

Grade 11 Biology - Plants: Anatomy, Growth, and Function Unit
The Three Sisters: Corn, Squash, and Beans
Lessons in - Companionship

About The Three Sisters

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The term “Three Sisters” emerged from the Iroquois creation myth. It was said that the earth began when “Sky Woman” who lived in the upper world peered through a hole in the sky and fell through to an endless sea. The animals saw her coming, so they took the soil from the bottom of the sea and spread it onto the back of a giant turtle to provide a safe place for her to land.

This “Turtle Island” is now what we call North America. Sky woman had become pregnant before she fell. When she landed, she gave birth to a daughter. When the daughter grew into a young woman, she also became pregnant (by the West wind). She died while giving birth to twin boys. Sky Woman buried her daughter in the “new earth.” From her grave grew three sacred plants—corn, beans, and squash. These plants provided food for her sons, and later, for all of humanity. These special gifts ensured the survival of the Iroquois people.

Source: Erney, Diana. 1996. Long live the Three Sisters. Organic Gardening. November.p.37-40.

Science and Technology Curriculum Expectations - Connections:

Grade 11 Biology - Plants: Anatomy, Growth, and Function

Overview:

Throughout a series of explorations involving the use of Indigenous People’s stories students will learn about the importance of plants and their relationship with us and the the natural environment. By deepening their understanding and appreciation of the natural world, students will begin to establish a more intimate relationship with their surroundings. The key ideas that will be focused on are the concepts of companionship, sustainability, balance and respect in regards to how we interact with our natural world. By the end of these activities students should be able to answer three driving questions.

It is important for educators to understand that one of the main ways Indigenous People’s Knowledge and Ways of Knowing are passed down is through storytelling. These three lessons explore the story of The Three Sisters and the significance of plants and their relationship to us as human beings and in the environment.

Assessment:

Assessment for, as, and of learning is used when teachers use triangulation to collect their assessment data.

Driving Questions:

1. Why is it important for humans to know about the different relationships that exist between plants and how they respond and adapt to the environment?
2. How does the diversity of plants help us understand that variety is critical to the survival and sustainability of ecosystems?
3. In order to live in a responsible and sustainable way, what do plants help us to understand about the world around us?

Lesson	Title
1	Uses, Form, and Function
2	Reproduction and Growth
3	Sustainability

Grade 11 Biology
Unit: Plants: Anatomy, Growth, and Function
Lesson 1: Uses, Form, and Function

Stage 1: Desired Results

Establish Curriculum Goals (Learning Goals): F1.1, F1.2, F2.1, F2.3, F3.1, F3.2

- F1.1 evaluate, on the basis of research, the importance of plants to the growth and development of Canadian society (e.g., as a source of food, pharmaceuticals, Aboriginal medicines, building materials, flood and erosion control; as a resource for recreation and ecotourism) [IP, PR, AI, C]
- F1.2 evaluate, on the basis of research, ways in which different societies or cultures have used plants to sustain human populations while supporting environmental sustainability (e.g., sustainable agricultural practices in developing countries such as crop rotation and seed saving; traditional Aboriginal corn production practices) [IP, PR, AI, C]
- F2.1 use appropriate terminology related to plants, including, but not limited to: *mesophyll, palisade, aerenchyma, epidermal tissue, stomata, root hair, pistil, stamen, venation, auxin, and gibberellin* [C]
- F2.3 identify, and draw biological diagrams of, the specialized plant tissues in roots, stems, and leaves (e.g., xylem, phloem), using a microscope and models [PR, AI]
- F3.1 describe the structures of the various types of tissues in vascular plants, and explain the mechanisms of transport involved in the processes by which materials are distributed throughout a plant (e.g., transpiration, translocation, osmosis)
- F3.2 compare and contrast monocot and dicot plants in terms of their structures (e.g., seeds, stem, flower, root) and their evolutionary processes (i.e., how one type evolved from the other)

Success Criteria

Learning Goals:

Evaluate why it is important for humans to know about the different relationships that exist between plants and how they respond and adapt to the environment

Success Criteria:

Describe how plants are a valuable bio-resource using a modelling activity.
 Create a 1 page infographic describing the important of a plant on Canadian society

Stage 2: Assessment Evidence

1 page infographic - Why are plants important to Canadian society?

Stage 3: Lesson Outline

Background/Intro (15 minutes):

Focus

1. Share with students:
 - a. In some North American Aboriginal societies, corn, climbing beans, and squash, are known as “the three sisters.” These three species have been planted together by Indigenous People in all over North America for thousands of years. The three species truly benefit each other, growing very successfully when planted in companionship. The corn is tall, and thus acts as a vertical structure for the beans to climb up. After the bean plant dies, it begins to decompose and adds valuable nitrogen to the soil. The corn and squash continue to use this resource for growth and development. The squash covers the ground, and the horizontal growth acts like a ground cover. This in turn provides protection for the corn and beans. It keeps water in, prevents weed growth, and blocks some insects.
2. Modelling Activity
 - a. Play jenga, colour code each piece as corn, beans, or squash.

Developmental Activities (30 minutes):

Explore, Analyze

3. Read the story of The Three Sisters
4. Introduce infographic assignment
 - a. Link to excellent rubric - http://www.schrockguide.net/uploads/3/9/2/2/392267/schrock_infographic_rubric.pdf
5. Have students choose either corn, beans, or squash and explain why this plant resource is important to Canadian society

Closing Activities (25 minutes): Share

1. Debrief from modelling activity
 - a. What worked? What didn't?
 - b. How did you have to work together?
 - c. How might we connect this activity to the story you heard at the beginning of class.

Extension

- Plant corn, beans, and squash in your school's garden or a raise garden bed

Accommodations: - ½ a page infographic	Modifications: - At teachers discretion based on students IEP
Web Resources/Technology Integration/Materials: Canadian Seed Bank - http://pgrc3.agr.gc.ca/about-propos_e.html	

Grade 11 Biology
Unit: Plants: Anatomy, Growth, and Function
Lesson 2: Reproduction and Growth

<u>Stage 1: Desired Results</u>	
Establish Curriculum Goals (Learning Goals): F3.1, 3.2, 3.4, 3.5	
<ul style="list-style-type: none"> • F3.1 describe the structures of the various types of tissues in vascular plants, and explain the mechanisms of transport involved in the processes by which materials are distributed throughout a plant (e.g., transpiration, translocation, osmosis) • F3.2 compare and contrast monocot and dicot plants in terms of their structures (e.g., seeds, stem, flower, root) and their evolutionary processes (i.e., how one type evolved from the other) • F3.4 describe the various factors that affect plant growth (e.g., growth regulators, sunlight, water, nutrients, acidity, tropism) • F3.5 explain the process of ecological succession, including the role of plants in maintaining biodiversity and the survival of organisms after a disturbance to an ecosystem 	
Success Criteria	
<p>Learning Goals: Understand how the diversity of plants help us understand that variety is critical to the survival and sustainability of ecosystems.</p> <p>Demonstrate an understanding of the diversity of vascular plants, including their structures, internal transport systems, and their role in maintaining biodiversity.</p>	<p>Success Criteria: Complete the pre lab and discussion questions for Seed Lab</p> <p>Complete journal questions on Virtual Lab</p>
<u>Stage 2: Assessment Evidence</u>	
Seed Dissection Lab and Report Could use both products (lab), observations, and conversations as assessment for this lesson	

Stage 3: Lesson Outline

Background/Intro (15 minutes):

Focus

[Glencoe Virtual Photosynthesis Lab](#) - Introduce students to the concept of photosynthesis, and changing variables. The Journal Questions students answer after they complete the lab can be taken up as a whole class.

Developmental Activities (30 minutes):

Explore, Analyze

Do a comparison of seeds, stem, flower and root.

Seed Dissection Lab - Exploring Monocots and Dicots.

Continuing with the framework of “The Three Sisters” it is important to note that corn is a monocot and that beans are dicots. Such an important connection to make during the dissection as well as the initial comparison before the lab starts.

Closing Activities (25 minutes):

Share

Which type do you think evolved first? What makes you say that?

Accommodations:

- Work in partners for pre-lab and discussion questions.
- Answer the questions orally or in typed form (rather than hand written)

Modifications:

- At teachers discretion based on students IEP

Web Resources/Technology Integration/Materials:

http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS12/LS12.html

Comparison of Monocots and Dicots <https://www.holganix.com/blog/monocots-vs-dicots-what-you-need-to-know>

Grade 11 Biology
Unit: Plants: Anatomy, Growth, and Function
Lesson 3: Sustainability

<u>Stage 1: Desired Results</u>	
<p>Establish Curriculum Goals (Learning Goals): F1.1, F1.2,</p> <ul style="list-style-type: none"> • F1.1 evaluate, on the basis of research, the importance of plants to the growth and development of Canadian society (e.g., as a source of food, pharmaceuticals, Aboriginal medicines, building materials, flood and erosion control; as a resource for recreation and ecotourism) [IP, PR, AI, C] • F1.2 evaluate, on the basis of research, ways in which different societies or cultures have used plants to sustain human populations while supporting environmental sustainability (e.g., sustainable agricultural practices in developing countries such as crop rotation and seed saving; traditional Aboriginal corn production practices) [IP, PR, AI, C] 	
Success Criteria	
<p>Learning Goals: Describe why in order to live in a responsible and sustainable way, what do plants help us to understand about the world around us.</p>	<p>Success Criteria:</p>
<u>Stage 2: Assessment Evidence</u>	
<p><u>Stage 3: Lesson Outline</u> Background/Intro (15 minutes): Focus</p> <p>This lesson takes students outside, so it is important to explain both safety, and ethical practices when exploring the outdoors.</p> <p><u>Share with students the following sample issue:</u> Aboriginal peoples living near Canada’s boreal forest rely on forest plants for food and medicine. Plants are harvested by traditional methods to maintain natural habitats and local biodiversity. However, these traditional practices are threatened as more areas are subject to development and commercial resource exploitation.</p>	

Questions to launch into activity:

What are some plants that we use in everyday medicine that you might be familiar with?
How might Indigenous People's have discovered the properties of certain plants and their healing power?
How might traditional healing and Western science be related when thinking about plant based medicine?
Ask students if they have any questions.

Ask students to explore the linked websites below (and any others you might find) to read and research about some traditional plants used by Indigenous Peoples in Canada.

Take students outside for a 10-15 minute nature walk to see if they can locate any of the plants, or even some that are not on the list. Suggested idea to ask a local elder to come and join you, and provide information on some of the native species and how they might be used.

Developmental Activities (30 minutes):

Explore, Analyze

After students return from outside, debrief, ask them what they found.

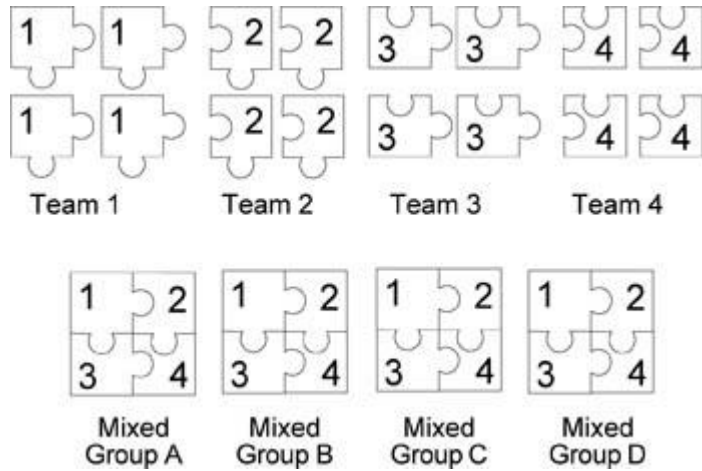
Sample question: How are strategies for the conservation and sustainable use of medicinal plants being used by small communities and traditional healers in some developing countries?

Give groups of students different Indigenous communities - preferably in Canada - to research the above sample question (or bring in guest speakers). Students should great 'jot' notes as they begin to learn about the medicinal plants traditionally used.

Closing Activities (25 minutes):]

Share

Groups should share their learning using a [Jigsaw activity](#)



Exit ticket” Write down one important fact from 4 different communities and the traditional plants used and why.

OR

Relate what you have learned back to Lesson 1 and the Three Sisters.

Accommodations:

- Use technology to type up ‘jot’ notes

Modifications:

- At teachers discretion based on students IEP

Web Resources/Technology Integration/Materials:

<https://www.alive.com/health/aboriginal-medicine/>

<https://www.thecanadianencyclopedia.ca/en/article/plants-native-uses/>

References

Lesson	Title and APA References
1	<p><u>Uses, Form, and Function</u></p> <p>Erney, Diana. 1996. Long live the Three Sisters. Organic Gardening. November.p.37-40. Accessed from: http://www.wabano.com/wp-content/uploads/2014/06/CLANconnections-AUGUST-2014-final-2.pdf</p> <p>Government of Canada. 2018. Agriculture and Agri-Food Canada. Accessed from: http://pgrc3.agr.gc.ca/about-propos_e.html</p>
2	<p><u>Reproduction and Growth</u></p> <p>Glencoe. Date unknown. Virtual Lab LS12. Accessed from: http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS12/LS12.html</p> <p>Holganix. 2013. Monocots and Dicots: What you Need to Know. Accessed from: https://www.holganix.com/blog/monocots-vs-dicots-what-you-need-to-know</p>
3	<p><u>Sustainability</u></p> <p>Tewksbury, B. 2016. The Jigsaw Technique. Accessed from: https://serc.carleton.edu/NAGTWorkshops/coursedesign/tutorial/jigsaw.html</p> <p>McKenna, T. 2015. Aboriginal Medicine: Four Canadian Plants with the Power to Heal. Accessed from: https://www.alive.com/health/aboriginal-medicine/</p> <p>Turner, N., Arnason, J., Hebda, R., and John, T. 2012. Uses of Plants among Indigenous Peoples in Canada. Accessd from: https://www.thecanadianencyclopedia.ca/en/article/plants-native-uses/</p>