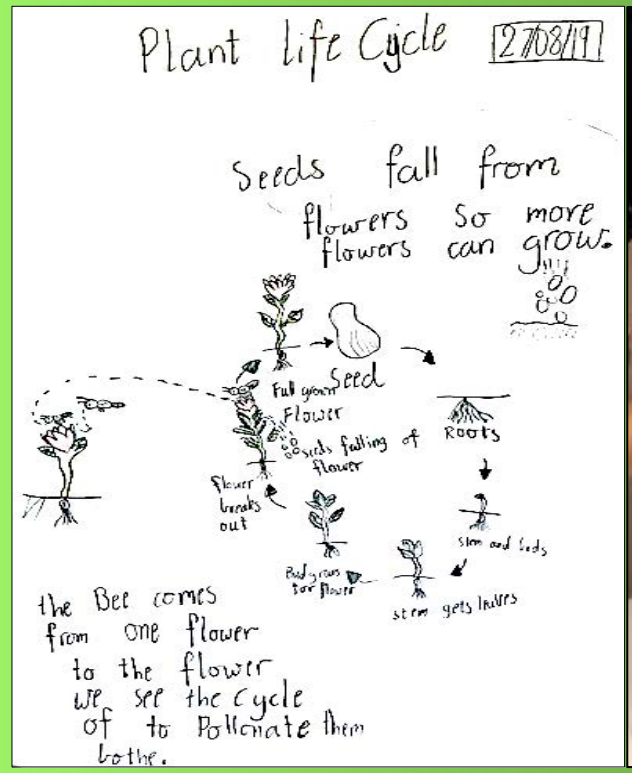
Fast Plant Growth

Year 2



Students plant, observe and analyse the growth of their own flowering plant. They record, organise, categorise and represent their observations, and communicate their ideas. Students generate recording and representing methods to investigate and track the growth of their plant, including the variation in growth, pollination and seed production. These include diagrammatic drawings, tallying of recordings, tabulation of data and line graphing. They discuss the structure and function of flowering plants, and establish an understanding of the life cycle of a flowering plant.

INTERDISCIPLINARY MATHEMATICS AND SCIENCE (IMS) LEARNING

DEAKIN UNIVERSITY
MACQUARIE University
VANDERBILT UNIVERSITY
Australian Government
Australian Research Council

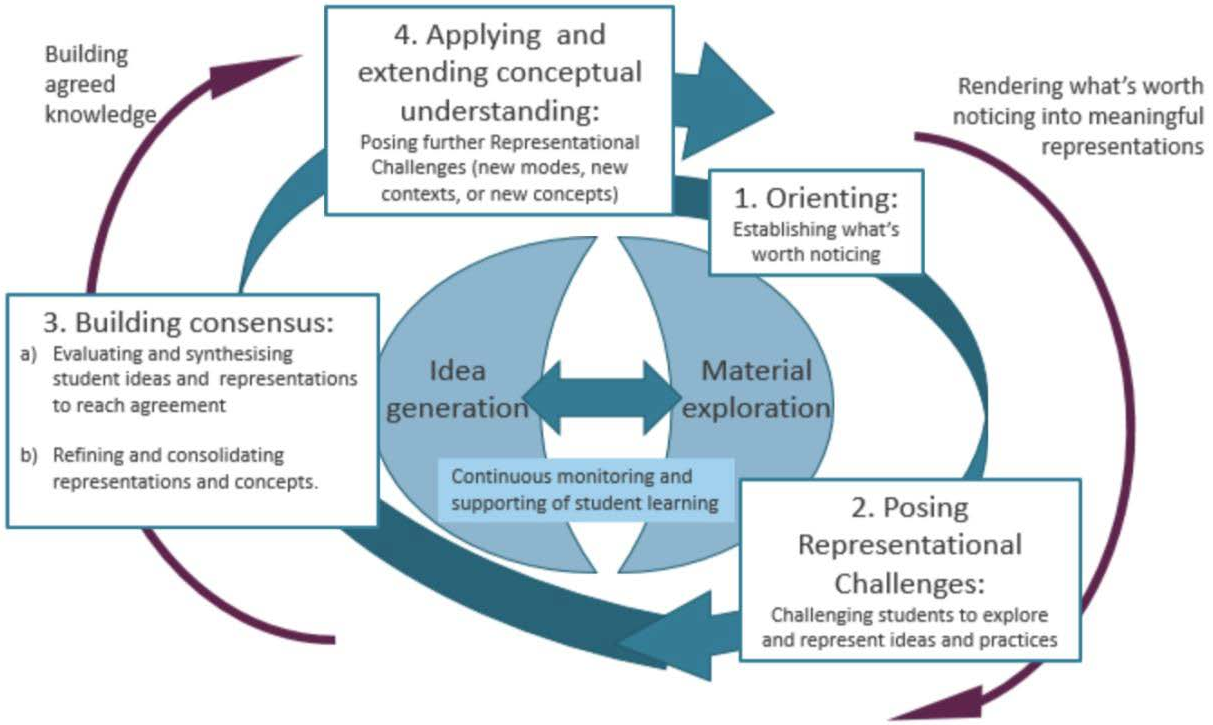
This teaching and learning sequence is one of a number that are designed to productively integrate mathematics with science, using a guided inquiry approach in which students construct, share, evaluate and revise multimodal representations to establish conceptual understanding. See website https://imslearning.org/

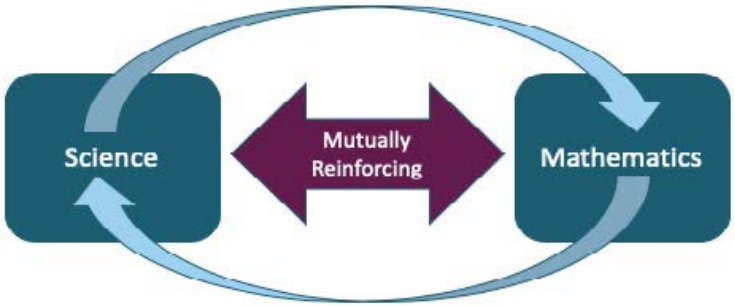
Interdisciplinary Mathematics and Science (IMS) Learning

IMS aims to enrich learning through two interconnected principles, which are key to the nature of the unit design and the pedagogy. The first principle concerns a focus on students constructing, evaluating, and refining multimodal representations, enacted through a four-stage IMS pedagogical model. The second principle concerns interdisciplinarity: the relation between science and mathematics. The project can be found at https://imslearning.org/
Below we describe the key features of the approach.

Student constructed representations

The teaching and learning sequences follow a guided inquiry pedagogy that focuses on students constructing, evaluating, refining, and extending multimodal representations. This is a literacy focus built on the insight that learning in both science and mathematics involves students being inducted into the representational practices that underpin explanation and problem solving. Representations can include diagrams, models, equations, graphs and tables, and symbols as well as written text. The approach involves a number of stages through which the teacher guides student learning. These stages, although distinct, often cycle and repeat within and across lessons. The model (to the right) showing these stages has been developed as an outcome of the IMS research.





Interdisciplinarity

In the teaching and learning sequences, the mathematics and science activities are built around 'concepts in common', with the principle that the learning in each subject enriches learning in the other. For instance, measuring, graphical work and data modelling generally are freshly developed in science contexts in ways that raise questions and promote deeper knowledge in science, and the science context raises questions that can be further explored mathematically.

Stages of the IMS Pedagogical Model

Orienting: Teachers pose questions, explore student ideas and orient students to the learning focus by a variety of means such as asking for predictions, questioning what they have noticed, asking for ideas about what could be measured, etc. This provides a way to focus students' attention on what is worth noticing about the school environment, or about data sets for instance, and could be interesting to explore.

Posing representational challenges: Students are challenged to explore and represent their ideas and practices, for instance they may be challenged to represent the movement of their shadow over a day, involving decisions about what to measure and how to represent patterns in length, and angle, or to use particle representations to predict, investigate and explain why a saucer of water evaporates more quickly in warm, or windy places.

Building consensus: This involves two stages. First, using the student ideas and representations to compare, evaluate and then synthesise these to reach agreement about which aspects of these effectively show patterns in data, or suggest explanations. Second, these ideas are refined by students, and consolidated to establish a shared understanding of the concept and associated representations. In this process students develop knowledge of the role of representational work in learning.

Applying and extending conceptual understanding: Students are given new representational challenges to extend their new knowledge and practices in related situations, or further concepts are introduced through representational tasks, to repeat the cycle. In these stages the teacher is constantly monitoring and responding to students' representations and ideas. The approach can be seen as 'assessment as learning'. The focus on student production has been found to allow the teacher significant insights into student thinking. The art of teaching in this way involves setting appropriate tasks, preparing students strategically through questioning and challenges, and guiding their work to reach consensus about the key ideas and their representations. The sequences all involve a close association of material exploration, and the generation of ideas.

These stages have much in common with the 5Es that underpin Primary Connections (PC). The stages line up as Orienting=Engage, Posing Representational Challenges-Explore, Building Consensus = Explain; and Applying and Extending Conceptual Understanding = Elaborate. The 'Evaluate' stage appears in the IMS pedagogy as a continuous process of monitoring and formative assessment (assessment as learning) throughout the stages. Most sequences have a post sequence assessment task, but this sits outside the cycle. Distinct from the 5Es, the IMS stages are explicitly focused on representations as central to learning (consistent with the PC focus on literacy), and structured to lead from noticing what is of interest to investigate, through the generation of representations to generating class agreement on key concepts as systems of representations and representational practices. The teaching and learning sequence follows these stages explicitly, but they cycle in different ways, in different lessons and in different topics. In some lessons there are more than one cycle, or even interweaving cycles for science and mathematics. In other cases, a cycle is spread over a number of lessons. Sometimes, activities have more than one role, such as an extension representational challenge acting as an orientation into a further concept. Nevertheless, we believe the movement from opening up what is noticed, to exploration and representation construction, to evaluating and building consensus, is a fundamental and powerful aspect of effective teaching and learning.

Supporting differentiation of learning in the IMS learning design

In the IMS learning sequences the student- guided inquiry design enables diverse student learning needs to be responded to within the regular classroom. The open learning tasks are designed flexibly to enable students to work at their own level, and at their own pace, to develop their understanding and skills in a variety of ways. Variation in student responses offers a resource for promoting, encouraging and refining learning as students demonstrate, in different ways, what they know and understand. With teacher support, students learn from each other's ideas and productions. The focus on student-constructed representations, and open questioning and discussion, enables the teacher to monitor individual students' understandings and cater for their learning needs over time.

Features of the learning sequences that enable embedded and teacher-supported differentiation

There are three distinct aspects of the IMS pedagogy that enable differentiation.

Open questioning, guided inquiry and open tasks provide the teacher with insight into individual student learning and understanding that:

a) enables teacher decisions for on-the-spot feedback, and individualised monitoring and support of student learning through targeted learning adjustments, scaffolding, and extension challenges.

> "Giving them (students) more freedom is a good approach because they're more capable than I thought they would be, but they still needed the support as well. So, giving students the initial freedom to do whatever they thought they could do and then helping them from that…"

b) enables support for students to navigate tasks with multiple entry points, solution pathways and outcome possibilities, whilst negating possible student stigmatisation from the withdrawal from their peer group, or students assigned a different task.

> "the fact that they are open-ended so they (the students) can come to a solution in a variety of different ways. There was not one student where I had to really modify an activity for, they could participate in the activity, they could all have success in the activity but they all got something from it and because it was open-ended…"

c) enables the development of creative and critical thinking skills, and higher-order thinking, as student responses are not limited

> "…I always found everything was just deeper level thinking."

Peer learning, collaborative learning and student voice increases student engagement as students learn from and with their peer group.

Students learn collaboratively as a whole class and in mixed ability peer groups. Student are encouraged to share ideas, co-construct investigations, designs, data and representations. Through purposeful guided reflection, targeted scaffolding, prompts and extension challenges, students engage in comparative discussions and review of peer representations (e.g. graphical representations) to build their understandings.

> "…we were able to cater for everyone without making it obvious to them that we had to modify the activities, which I think is really important for their confidence and self-esteem and learning too."
>
> "…coming from their peers and it's quite interesting because when they actually get feedback from their peers as well I find that they really do put it into practice a lot quicker, it's quite interesting, as opposed to coming from the teacher all the time, it's coming from someone different. That has been a really interesting pick up that we have found..."

Multimodal representational challenges cater for diverse learner needs and provide differentiated insight into students' conceptions.

Teachers have identified that a focus on multimodal representation enhances learning for students with language difficulties, who are English Second Language (ESL), and/or have literacy support needs, since they are not so constrained by their language skills. Access to multiple modes reduces the effects of language demands as barriers to learning. Students' multimodal representations provide teachers with insight into individual students' knowledge, skills and learning needs.

> "…this has been really interesting, seeing children that don't speak up as often really come up with some really insightful representations. I mean, they're a lot further ahead than what I thought."
>
> "show me what you know through your drawings' and often that speaks volumes because children find it difficult to articulate at the time. They might understand more than what they are conveying… But they are actually showing me so much of their knowledge through their diagrams."

Fast Plant Growth: Sequence Overview

Sequence Overview: This sequence will enable students to learn about how data can be gathered, represented, and evaluated to effectively display the life cycle of a plant. The things plants need to survive are investigated as well as plant structures like flowers and seeds are considered while plants are grown in a classroom setting. Students will engage in planting their own seeds, recording germination, tracking the growth of their plant, considering variation in growth, pollinating their plants, recording seed production and communicating their observations with others.

Lesson Sequence

Lesson 1: Fast Plant Growth and engagement in plant lifecycles
Pre sequence assessment of fast plant growth and engagement in the life cycle of plants. Planting seeds for further investigation and preparing recording systems

Lesson 2: Seed germination and recording growth
Data representation, the structure of the seed and germination is discussed.

Lesson 3: Plant growth rate, variation and recording growth
Variation in plant growth based on observations of plant height and characteristics. Consideration of rate of growth.

Lesson 4: Flowering Plants-Representing data for interpretation and communication
Review effectiveness of how we represent data in a variety of ways, including additional data for comparison. Measurement using informal and formal measures. The structure of the flower.

Lesson 5: Pollination - Comparing change over time and representations
Discuss class data and variations within the data. Monitor and compare changes

Lesson 6: Flowering Plant Life Cycle-Refining and evaluating representations
Refine and evaluate representations. Create models. Seed production.

Lesson 7: Class sharing and communicating (+ post sequence assessment task)
Post sequence assessment task of plant life cycle and class sharing

Science and Mathematics Learning and Curriculum Focus

Learning focus	Key Curriculum Outcomes (Victoria Curriculum)
Science ideas and practices • Students investigate the life cycle of a flowering plant, considering germination, plant needs, rate of growth, variation in growth, plant structures (flowers, leaves, and seeds), pollination and seed production. • Students reflect on their predictions and findings and compare with others. • Students communicate the cause of variation in natural systems: variation, diversity and survival needs.	**Science** **Science as a human endeavor:** People use science in their daily lives (VCSSU041) **Biological sciences:** Living things have a variety of external features and live in different places where their basic needs, including food, water and shelter, are met (VCSSU042) Living things grow, change and have offspring similar to themselves (VCSSU043) **Science Inquiry Skills** ***Questioning and predicting*:** Students respond to and pose questions, and make predictions about familiar objects and events (VCSIS050) ***Planning and conducting:*** Students participate in guided investigations, including making observations using the senses, to explore and answer questions (VCSIS051) ***Investigation*:** Students use informal measurements in the collection and recording of observations in the school grounds (VCSIS052) Students use a range of methods, including drawings and provided tables, to sort information (VCSIS053) ***Analysing and evaluating:*** Compare observations and predictions with those of others (VCSIS054) ***Communicating*:** Students represent and communicate observations and ideas about changes in objects and events in a variety of ways (VCSIS055)
Mathematics ideas and practices • Assign numerical values to systems of living things in order to answer questions, and raise questions for further investigation. • Observe, measure and record the growth of plants. • Formulate consistent measuring and recording systems. • Measure, record, analyse and interpret numerical data, comparing the growth of plants. • Students design graphical representations (e.g. line graphs) to compare and contrast the growth rate of their plant and that of others.	**Mathematics** ***Number and place value*:** Recognise, model, read, write and order numbers to at least 100 (VCMNA087)***Patterns and algebra:*** Recognise the importance of repetition of a process in solving problems (VCMNA094) ***Using units of measurement:*** Students use informal units of measurement to order objects based on length and area (VCMMG115) ***Data representation and interpretation:*** Identify a question of interest based on one categorical variable. Gather data relevant to the question (VCMSP126) Collect, check and classify data (VCMSP127) Create displays of data using lists, table and picture graphs and interpret them (VCMSP128)

Fast Plant Growth: Equipment/Resources

Lesson		Equipment/Resources
All Lessons		**Pre-sequence plant set up (Refer to Appendix 2 for instructions and example)** Plastic take-away containers (one per group of four students) with hole in the bottom Scissors/stanley knife (teacher only – hole in bottom of plant containers preparation) Wick (rope) inserted, foil, light and growing rack, soil in the take-away containers, gaffa tape, masking tape (able to write on) *seeds – 1 per student (ideally brassica raps seeds available at https://www.southernbiological.com/biology/botany/s13-16-brassica-rapa-seeds-f1-rosette-dwarf-non-purple-stem/) Paddlepop sticks (one per group or one per student/seed) 2X Borlotti Beans (or similar bean), 2 x ziplock backs, pipe cleaners (measuring and staking) **Students:** student workbooks (unlined), pencils, coloured markers and rulers. **Teachers:** Board (IWB/whiteboard) and or butchers' paper for shared recording, pens and computer
1	**Fast Plant Growth and engagement in plant lifecycles**	Pre-sequence assessment task (handout) As above - Plant set up and seeds (one for each student) Lesson video (jack and the beanstalk) link. https://www.youtube.com/watch?v=_vcpayajmvo
2	**Seed germination and recording growth**	Bean growth video weblink: https://www.youtube.com/watch?v=w77zPAtVTuI Plant Growth Calendar (Appendix 2 – student handout), pipe cleaners (for measuring plants)
3	**Plant growth rate, variation and recording growth**	Video weblink: https://www.youtube.com/watch?v=AQ7l40Y2zAU or https://www.youtube.com/watch?v=tkFPyue5X3Q Seeds – range of different seeds, pipe cleaners (soft)
4	**Flowering Plants: Represent data for interpretation and communication**	**Flowers** – examples of a range of different flowers Digital microscopes/magnifying glass/hand lenses/ iPad magnifying apps, scissors (for dissecting flowers) Newspaper/scrap paper (to place flowers on), pipe cleaners (soft), skewers (for staking) **Video weblink:** https://www.youtube.com/watch?v=zy3r1zlC_IU
5	**Pollination: Comparing change over time and representations**	
6	**Flowering Plant Life Cycle: Refine and evaluate representations**	
7	**Class sharing and communicating (+ post sequence assessment task)**	

Appendices

1. Teacher Notes: Growing Fast Plants
2. Plant system set-up instructions and examples
3. Plant growth calendar recordings, observations & maintenance
4. Pre/Post sequence assessment task (with examples)

LESSON 1: Fast plant growth and engagement in plant lifecycles

(Approximate duration 90 minutes + 20 minutes pre-sequence assessment task)

Curriculum focus:

Science ideas and practices

- Identify characteristics of plants and plant needs
- Investigate the life-cycle of a flowering plant
- Predictions about what plant growth and characteristics

Mathematics ideas and practices

- Plant height predictions and rate of growth predictions

Learning intention:

- Establish an understanding of plant needs, that is seeds need water, soil (usually) and sunlight (light) to grow
- Make reasoned predictions about how tall their plant will grow and what it might look like through diagrammatic drawings
- Devise ways of recording their plant growth

The lesson at a glance:

In this lesson students plant their own seeds and are introduced to plant life cycles. They consider different characteristics of plants, their needs and how they grow. Students develop their understanding that plants grow, reproduce, respond to environment/stimuli.

Preparation:

Group pots (take-away containers) need to be prepared with soil and lighting set up (See Appendix 2 example image 1 and image 2).
Prior to commencing this lesson the students complete the Pre Sequence Assessment Task (Appendix 4) to establish prior learning, understanding and skills. Teachers are to ascertain student knowledge, understanding and learning needs.

Equipment/Resources

Pre-lesson plant set up
(see appendix 2 for instructions and example)
Plastic take-away containers (one per group of four students) with hole in the bottom
Scissors/stanley knife (teacher only – hole in bottom of plant containers preparation)
Wick (rope) inserted
Foil
Light and growing rack
Soil in the take-away containers
Gaffa tape
Masking tape (able to write on)
*seeds – 1 per student (ideally brassica raps seeds available at https://www.southernbiological.com/fast-plants-brassica-rapa-standard-small-50-pack/)
Paddlepop sticks (one per group or one per student/seed)
2x Borlotti beans (or similar beans), 2x ziplock bags

Other
Pre sequence assessment task (appendix *)
Lesson video (jack and the beanstalk) link https://www.youtube.com/watch?v=_vcpayajmvo

Equipment required for all lessons
Students: student workbooks (unlined), felt pens, pencils, colours and rulers
Teachers: board (iwb/whiteboard), and or butchers' paper for shared recording and pens

LESSON 1 – Fast plant growth pre sequence assessment engagement in plant lifecycles

(Approximate duration 90 minutes + 20 minutes pre sequence assessment task)

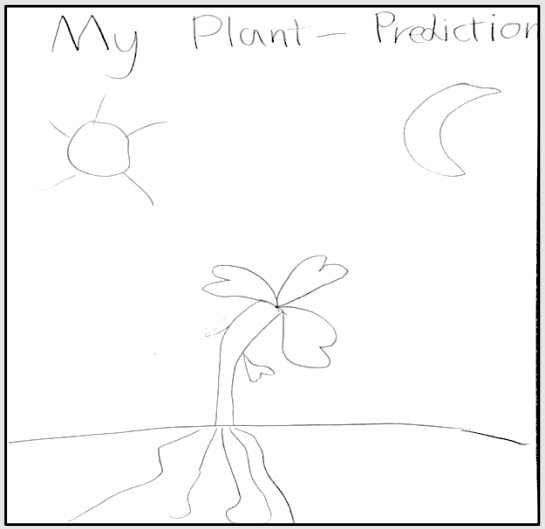
Learning Focus	Pedagogical Stage	Lesson Outline (NB: time allocations a guide only)	Monitoring and Supporting Learning
Science: Plant life cycle Seeds and planting Plant needs Germination and plant growth	***Orienting*** Probing students' prior knowledge of plants; plant needs, parts of a flowering plant and the life cycle of a flowering plant	**Pre Sequence Assessment Task** *(20 minutes)* **Ascertainment of student knowledge and skills** Students complete the Pre Sequence Assessment Task Read through tasks with students answering independently (Appendix 3) Answers can be shown through text or drawings with labels.	Gauge student prior knowledge, understanding and skills to inform individual student learning differentiation
Mathematics:	***Orienting*** Students developing understanding of plant needs, planting and the life cycle of a flowering plant	**Whole Class:** *(10 minutes)* **Jack and the beanstalk and growing beans** Read Jack and the Beanstalk or a similar picture story book. Focus on the beanstalk and how quickly it grows. And/or Youtube https://www.youtube.com/watch?v=_VCpAYajmvo **Whole Class Plant Needs: Borlotti bean growing** Explain to students that we're going to grow our own bean, like Jack. Place 2 borlotti beans in a ziplock bag with water and discuss water as a necessity for plant growth. Ask students ❖ Will where the seed is placed make a difference to how it grows? why? ❖ Can you suggest suitable places in the classroom to compare growth over time (i.e. a position in the light and a position not in the light)? Set up the borlotti beans for monitoring over the following weeks Using a mid-sized plant discuss the following and record student ideas on the board ❖ How do plants grow? ❖ What do they need to grow? ❖ How do we know they grow?	What range of ideas do students have about seeds and plant growth? Do students make justified suggestions for where the bean should be placed? Can students nominate a variety of suitable locations for the seed? Do students identify the needs of plants and living things?

Measurement and recording methods	***Orienting*** Students are prepared for what data they will collect and how they will record the growth and changes in their flowering plant over time	❖ What can we see when a plant grows? ❖ Do they go through different stages in their life? ❖ What are the stages of a plant's life? Review student ideas about what plants need to survive, and watch this Youtube video (may prompt some ideas) https://www.youtube.com/watch?v=dUBIQ1fTRzI **Fast Plants and investigation introduction** *(5 minutes)* Introduce fast plants (show seeds and show mid-sized fast plant) and describe the investigation (planting seeds, monitoring their growth and life cycle changes). Ask questions about student understanding of investigations, data collection, plant lifecycles. ❖ How will we keep track of their growth? ❖ Will they all grow at the same rate? Will they grow at a constant rate or in spurts? Do humans grow at a constant rate?	Do they recognise parts of a growing plant? What plant part terminology is used by students? Do students recognise the different stages of a flowering plant? Do students suggest appropriate measuring and recording methods to track their plant growth? If so, what are these?

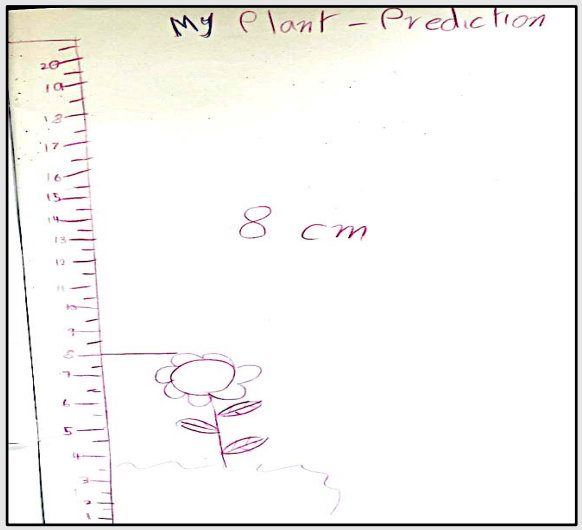
Bean Seed: Example of two positions in the classroom: Students made inferences that the one near the window would grow faster as it had more light

Mathematics: Estimation of growth time and plant height Formal and informal measure	***Orienting and posing representational challenges*** As part of the orienting phase, students are challenged to represent their predictions	**Individual Student Representation: My Plant Prediction (Student Books)** *(5 minutes)* Students draw and write a prediction of how tall they expect their plant will grow and what it will look like	What is the range of heights students predict? What scale of measure do they employ (metres, centimetres, millimetres etc.)? Can students make reasoned and appropriate predictions?

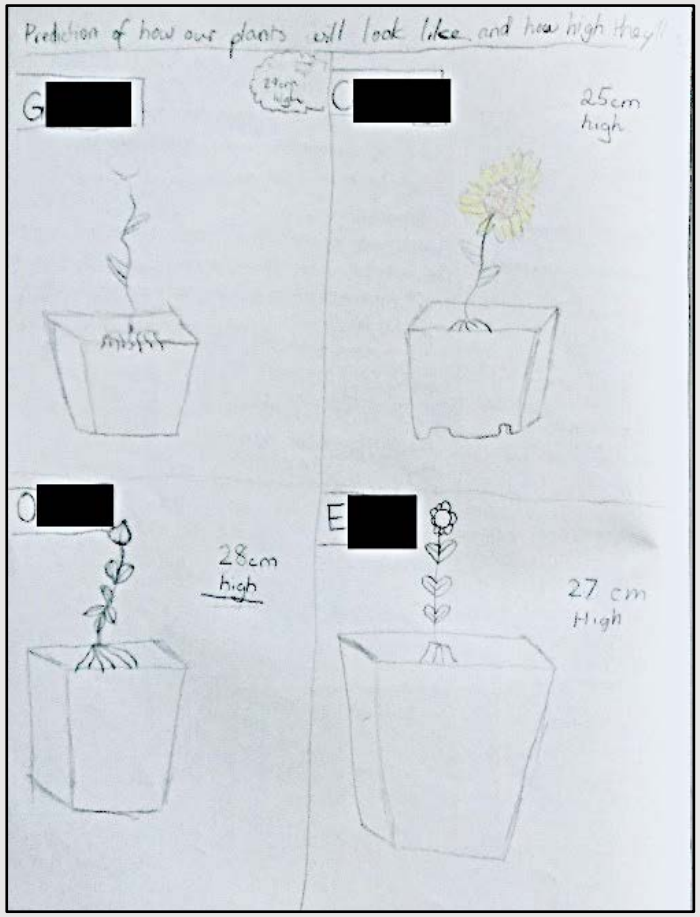
Flowering Plant Predictions: Examples of individual student responses



Example with no height measurement and root structure understanding

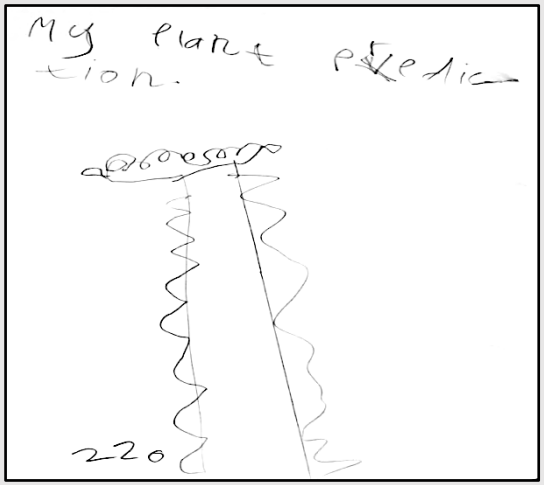


Prediction in centimetres and ruler increments

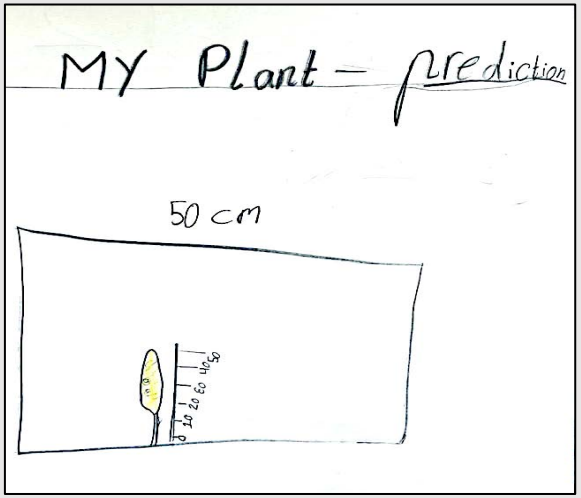


Example of student extension student – Challenged to predict the heights of all the group/pot plants.
A student generated recording method to show heights of all plants in the group plot

NB: This is a suitable recording system to record and compare the group plants. It was adopted by classes.



Example of an abstract representation with a unclassified numeric height representation



Leaf like representation of a plant, counting in tens and prediction in centimetres

Science: Plant needs, seeds and planting	***Orienting*** Students are oriented to the needs of a flowering plant and the process of planting their seeds	**Student seed planting** *(25 minutes)* **Teacher demonstration** Show how to plant seed (small indentation in soil, place seed in, cover with 0.5 mm soil) and how these plant trays work (wick in bottom – water in the reservoir) **Student group pot planting** Each group of three students will have 4 seeds to plant (note: seeds are very small and one seed is a spare seed). NB: Plant identification - students will identify each seed with a pop-stick inserted in the tray close to a seed. Group trays are to be placed in larger tray and under lights. **Teacher note:** Teacher will model taking a photo of the seed tray – this will be repeated daily for lesson 6. Measures of the plants' growth should ideally occur two to three times a week.	Ensure students label the position of their plant accordingly. Are they able to locate their plant in the pot?
	Building consensus	**Class discussion and conclusion** *(5 minutes)* Next lesson, fast plants should be growing and monitoring will continue. Ask and record on the board student ideas: measuring and recording ❖ How we will construct tools to help us collect data to be sure that plants are growing? Discuss ways for selecting appropriate tools and units of measure. NB: In the next lesson use the growth calendar (Appendix 3) to record observations and maintenance actions.	Can students agree on an appropriate, consistent method of collection and unit of measure? (i.e. millimetres)

LESSON 2: Seed germination and recording growth

(Approximate duration 90 minutes pre-sequence assessment task)

Curriculum focus:

Science ideas and practices

- Characteristics of seeds and seed needs
- Plant needs, growth and rate of growth
- Growth recording and representation methods

Mathematics ideas and practices

- Informal and formal measurement - plant growth
- Consistent measurement systems, methods and recording
- Tabulated recordings of plant growth

Learning intention:

- Record, measure and tabulate their plant growth and other plants in their group pot
- Establish an understanding of plant needs
  seeds need water, soil (usually) and sunlight (light) to grow
- Build an understanding of how we can represent data produced when a plant grows

Equipment/Resources

Bean growth video weblink:
https://www.youtube.com/watch?v=w77zPAtVTuI
Plant Growth Calendar (Appendix 2 – student handout)

Equipment required for all lessons
Plants and planting system (from lesson 1)
Class borlotti beans (or similar – from lesson 1)

Students: student workbooks (unlined), felt pens, pencils, colours and rulers

Teachers: Board (IWB/whiteboard), and or butchers' paper for shared recording and pens

The lesson at a glance:

Students observe the germination of the class borlotti beans and watch the bean growth video to develop an understanding of how beans and seeds grow and seed structure. Students represent the parts of a seed. They measure, record and represent the growth of their plant and that of their group pot, tabulating the data (Appendix 2) and using diagrammatic drawings.

Preparation:

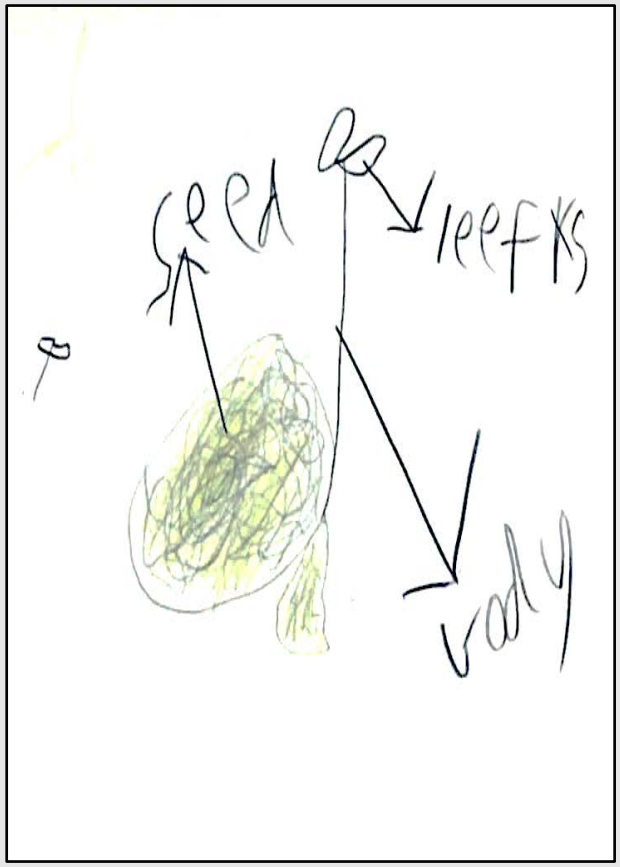
What variation in students' work, from Lesson 1, can be drawn on to discuss possible ways of representing plant growth? Purposefully select student examples to discuss, orient and guide students towards an agreed representation method. You may wish to also use the Growth Calendar example (Appendix 3) as a recording system (photocopy for each student).

LESSON 2: Seed germination and recording growth

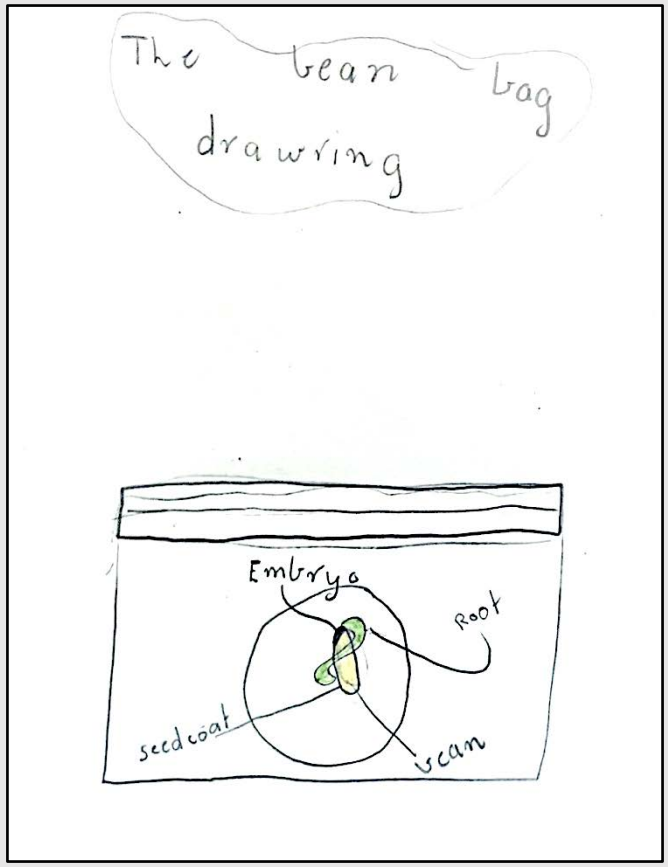
(Approximate duration 90 minutes)

Lesson focus	Pedagogical stage	Lesson Outline (NB: time allocations a guide only)	Monitoring and supporting learning
Science: Growth, lifecycle Parts of a seed – seed structure Seed dispersal	***Orienting*** Students are oriented to seed germination and the parts of a seed	**Whole Class: Seed discussion** *(5 minutes)* Look at a variety of seeds (including planted seeds) **Probing Questions** ❖ Are all seeds the same? ❖ Why might they be different? ❖ How do seeds spread (without people) and grow? (dispersal and needs) ❖ Do all seeds look and grow the same way? Look closely at bean seeds (borlotti seeds are ideal) Name the different parts of a seed (Appendix 2) Show the youtube clip of a bean growing https://www.youtube.com/watch?v=w77zPAtVTuI **Discuss the video** **Teacher Note: Focus Science Language** Seed parts- embryo, food store, and seed coat, germination, tap root, lateral roots, cotyledon (see next page for representation) **Germination** Look at some examples of group pots and the class borlotti beans ❖ Have all our seeds started to grow - sprouted - germinated?	Do students identify different parts of the seed and their purposes? Can students make inferences about ways seeds are dispersed from their appearance/attributes? Can students relate the bean growth video to their own seeds?
Science: Seed structure and parts	***Posing representational challenge*** Students challenged to diagrammatically represent the parts of a bean	**Individual Bean Structure** **Representation Task** *(5 minutes)* Students draw and label the parts of the seed The diagrams in the Sequence can be used to scaffold this task)	

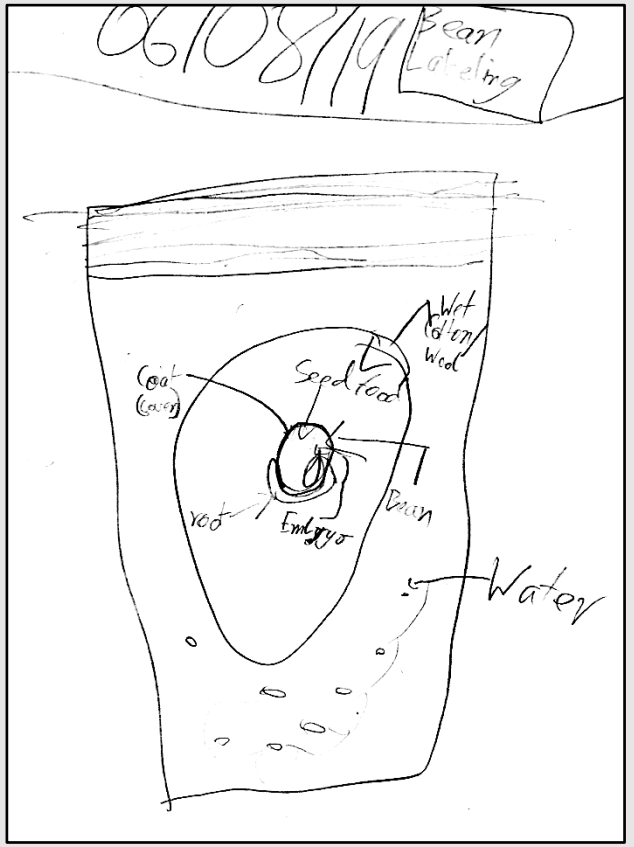
Bean Structure and Parts: Examples of student responses



Student gives 'human' characteristics to parts of the germinating bean (i.e. body instead of stem/sprout)



Student representation and labeling of class borlotti bean (germinating).

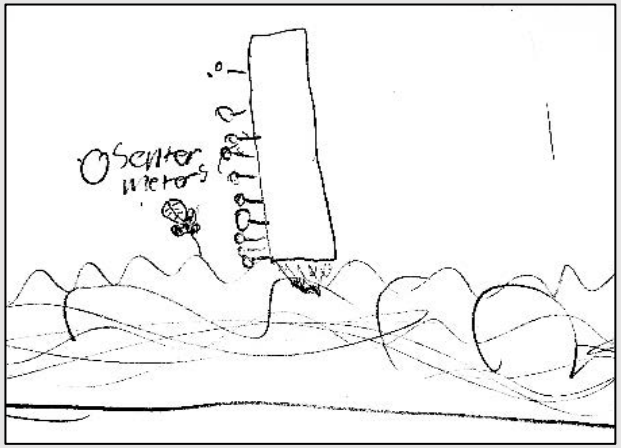


Student labels parts of the class, germinating bean, giving some elaborations and explanations (e.g. seed coat – cover).

Mathematics: Measurement Equivalents (cm to mm, ½ cm to mm) Recording growth duration Idea of intervals Data representation showing growth over time Need for uniform measurements (mm)	***Orienting*** Students are oriented to what will be recorded and how. The need for consistency, measuring and recording methods.	**Whole class discussion:** **Data Recording and Representation Review** *(15 minutes)* Share and discuss purposefully selected data and representation ideas from lesson 1. ❖ How will collect our plant data? ❖ What data will we collect? What changes might we see? ❖ Should we all measure the same way? Why? ❖ What would be the best measurement to record the plant heights (cm/mm)? ❖ How will we track plant growth? Will we measure each plant? ❖ Will they all grow at the same rate? Will they grow at a constant rate or in spurts? Do people/ humans grow at the same rate? ❖ How will we record this data? Will we write observations and include scientific drawings? **Record students' ideas on the board** Collate student ideas and ways of recording growth data, and representing change, to come to an agreement on a consistent way of measuring and recording change. Draw student attention to the need for a consistent process and plant fragility, using pipe cleaners vertically from the soil upwards etc. Establish agreed measuring and recording methods. **Introduce and explain the recording table** *(5 minutes)* Discuss with students the need for accurate measurements and recording (Appendix 3) ❖ Would it be helpful to measure the plants with a ruler? (formal measure) Why? (consistency and comparison) **Teacher models measuring a plant height** *(5 minutes)* **Teacher Note:** The plants are very fragile, and rulers can damage them. It is recommended that students use pipe	What variation in students' work (lesson 1) can be drawn on to discuss possible ways of representing? What range of responses are there to these questions? Do student make appropriate and/or reasoned explanations for their ideas? Do students suggest that the plants will/will not grow at the same rate? Are they able to explain their answers? Are formal measurements identified as more consistent than informal measures? Do students suggest appropriate measuring and recording methods? Do students recognise the importance of consistent measures, methods and recording? If so, what is there reasoning? Are students able to agree on a consistent way of measuring and recording their plant growth?

		cleaners to informally measure and mark the height of the plants from the soil up. They can then use this against a ruler to gain a formal measurement (mm) Discuss and model equivalents (heights) with students e.g. How many millimetres in 1 centimetre?	Do students identify millimeters as the best form measure scale? Can students recognise equivalent measure? (e.g. 1/2cm, 0.5cm and 5mm are the same)

First plant height recording and representation: Example of student responses

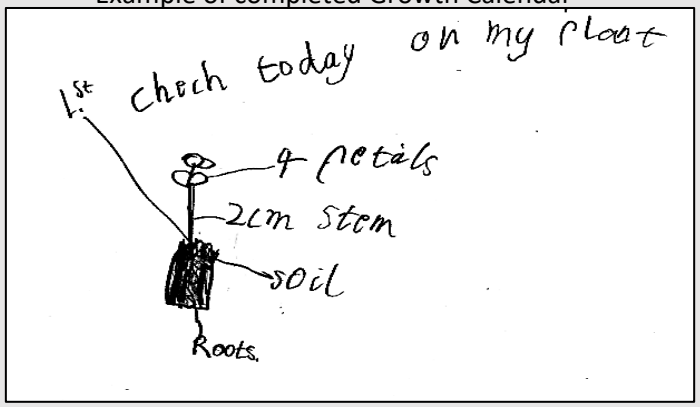


Height measurement in reverse 1mm
at the top of the ruler. Shows location of plant in pot

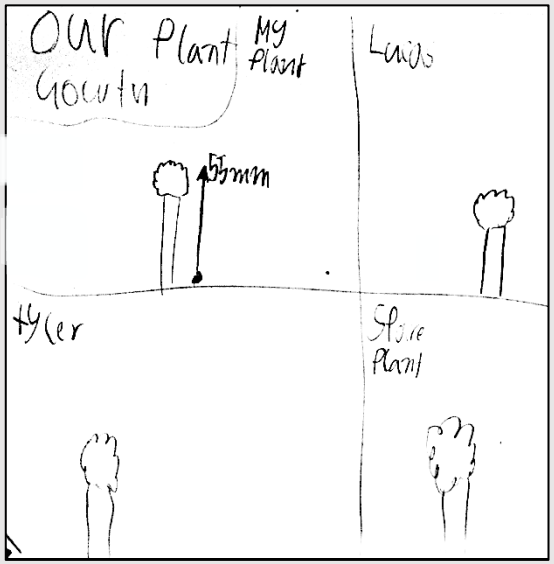
PLANT GROWTH CALENDAR (Recordings, Observations & Maintenance)

DAYS SINCE PLANTING	DATE	PLANT HEIGHT				NUMBER OF LEAVES				OBSERVATIONS (what we see & changes)	MAINTENANCE (what we did or was done)
		My Plant	Lucas	Tyler	SPARE	My Plant	Ty	Lu	SPARE		
1 – Seed planting	4/10/19	0	0	0	0	0	0	0	0	Seeds are very small	Planted four seeds in shallow hole. Moist soil in container with wick to water.
8	16/10/19	55mm	31mm	35mm	40mm	3	3	3	3	high Stem	

Example of completed Growth Calendar

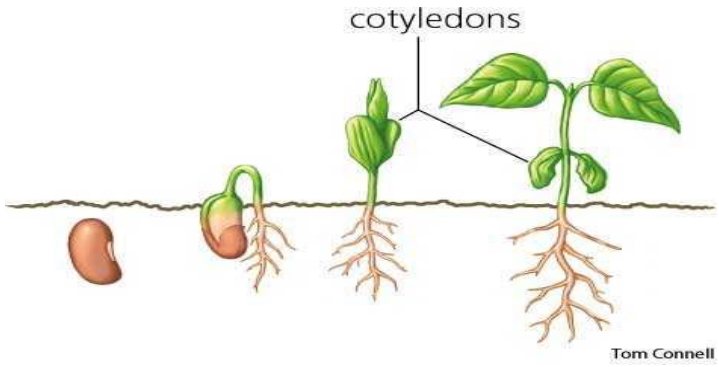


Example of first recording labels the parts of the plant. The first, heart shaped leaves 'cotyledons' are labeled as petals



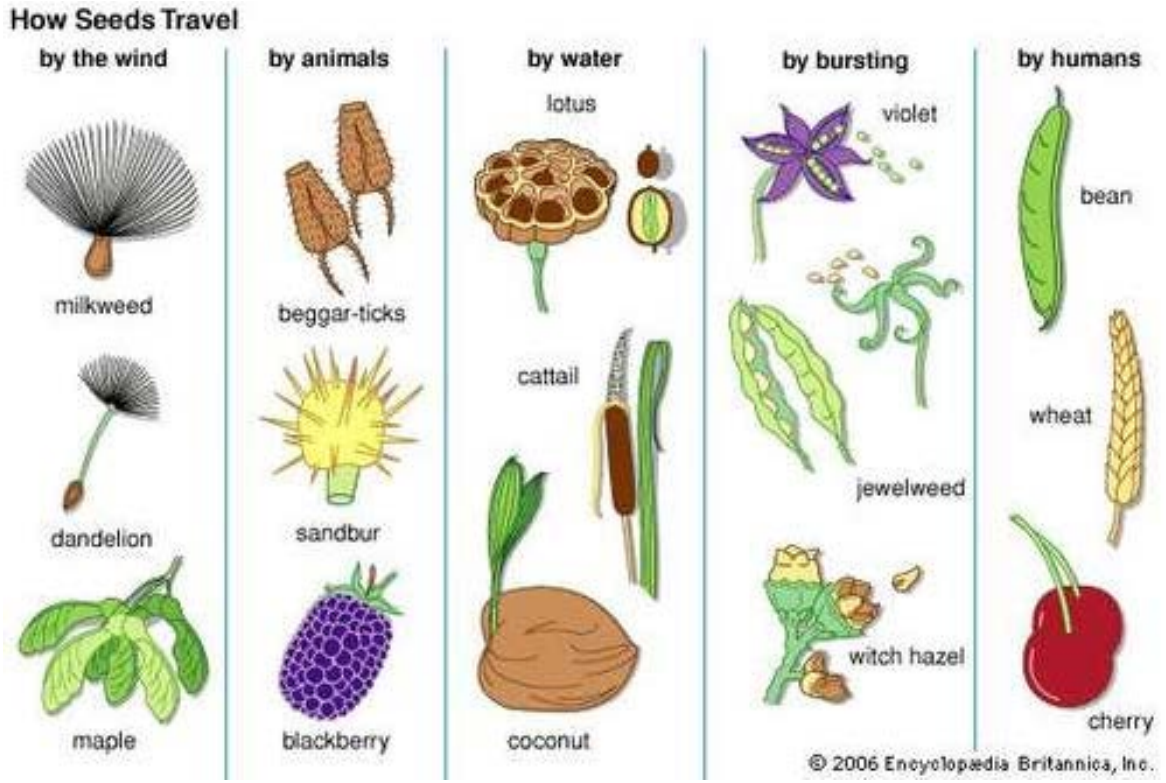
Student's first representation of all plants in their pot, using millimeters to measure and represent their plant height.

	Building consensus Evaluating and synthesising student ideas Suggesting refinements (from student examples) and consolidating representations to reach a class consensus)	**Considering and Sharing Ideas and Representations** **Gallery Walk** *(10 minutes)* Students compare and contrast others' representations and ideas Teacher purposefully selects examples (do not remove yet) **Probing questions during gallery walk and guiding questions for following discussion** ❖ What can you tell from the different representations? ❖ How effective are they? ❖ What do they show? ❖ What don't they show? Model and discuss purposefully selected student's work. Inform the class that the plants will have grown more next week and we will be working on ways we can represent how much the plants have grown during each week. This leads students towards the idea of constructing graphs (bar graphs or line graphs)?'	What is the range of representational responses? Do students represent the growth of their plant with accuracy and/or detail? Do students identify characteristics/details of representation, that make them easy to understand?

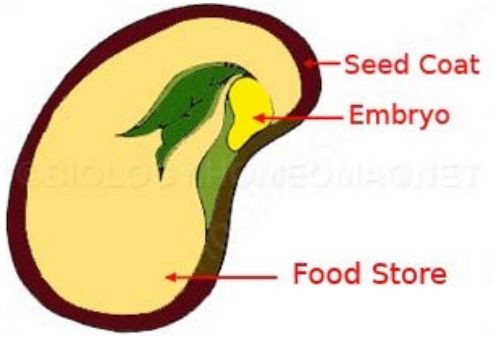


Lesson 2: Seed Germination and Recording Growth

Seed structures and dispersal



Pinto Seeds – naming the parts of a seed



LESSON 3: Plant growth rate, variation and recording growth

(Approximate duration 60 minutes)

Curriculum focus:

Science ideas and practices

- Growth recording and representation methods
- Plant growth and variation
- Plant needs

Mathematics ideas and practices

- Informal and formal measurement - plant growth
- Consistent measurement systems, methods and recording
- Tabulated recordings of plant growth

Learning intention:

- Students diagrammatically represent their plant growth, and that of their groups.
- Students record, measure and tabulate their plant growth and other plants in their group pot.
- Students examine how plants grow at different rates and how we can represent the difference in growth

The lesson at a glance:

Students focus is drawn to variation in growth and growth rates and possible reasons. They use the growth calendar to record plant measurements, consider different characteristics of plants, their needs and how they grow. Students develop their understanding that plants grow, reproduce, and respond to environment/stimuli.

Equipment/Resources

Video weblink:
https://www.youtube.com/watch?v=AQ7l40Y2zAU
or
https://www.youtube.com/watch?v=tkFPyue5X3Q

Seeds – range of different seeds
2x Borlotti bean s from previous lessons (or similar bean)
Pipe cleaners (soft)

Equipment required for all lessons
Plants and plant system (from first lesson)

Students: student workbooks (unlined), felt pens, pencils, colours and rulers

Teachers: Board (IWB/whiteboard), and or butchers' paper for shared recording and pens Plastic take-away containers

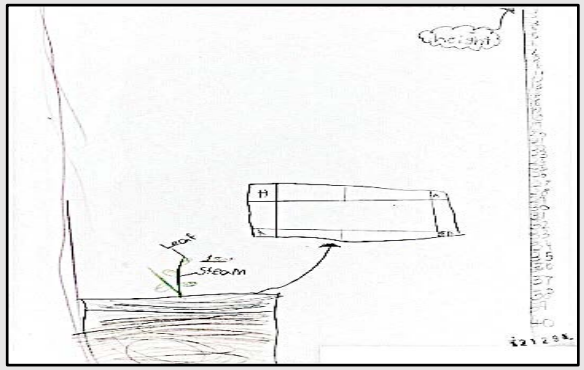
LESSON 3 - Plant growth rate, variation and recording growth

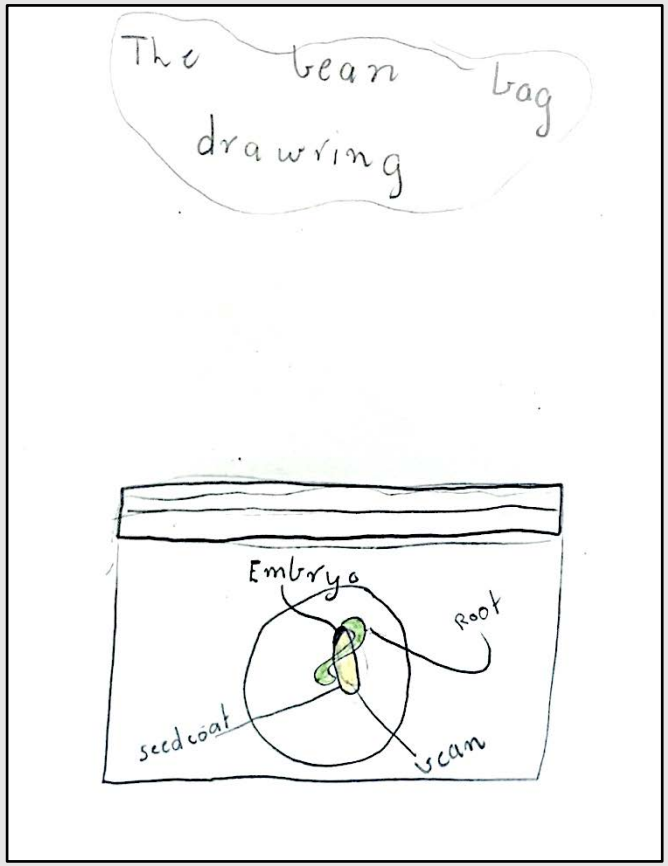
(Approximate duration 60 minutes)

Lesson focus	Pedagogical stage	Lesson Outline (NB: time allocations a guide only)	Monitoring and supporting learning
Science: Seed structure and parts of a seed	***Orienting and posing representational challenge***	**Whole Class Discussion and Review: Plant Life cycle** Revisit the plant life cycle. *(10 minutes)* Use either of the Youtube clips https://www.youtube.com/watch?v=AQ7l40Y2zAU or https://www.youtube.com/watch?v=tkFPyue5X3Q ❖ ***What did you see in the video?*** ❖ ***Is this the same for our seeds?*** Look at the two class beans and discuss their growth (borlotti beans) **Individual Student Bean Parts Representation***(10 minutes)* Students make obervations of the class Borlotti bean ❖ Are our beans germinating? ❖ Can you identify the different parts of the bean? Students draw and label the parts of the bean (as per the diagram from last week).	What range of ideas do students have about seeds and how seeds grow? Can students identify plant needs, and seed structures with or without prompting? Are students able to diagrammatically represent a seed/bean with some accuracy? Can students identify the different parts of a bean, making connections to the class borlotti bean?

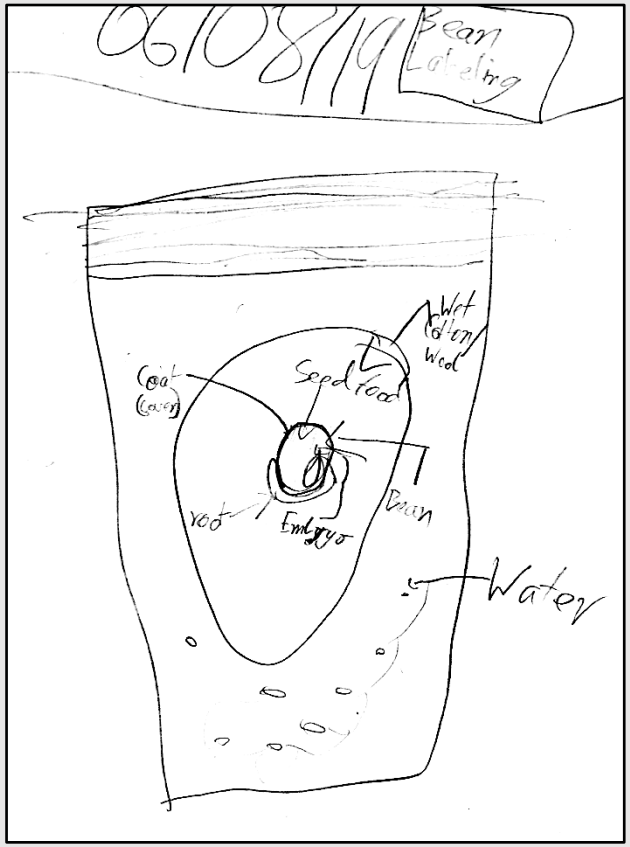
Bean Structure and Parts: Examples of student responses

Student gives 'human' characteristics to parts of the germinating bean (i.e. body instead of stem/sprout)





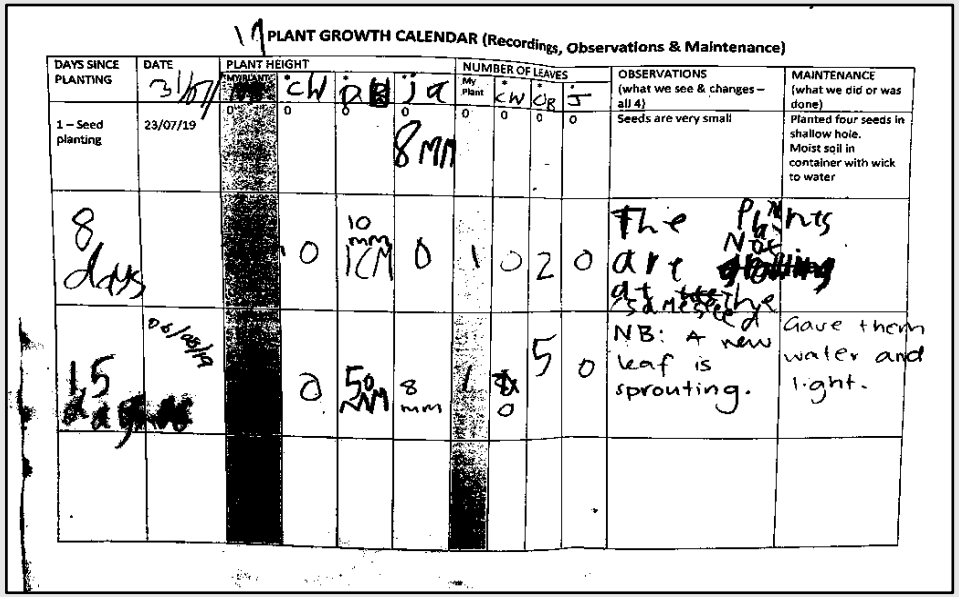
Student representation and labeling of class Borlotti bean (germinating).



Student labels parts of the class, germinating bean, giving some ellaborations and explanations (e.g. seed coat – cover).

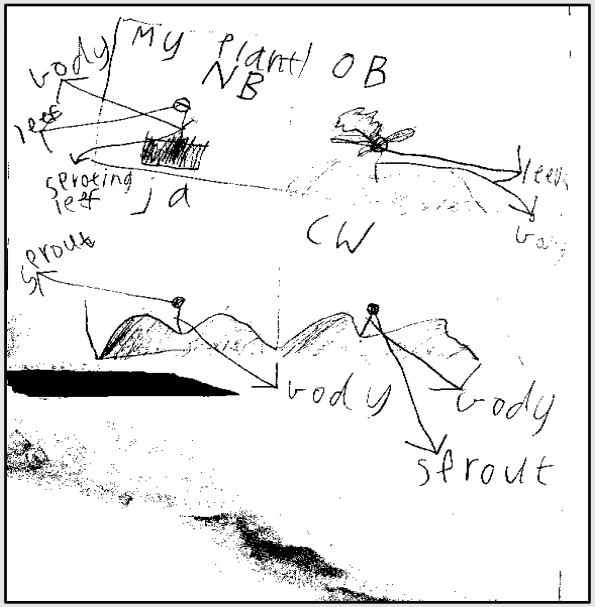
Science: Lifecycle, variation in growth rate; environmental influences on plant growth	***Orienting*** Students are oriented to notice the germination of most of the plants and consistent recording methods.	**Fast Plant monitoring** *(5 minutes)* Plants have germinated but are very fragile at this stage. Students check their plants – do they need water, nutrients, staking (if seeds are too long and skinny they might need securing to a support (use skewer and pipe cleaner)? **Review data recording methods** *(5 minutes)* Discuss how to keep track of measurements. Review agreed form to enter data. (see Appendix 3) At this stage note the size variation in the leaves of each plant and across the class and encourage students to record and represent all their plants details (e.g. number and shape of leaves).	Are students able to identify their plant's needs (e.g. water, staking) and care for their plant appropriately?
Mathematics: Collect, record and represent data Choose tools and processes for measuring growth Use and interpret data recording table (tracking sheet) Data modelling to compare measure of plants over time	***Posing representational challenges*** Students engage with their plant and those in their group pot, to measure, record and represent change and differences	**Flowering plant monitoring and recording** *(25 minutes)* **Data collection and representation** Students 1) Measure their plant height. 2) Draw their plants and their features. Encourage students to include measurements in their drawing and draw plants to "scale". Encourage students to notice the different types of leaves. **Teacher Note:** Most plants will be starting to grow their second leaves now. Ask students to note the difference and draw them accurately. (NB: The first leaves (cotyledons) are heart shaped and the second leaves are larger. Once complete students can compare their plant with others in their group and around the class. Ask student to make assumptions / predictions about the rates of growth in their plants.	Are students able to measure and record their plant data accurately? Do students draw their plant with detail? Can students draw plants to scale? Are students able to identify different types of leaves Can students make appropriate predictions about the rate of growth

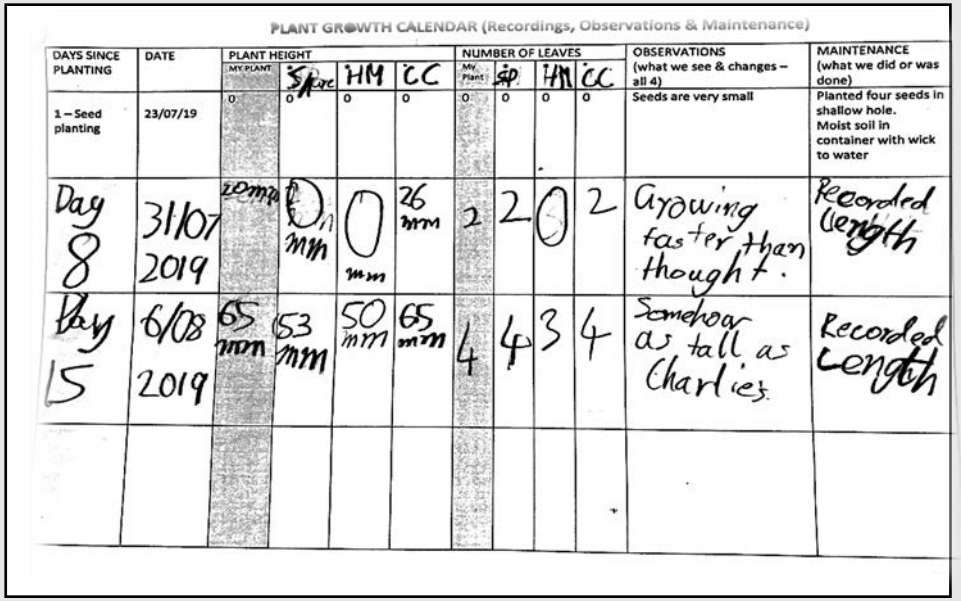
Week 3 Growth Calendar and Plant Representations Two examples of student responses



PLANT GROWTH CALENDAR (Recordings, Observations & Maintenance)

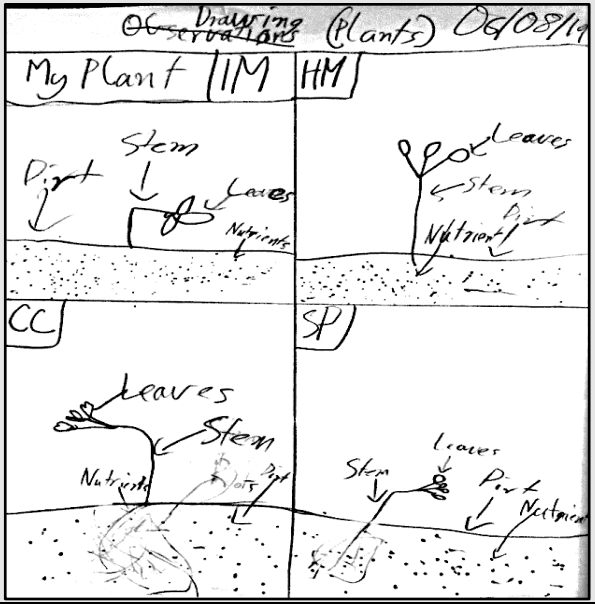
DAYS SINCE PLANTING	DATE	PLANT HEIGHT (MY PLANT)	PLANT HEIGHT (cw)	PLANT HEIGHT (jd)	NUMBER OF LEAVES (My Plant)	NUMBER OF LEAVES (cw)	NUMBER OF LEAVES (CR)	NUMBER OF LEAVES (J)	OBSERVATIONS (what we see & changes – all 4)	MAINTENANCE (what we did or was done)
1 – Seed planting	23/07/19	0	0	0	0	0	0	0	Seeds are very small	Planted four seeds in shallow hole. Moist soil in container with wick to water
8 days		0	10 mm	8 MM	0	1	2	0	The Plants are at the same stage	
15 days	06/08/19	0	50 MM	8 mm	1	5	0		NB: A new leaf is sprouting.	Gave them water and light.





PLANT GROWTH CALENDAR (Recordings, Observations & Maintenance)

DAYS SINCE PLANTING	DATE	PLANT HEIGHT (MY PLANT)	PLANT HEIGHT (SP)	PLANT HEIGHT (HM)	PLANT HEIGHT (CC)	NUMBER OF LEAVES (My Plant)	NUMBER OF LEAVES (SP)	NUMBER OF LEAVES (HM)	NUMBER OF LEAVES (CC)	OBSERVATIONS (what we see & changes – all 4)	MAINTENANCE (what we did or was done)
1 – Seed planting	23/07/19	0	0	0	0	0	0	0	0	Seeds are very small	Planted four seeds in shallow hole. Moist soil in container with wick to water
Day 8	31/07 2019	20mm	0 mm	0 mm	26 mm	2	2	0	2	Growing faster than thought.	Recorded length
Day 15	6/08 2019	65 mm	53 mm	50 mm	65 mm	4	4	3	4	Somehow as tall as Charlies	Recorded Length



	Building consensus Synthesise and analyse the students plant data to explain the variation in plant growth	**Data Review** *(15 minutes)* **Gallery walk** Discuss the differences – or variation between plants and groups and how this could be represented so that others could understand. perhaps this may involve making a combined data display. Model and discuss deliberately selected student's work. ❖ What can you tell from the representation? ❖ What does it show/not show?	Can students identify in their work and that of others what is effective and what understanding is/isn't clear. Can students make inferences and/or predictions about their plants growth?

LESSON 4 – Flowering plants: Represent data for interpretation and communication

(Approximate duration 90 Minutes)

Curriculum focus:

Science ideas and practices

- Plant and flower structure
- Growth recording and representation methods
- Plant growth and variation
- Pollination

Mathematics ideas and practices

- Informal and formal measurement - plant growth
- Consistent measurement systems, methods and recording
- Tabulated recordings of plant growth

Learning intention:

- Students identify different parts of flowers and begin to use the scientific terminology correctly.
  Ongoing (from previous lessons)
- Students diagrammatically represent their plant growth, and that of their groups.
- Students record, measure and tabulate their plant growth and other plants in their group pot.
- Students examine how plants grow at different rates and how we can represent the difference in growth

The lesson at a glance:

Students explore a range of different flowers, dissecting and looking at them under a digital microscope. They are supported to identify different parts of the flower, referring to the diagrammatic labeled fast plants flower (Appendix 3 and attachment following lesson). Students record changes in their plant i.e. growth, different and more leaves, the development of a flower bud/flower etc. They record changes and the height measurement in their Growth Calendar and represent their flower, and those of their group, diagrammatically.

Equipment/Resources

Flowers – examples of a range of different flowers
Digital microscopes/magnifying glass/hand lenses/ iPad magnifying apps.
Scissors
Newspaper/scrap paper (to place flowers on)

Pipe cleaners (soft), skewers (for staking)

Video weblink: https://www.youtube.com/watch?v=zy3r1zlC_IU
Equipment required for all lessons
Plants and plant system (from first lesson)
Class Borlotti beans (or similar bean)

Students: student workbooks (unlined), felt pens, pencils, colours and rulers

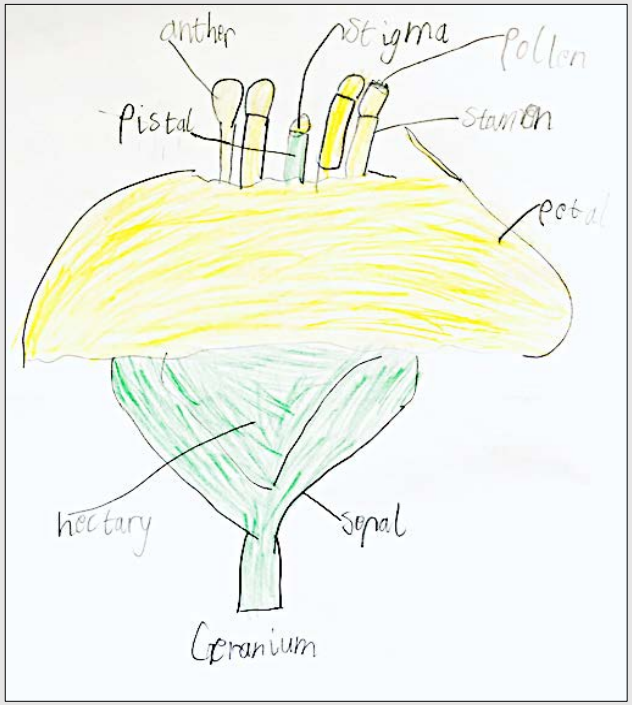
Teachers: Board (IWB/whiteboard), and or butchers' paper for shared recording and pens Plastic take-away containers

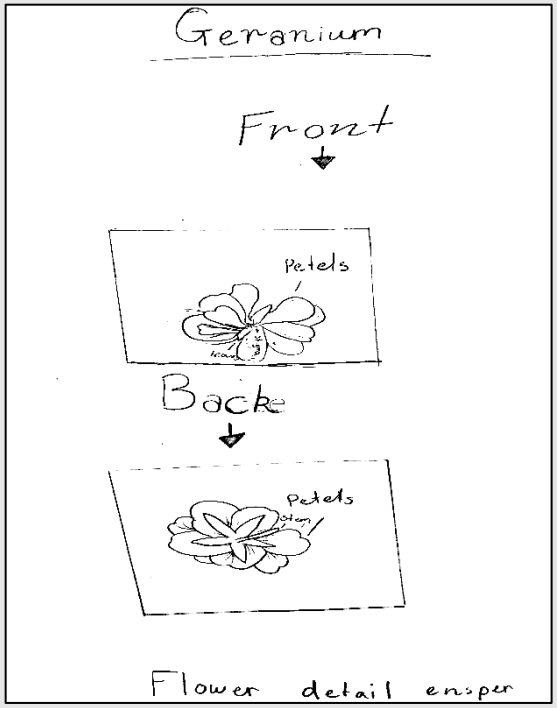
LESSON 4 - Flowering plants: Represent data for interpretation and communication

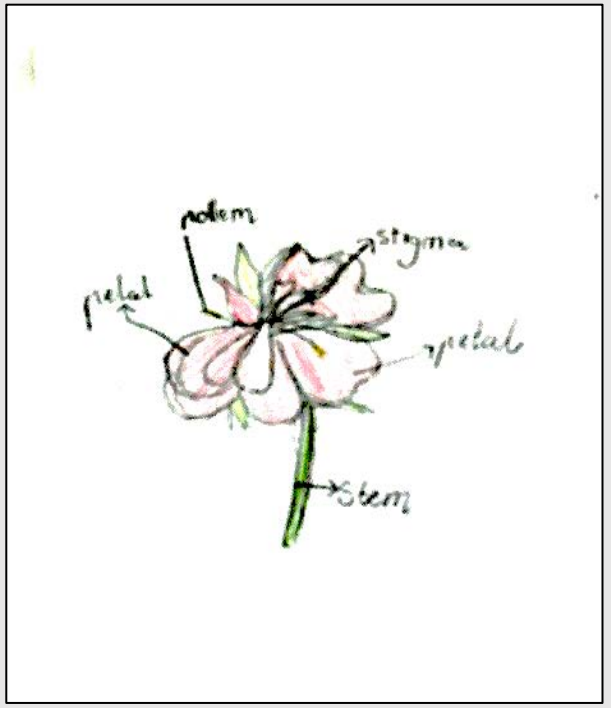
(Approximate duration 90 Minutes)

Learning focus	Pedagogical stage	Lesson Outline (NB: time allocations a guide only)	Monitoring and supporting learning
Science: Lifecycle Variation in growth rate; environmental influences on plant growth	***Orienting*** Probing student's knowledge and observations of flowering plants to orient them to the parts of the flowers and the part they play in flower reproduction	**Whole Class: Flowers and Pollination** *(10 minutes)* **Probing questions** Record *student* knowledge and ideas on the board ❖ How have our plants changed? (should be starting to flower) ❖ What do you know about flowers and pollination? **Explore– Flowering plants** *(20 minutes)* Using a variety of different flowers and Appendix 3 (flower structure diagram) Together and then, individually or small groups, students look at the different types of flowers with digital microscopes/hand lenses etc. and develop the language of flower structure and pollination using the flower structure diagram (Appendix 3) Ask students to find the different parts of the flower on the real sample flowers ❖ Can we find the pollen? ❖ And the anther? ❖ Where is the stigma? ❖ Where is the pistol? ❖ Nectary? Sepal? Petals?	Can students identify the stages of development/change of their flowering plant?
	Posing representational challenges Students are challenged to diagrammatically represent a flowering plant, identifying the parts of a flower	**Individual Flower Representation** *(10 minutes)* (own book) Students draw their flower and annotate, identifying the different structures and their function. Students can represent their dissections and observations	Are students able to accurately identify and represent parts of a flower?

Flower Structure: Three student examples of representations

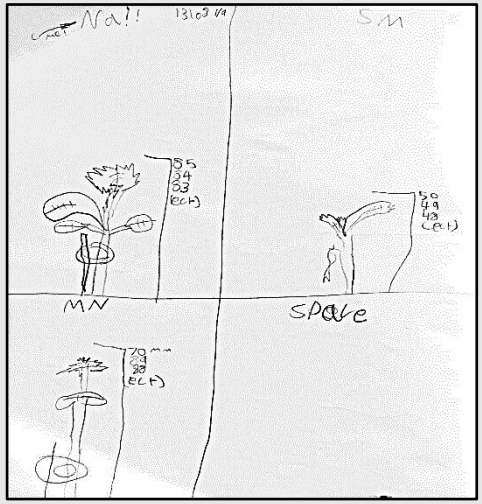


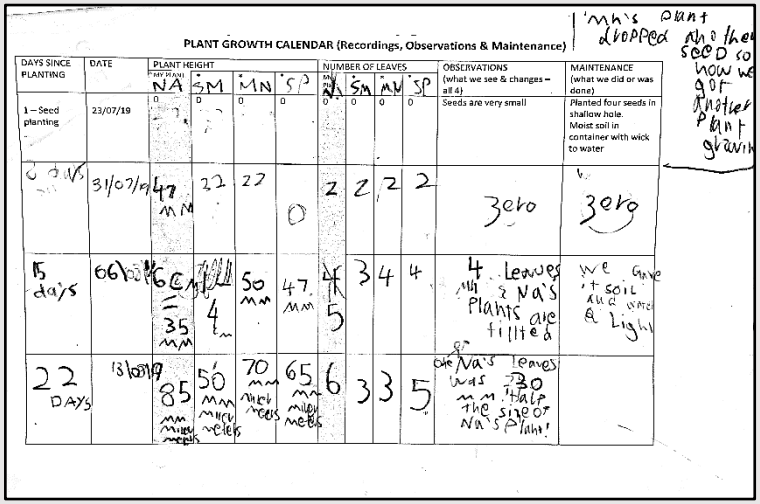




Mathematics: Invent methods to display data	***Orienting*** Students observe and note the process of pollination and the role of pollen and bees	**Pollination** **Whole Class discussion and video clip** *(5 minutes)* 1) Watch the video https://www.youtube.com/watch?v=zy3r1zlC_IU ***What did you see in the video?*** ***Is this the same for our plants? Do we have bees in our classroom?*** ❖ How can we keep a record of our flower pollen production/making? ❖ Where and how can we record our flower pollination? ❖ Why might that be helpful?	What are the range of ideas students present to record flower pollination?
Science: Students record the growth of their plant, influencing factors, stage of the life cycle (e.g. flowering) and parts of the plant/flower **Mathematics:** Measurement (mm) Table recording Date and days since planting	***Posing representational challenges*** Students engage with their plant and those in their group pot, to measure, record and represent change and differences	**Flowering plant monitoring and recording** **Plant Growth Calendar (own books)** *(20 minutes)* Use the Growth Calendar (Appendix 2). **Pant care:** Check in on their plants – do they need water, nutrients, moving the light (so they the plants have space to grow but are still close to the light (10 cms). **Plant measuring, recording and representing** 1) Plant Growth Calendar (Appendix 3) Students record the number of days since planting, date, height (mm) of the plant, number of leaves and any other changes in their plant/plant care. **Probing questions** ***How has your plant changed?*** ❖ *How much has it grown since your last recording?* ❖ *Are any plants starting to FLOWER?* ❖ *Are they all growing at the same RATE?* (variation) *Can you see any POLLEN yet?* 2) Students represent their plant and that of others in their group pot in their books.	Can students measure and record the height of their plant accurately? Do students record the details of their plant numerically and/or diagrammatically? Do students draw their plant with detail? Can students draw plants to scale? Are students able to identify different types of leaves? Can students make appropriate predictions about the rate of growth?

Two examples of student plant growth recording and representing



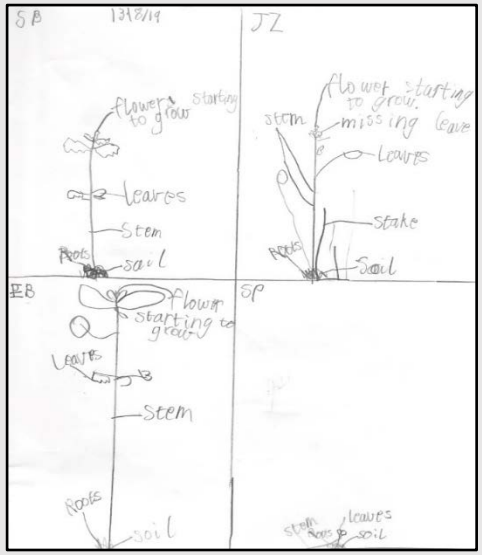


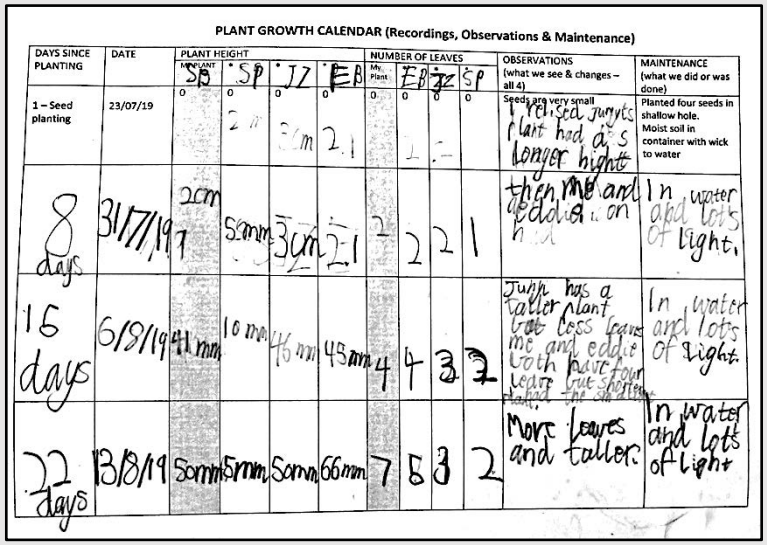
PLANT GROWTH CALENDAR (Recordings, Observations & Maintenance)

DAYS SINCE PLANTING	DATE	PLANT HEIGHT NA	SM	MN	SP	NUMBER OF LEAVES NA	SM	MN	SP	OBSERVATIONS (what we see & changes – all 4)	MAINTENANCE (what we did or was done)
1 – Seed planting	23/07/19	0	0	0	0	0	0	0	0	Seeds are very small	Planted four seeds in shallow hole. Moist soil in container with wick to water
	31/07/19	47 mm	22	27	0	2	2	2	2	Zero	Zero
15 days	06/8/19	35 mm	4	50 mm	47 mm	5	3	4	4	4 leaves Na's Plants are tilted	We Gave it soil and water & Light
22 DAYS	13/8/19	85 mm	50 mm	70 mm	65 mm	6	3	3	5	the Na's leaves was 30 mm. half the size of Na's Plant!	

Na's plant dropped another seed so now we got another plant growing

Example 1: Student is beginning to show more detail in their diagrammatic drawings e.g. more leaf detail, representing different types of leaves.
Detailed recording of changes in the Growth Calendar including comparing plant growth and change





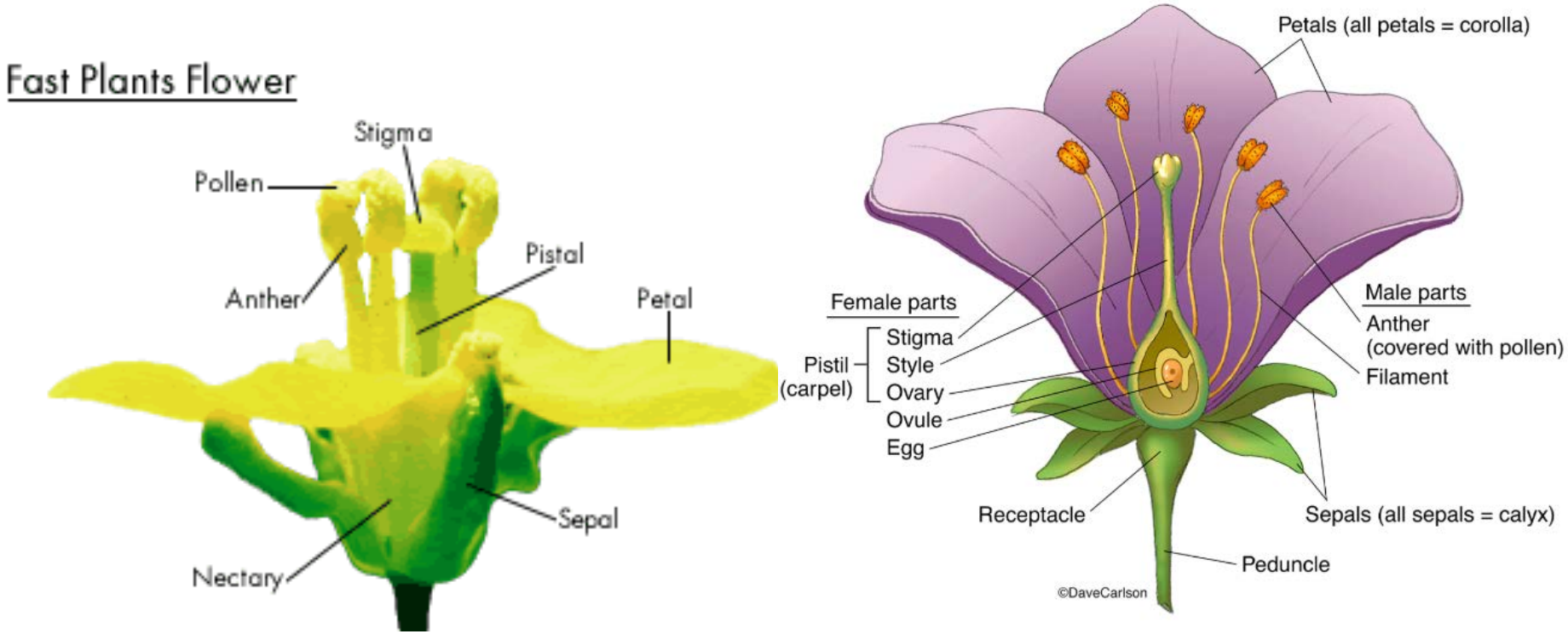
PLANT GROWTH CALENDAR (Recordings, Observations & Maintenance)

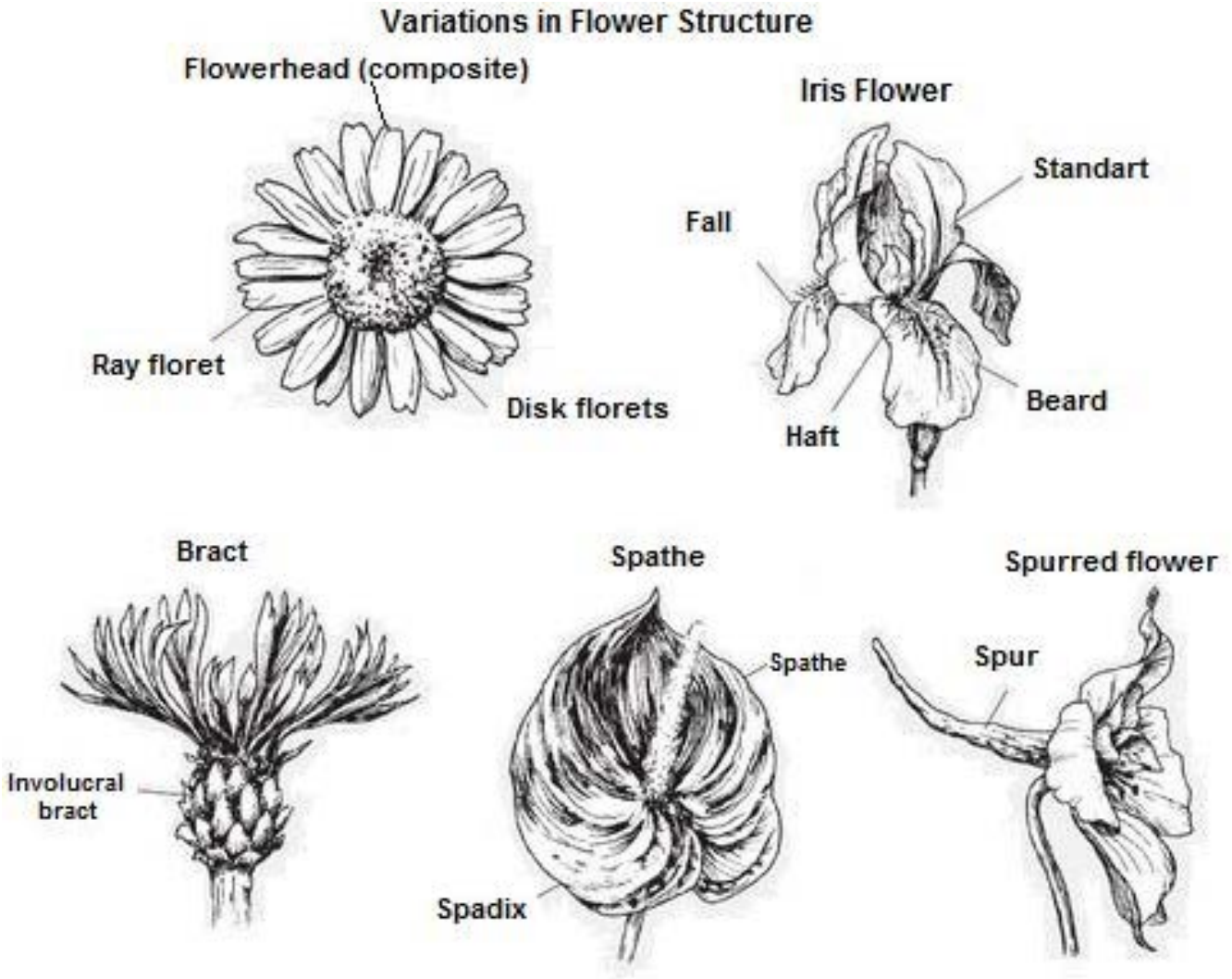
DAYS SINCE PLANTING	DATE	PLANT HEIGHT SB	SP	JZ	EB	NUMBER OF LEAVES EB	JZ	SP	OBSERVATIONS (what we see & changes – all 4)	MAINTENANCE (what we did or was done)
1 – Seed planting	23/07/19	0	0	0	0	0	0	0	Seeds are very small	Planted four seeds in shallow hole. Moist soil in container with wick to water
8 days	31/7/19	2cm	5mm	3cm	2.1	2	2	1	then me and eddie on it	In water and lots of light.
16 days	6/8/19	41 mm	10 mm	46 mm	45 mm	4	3	2	Jupp has a taller plant but less leaves me and eddie both have four leaves but shorter	In water and lots of light.
22 days	13/8/19	50mm	5mm	50mm	66mm	7	3	2	More leaves and taller.	In water and lots of light

Example 2: Student using ordinal number as well as numerals in their Plant Calendar. The different heights of the plant drawings correlate with comparative recorded heights. Students not consistently using mm in their diagrammatic measurements or Plant Growth Calendar

Mathematics: Interpret data table, record measurements and sketch representation of plant growth (to date) Estimate growth rate from interpretation of data Make predictions about further plant growth based on current data	***Building consensus*** Synthesising student ideas to establish the affordances of representation attributes and methods Collate student ideas and ways of representing to come to an agreement on what is effective and what understanding is clear.	**Whole class: Plant growth, life cycles, data representation** **Considering and Sharing Ideas and Representations** **Gallery Walk** *(5 minutes)* Students compare and contrast others' representations and ideas Teacher purposefully selects examples (do not remove yet) **Probing questions during gallery walk and guiding questions for following discussion** ❖ What can you tell from the different representations? ❖ How effective are they? ❖ What do they show? ❖ What don't they show? **Representation review** *(5 minutes)* Share examples of what students have done. How have they represented the plant growing? (and above questions) Records results, student observations and ideas on the board. Check understanding of plant growth, life cycles, and data representation. **Teacher note:** Plants will have grown quite tall – make sure they have space to grow further.	Do students make appropriate judgement from others representations? How do students compare and analyse different representations? Do they make meaning from others representations? Do they identify what is shown/not shown confidently? Are students able to identify characteristic, details and conventions in representations, that make them effective? Are students able to make reasoned predictions/inferences about their plants growth and/or development?

Lesson 4: Flowering plants - naming the parts of a flower




Variations in Flower Structure
Flowerhead (composite)
Ray floret
Disk florets
Iris Flower
Standart
Fall
Beard
Haft
Bract
Involucral bract
Spathe
Spathe
Spadix
Spurred flower
Spur

LESSON 5: Pollination - Comparing change over time and representations

(Approximate duration 90 Minutes)

Curriculum focus:

Science ideas and practices

- Pollination, flower structures
- Flowering plant life cycle
- Growth recording and representation methods
- Plant growth and variation

Mathematics ideas and practices

- Students represent their data graphically (line graph – change over time)
- Informal and formal measurement - plant growth
- Consistent measurement systems, methods and recording
- Tabulated recordings of plant growth

Learning intention:

- Students attempt to meaningfully represent their plant growth data graphically (line graph)
- Students identify parts of their flowering plant using scientific terminology correctly. **Ongoing** (from previous lessons)
- Students diagrammatically represent their plant growth, and that of their groups.
- Students record, measure and tabulate their plant growth and other plants in their group pot.
- Students examine how plants grow at different rates and how we can represent the difference in growth

The lesson at a glance:

Students co-construct with teacher guidance, a graphic representation of a plant's growth (line graph), then individually represent their own plant data graphically. They pollinate their flower, identifying different parts of the flowers using scientific terminology (e.g. pollen, petals, stigma etc.). Students record changes in their plant i.e. growth, different and more leaves, the development of flowers etc. They record pollination, changes and the height measurement in their Growth Calendar and represent their flower, and those of their group, diagrammatically.

Equipment/Resources

Pollination sticks: cotton buds

Class borlotti beans (or similar bean)
Pipe cleaners (soft), skewers (for staking) and

Video weblink:
https://www.youtube.com/watch?v=dUBIQ1fTRzI
Equipment required for all lessons
Plants and plant system (from first lesson)

Students: student workbooks (unlined), felt pens, pencils, colours and rulers

Teachers: Board (IWB/whiteboard), and or butchers' paper for shared recording and pens Plastic take-away containers

LESSON 5: Pollination - Comparing change over time and representations

(Approximate duration 90 minutes)

Learning focus	Pedagogical stage	Lesson Outline (NB: time allocations a guide only)	Monitoring and supporting learning
Science: Lifecycle, variation in growth rate; environmental influences on plant growth **Mathematics:** Compare and interpret data sets (different groups).	***Orienting*** Students discuss their experience of growing the fast plants and how they've changed over time	Whole Class: Plant review (10 minutes) Are all our plants surviving? What do plant need to survive? Review what a plant needs to survive. The Youtube may prompt some ideas https://www.youtube.com/watch?v=dUBIQ1fTRzI Show the students photos taken each week of the plants (or teacher plant) and/or use a students detailed and accurate bookwork with measurements and drawing to scale. **Probing question** ❖ What do you notice about the growth over time and the data? Encourage students to pay attention to the changes over time to their plant as they complete their Plant Growth Calendar for the day	Are students able to recognise the changes and needs of their plant? What do students notice and can they provide evidence for what they notice from their own data?
Mathematics: Estimate and measure amount of space required for plants to grow using formal measure as a guide (cm)	***Posing representational challenges*** Students engage with their plant and those in their group pot, to measure, record and represent change and differences	**Flowering plant monitoring and recording** **Plant Growth Calendar (own books)** *(20 minutes)* Use the Growth Calendar (Appendix 2). **Pant care:** NB: Plants will be flowering now – make sure they have space to grow further and are gently, securely staked. **Plant measuring, recording and representing** 1) Plant Growth Calendar (Appendix 3) Students record the number of days since planting, date, height (mm) of the plant, number of leaves and any other changes in their plant/plant care.	Can students measure and record the height of their plant accurately?

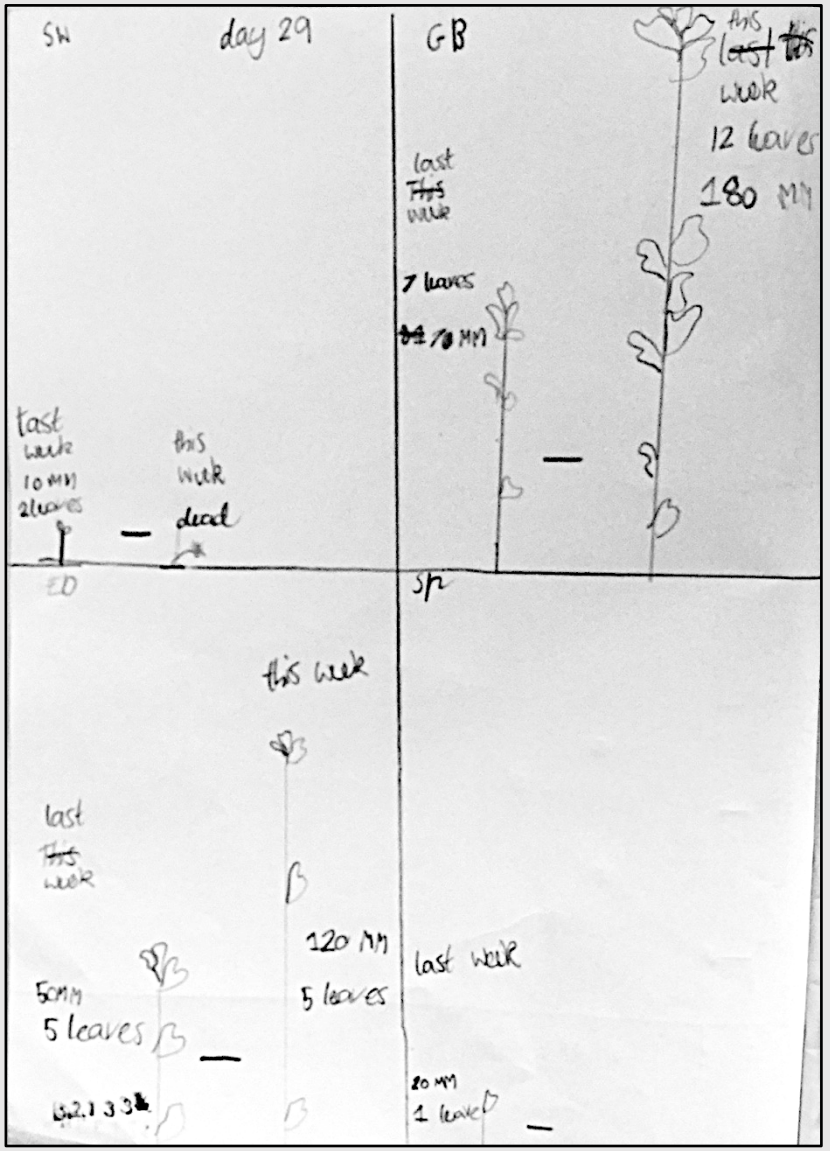
Mathematics: Rate of growth Variation Reading and comparing heights (mm) **Science:** Plant structure and stages		**Probing questions** ***How has your plant changed over time?*** ***Look at your whole table data*** ❖ *How much has it grown since your last recording?* ❖ Has your plant grown at the same rate or in spurts? ❖ When did it grow the most or the least? Why? ❖ *Are they all plants growing at the same RATE?* (variation) ❖ *Can you see any POLLEN yet?* 2) Students representation of their plants, showing how it has changed over time. Developing representations prompt students to make thorough observations and representations Ask the students ***show*** the following ❖ What are the parts of your plant? ❖ Do all the leaves look the same? ❖ Are there different types of leaves? ❖ How much has it grown since your last recording? ❖ Are they all (group pot plants) growing at the same RATE? (variation) ❖ Are their FLOWERS? How many flowers? ❖ Can you see the ANTHER & POLLEN? ❖ Can you see seed pods starting to form**?**	Do students record the details of their plant numerically and/or diagrammatically? Do students draw their plant with detail? Can students draw plants to scale? Are students able to identify different types of leaves? Can students make appropriate predictions about the rate of growth?

Artificially pollinating a flower

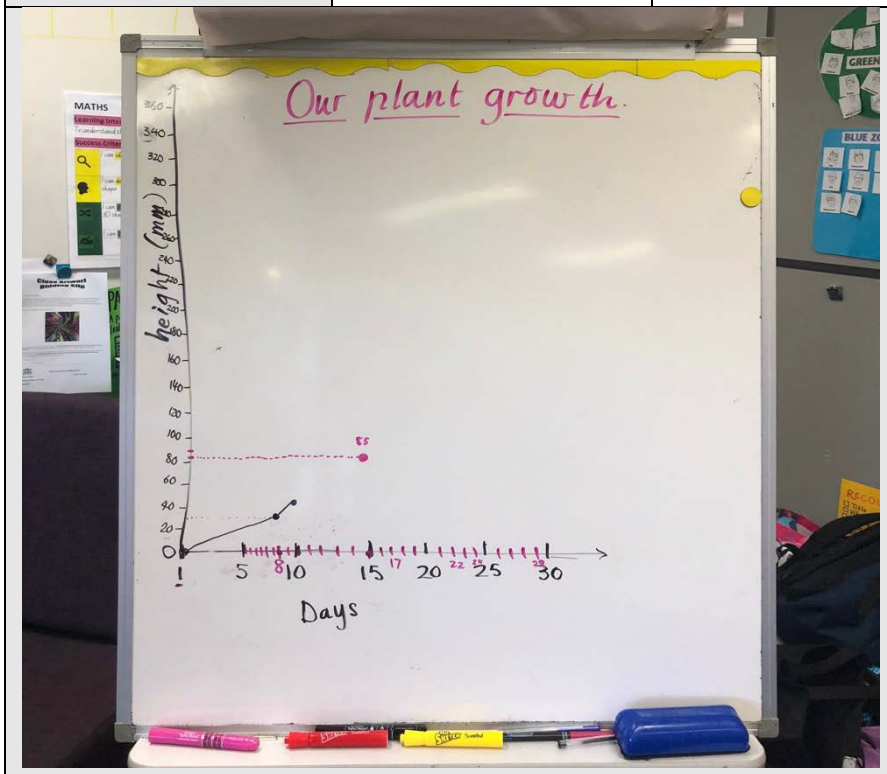
Week 5 Plant Growth Calendar and Flowering Plant Representation Example

PLANT GROWTH CALENDAR (Recordings, Observations & Maintenance)

DAYS SINCE PLANTING	DATE	PLANT HEIGHT				NUMBER OF LEAVES				OBSERVATIONS (what we see & changes – all 4)	MAINTENANCE (what we did or was done)
		My Plant SW	GB	EB	SP	My Plant	GB	EB	SP		
1 – Seed planting	23/07/19	0	0	0	0	0	0	0	0	Seeds are very small	Planted four seeds in shallow hole. Moist soil in container with wick to water
day 29	20/8/2019	20 MM	120 MM	120 MM		1	12	5		My plant is fuzzy and is dead.	We measured the growth and the number of leaves.



	Orienting Students are prepared to think about how to organise their data clearly to show change over time	**Whole Class Data Representation of Change Over Time** Probing Question (10 minutes) Students reference their books (Growth Calendar) Question students about how the plant growth over time could be shown in one visual form that people will recognise and understand easily? Record student suggestions on the board NB: students usually will suggest a graph use this notion to develop a co-constructed line graph by following the following prompts	

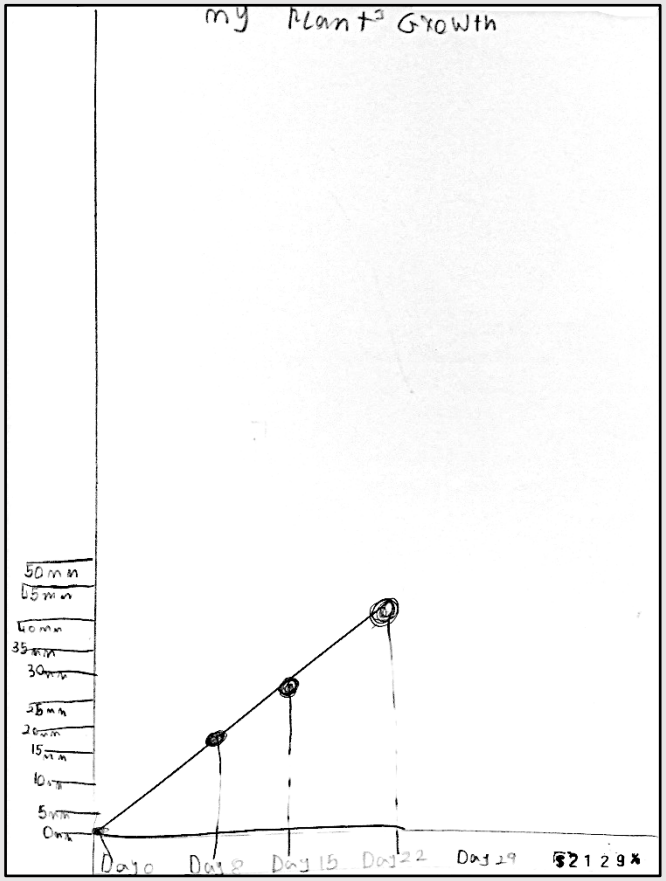


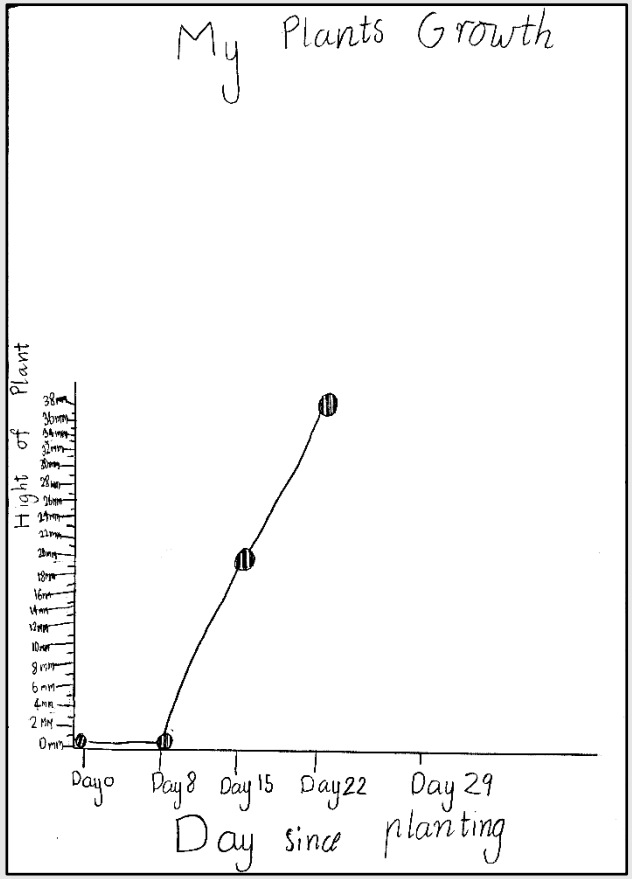
Teacher Note: It is important to guide students toward an easy recording system, based on the frequency of their recordings e.g. Week 1, Week 2 etc. OR Counting in 5's if readings were every 5 days etc. It is easier for students if the plants are measured and recorded at consistent intervals. *Ask* the students what is an appropriate record for time?

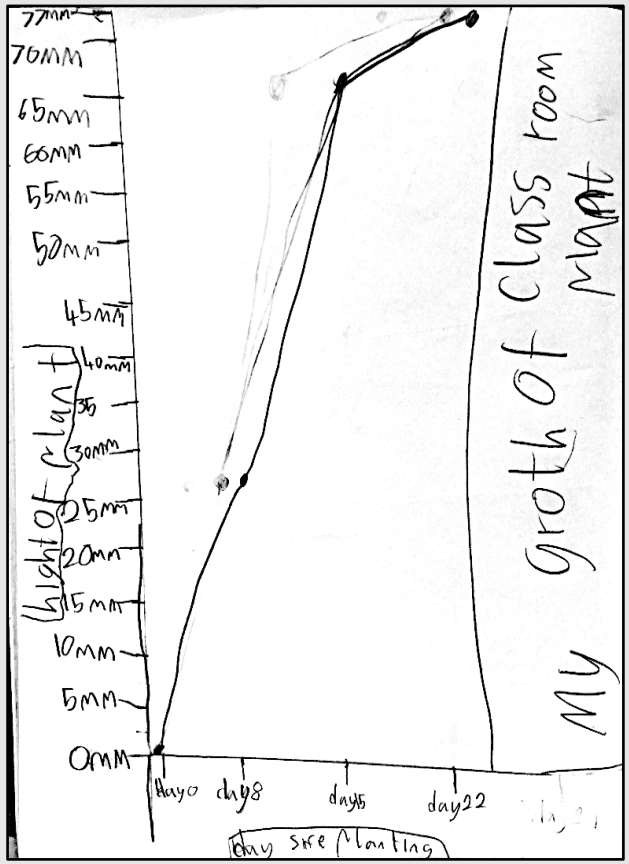
Mathematics: Data modelling and collation from table to graphic representation	***Posing representational challenges and building consensus*** Synthesise student ideas to establish the affordances of line graphs for identifying patterns and showing the rate of growth	Student Co-construction – Graph (line) What is it we will be showing in the graph? (height and time) What does a graph have/need? (student draws two axis) Clarifying prompts – while a student writes on the board Ask students What has changed over time? (height) Where could we show that on our graph? (vertical axis) What has it been measured in? (labels) When has the height changed? (over time) When have we recorded this? (days/weeks) Where could we put the time (days/weeks)? Student writes time on the horizontal axis NB: encourage students to use even increments and times. You may add dates as a whole class – students referring to their own Plant Growth Calendars and reading aloud the dates and days of plant growth Ask a student to add in the corresponding heights as points/dots (at least two) of their plant to the whole class graph Explain to students we usually use bar/column graph to show an amount of something – quantity. This isn't an amount of plants, we're showing the growth of one plant. Instead of making the dots into a bar graph. What could we do to show it's one thing changing? What could we do with the dots? (students suggest join them) Discuss with students what the line, when the students join the dots (line graph) looks like Can you describe the line? Is it the same across all the readings/times? What does it tell us when it's steep? Flat? (RATE of plant growth)	How do students compare and analyse different representations? Do they make meaning from others representations? Do they identify what is shown/not shown confidently? Are students able to identify characteristic, details and conventions in representations, that are important to representing change over time (i.e. days since planting and height measurement) Do students confidently identify days since planting and height in centimetres as the two axis descriptors? Do students accurately translate data from a growth calendar to measurements and data points on a line graph?

Mathematics: Data representation Graphing (line graph)	***Posing representational challenges*** Students engage with the meaning of a line graph as a representation that captures their plant growth measurement data graphically	Individual Student Data Representation: Plant growth (own books – referencing growth calendar) (20 minutes) Students represent their own plant growth data to date, in their books. Students encourages to try to use a line graph (the best way to show clearly change over time, and the rate of growth). Teacher note: Some students will need scaffolding, whilst others who adopt a line graph with ease, may be encouraged to represent more than one plant in their line graph (once one plant is completed). Prompting questions • How could you show a different plants growth on the same graph? (different colour) • How would I know which colour is which plant or what the colours mean? (key/legend) Have students compare their displays – privilege, in the discussion, the use of line graphs over bar graphs – it is easier to represent the height of a number of plants Hint at using graphs to communicate data. ACTIVITY – Communicating results (30 minutes) How could students represent their 5 weeks of data in their workbooks. Select groups' work that shows variety of representation and discuss 'which representation shows the growth patterns clearly'. Privilege the use of graphs and particularly lead to line graphs if some students construct these. Ask students to think about how they could add to this in future as they collect more data and their plant completes the life cycle. At this stage a discussion could take place about the amount of growth in each week – whether it is constant, and how we can tell by the graph display. Students could estimate growth rates from the observations and collected data. Students could then make predictions about future growth rates based on current data.	What is the range of responses and attempts to collate individual plant growth data into a line graph? Can students plot their plant growth data into a graphical system with accuracy? Are students able to represent their plant growth data as a line graph, effectively employing the conventions of a line graph?

Plant growth line graphs Examples of the range of student responses







Teacher note: When students are encourage to look at the rate of growth of their plant and changes in the rate of growth students may make the following suggestions.
Example 2 – Student, in discussion, suggested their plant took a while to start growing because it "was busy growing roots underground"
Example 3 - Student suggested their plants growth was "starting to slow down, because it's busy making flowers".

Science: Pollination Parts of a flower	***Applying conceptual understanding*** Students pollinate their own plant - applying their understanding of the process of pollination	**Pollinating** ***(10 minutes)*** **Our flowers are now flowering** Discuss the importance of pollinating (reviewing last lesson) and how the students will need to pollinate, as there are no bees in the classroom. Demonstrate to students how to use cotton buds to transfer pollen from one flower to another. Roll the bee stick in the centre of the flower of the donating flower (one flower) and then repeat in the receiving flower (different flower) centre – to transfer the pollen grains. NB: The flowers are very fragile, so no pressure is placed on the flowers Make sure you transfer pollen to the centre (stigma) of all flowers. Encourage students to take notes of which flower's pollen is used to pollinate another (diagrams may be useful here). Discuss how they might produce (invent) scores for each flower's pollen production and record this data. Are there any interpretations to be made based on quantifying this observational data?	What variation in students' work can be drawn on to discuss possible ways of representing?

Science: Plant growth Variation Rate of growth **Mathematics:** Data modelling and representation Line graph- change over time	***Building consensus*** Comparing, evaluating and synthesising the plant data and growth variation. Refining and consolidating the concept of rate of growth and variation in growth	**Sharing and reviewing results***(5 minutes)* **Gallery walk** Ask students to consider: ❖ Have all plants grown at the same rate? ❖ How quickly or slowly are they growing? ❖ When did they grow the most? ❖ How is the representation helpful in explaining what is happening? **Class discussion: Summing up and evaluating***(10 minutes)* After the gallery walk, ask students**:** ❖ What did you learn? ❖ Which line graphs were interesting and clear? Purposefully select some examples to share – ❖ Why is this clear? ❖ When did this plant grow the fastest/slowest? Why? What was happening	What variation in students' work can be drawn on to discuss possible ways of representing? Can students identify suitable representations and conventions that are used effectively to make a representation and understanding clear i.e. table, drawings with suitable and clear labels, titles etc.?
		CONCLUSION (10 minutes) Share examples of what students have produced. What are students seeing happening to the plant? What is happening with their data representation?	

LESSON 6: Flowering Plant Life Cycle: Refine and evaluate representations

(Approximate duration 90 Minutes)

Curriculum focus:

Science ideas and practices

- Flowering plant life cycle
- Pollination, flower structures, seed pods
- Growth recording and representation methods
- Plant growth and variation

Mathematics ideas and practices

- Graphic representation of their plant data (continued)
- Informal and formal measurement - plant growth
- Consistent measurement systems, methods and recording
- Tabulated recordings of plant growth

Learning intention:

- Students represent the life cycle of a flowering plant
- Students review and refine the effectiveness of their representations
-
- Students add plant data to their graphic representation (previous lesson) Ongoing (from previous lessons)
- Students identify parts of their flowering plant using scientific terminology correctly.
- Students diagrammatically represent their plant growth, and that of their groups.
- Students record, measure and tabulate their plant growth and other plants in their group pot.
- Students examine how plants grow at different rates and how we can represent the difference in growth

The lesson at a glance:

Students represent the life cycle of their flowering plant (as observed). They continue to measure and record their plant growth data to their calendar *adding measurements to their line graph*. They pollinate their flower and identify different parts of the flowers using scientific terminology (e.g. pollen, petals, stigma etc). Students record changes in their plant i.e. number of flowers and seedpods and diagrammatically represent these changes in detailed drawings.

Equipment/Resources

Pollination sticks: cotton buds

Class borlotti beans (or similar bean)
Pipe cleaners (soft), skewers (for staking)

Video weblink:
https://www.youtube.com/watch?v=dUBIQ1fTRzI
Equipment required for all lessons
Plants and plant system (from first lesson)

Students: student workbooks (unlined), felt pens, pencils, colours and rulers

Teachers: Board (IWB/whiteboard), and or butchers' paper for shared recording and pens Plastic take-away containers

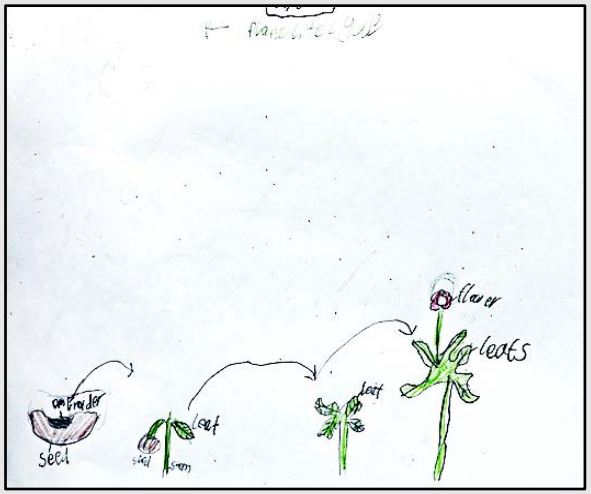
LESSON 6: Flowering Plant Life Cycles: Refine and evaluate representations (create models)

(Approximate duration 60 minutes)

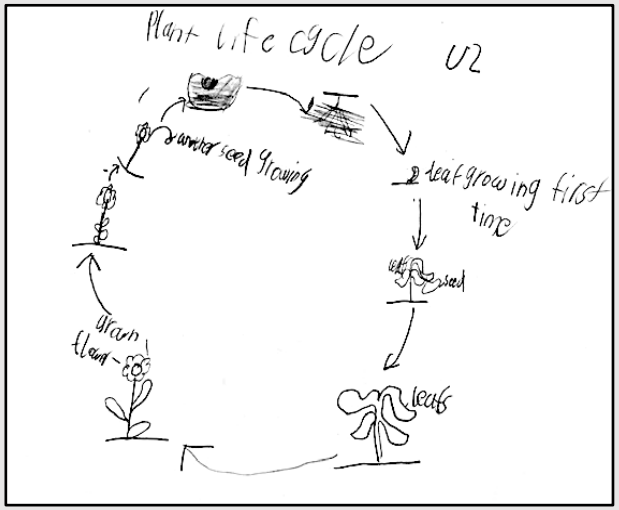
Learning focus	Pedagogical stage	Lesson Outline (NB: time allocations a guide only)	Monitoring and supporting learning
Science: Lifecycle Variation in growth rate Environmental influences on plant growth	***Orienting*** Students attention is drawn to the different stages of life, of their flowering plant – flowering plant life cycle	**Whole class discussion: Flowering Plant Life Cycle** *(10 minutes)* Looking at student plants at different stages (including with seed pods as well as flowers) **Probing questions** (Record student ideas on the board) ❖ What do you notice about our plants and how they've changed? (seeds etc.) ❖ What is the important that our flowers now have seed pods? NB: You may wish to cut open a seed pod from the egg carton/spare plants – to show the students the seeds Students should recognise that seeds are how new plants will grow (sign of a living thing and life cycle) ❖ What have been the different stages of our plants growth? Introduce representational challenge ❖ How could we represent the life cycle of our flowering plant?	What do students identify as changes in their flowering plant? What scientific terminology do student use (e.g. plant part names, 'life cycle')? Are students able to recognise the significance of seeds? (reproduction and the completion of the life cycle) Do students suggest a 'life cycle', as a way of representing the stages of change?
Science: Life cycle representation	***Posing representational challenge*** Students are challenged to represent the life cycle of their flowering plant	**Individual Representation:** *(10 minutes)* **Flowering Plant Life Cycle** Students represent through diagrammatic drawings a detailed representation of the stages of a (their) flowering plant life cycle. Ask students to consider: ❖ What could you use to show and explain you're drawing one plant changing over time?	What is the range of representation responses? Which representations can be purposefully selected to exemplify effective characteristics of a flowering plant life cycle?

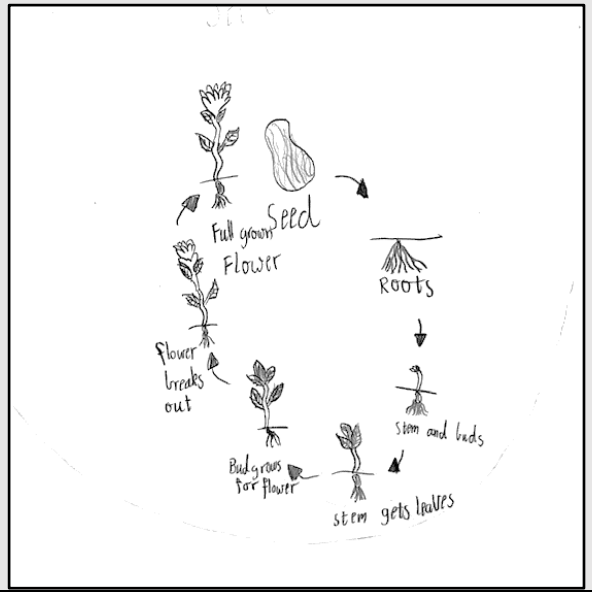
Flowering Plant Life Cycle: Examples of student responses (before and after gallery work and review)

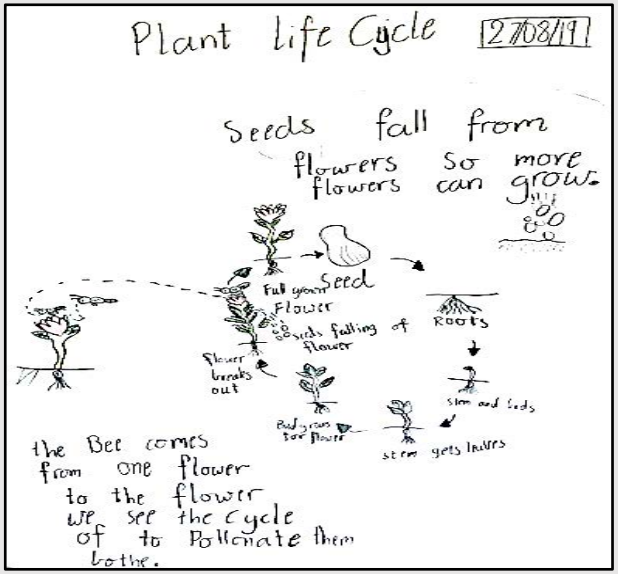
Student samples: Before gallery walk and class review



After student review and refinement







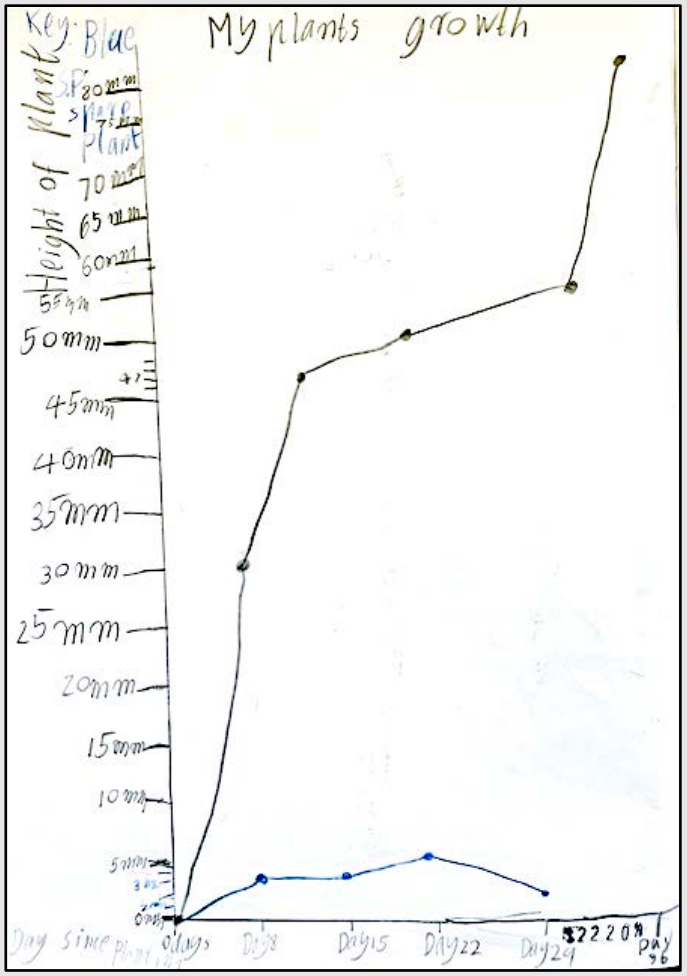
Science: Life cycle	***Building consensus*** Students share, compare, evaluate each other's ideas and the teacher synthesises these ***Building consensus*** Consolidating understanding about the life cycle of a flowering plant through student generated examples	**Whole class gallery walk and discussion** *(10 minutes)* **Considering and Sharing Ideas and Representations – Life Cycle** Students compare and contrast others' representations and ideas Teacher purposefully selects examples (do not remove yet) **Probing questions during gallery walk and guiding questions for following discussion** ❖ What can you tell from the different representations? ❖ How effective are they? ❖ What do they show? ❖ What don't they show? ❖ What have students used to help explain their representation of the life cycle? Teacher guided review of purposefully selected examples Draw student attention to what makes the examples accurate and clear examples of the 'life cycle of a flowering plant' (e.g. arrows, cyclic positioning, labels, title, detail in diagrammatic drawings).	How do students compare and analyse different representations? Do they make meaning from others life-cycle representations? Do they identify what is shown/not shown confidently? Are students able to identify characteristic, details and conventions in representations, that make them effective? (e.g. arrows, cyclic positioning and labels)
	Posing representational challenges Challenge students to review and refine their Flowering Plant Life Cycle Representation	**Individual Representations:** *(10 minutes)* **Reviewing and refining: Flowering Plant Life Cycle** Students review and refine their own representations, based on review and discussion of student examples	Do students effectively refine their representations? Do they adopt agreed characteristics of an effective life cycle representation in their own representation?

Mathematics: Interpret features of calendar. Estimate and measure amount of space required for plants to grow using formal measure as a guide (cm). Tabulation of height measurements, and other data (number of leaves, flowers and seedpods) Graphic representation of measurements (line graph)	***Posing representational challenges*** Students engage with their plant and those in their group pot, to measure, record and represent change and differences	How do models help us understand a phenomenon? How useful are posters, 3 D models, videos when we want to understand? Explore some models (in addition to the videos we have seen with animations, songs, stop motion) This may be useful https://www.youtube.com/watch?v=EEPwnw_EgWY (finish after the first few minutes) **ACTIVITY** *(30 minutes)* Reflect on the life cycle of a plant. How could students model the life cycle of a fast plant? Use strategies such as posters, brochures, or stop motion/clay mations to generate a video. Plan the storyboard or the draft in the Maths & Science Book. **Fast Plant monitoring, representation and continuation of life graphs** *(15 minutes)* Plants will be flowering now – make sure they have space to grow further. Students continue to use the Growth Calendar (Appendix 3). Check in on their plants – do they need water, nutrients, moving the light (so the plants have space to grow but are still close to the light (10 cms). Next week's final lesson is a showcase of the classes' work. Students to begin displaying this. Could be a poster, brochure, powerpoint, video NO CONCLUSION HERE AS WORK WILL BE SHOWCASED IN THE FINAL LESSON	Can students measure and record the height of their plant accurately? Do students record the details of their plant numerically and/or diagrammatically? Do students draw their plant with detail? Can students draw plants to scale? Are students able to identify different types of leaves? Can students make appropriate predictions about the rate of growth?

Week 6 Examples of student Growth Calendar and adding to student line graphs

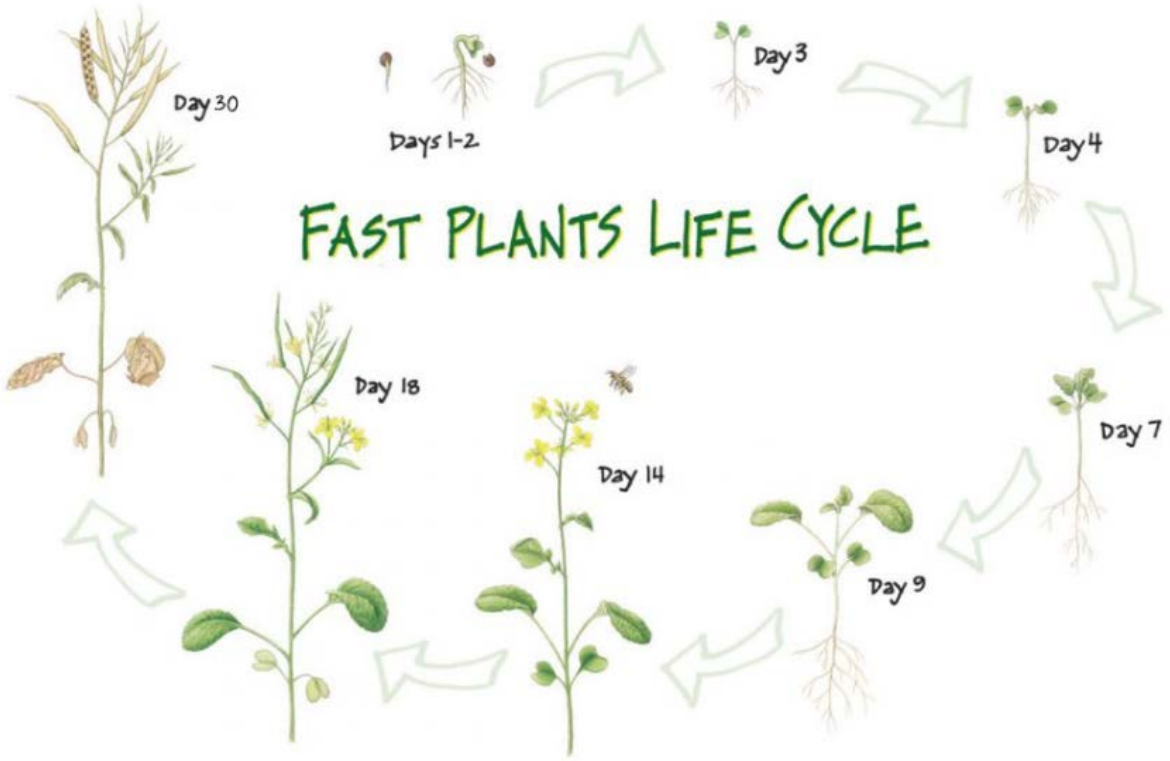
PLANT GROWTH CALENDAR (Recordings, Observations & Maintenance)

DAYS SINCE PLANTING	DATE	PLANT HEIGHT				NUMBER OF LEAVES				OBSERVATIONS (what we see & changes – all 4)	MAINTENANCE (what we did or was done)
		My Plants	EB	SB	SP	My Plants	EB	SB	SP		
1 – Seed planting	23/07/19	0	0	0	0	0	0	0	0	Seeds are very small	Planted four seeds in shallow hole. Moist soil in container with wick to water
Day 29	30/8/19	60mm	155mm	90mm	2mm	5	6	8	2	bigger Plant.	we give it water and light.
Day 36	27/08/19	82 mm	205 mm	132 mm	2 mm	6	8	10	2	-growing flower -Plant higher	We Put the Plant to give it light and water.



Extension example – Student representing the growth of more than one plant in the group pot

The Fast Plants Life Cycle (a model plant)



LESSON 7: Class sharing and communicating (+ post sequence assessment task)

(Approximate duration 90 Minutes)

Curriculum focus:

Science ideas and practices

- Flowering plant life cycle
- Pollination, flower structures, seed pods
- Growth recording and representation methods
- Plant growth and variation

Mathematics ideas and practices

- Graphic representation of their plant data (continued)
- Informal and formal measurement - plant growth
- Consistent measurement systems, methods and recording
- Tabulated recordings of plant growth

Learning intention:

- Students represent the life cycle of a flowering plant
- Students review and refine the effectiveness of their representations
-
- Students add plant data to their graphic representation (previous lesson)
  Ongoing (from previous lessons)
- Students identify parts of their flowering plant using scientific terminology correctly.
- Students diagrammatically represent their plant growth, and that of their groups.
- Students record, measure and tabulate their plant growth and other plants in their group pot.
- Students examine how plants grow at different rates and how we can represent the difference in growth

The lesson at a glance:

Students represent the life cycle of their flowering plant (as observed). They continue to measure and record their plant growth data to their calendar *adding measurements to their line graph*. They pollinate their flower and identify different parts of the flowers using scientific terminology (e.g. pollen, petals, stigma etc.). Students record changes in their plant i.e. number of flowers and seedpods and diagrammatically represent these changes in detailed drawings.

Equipment/Resources

Representation/Report Materials
(per group – approx. 3 students per group)
Cardboard sheet, felt pens, glue, craft paper, scissors

Equipment required for all lessons
Plants and plant system (from first lesson)
Class borlotti beans (or similar bean)

Students: student workbooks (unlined), felt pens, pencils, colours and rulers

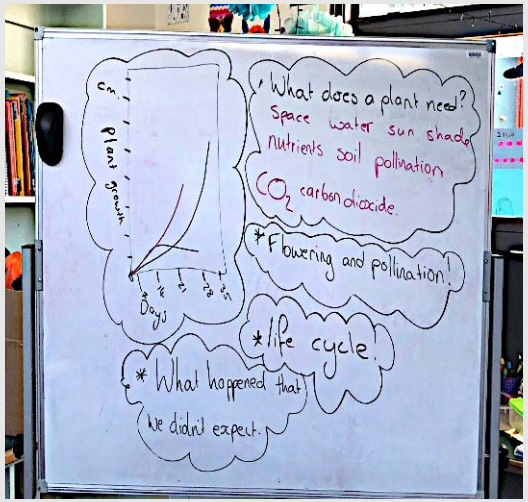
Teachers: Board (IWB/whiteboard), and or butchers' paper for shared recording and pens Plastic take-away containers

LESSON 7: Class sharing and communicating (+ post sequence assessment task)

(Approximate duration 90 minutes)

Learning focus	Pedagogical stage	Lesson Outline (NB: time allocations a guide only)	Monitoring and supporting learning
Science: Lifecycle, variation in growth rate **Mathematics:** Data representation Tables Line graphs	***Building consensus And applying conceptual understanding*** Students review the growth of their flowering plant and the class beans. They apply their understanding of plant needs, rate of growth, variation, stages of change and the life cycle of a flowering plant	**Whole class discussion: Fast Plant Review** *(5 minutes)* Look at the Fast Plants (will have seed pods now) and borlotti beans (or other) and review their growth, student observations and learning through questioning. ❖ What have you noticed? Has anything surprised you? Why? ❖ What have you learned about flowering plants?	Are students able to communicate the changes in their plant in terms of a stages of a life cycle, needs of plants, parts of plants, rate of. growth and/ or variation?

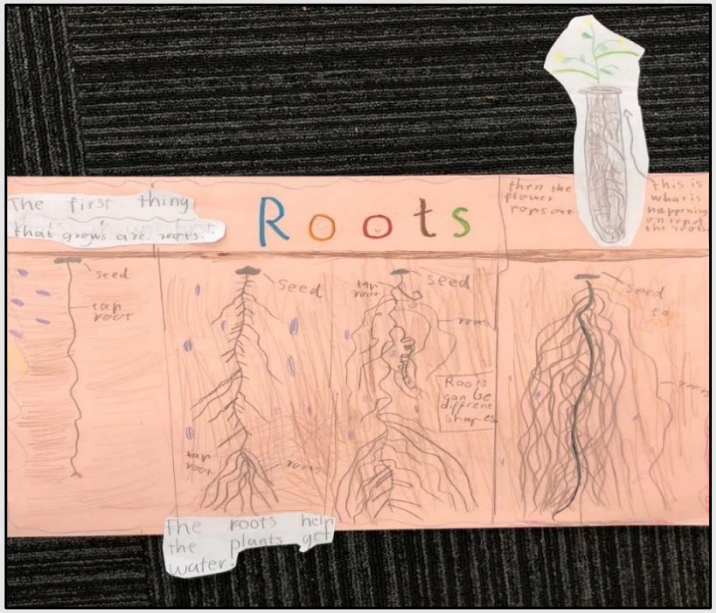
Example of class board response

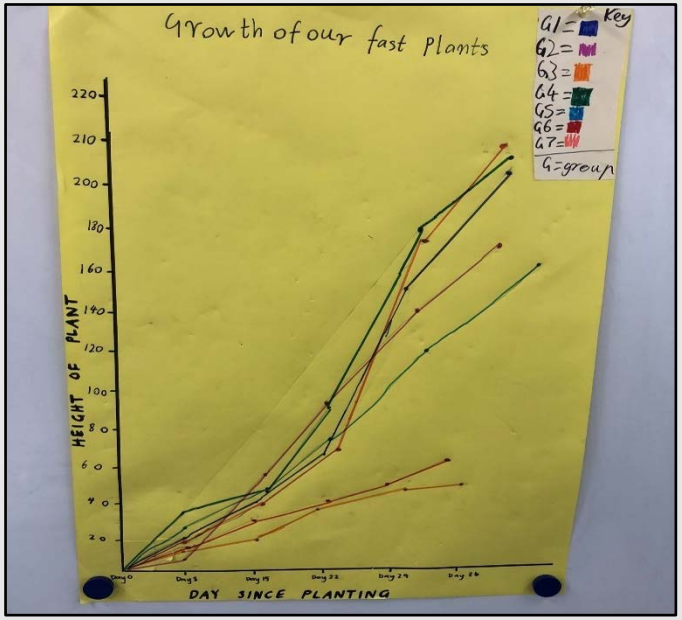


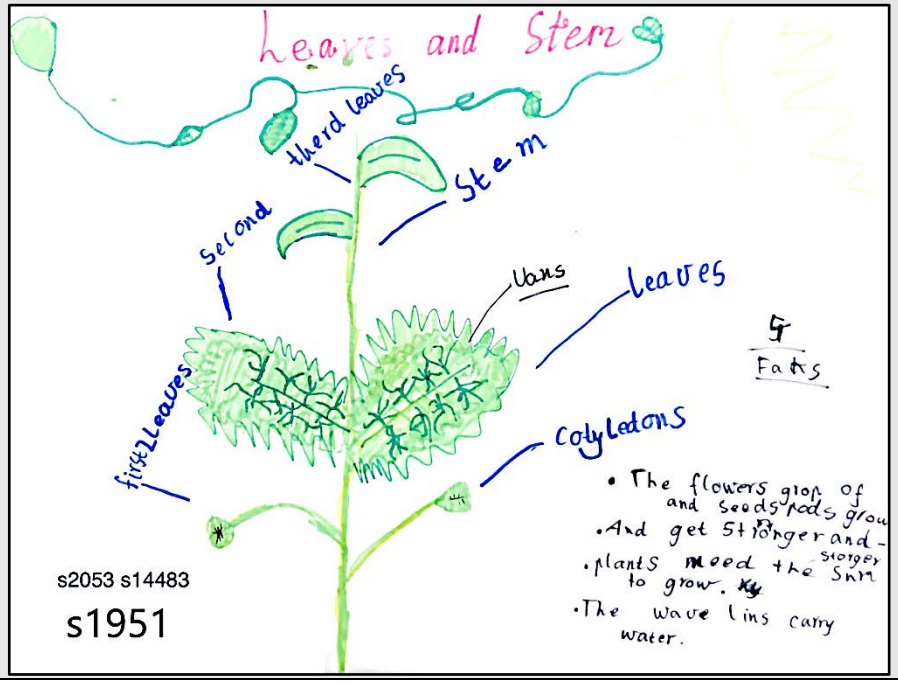
This board example included discussion around variation in plant growth (line graph plotted growth example) and reasons for variation (seed planted too deep, plant damaged, plant flowered early etc.)

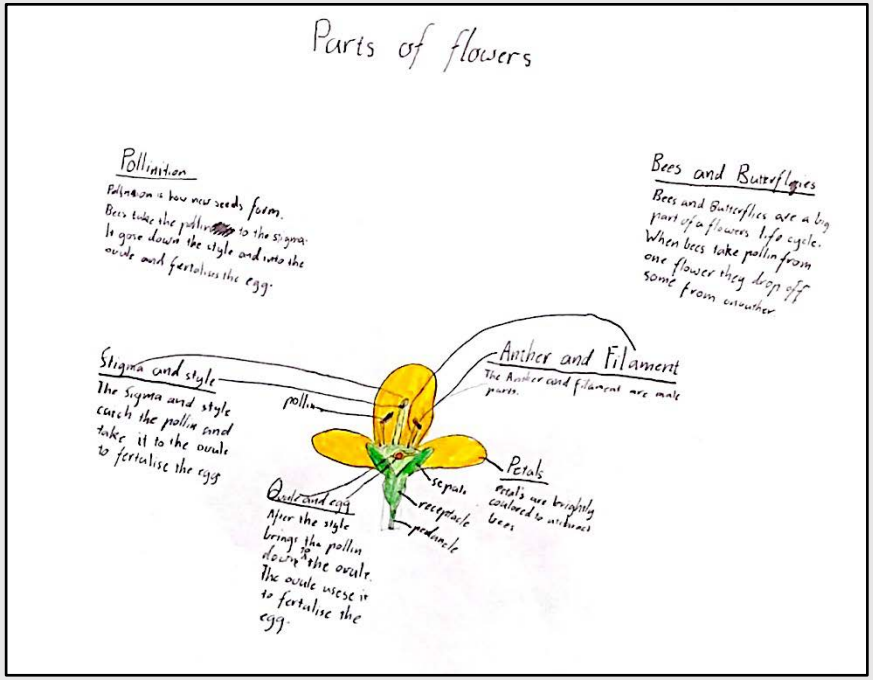
	Posing representational challenges and applying and extending conceptual understanding Students are challenged to represent and communicate their learning and conceptual understanding This activity extends the understandings and representational practices developed throughout the sequence	**Learning Review and Sharing Representations** *(40+ minutes)* **(small groups or individually***)* Divide students into groups (approx. 3 students) Groups of students represent their learning in a report/poster/model for sharing and communicating with the whole class. Possible group focus's • Flowering plant life cycle • Seeds and germination • Parts of a flower • How a plant grows (e.g. plant needs, our plant system) • Our Whole Class Plant Growth Data (line graph) NB: Mathematics extension group – students select one plant (tallest or 'average- typical or best representative plant' to plot on a whole class data line graph). Discuss with the students the choice must be consistent e.g. tallest in each plot or 'average – typical – best representative plant from each plot). Encourage students to consider what will make it clear? (different colours for each group plant and legend/key)	Student groups can be mixed ability, interest based or scaffolded. What is the range of learning, understanding and representational skills demonstrated in student responses? Do students represent their data, observations and focus concept with detail and/or accuracy? Are students able to communicate effectively with diagrammatic representations etc. their focus science concept?

Communicating Examples of group reports







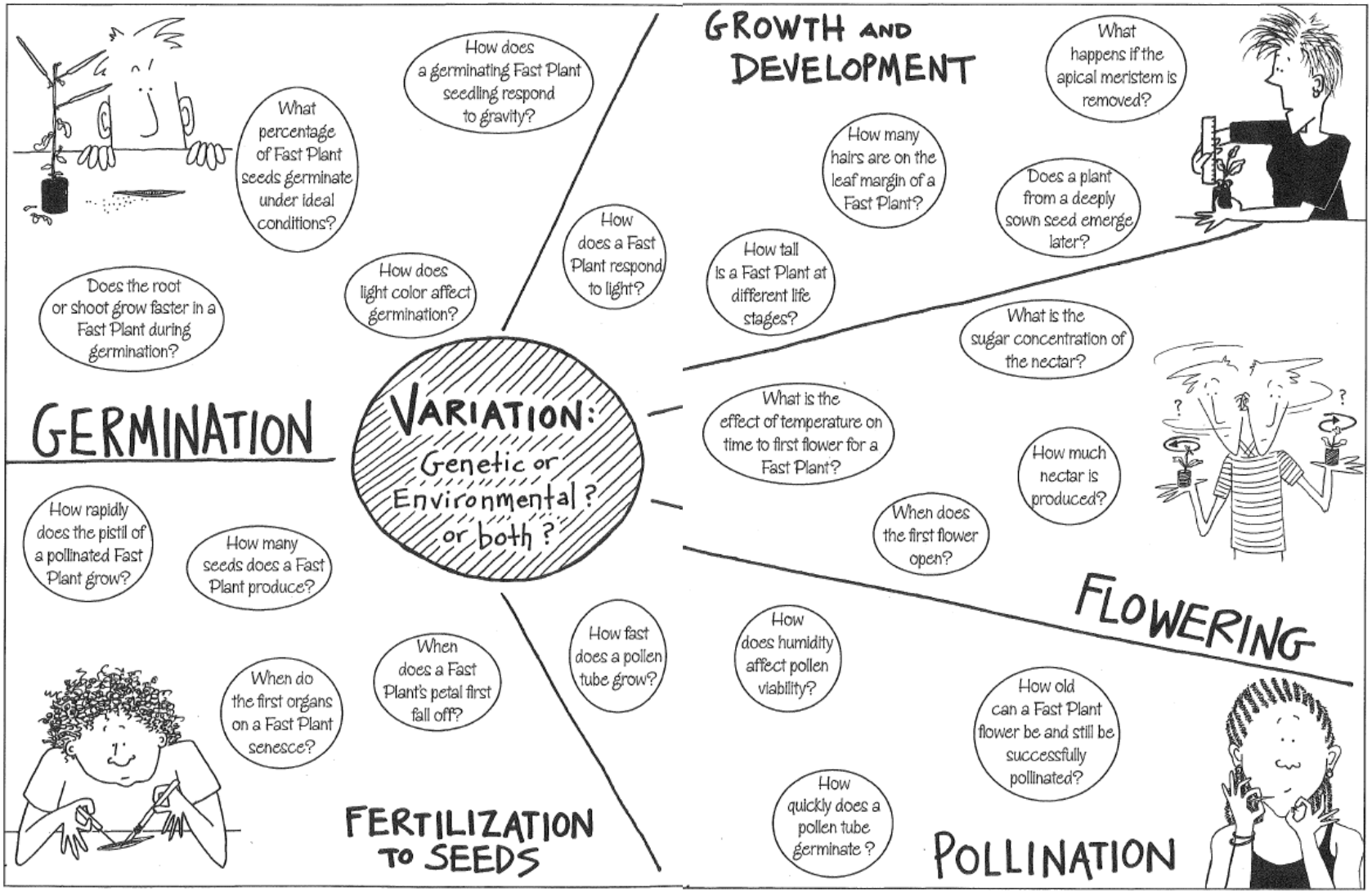


	Applying conceptual understanding Students communicate their learning and conceptual understanding, making connections to their observations and recordings of their flowering plant	**Student Presentations** *(30 minutes)* Students present their posters /models/displays to the class Teacher Notes: This could possibly also be presented to other classes, family and friends as part of an end of sequence, work showcase.	Are students able to confidently articulate scientific concepts learned through the sequence (e.g. plant structures, germination, life cycle)? Do students make inferences about and/or draw from their own flowering plant data and/or observations?
	Applying conceptual understanding Students complete the post sequence assessment Teacher ascertains learning and understanding development	**Student Post Assessment Task** *(30 minutes)* Teacher read the questions and students review their pre-sequence responses. Students may respond in a different colour on the same handout, to modify/change their answers, or a new handout may be provided.	Collate evidence about student learning, understanding and representational skill development from the student responses.

Wisconsin Fast Plants

APPENDIX 1 - Teacher Notes: Growing Fast Plants

"Teaching With Fast Plants: learning science concepts through the engaging Fast plant life cycle". Second edition. Kendall Hunt Publishing Company. Wisconsin Fast Plant Program. Available from Southern Biological https://www.southernbiological.com/



Appendix 2 – Plant system set-up instructions and examples

Deli-container Growing System

The Deli-container Growing System is a stable growing system that is easy to construct for all age learners growing Wisconsin Fast Plants. Made from recycled deli-containers, these growing systems can be cleaned and reused for multiple years.

Materials

- one 8 oz plastic deli-container
- one 16 or 32 oz plastic deli-container
- wicking material (cotton or polyester macrame cord or thick string)
- planting medium (a soilless seed starter mixture)
- fertilizer: solid pellets (Osmocote™)—added during planting
- Wisconsin Fast Plants seeds
- water

Step 1 – Poke a hole with scissors in the bottom of the smaller, 8 oz deli-container. Cut 12–14 centimeters of wick.

Step 2 – Wet the wick thoroughly with water. Push 1–2 centimeters of one end of the wick into the hole in the bottom of the smaller container.

Step 3 – Pour 1/4 cup of soil into the smaller container.

Step 4 – Spread around 18 pellets of fertilizer on top of the soil.

Step 5 – Add 1/2–3/4 cup of soil on top of the fertilizer pellets.

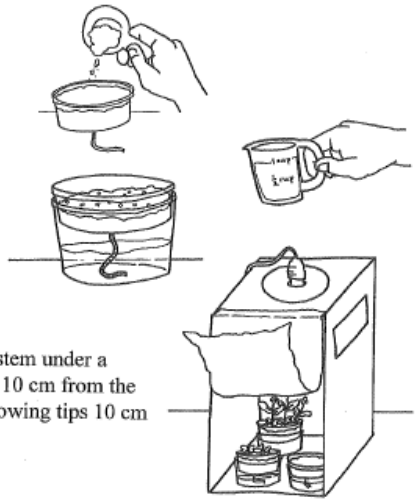
Step 6 – Sprinkle water over the top of the soil until you can see the water dripping from the wick underneath the cup.

Step 7 – Carefully place 10 Fast Plant seeds in a circle pattern on top of the soil.

Step 8 – Lightly cover the seeds with 1/4 cup of soil.

Step 9 – Pour 1 cup of water into the larger container.

Step 10 – Set the smaller container into the larger container with the ends of the wick floating in the water. Lightly sprinkle water over the top of the soil covering your seeds.



Growing Your Plants

The last step is to place your Deli-container Growing System under a fluorescent light with the soil mix surface approximately 10 cm from the light bulb. Adjust as the plants grow to also keep their growing tips 10 cm from the light bulb.

NOTE: As your plants grow, you may begin to see algae growing in the water reservoir. Two solutions to this that we recommend:

1. Cut a piece of black plastic trash bag into strips the width of the height of your water reservoir, and tape the plastic around the reservoir to prevent light from getting to the water.
2. Rinse and clean out the water reservoirs approximately once a week to prevent a build up of the algae.

Planting System Examples: Details and guidelines

Example of Light rack system
Materials:
Two milk crates turned sideways
One light (fluro light– ideally a fish tank light) taped to the top of the crates. A piece of timber can be used to help stability.
Gaffa tape
Foil (over the sides and as a cover to keep the light and heat in and keep the plants protected.
Disposable foil baking tray *(see image 2)*
Egg carton crate – for extra seeds – these can be used to see the roots and press at different stages of growth and/or to supplement any students seeds that don't germinate *(see image 3)*

Image 2: Example of whole class seeds set up
NB: A disposable foil baking tray provides an ideal organization system

Image 3: Example of wick (rope) in container
Materials:
Plastic take-away container
Scissors/stanley knife
(pre-lesson -teacher to make hole in the bottom to insert wick)
Wick – Rope/fabric strip

NB: Make sure the hole is made in the bottom and wick inserted before adding soil.

NB: This class has used tape and student initials to identify individual student seeds

Appendix 3 -Growth Calendar (Lesson 2 onwards)

PLANT GROWTH CALENDAR (Recordings, Observations & Maintenance)

DAYS SINCE PLANTING	**DATE**	**PLANT HEIGHT**				**NUMBER OF LEAVES**				**OBSERVATIONS** (what we see & changes)	**MAINTENANCE** (what we did or was done)
		MY PLANT	*	*	SPARE	My Plant	*	*	SPARE		
1 – Seed planting		0	0	0	0	0	0	0	0		

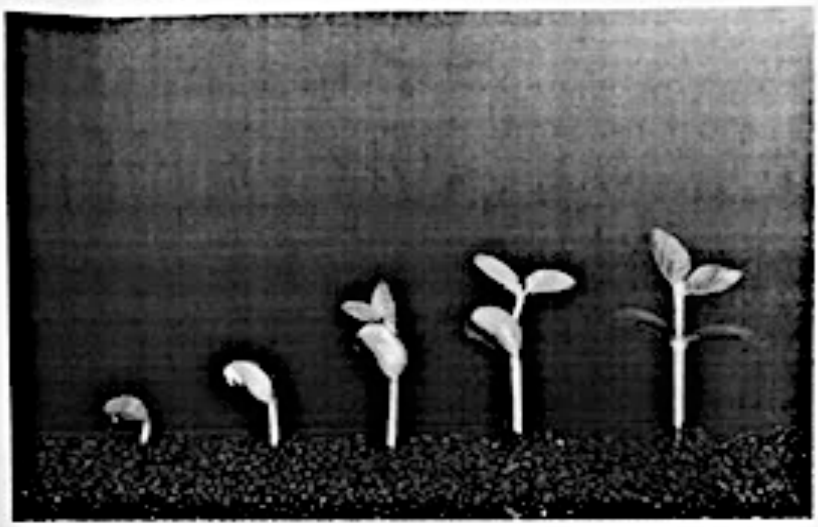
APPENDIX 4 – Pre-Post Test

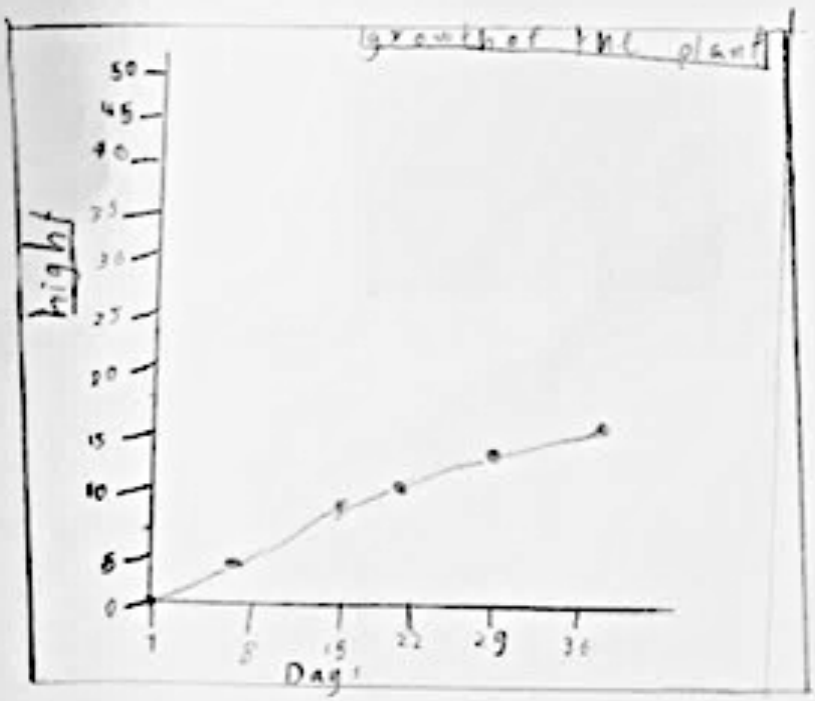
APPENDIX 4 – Pre-Post test

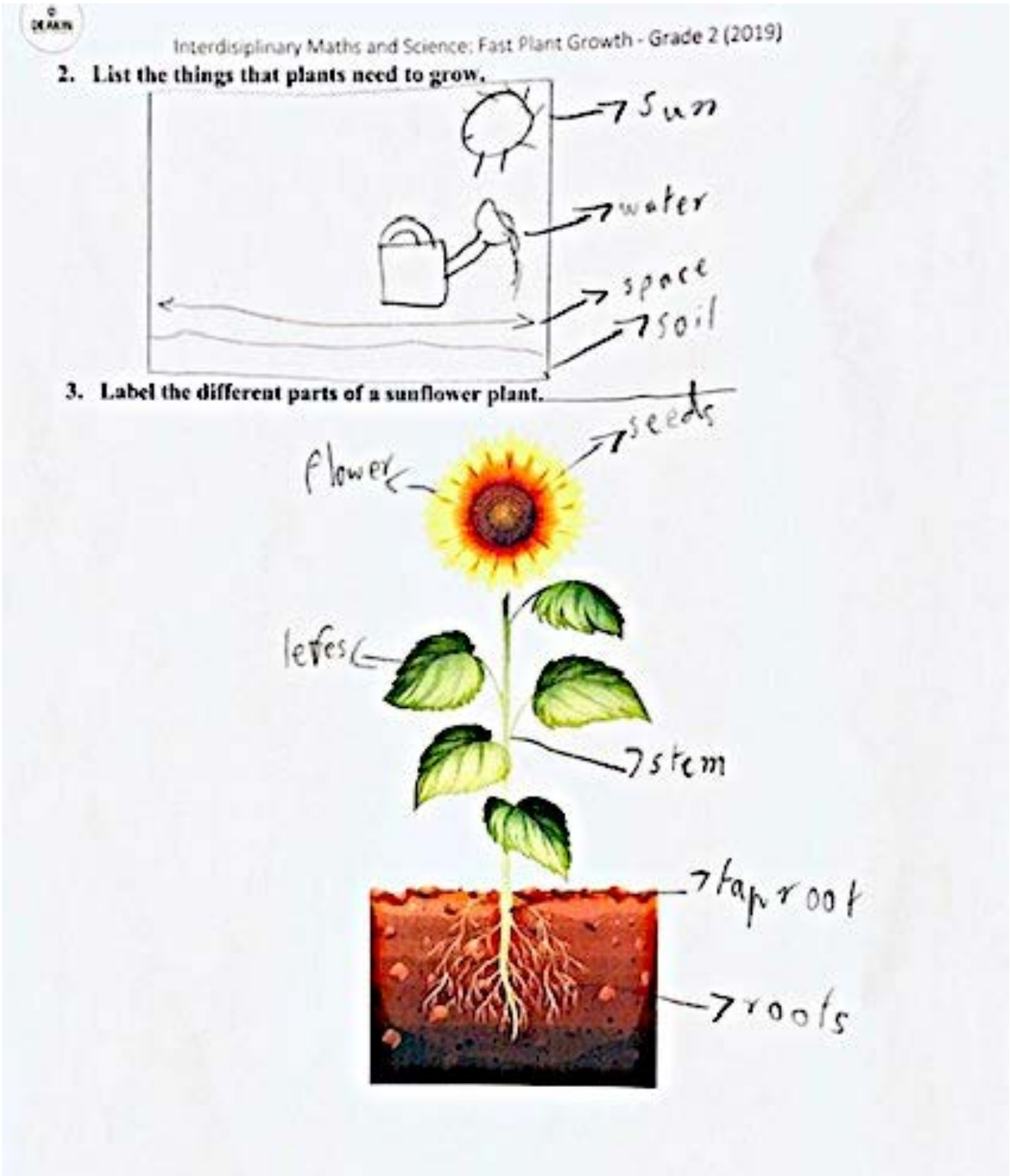
FAST PLANT GROWTH

1. Below is a photo showing the growth of a plant over time.

Imagine that this is the same plant (photos taken as it grows).
Take some measurements and represent how fast this plant grows over time.






Interdisiplinary Maths and Science: Fast Plant Growth - Grade 2 (2019)
2. List the things that plants need to grow.
Sun
water
space
soil
3. Label the different parts of a sunflower plant.
seeds
Flower
leves
stem
taproot
roots

Interdisciplinary Maths and Science: Fast Plant Growth - Grade 2 (2019)

4. Put these words in the sentences below.

Roots	Stem	Leaves	Seed	Flower

a) The ..leaves..make the food for the plant.

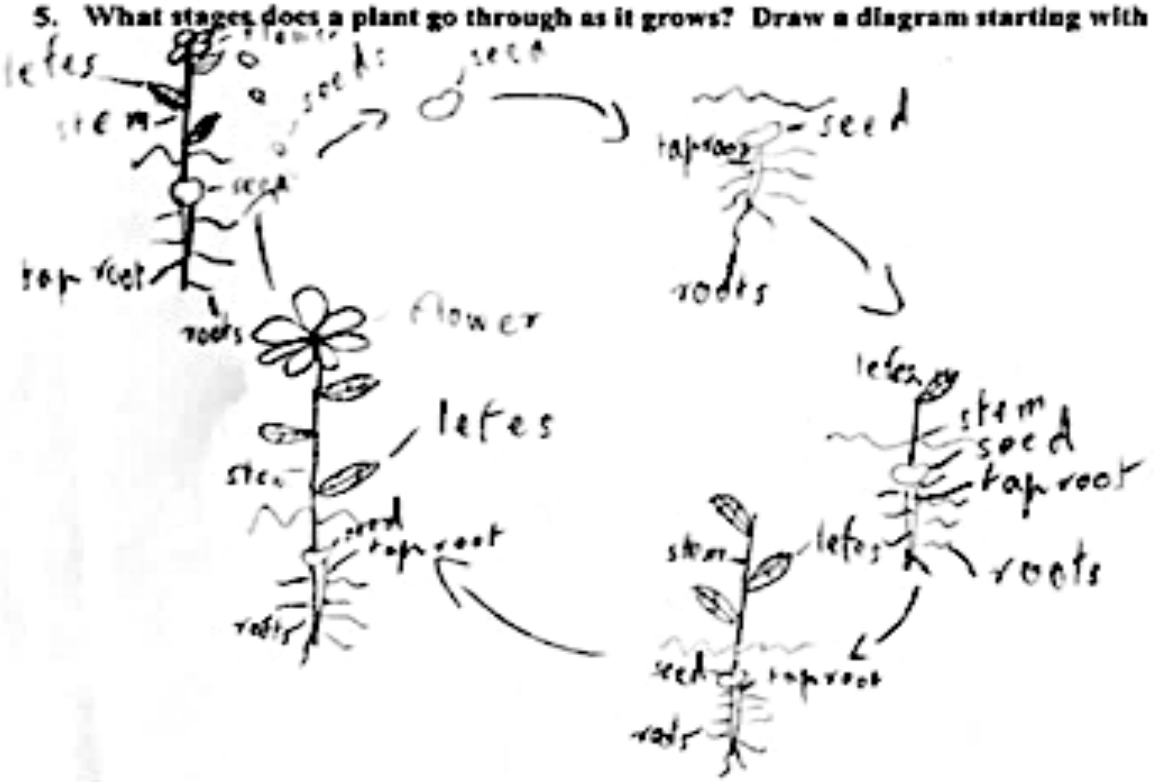
b) The part of the plant that acts like a straw to carry water from the roots to the leaves is the ..stem..

c) The ..flower..makes the seeds and the fruit.

d) All plants start as a ..seed..

e) The..soil..absorbs water from the soil and help hold the plant in the soil.

5. What stages does a plant go through as it grows? Draw a diagram starting with a seed.



APPENDIX 4 – Master Pre/Post assessment task

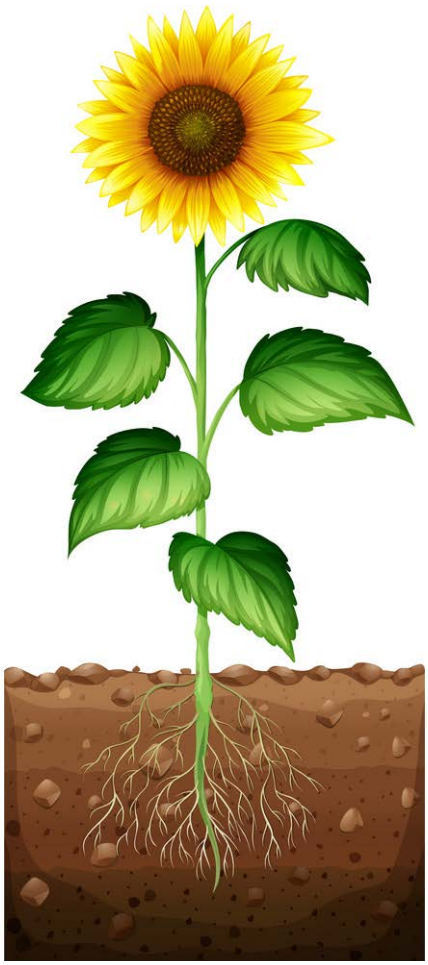
FAST PLANT GROWTH

1. Below is a photo showing the growth of a plant over time.

Imagine that this is the same plant (photos taken as it grows).
Take some measurements and represent how fast this plant grows over time.

2. **List the things that plants need to grow.**

3. **Label the different parts of a sunflower plant.**



4. Put these words in the sentences below.

Roots	Stem	Leaves	Seed	Flower

a) The ……make the food for the plant.

b) The part of the plant that acts like a straw to carry water from the roots to the leaves is the

…….

c) The ……makes the seeds and the fruit.

d) All plants start as a ……..

e) The…….absorbs water from the soil and help hold the plant in the

soil.

5. What stages does a plant go through as it grows? Draw a diagram starting with a seed.