

USING MAKEBLOCK NEURONS TO COLLECT DATA ABOUT WHAT PLANTS NEED (GRADE 3)

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Technology Focus: Microcontrollers, Digital Sensors, Coding Apps, Spreadsheets

Description: The students will learn about the needs of plants by using a data collection tool (Makeblock Neurons). This tool will allow students to measure the temperature and humidity around a plant as well as its soil moisture level. This data will be graphed using a spreadsheet application to determine when the plant would need more water.

Level: Primary / Junior

Audience: Grade 3

Tool Highlights: Makeblock Neurons, Computers (Tablet, Laptop or Desktop) and supporting Apps

Big Idea: Plants have distinct characteristics and needs that technology can be used to identify as well as measure.

Ministry Expectations: Understanding Life Systems Growth and Changes in Plants

Overall expectations: STSE expectations, specific expectations)

2. investigate similarities and differences in the characteristics of various plants, and ways in which the characteristics of plants relate to the environment in which they grow;
3. demonstrate an understanding that plants grow and change and have distinct characteristics.

Specific:

- 2.1 follow established safety procedures during science and technology investigations (e.g., avoid touching eyes when handling plants; never taste any part of a plant unless instructed to do so by the teacher)
- 2.3 germinate seeds and record similarities and differences as seedlings develop (e.g., plant quick-growing seeds – nasturtium, morning glory, sunflower, tomato, beet, or radish seeds – in peat pellets to observe growth)
- 2.6 use appropriate science and technology vocabulary, including stem, leaf, root, pistil, stamen, flower, adaptation, and germination, in oral and written communication

2.7 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., make illustrated entries in a personal science journal to describe plant characteristics and adaptations to harsh environments)

3.1 describe the basic needs of plants, including air, water, light, warmth, and space

3.4 describe how most plants get energy to live directly from the sun (e.g., plants turn the energy from the sun into food for themselves) and how plants help other living things to get energy from the sun (e.g., Other living things, which cannot “eat” sunshine, eat the plants to get the energy. They also get energy when they eat the animals that eat the plants.)

Prior Skill Sets

- Know how to collect data by taking pictures, notes and drawings
- Have used a device for simple coding
- Ability to put data into table or a spreadsheet

Materials and Equipment

- Note taking sheet for outdoor and indoor observations.
- Chart to collect daily data from data collections device
- Makeblock Neuron Inventors Kit, Neuron Moisture and Temperature Sensors or Makeblock Neuron Creative Lab Kit <https://www.makeblock.com/steam-kits/neuron> (<https://www.makeblock.com/steam-kits/neuron>)
- Tablet, Laptop or Desktop computer with Neuron App or Makeblock software installed (note: computers require bluetooth to connect with Neuron) <https://www.makeblock.com/steam-kits/neuron/software> (<https://www.makeblock.com/steam-kits/neuron/software>)
- Computer with Spreadsheet application (Excel or Google Sheets)
- 3 or 4 house plants to be used for the in class data collection
- Measuring Cup for water

Lesson 1: What plants need (40-60 minutes)

- Brainstorm with students to identify what things they think a plant needs to survive. They should identify things like sun, soil and water
- Ask students "why does a plant need sun? Do all plants need the same amount of sun? How do you know?. Then give them the note taking sheet to collect data about types of sunlight: Full , (grass or trees in the middle of field) Partial (plants near a fence or side of building, Full Shade (underneath a tree or blocked from 2 sides) and No-Light (underneath a play structure) See Appendix 1 and 2
- To best understand what plants need to survive students should see them in an outdoor environment. Take students outside
- Have students find those 4 locations and take note of what plants are there and about the other things they identified as being required to grow.
- Bring students back to class and have a knowledge building circle about what they discovered or noticed. Record the students ideas on the class anchor chart.

Lesson 2: (40 minutes)

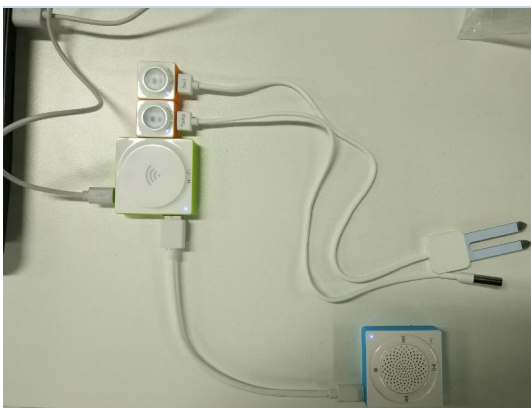
- Review with the students their finding from going outside
- Point out the importance of the sun, water and soil.
- Ask the questions “How might the weather outside affect the plants growth?” “How could we grow plants inside” and “What could we do to create the best conditions for plants to grow inside”
- Note the answers to these questions on chart paper. Make sure to point out the need to control the amount of light, temperature and moisture (water).
- Explain to the class they will be doing some experiments over the next few weeks on some store bought houseplants to reproduce the conditions they noticed outside.
- To help measure the temperature and moisture for each plant they will be building and programming a tool to do this.
- Show the students the Makeblock Neurons or promotional Video <https://youtu.be/owLF-iBwJ20> (<https://youtu.be/owLF-iBwJ20>)

Lesson 3: (20 whole class)

- Review with students that we will be trying to recreate the conditions they found outside for plants in the classroom.
- Identify 4 areas in room and list them (Full Sun, Partial, Full Shade and No light
- Introduce students to the 4 plants and number them or name them
- Show students their note taking sheet for individual data collection (appendix 4)
- Make an anchor chart with the students of the information that will need to be collected
- (Date, Time, Temperature and Soil Moisture)
- Remind the class that all the students will have a chance to assemble the measurement tool and program it

Lesson 4 (40- 60 minutes per group)

Note: As you are likely to have only 1 kit per classroom this lesson should be for small groups of 2 to 3 students. Each group will have chance to put the sensors together, programming and take some initial readings on all 4 plants



- Give the group of students the Neuron kit and allow them to explore it for 10-15 minutes to see what they can do
- Have them share what they did with you as well as shoot a video or take photos to document what they created
- Give them the task or provide the instructions to connect the Neurons so they can measure both temperature and moisture

- Then show them the programming App and give them the sample code to program it. See Appendix 3 (Note: the blocks are preprogrammed so this step can be skipped)
- The group will then go and test the sensor on all 4 plants and note what they find.
- Repeat the task for all groups

Lesson 5 (40 minutes)

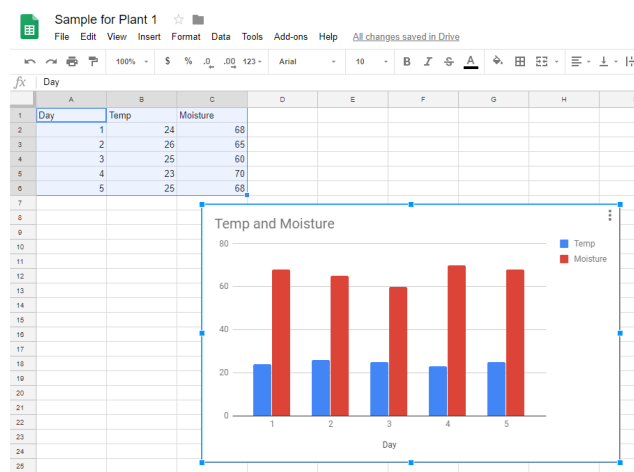
- Explain to the class they need to check on the plants every day, take measurements and keep accurate notes about what they found and what they did.
- Have a discuss with the class about watering the plants.
- Introduce the the measuring cup and how to use it
- Water the plants as a class by adding a set amount of water (depending on plant chosen)
- Take measurements as a class of the moisture and temperature values an place on class data chart
- Then place plants in 4 chosen locations

Lesson 5 (10 -20 per group per day for 2 or more weeks)

- Divide class into 4 or 5 groups.
- Each group will a chance to visit the plants and collect data using the Neuron tool they built.
- One group each day will have the added responsibility of watering the plants if needed and noting that on the chart (amount of water given to each plant)
- One group will note on the class chart their measurement for the day
- One group will be responsible for making sure the Neuron is working, been charged and put away safely when not in use
- One group will take a photo of each plant

Lesson 6

- After collecting data for 2 week bring the class together to look at the data
- Ask them what the students noticed
- Show them how you can take the data the you collected and put into a spreadsheet



- Have students put their data for each plant in a spreadsheet.
- Then create a bar graph for each plant.

- Either print each graph out or copy and paste them into another document

Lesson 7 (40 minutes)

- Ask the students after looking at their graphs what conclusions they draw about the needs of plants to survive and what humans can do to help with that.
- Review with them the Ladder of Inference (Appendix 6) so they can work through their ideas to a conclusion.
- Have students write their conclusions and share them with their groups

Assessment strategy

For Learning: Ask the students what things they think a plant needs to survive in Lesson 1

As Learning: During the activities use Observation Sheet or Blank Rubric Strip to note what questions the students are asking and what observations or conclusions they drawing as they work with the plants and Neurons

Of learning: Use the Rubric Strip 1 and 2 (Appendix 7 & 8) and anecdotal notes to determine the students Transfer and Processing Skills and Strategies

NEXT STEPS/EXTENSIONS/ACCOMMODATIONS/OTHER TOPICS FOR THIS TECH TOOL:

With all the information that was collected in the students notes, tables graphs and photos each student could be asked to create a multimedia presentation to document their journey

The students now have a baseline of data for when a plant needs water. This information could be used to create other devices with Neurons to alert you when the plant needs water.

It is also possible with the addition of either servos or a water pump to create a self watering system.

ADDITIONAL RESOURCES:

Ordering information for the 2 additional sensors:

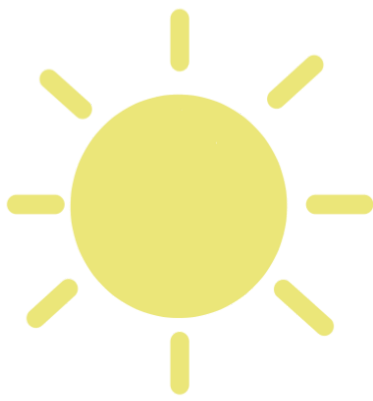
The basic kit can be ordered from many Canadian based vendors. The Moisture sensor can be bought here:

<https://store.makeblock.com/Soil%20Moisture%20Sensor%20Block>
(<https://store.makeblock.com/Soil%20Moisture%20Sensor%20Block>)

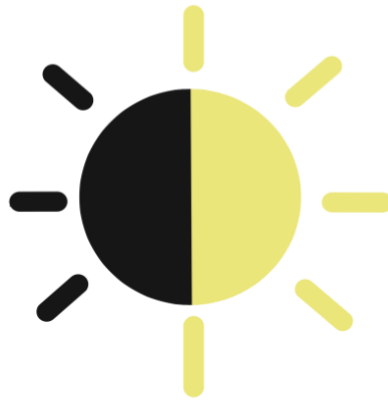
The temperature sensor can be found here:

<https://store.makeblock.com/Temperature%20Sensor%20Block>
(<https://store.makeblock.com/Temperature%20Sensor%20Block>)

Appendix 1



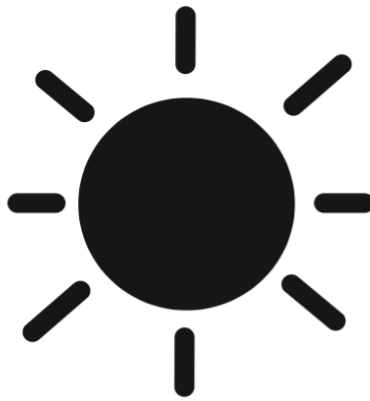
Full Sun



Partial Sun



Full Shade







No Light

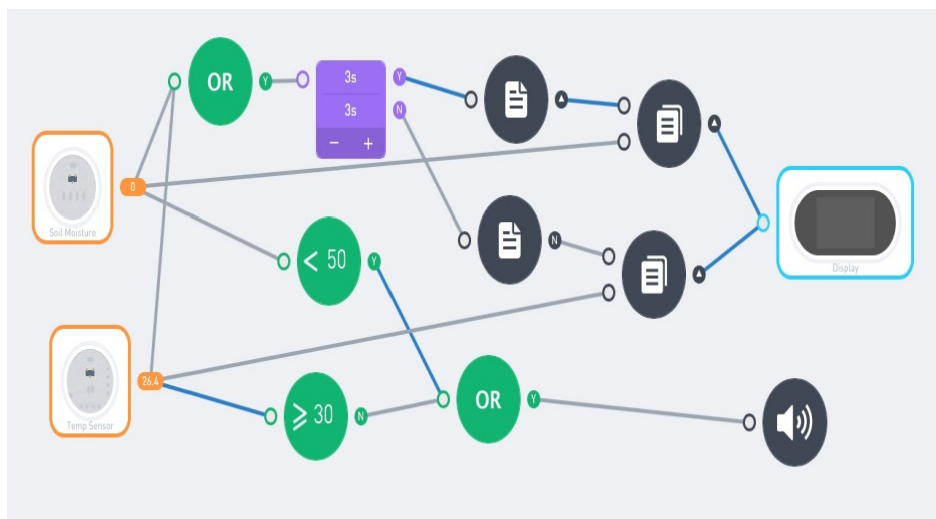
Appendix 2

Names:

Date:

<div><div>Full Sun</div></div> <div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div>Partial Sun</div></div> <div><div></div><div></div><div></div><div></div><div></div><div></div></div>
<div><div>Full Shade</div></div> <div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div>No Sun</div></div> <div><div></div><div></div><div></div><div></div><div></div><div></div></div>

Appendix 3







Appendix 4

Data Collection

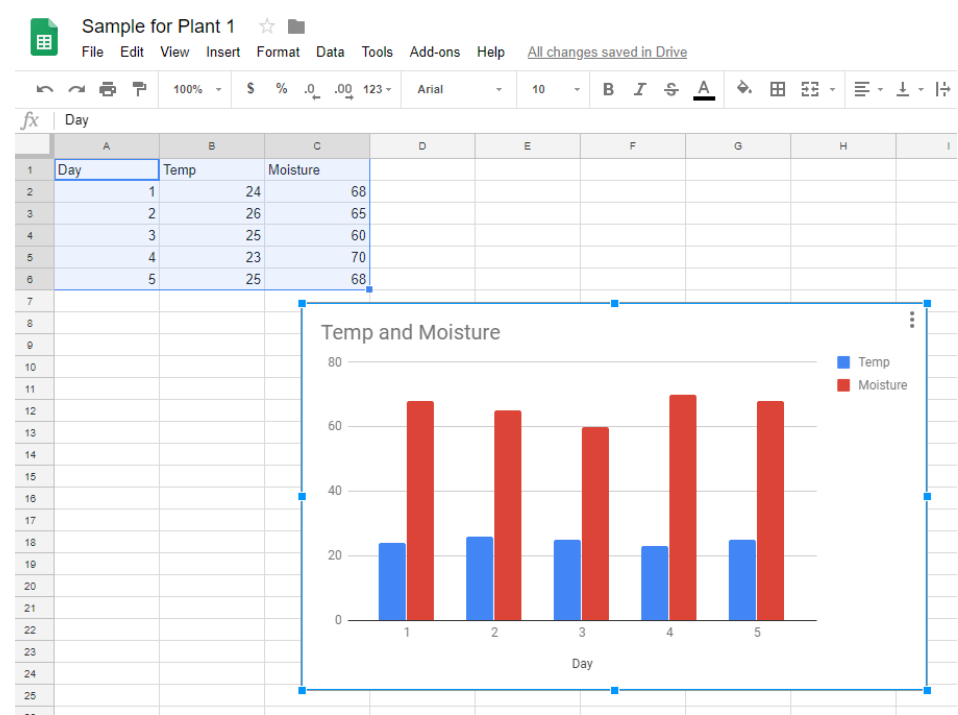
Name:

Group:

Week:

Date & Time	Plant 1 	Plant 2 	Plant 3 	Plant 4 
	Temp: Moisture:			

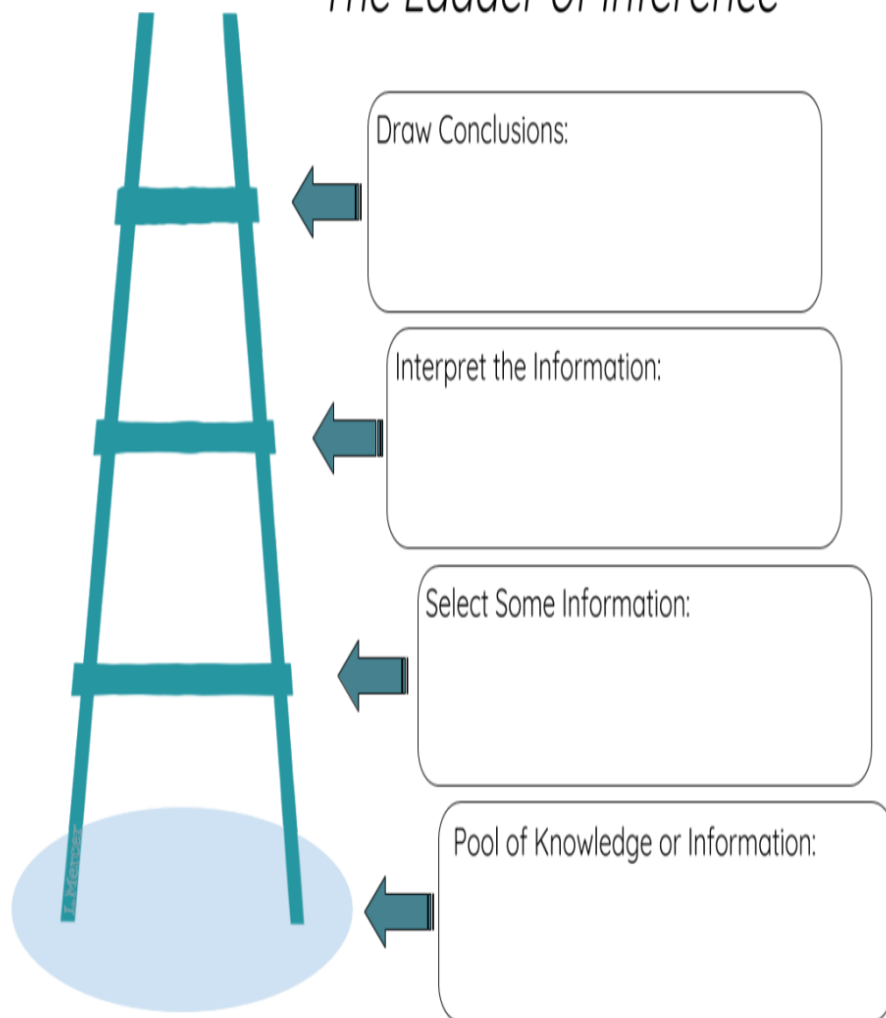
Appendix 5



Appendix 6

Name:

Date:

Plant Experiment Conclusions*“The Ladder of Inference”***Appendix 7**

Term:		Observation Page		Lesson #	
Use of processing skills and strategies (e.g.,performing and recording,gathering evidence and data,observing, manipulating materials and using equipment safely, solving equations,proving)					
1		2		3	
uses processing skills and strategies with limited effectiveness		uses processing skills and strategies with some effectiveness		uses processing skills and strategies with considerable effectiveness	
uses processing skills and strategies with a high degree of effectiveness					

Appendix 8

Term: Observation Page Lesson #

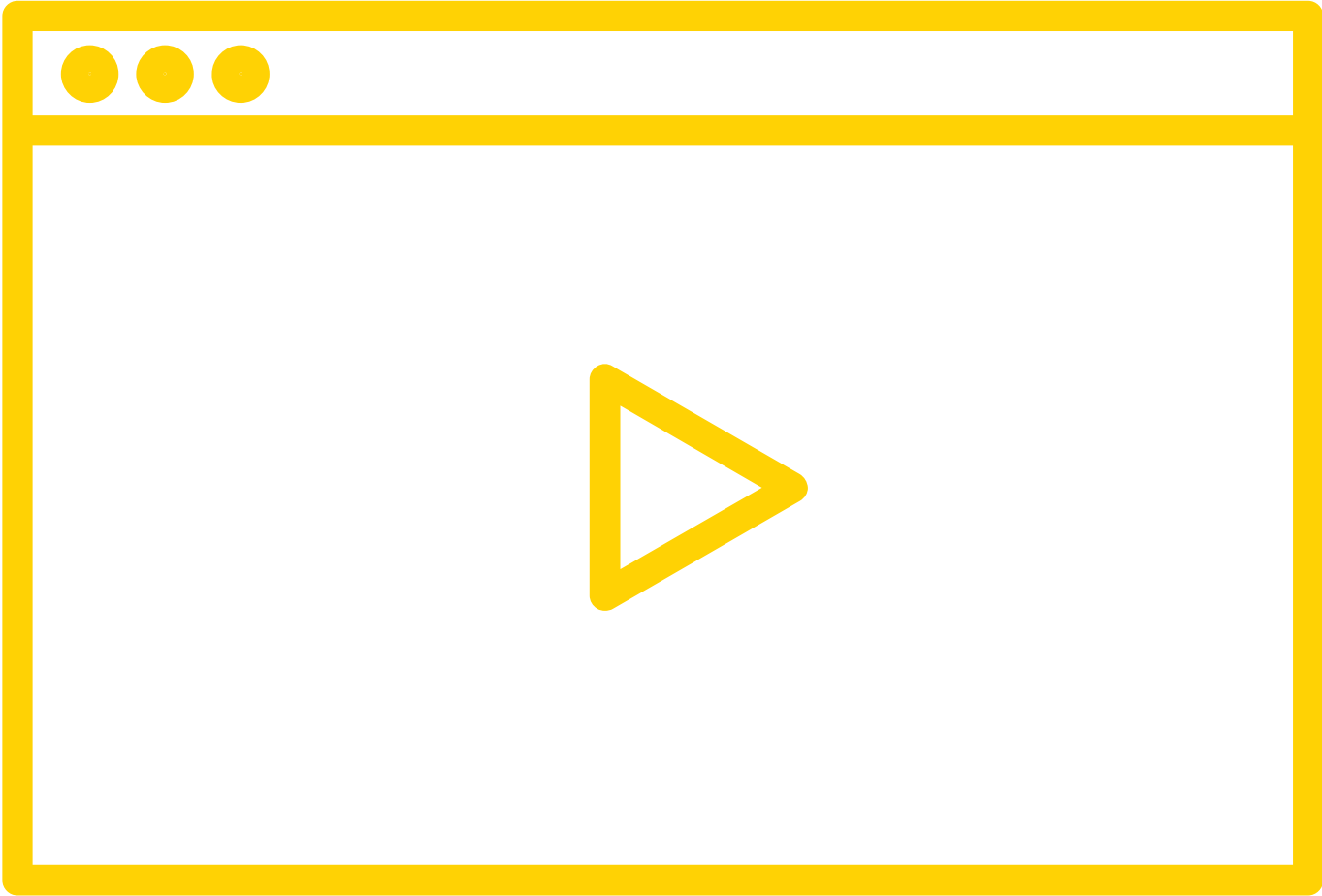
Transfer of knowledge and skills (e.g., concepts and processes, safe use of equipment and technology, investigation skills) to unfamiliar contexts			
1	2	3	4
transfers knowledge and skills to unfamiliar contexts with limited effectiveness	transfers knowledge and skills to unfamiliar contexts with some effectiveness	transfers knowledge and skills to unfamiliar contexts with considerable effectiveness	transfers knowledge and skills to unfamiliar contexts with a high degree of effectiveness



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WATCH THE VIDEO

01:53 min

(//www.youtube.com/embed/gVqbUTGSKx0?width=800&height=450&iframe=true)

RESOURCES

-  Appendix 1 Types of Light (https://connex.stao.ca/sites/default/files/appendix_1_types_of_light.png?width=960px&height=1056px&iframe=true)
-  Appendix 2 Plant Survey (https://connex.stao.ca/sites/default/files/appendix_2_plant_survey.png?width=816px&height=1056px&iframe=true)
-  Appendix 3 Sample Code (<https://connex.stao.ca/sites/default/files/catchfb78.jpg?width=1293px&height=512px&iframe=true>)
-  Appendix 4 Data Collection Chart (https://connex.stao.ca/sites/default/files/data_chart_1.png?width=960px&height=1056px&iframe=true)
-  Appendix 5 Sample Spreadsheet with Graph (https://connex.stao.ca/sites/default/files/sample_for_plant_1_-_sheet1_0.pdf)
-  Appendix 6 Plant Experiment Conclusion (https://connex.stao.ca/sites/default/files/plant_experiment_conclusions_1.pdf)
-  Appendix 7 Observation Rubric Process Skills (https://connex.stao.ca/sites/default/files/appendix_7_observations_rubric_strip_1.png?width=816px&height=1056px&iframe=true)
-  Appendix 8 Observation Rubric Transfer or Knowledge (https://connex.stao.ca/sites/default/files/appendix_8_observations_rubric_strip_2.png?width=816px&height=1056px&iframe=true)


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