



Plant Growth and Changes: An Inquiry Unit for Grade 3 Science

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**Teaching Materials
from the
Stewart Resources Centre**



Table of Contents

Unit Overview	4
• Essential Understandings	4
• Essential Questions	4
• Outcomes and Indicators	4
Assessment Evidence	6
• Performance Task	6
• Criteria	6
• Other Assessments	6
Learning Activities	7
• Lesson 1	7
• Lesson 2	8
• Lesson 3	9
• Lesson 4	10
• Lesson 5	11
• Lesson 6	12
• Lesson 7	13
• Lesson 8	13
Final Assessment	14
Resources	15
• Resources Used for This Unit	15
• Recommended Videos Available on R.O.V.E.R.	16
• Database	16
Appendix A	17

UNIT OVERVIEW

This unit covers one of two outcomes in the life science area and would take approximately one month to complete. As it addresses plant growth and a lesson in the unit involves an outdoor trip, it would be most appropriate to teach this unit in the spring. This unit has an inquiry focus.

Essential Understandings

- Plants need specific elements so they can grow and develop.
- Plants have similar structures, but are very diverse.
- Plants, like humans, have a life cycle.

Essential Questions

- a. What should you do to look after a plant?
- b. How does a rose differ from a tree?
- c. Do plants need the same kinds of food as humans?

Outcomes and Indicators*

Outcome PL3.1 - Investigate the growth and development of plants, including the conditions necessary for germination. [CP, SI]

Students will be able to:

- a. **Pose** questions related to plant growth. (Creating)
- b. **Observe and explain** the function of the major structures (i.e., root, stem, flower, leaf, and fruit or seed) of a variety of plants. (Understanding)
- d. **Sort and classify** plants and/or seeds according to one or more student-selected attributes. (Applying)
- e. **Observe and represent**, using written language, pictures, and charts, changes that occur through the life cycle of a flowering plant. (Understanding)
- f. **Compare** the basic needs of plants to the basic needs of animals and humans. (Analyzing)
- g. **Research** ways in which plants rely on animals and abiotic factors (e.g., gravity, wind, and water) to support plant reproduction by dispersing seeds. (Understanding/Analyzing)
- h. **Predict and investigate** conditions such as the temperature, available sunlight, available nutrients in soil, and available water, which are necessary for plant germination and growth. (Analyzing)

- i. **Care** for a flowering plant throughout its life cycle, tracking its growth and changes. (Understanding)
- j. **Estimate, record, and display** relevant measurements of plant growth, using rulers, tables, and bar graphs. (Creating and Understanding)
- l. **Explain** the importance of water and light for plant growth and the mechanisms by which plants obtain water and light from the environment. (Understanding)

*All outcomes and indicators throughout this document are excerpted from the Saskatchewan Ministry of Education's *Science 3* curricula.



ASSESSMENT EVIDENCE

Performance Task (summative)

Your school has decided to build a garden and you have been asked to give some advice to those who will be planning this garden. What is necessary for the growth and development of plants? You can write your answer in a paragraph, create a timeline or chart, or use pictures to illustrate your answer. (Please see Appendix A with the assessment rubric.)

Criteria

- Understands and explains the basic needs of plants (Understanding)
- Can differentiate between the elements needed for reproduction (Analyzing)
- Identifies and explains the conditions needed for healthy plant growth including water and light (Analyzing)

Other Assessments

- KWL chart (formative)
 - An example of a KWL chart can be found at:
<http://www.readwritethink.org/files/resources/printouts/KWL%20Chart.pdf>
- Sort and classify observation (formative)
- Predictions (formative)
- Observations of new learning (formative)
- Labelled diagram (formative)
- Completed growth chart/bar graph of plant growth (formative)
- Care of own plant (formative)
- Explanations of functions of major structures (formative/summative)
- Presentations on inquiry questions (formative)
- Venn diagram (formative/summative)
 - An interactive version of a Venn diagram for students can be found at:
<http://www.readwritethink.org/classroom-resources/student-interactives/venn-diagram-30973.html>
- Journals (formative)



LEARNING ACTIVITIES

Lesson 1

Indicators

PL3.1i - Care for a flowering plant throughout its life cycle, tracking its growth and changes.

PL3.1e - Observe and represent, using written language, pictures, and charts, changes that occur through the life cycle of a flowering plant.

PL3.1a - Pose questions related to plant growth.

PL3.1f - Compare the basic needs of plants to the basic needs of animals and humans.

- Bring some seeds for a flowering plant into the classroom and small pots filled with soil. Ask students to each plant a few seeds into a pot and to write their names on their pots. Let them know that their job is to take care of these plants as they grow.
- Let students know they will be watching their plants grow and drawing the changes that they notice. Provide regular time for this task.
- Create a KWL chart and ask students what they already know about how plants grow and what contributes to the growth of plants. Also ask what they would like to know and chart these ideas.
- Ask students what *they* need in order to be able to grow and list these separately. See if students need to add anything to their KWL chart based on this discussion.
- Let students know that they will be learning about how plants grow and will be comparing what plants need to what they need to grow.
- Let students know how they will be assessed and share the assessment rubric.

Assessment (formative)

Note and record what students know and don't know for future lessons and adjust teaching accordingly.



Lesson 2

Indicator

PL3.1d - Sort and classify plants and/or seeds according to one or more student-selected attributes.

- Divide students into small groups of three or four.
- Model a sort-and-classify activity using pictures or objects using the think-aloud process.
- Ask students to summarize what you did first, second, etc.
- Provide students with numerous pictures of a variety of plants and flowers (Print photos from the Internet).
- Ask students to sort and classify these using the same process as used earlier. (Students should not be given categories in advance.)
- Ask each group to share with the class how they sorted and classified their pictures. After each group presents, the teacher summarizes by stating the categories each group used.
- After all have shared, ask students what reasons they think people might have for wanting to classify plants. Encourage them to think about other sorts of classifications and categories, such as types of cars, types of books, types of materials, etc.

Assessment (formative)

Observe the extent to which students are able to sort and classify. For those who are successful, note this in grade book. For those who are not, provide additional opportunities to sort and classify using objects first and then returning to plants.



Lesson 3

Indicator

PL3.1h - Predict and investigate conditions such as the temperature, available sunlight, available nutrients in soil, and available water, which are necessary for plant germination and growth.

- Bring in some seeds that were planted earlier and have at least 2 inches of growth in individual pots.
- Let students know they are going to investigate a variety of conditions that might affect plant growth.
- Ask students what elements they think might affect growth. Ask them what they need as a prompt if necessary. Let students refer to the KWL chart created earlier.
- Add additional ones that might not be raised by asking students: Do you think that _____ might affect plant growth? Should we find out?
- Ask students to predict how they might investigate the importance of light in growth. Support them in coming up with responses if necessary.
- Let students know they will be writing a daily journal response about their observations and predictions.
- Keep one plant as a control and place another two or three under test conditions (possibly no light at all, light for certain hours per day, etc.).
- Repeat this process with temperature, water, and soil.
- Let students take part in setting up the experimental conditions.
- Ask students to predict what they think will happen and chart these ideas.
- Return to observe every day or couple of days, to adjust predictions, and to note observations.
- Provide daily time for journal writing.
- Ask students to summarize observations and to explain why.

Assessment (formative)

Criteria:

To what extent are students able to predict? To what extent can students observe and explain what they are seeing?



Lesson 4

Indicator

PL3.1b - Observe and explain the function of the major structures (i.e., root, stem, flower, leaf, and fruit or seed) of a variety of plants.

(Adapted from *Pearson Saskatchewan Science 3: Teacher's Resource*, p. 28)

- Show students a branch, a stalk, and a stem of a flower and ask students if they know the names of these parts and their purposes.
- Discuss the students' responses and explain that the stem has two functions: to hold the plant/flower up and to carry nutrients and water up from the ground/soil to the leaves and flowers.
- Read the material on page 8 of the *Pearson Saskatchewan Science 3* student textbook and ask questions such as: Are the roots of all plants the same? Do all plants have flowers? What is the purpose of leaves?
- Have students give examples of the above – types of flowers they know, different leaves and roots, etc.
- Explain that although roots (or stems) have the same purpose, they can look different.
- Have students observe, draw, and label the parts of a plant.
- Show students a carrot and have them discuss its parts. Ask students to draw and label it as well.
- Ask students to return to the photographs they classified in the opening activity. Ask them to make observations about what they notice about the plants in these photos in respect to their parts.
- Student could also reclassify these photos based on their new knowledge.

Assessment (formative)

Criteria:

Do students understand and can they explain the functions of the structures of a plant? If some students are having difficulty, consider ways in which to reteach this material or to differentiate for further lessons.



Lesson 5

Indicator

PL3.1b - Observe and explain the function of the major structures (i.e., root, stem, flower, leaf, and fruit or seed) of a variety of plants.

- Provide students with the opportunity to visit an environment where they can observe plants and trees growing. This could be the schoolyard, the neighbourhood, or a trip to an outdoor nursery or some other location.
- Take a walk with students and ask them to point out parts of the plants and trees they can identify. Ask students to discuss why a tree has a thick trunk and why plants have thinner stems. Ask them to compare leaves on a plant and leaves on a tree. Ask them to compare flowers and plants and to speculate on why they might differ.
- Ask students to find a plant, flower, or tree that interests them and to draw and label it. If possible, support students in finding the name of their tree/flower/plant for additional research.

Assessment (formative)

Criteria:

To what extent can students correctly label the structures of a plant, flower or tree? For students who have difficulty with this task, reteach the names and provide additional opportunities to complete the assessment.



Lesson 6

Indicator

PL3.1j - Estimate, record, and display relevant measurements of plant growth, using rulers, tables, and bar graphs.

- Draw the students' attention to the seeds they planted earlier.
- If some growth has occurred, ask students to estimate how much the plants have grown and to follow this with a measurement using a ruler.
- See to what extent their estimations were accurate.
- Have students write down their measurements on the sheets provided earlier.
- Based on the actual growth, ask students to estimate how much their plants might grow in another week and ask them to record their estimates.
- Ask students for examples of ways in which they might represent this growth over time. Show examples of a graph and a bar graph.

Assessment (formative)

Criteria:

Can students estimate? Can they measure their plants accurately? If not, consider how these gaps might be addressed in math classes.



Lesson 7

Indicator

PL3.1g - Research ways in which plants rely on animals and abiotic factors (e.g., gravity, wind, and water) to support plant reproduction by dispersing seeds.

- Ask students if they know how new plants or trees are created. Collect information that students know and questions to which they would like answers.
- Provide/prompt additional questions if necessary.
- Write each question on a sentence strip and identify groups of students (2 or 3) who will be tasked with researching for answers. Weaker students can be grouped with strong peers.
- Ask students how they might find answers to their questions (ask an expert, ask a parent, find a book in the library, look on the Internet, etc.).
- When students have their answers, ask them how they might provide this information to the class (presentation, representation, interview, oral report, etc.).
- Provide teaching opportunities for each of the above, or choose methods that students already have learned about in other classes.

Assessment (formative)

Criteria:

To what extent can students pose questions? To what extent can students respond to questions?

Lesson 8

Indicator

PL3.1f - Compare the basic needs of plants to the basic needs of animals and humans.

- Return to the KWL chart created at the beginning of this unit.
- Ask students to summarize what they have learned about the basic needs of plants and to compare this to what they think they know about the basic needs of animals and humans using a Venn diagram.
- Students could also summarize orally or could be supported in developing their summaries.

Assessment (summative)

Provide formative assessment for those students who need it as they will need this information for their final assessment.

FINAL ASSESSMENT (summative)

Using their learning materials, students will complete the summative performance task individually, and with support where needed. The assessment rubric can be found in Appendix A.



Your school has decided to build a garden and you have been asked to give some advice to those who will be planning this garden. What is necessary for the growth and development of plants? You can write your answer in a paragraph, create a timeline or chart, or use pictures to illustrate your answer.

RESOURCES

Resources Used for This Unit

Contact the STF's Stewart Resources Centre to borrow any of these print or audiovisual resources.

AIMS Education Foundation. (2009). *The budding botanist: Investigations with plants*. Fresno, CA: Author.

Aspen-Baxter, L., Brockman, A., Molnar, C., Shields, K., O'Soup, D., Racette, C., & View, T. (2012). *Pearson Saskatchewan science 3*. Toronto, ON: Pearson Education.

Aspen-Baxter, L., Brockman, A., Molnar, C., Shields, K., O'Soup, D., Racette, C., & View, T. (2012). *Pearson Saskatchewan science 3: Teacher's resource*. Toronto, ON: Pearson Education.

Bloom, J. W. (2006). *Creating a classroom community of young scientists* (2nd ed). New York, NY: Routledge.

Chiarotto, L. (2011). *Natural curiosity: Building children's understanding of the world through environmental inquiry: A resource for teachers*. Retrieved from www.naturalcuriosity.ca/pdf/NaturalCuriosityManual.pdf

Cole, H. (2007). *On Meadowview Street*. New York, NY: Greenwillow Books.

Darling-Hammond, L., Barron, B., Pearson, P. D., Schoenfeld, A. H., Stage, E. K., Zimmerman, T. D., . . . Tilson, J. L. (2008). *Powerful learning: What we know about teaching for understanding*. San Francisco, CA: Jossey-Bass.

Fishbaugh, A. S. (2011). *Celebrate nature! Activities for every season*. St. Paul, MN: Redleaf Press.

Herridge, D. (2000). *Plant growth*. Don Mills, ON: Addison Wesley.

Herridge, D. (2000). *Plant growth: Teacher's guide*. Don Mills, ON: Addison Wesley.

James, R. (2008). *Plant cycle*. Calgary, AB: Weigl.

Keeley, P., Eberle, F., & Tugel, J. (2007). *Uncovering student ideas in science, volume 2: 25 more formative assessment probes*. Arlington, VA: NSTA Press.

Lawson, J. E. (1999). *Hands-on science: Level 3*. Winnipeg, MB: Peguis.

Morgan, E. R., & Ansberry, K. R. (2013). *Even more picture-perfect science lessons, K-5: Using children's books to guide inquiry*. Arlington, VA: NSTA Press.

Revised Bloom's taxonomy of cognitive levels [revised]. (n.d.). Retrieved from <http://faculty.chass.ncsu.edu/slatta/hi216/learning/bloom.htm>

Saskatchewan Ministry of Education. (2011). *Science 3*. Retrieved from https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/Science_3_2011.pdf

Schlessinger Media. (Producer). (2006). *All about plant pollination: Fruit, flowers and seeds* [DVD]. Available from www.distributionaccess.com

Visual Learning Company. (Producer). (2012). *Plants* [DVD]. Available from www.mcintyre.ca

Visual Learning Company. (Producer). (2012). *Plants with flowers* [DVD]. Available from www.mcintyre.ca

Recommended Videos Available on R.O.V.E.R.

Saskatchewan Ministry of Education. R.O.V.E.R. (Recommended Online Video Education Resources) - The videos listed below can be freely accessed by Saskatchewan teachers from their schools. Every teacher and student in a preK-12 school in Saskatchewan is registered with a Blackboard account and is able to use R.O.V.E.R. (If you need help with your username or password, please contact the Ministry's Network Services department at: networkservices@gov.sk.ca or call their Sector Support Desk at 1-866-933-8333.) If accessing from outside the school, please follow the directions on the site.

- Living sunlight: How plants bring the earth to life
- Monarch and milkweed
- What are plants?

Database

GALE CENGAGE Learning. (2014). Kids Infobits: Plants. Retrieved from <http://galenet.galegroup.com.external.edonline.sk.ca/servlet/KidsInfoBits?locID=saskplschools> (you must login to your Blackboard account)

Please note: This and other databases can be freely accessed by Saskatchewan teachers and students from their schools.



APPENDIX A

Assessment Rubric

Criteria	Exceeding Expectations	Meeting Expectations	Almost Meeting Expectations
Understands and explains the basic needs of plants	Explains the basic needs of plants including the needs of different plants	Explains the basic needs of plants	Has difficulty identifying the basic needs of plants
Can differentiate between the elements needed for reproduction	Can differentiate between the elements needed for reproduction and provides a variety of examples	Can differentiate between the elements needed for reproduction	Has difficulty differentiating between the elements needed for reproduction
Identifies and explains the conditions needed for healthy plant growth including water and light	Identifies and explains the conditions needed for healthy plant growth including water and light in a variety of circumstances	Identifies and explains the conditions needed for healthy plant growth including water and light	Has difficulty identifying and explaining the conditions needed for healthy plant growth including water and light