are required for seeds to germinate. Seeds are able to germinate and begin growing without soil (nutrients) and light. This is because they contain all of the required nutrients for germination in their endosperm.

An endosperm is a tissue found in the seeds of flowering plants. It stores nutrients the developing plant embryo can use for growth. It provides essential proteins, carbohydrates, and other nutrients to support the early stages of plant development until the plant can start producing its nutrients through photosynthesis.

Seeds require specific temperatures to germinate successfully. Each plant species has its optimal temperature range, which triggers biochemical reactions in the seed. These reactions activate enzymes that break down stored nutrients and start growth. Temperature is a crucial factor that affects the speed and success of germination. If the temperature is too high or low, it can delay or prevent these biochemical reactions, leading to reduced germination rates.

This is why different types of fruits and vegetables are grown at different times of the year. As growth is influenced by temperature and light, some plants are able to germinate and grow successfully in cooler months (e.g. broccoli, potatoes, onions) while others grow successfully in warmer conditions with more hours of daylight (e.g. tomatoes, capsicums and zucchinis). These differences in growth requirements are the reason that some foods are only available at certain times of the year — seasonal foods. During this activity, encourage students to draw on their knowledge of the types of fruits and vegetables they might eat at different times of the year, with an understanding that temperature impacts the germination of seeds and growth of seedlings and plants.

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LESSON

Seeds and Seasons Investigations

RISK ASSESSMENTS

Note: Schools are responsible for generating their own risk assessments for activities. Risk assessments should address the potential hazards associated with using fruits and vegetables in the classroom, including food-borne illnesses, allergies, slips/falls, and cross-contamination, and propose control measures such as proper cooking, allergy awareness, accident prevention, and hygiene practices to ensure a safe learning environment for students.

LESSON OBJECTIVE

Students will follow a procedure that replicates winter and spring temperatures to make observations and record data about seed germination over a short period of time.

SUCCESS CRITERIA

I can observe and describe the impact of temperature on seed germination.

ACTIVITY LENGTH

Preparation: 45 min

Observation: Results will be visible between 2–3 weeks. The investigation can be continued for up to 10 weeks depending on teacher needs and time availability.

Seasons and Seeds Investigation

Materials (per student)

- 2 plastic cups
- 10 sheets of paper towel
- Experiment labels
- 8 seeds of the same plant (e.g. lettuce, cress, carrots, pumpkin, radish, etc.)
- 2 icy pole sticks
- Glue
- 1 pipette or spray bottle to water seeds
- **Seeds and Seasons** student worksheet

Instructions

1. Facilitate a class discussion about the things plants need to grow and survive. Record student ideas in a central area.

   Suggested answers: water, soil (nutrients), air, sunlight, warmth.

2. Play the Bean Time-Lapse – 25 days | Soil cross section video (3:09) to observe a seed germinating. After viewing the video, allow students to share their observations about the germination and growth of the bean plant.

   Pose the question:

   Did the seed need sunlight to germinate?

   Encourage students to share their thoughts, reminding them that germination occurred underneath the soil in the video.

3. Explain that seeds have a structure called the endosperm that contains all the nutrients they need to germinate and begin to grow. They don't need soil or sunlight to start growing, but they do need water and the right temperature. The seeds of some plants can germinate in cooler temperatures, so are usually grown in the winter months, while others germinate faster with warmer temperatures, so grow better in summer. During this experiment, students will investigate the optimum temperature for their chosen seeds to germinate.

4. Distribute the required materials to students. Depending on student ability, they may work independently to follow the instructions on the **Seeds and Seasons** student worksheet, or complete each of the following steps with teacher instruction.

Instructions (cont'd)

5. Students line both of their plastic cups by folding a single piece of paper towel in half and wrapping one piece around the inside of each cup.

6. Students scrunch three to four pieces of paper towel and place them inside each of the cups (six to eight pieces in total) until they are filled to the top with paper towel and they can keep the liners securely in place.

7. Demonstrate placing the four seeds evenly around the cup circumference (approximately one third of the way down), between the inside wall of the plastic and the lining layer of the paper towel so that the seeds are visible from the outside of the cup. Students complete this step after watching the demonstration.

8. Using a pipette or spray bottle, students slowly water the seeds and paper towel in both cups, allowing the paper towel to absorb the water so that it is wet. Water should not pool at the bottom of the cup.

9. Students cut out the experiment labels and glue them onto their icy pole sticks, inserting one labelled stick into each of their cups to indicate their growing conditions throughout the experiment. The cup labelled with a snowflake will be placed in the refrigerator to replicate winter conditions, while the cup labelled with the house will remain in the classroom to observe spring conditions.

10. Collect the labelled cups from each student and place them in the correct location for the duration of the experiment.

11. Take the cups out of the fridge once per day (preferably at the same time of day) over the course of the experiment and allow students to observe their seeds, water if necessary and compare the seed germination with the classroom/spring cups. Discuss any changes that may be occurring.

12. At the conclusion of the experiment, students record the total number of seeds that germinated in the two environments on the **Seeds and Seasons** worksheet.

13. Facilitate a discussion about the results of the experiment. Encourage students to identify which environment was the preferred germinating conditions for the seeds, and the season their seeds would be most likely to grow in.

Seasons and Seeds Investigation

LEARNING AREA

Science (Foundation – Year 2)

AUSTRALIAN CURRICULUM CONTENT

Observe external features of plants and animals and describe ways they can be grouped based on these features (**AC9SFU01**)

Identify the basic needs of plants and animals, including air, water, food or shelter, and describe how the places they live meet those needs (**AC9S1U01**)

Pose questions and make predictions based on experiences (**AC9SFI01**)

Pose questions to explore observed simple patterns and relationships and make predictions based on experiences (**AC9S1I01**, **AC9S2I01**)

Engage in investigations safely and make observations using their senses (**AC9SFI02**)

Suggest and follow safe procedures to investigate questions and test predictions (**AC9S1I02**, **AC9S2I02**)

Make and record observations, including informal measurements, using digital tools as appropriate (**AC9S1I03**, **AC9S2I03**)

Represent observations in provided templates and identify patterns with guidance (**AC9SFI03**)

Sort and order data and information and represent patterns, including with provided tables and visual or physical models (**AC9S1I04**, **AC9S2I04**)

Compare observations with predictions with guidance (**AC9SFI04**)

Compare observations with predictions and others' observations, consider if investigations are fair and identify further questions with guidance (**AC9S1I05**, **AC9S2I05**)

Share questions, predictions, observations and ideas with others (**AC9SFI05**)

Write and create texts to communicate observations, findings and ideas, using everyday and scientific vocabulary (**AC9S1I06**, **AC9S2I06**)

References

GPhase. (2018). Bean Time-Lapse – 25 days | Soil cross section [YouTube Video]. In YouTube. https://www.youtube.com/watch?v=w77zPAtVTuI

Seeds and Seasons

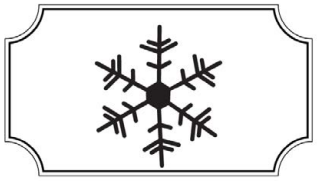
EQUIPMENT

Collect these materials before you start the experiment:

2 plastic cups

Spray bottle or pipette

8 seeds



10 sheets of paper towel

2 icy pole sticks

Scissors

Glue

Experiment labels

INSTRUCTIONS

1. Fold two pieces of paper towel in half and wrap one around the inside of each of the plastic cups.
2. Scrunch up the rest of the pieces of paper towel and place four of the scrunched-up balls into each of the cups.
3. Use a pipette or spray bottle to slowly water the seeds and paper towel in both cups so that they are wet, but water is not pooling at the bottom of the cup.
4. Cut out the experiment labels and glue them onto the icy pole sticks. Place one labelled stick into each of the cups. The cup labelled with a snowflake will be placed in the refrigerator where the temperature is cold, like winter. The cup labelled with the house will stay in the classroom where the temperature is warm, like spring.
5. Observe and compare the seeds in both cups every day during the experiment. Record your observations on your worksheet.

Seeds and Seasons (cont'd)

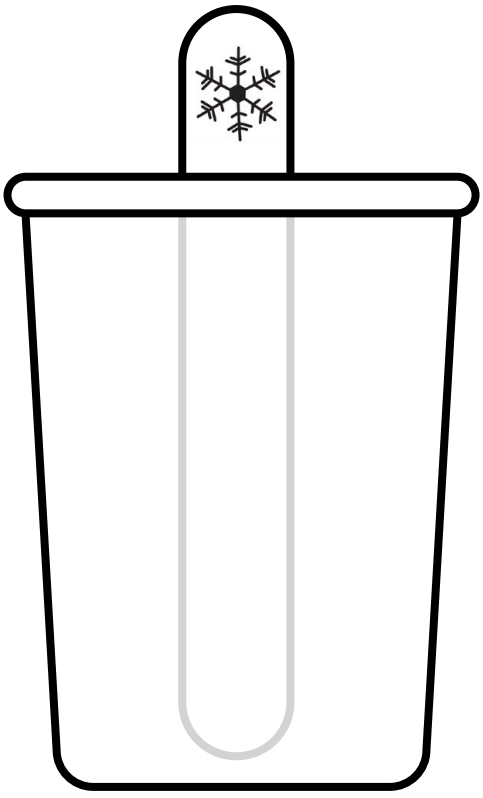
1. **Make a prediction about which temperature will cause the seeds to germinate first. Circle the snowflake (winter) or the house (spring) to show your prediction.**

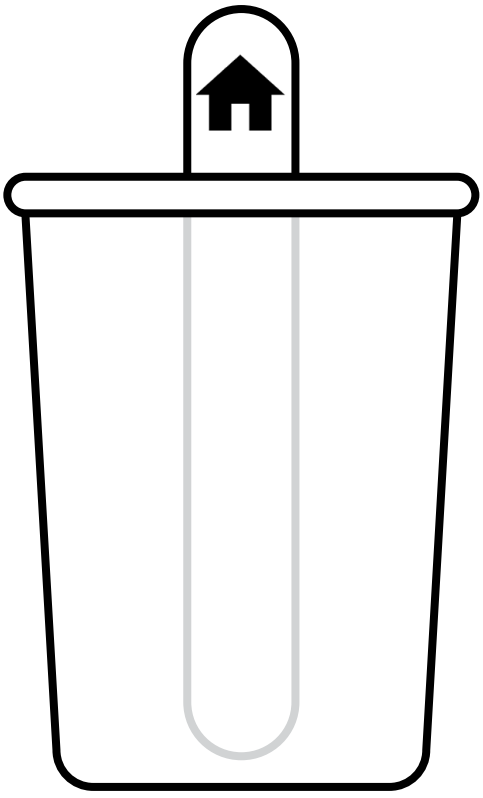
Fridge (winter)

Classroom (spring)

2. **Draw a picture to show the parts of the experiment. Use the word bank to label your picture.**

Seeds	Paper towel	Label	Cup





Seeds and Seasons (cont'd)

3. **Tick (✔) the number to show how many seeds germinated in the fridge.**

Fridge (winter)

1 ☐ 2 ☐ 3 ☐ 4 ☐

4. **Tick (✔) the number to show how many seeds germinated in the classroom.**

Classroom (spring)

1 ☐ 2 ☐ 3 ☐ 4 ☐

5. **Tick the box to show the correct answer. (✔)**
The best temperature for germination for my seeds was in the:

Fridge ☐

Classroom ☐

6. **Which season do you think your seeds would grow best in? Record your ideas below.**