Know It, Sow It, Grow It, Eat It!

Kids Dig Food

By Helene Fleury

These educational units were made possible by Groundbreakers Agriculture Association
Through a grant from Wetzinkwa Community Forest Corporation and the Real Estate Foundation of BC

GROUNDBREAKERS

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BRITISH COLUMBIA

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Introduction

Groundbreakers' Intention

The intention of these two units on food and gardening is to help foster meaningful exploration and discussion about our local food supply and all the essential steps to growing food in the Bulkley Valley.

The aim of these lessons is to help K-7 teachers meet the BC Prescribed Learning Outcomes (PLOs), while being meaningful for students in ways that extend beyond academics. While learning about soil and plant life cycles, for example, students will also experience the pleasure of digging in the garden, learn to understand where food comes from, taste some healthy vegetables, learn to exercise patience and caring and cooperation.

While reading these lessons please take the following ideas into consideration:

- Each unit contains lessons that are in sequence but can also be done individually.
- These lessons may be done with your whole class or in small groups.
- The lessons vary in length and include an estimated amount of time for inside and outside activities. Feel free to break the lessons into smaller parts to fit your schedule.
- The lessons have suggested months for teaching to help teachers sequence the lessons.
- Most lessons can be adapted for specific grade levels. K-7 is a huge audience and so we included easy and difficult ideas/activities for students at both end of the age and learning spectrum while hoping to engage the students in the middle of the spectrums.
- Please note Unit 1 on Local Food Security is classroom-based while Unit 2 on gardening extends classroom activities into the school gardens/yard.
- We would really like your feedback on these lesson plans. We plan to continue fine-tuning and expanding them. Please email Helene Fleury at helenefleury@bulkley.net with any comments, questions, or suggestions.

Recommendations

We encourage the use of student journals in all lessons, as they are an excellent form of non-traditional assessment as well as a means to share with family and friends. Students can reflect on their thoughts about new concepts without feeling as if they are being tested. The food security unit is rich in surprising information and journals can provide an outlet for students to process this new information. For activities in the garden, journals are a wonderful way for students to record new knowledge and skills as well as their thoughts and feelings and share in the excitement of gardening. See page 40 for Food and Garden Journal template.

If you plan to use journals for assessment here are some criteria for assessing them:

- Questions answered
- Number, regularity and length of entries
- Presentation and legibility
- Clarity of observation and evidence of speculation and reflection
- Evidence of creative and critical thinking
- The journal as a creative piece

Discussion Strategies

Think-Pair-Share: Many lessons are amenable to the **Think-Pair-Share** strategy. Be sure to provide adequate think time before the sharing portion. Ask the students to give a thumbs-up sign when they have something they are ready to share. Put students in pairs and have them take turns responding to the question(s). Randomly call on a few students to **share** their ideas with the class.

Fishbowl Tap-out Strategy

- 4 chairs placed in the middle of the room, while all students form an outside circle around the center group, thus forming a "fishbowl" effect.
- The 4 students sitting in the middle are the only ones allowed to speak.
- If an outside circle student wishes to speak they must "tap-out" (on the shoulder) one of the 4 people. That person must stand and move to the outside circle. There is no refusing to leave once tapped-out.
- Students should try to be in the "hot seat" at least once during the discussion, allow students 2 min. minimum before being tapped out, teacher may have to ask a question if discussion is stalling (otherwise they are a silent observer as well).

Acknowledgements

There are many people whose support and insight made the completion of these educational units possible. First I would like to thank the Real Estate Foundation of BC and the Wetzinkwa Community Forest Corporation for their financial support. My sincere thanks also go to Jennifer Hegan, Shawna Audet, Amanda Forstbauer-Bourrie, Carla Atherton, Pauline Mahoney, Gail Jenne, Paula Bartamucci, Emily Bulmer, Mark Fisher, Kala Hooker and Anne Docherty. And finally, I wish to acknowledge Facundo Gastiazoro for his fine illustrations.

Food Security Unit

Unit on Food Security

Background

Food Security is a topic that is increasingly on the tips of people's tongues and in the news. It is important to understand the security of our food supply and what assurances we have or can put in place to better guarantee our access to food. It is estimated that the amount of the Bulkley Valley's food supply is approximately 2 days worth in total, with a possibility of as much as 2 weeks worth of food during the summer months.

The food we find at our grocery stores comes from all over the world. Lemons from Argentina, apples from New Zealand, lettuce from the United States – our food is more travelled than we are.

Most of the food we now eat is no longer locally grown. Only 45 years ago, 50% of our food was produced in the Bulkley Valley, now that figure is less than 10%. The rapid expansion of international trade in food, made possible by the availability of cheap oil, has given Canadians access to the global market and an almost endless choice of food items. The benefits to consumers are lower food prices and a great variety of foods from which to choose. Adverse effects include lower food quality, negative impacts on the environment and our farming communities. As consumers in the "global market," we tend to look for the best buys, with little thought of the true nutritional, environmental, and social costs of what we purchase.

In the past decade, there has been an increased emphasis on the value and benefits of buying and consuming local foods. Farmers who sell directly to local consumers can select, grow, and harvest crops to attain peak freshness and nutrition. They also receive the full retail value of each food dollar spent, instead of losing profits to the high costs of transportation and packaging. Apart from benefiting the local economy and being more nutritious, another benefit of eating locally is that it encourages the use of local farmland and supports the preservation of open spaces. Finally, eating locally encourages eating seasonally, that is foods that are naturally grown at a given time of year, which in turn supports local economies, is supposed to be healthier, and has less environmental impact.

Weighing the cost of the food against the environmental, social and economic cost should be a major part of all food purchases. We can start by buying local foods – and eventually grow our own food!

The big idea of this unit:

Students will explore the complexities of the global food system including where food comes from, how it gets here, and the implications on the quality of our food and the environment.

Students will also learn about local foods, their benefits and realize that with the right information, they have as consumers, the power to choose.

Lesson 1: Earth as an Apple

TIME: 20-30 min.

Suggested month: Any month

MATERIALS:

- Big apple
- Knife
- Cutting board
- Container of salt water
- Rocks/pebbles
- Ice
- Legos
- Journals

Objective

Students will be able to:

- Observe a demonstration about how little topsoil we have on earth
- Introduce the concept of the limited amount of topsoil
- Discuss the importance of soil for all living things
- Appreciate soil as a nonrenewable resource

Vocabulary

Topsoil
Arable land
Non-renewable resource

Lesson

1. Begin by asking students to think about where our food comes from and what is necessary for food to grow and us to eat.
2. Use an apple as a model of the Earth to demonstrate the proportion of arable land to the Earth's total land surface.
3. Cut the apple into quarters. Separate the quarters, grouping three quarters together, leaving one by itself. Ask the participants what they think this represents. Place three of the quarters into a container of salt water, (since roughly 70% of our planet is made of water, most of which is salt water). That leaves **one quarter** to represent the total land area.
4. Cut this quarter in half to make **two eighths** and set one of the eighths aside as it represents the portion of the earth that is uninhabitable. Place this one eighth on rocks and ice.
5. The remaining **one**-**eighth** represents the portion of the earth where humans live. Cut this eighth in four pieces and again set three of the pieces aside. These three pieces (3/32) represent land that cannot be cultivated. Ask the students why the land cannot be cultivated? (There is land that has been covered by roads, buildings, golf courses, shopping centres, parking lots, that cannot be cultivated). Place these three pieces in a pile of Legos.
6. The remaining piece (1/32) of the apple represents the portion of Earth that can be used to grow food. Peel the skin off this piece of apple. The skin represents all the *arable land* (or *topsoil* in which food can grow), on which our whole existence depends.
7. Discuss why *topsoil* is important for plants. Plants concentrate their roots in and obtain most of their nutrients from topsoil.
8. Ask students if they think topsoil is a renewable resource or a non-renewable resource. (You can give them the example of forests, as being a renewable resource while fossil fuel is not). We tend to think of soil as a renewal resource - one that is constantly being replenished by decaying matter. But worldwide trends suggest that we may need to rethink that common understanding, because our behavior (unsustainable agriculture practices, land-use policies that support development rather than farming) has resulted in soil depletion at rates that exceed replenishment. To put it in perspective, it takes about

500 years to replace 25 millimeters (1 inch) of topsoil lost to erosion. What will happen if we don't maintain the health of our topsoil?

Reflection/Assessment

In their journals, students can answer the following questions:

Were you surprised at how little topsoil we have available to grow food? Why?

Reflect on the availability of topsoil in your neighbourhood or on your property. Draw a map and highlight the places where there is topsoil. Based on what your map tells you, what can you conclude?

Adapted from http://www.foodsecurityresearch.ca/resources/tasting_rainbows.pdf

Lesson 2: The Pizza's Family Tree

TIME: 45 min

Suggested month: Any month

MATERIALS:

- Pizza box or picture of pizza
- Pictures of processed or packaged foods, food wrappers (mac & cheese or lasagna or hamburgers)
- Large poster paper and markers
- Flip chart paper
- Journals

Objective

Students will be able to:

- Determine the origins of food
- Map a meal and determine where the plants are
- Explain the relationship between food and nature
- Realize that most things we eat originate from soil

Vocabulary

Food system

Lesson

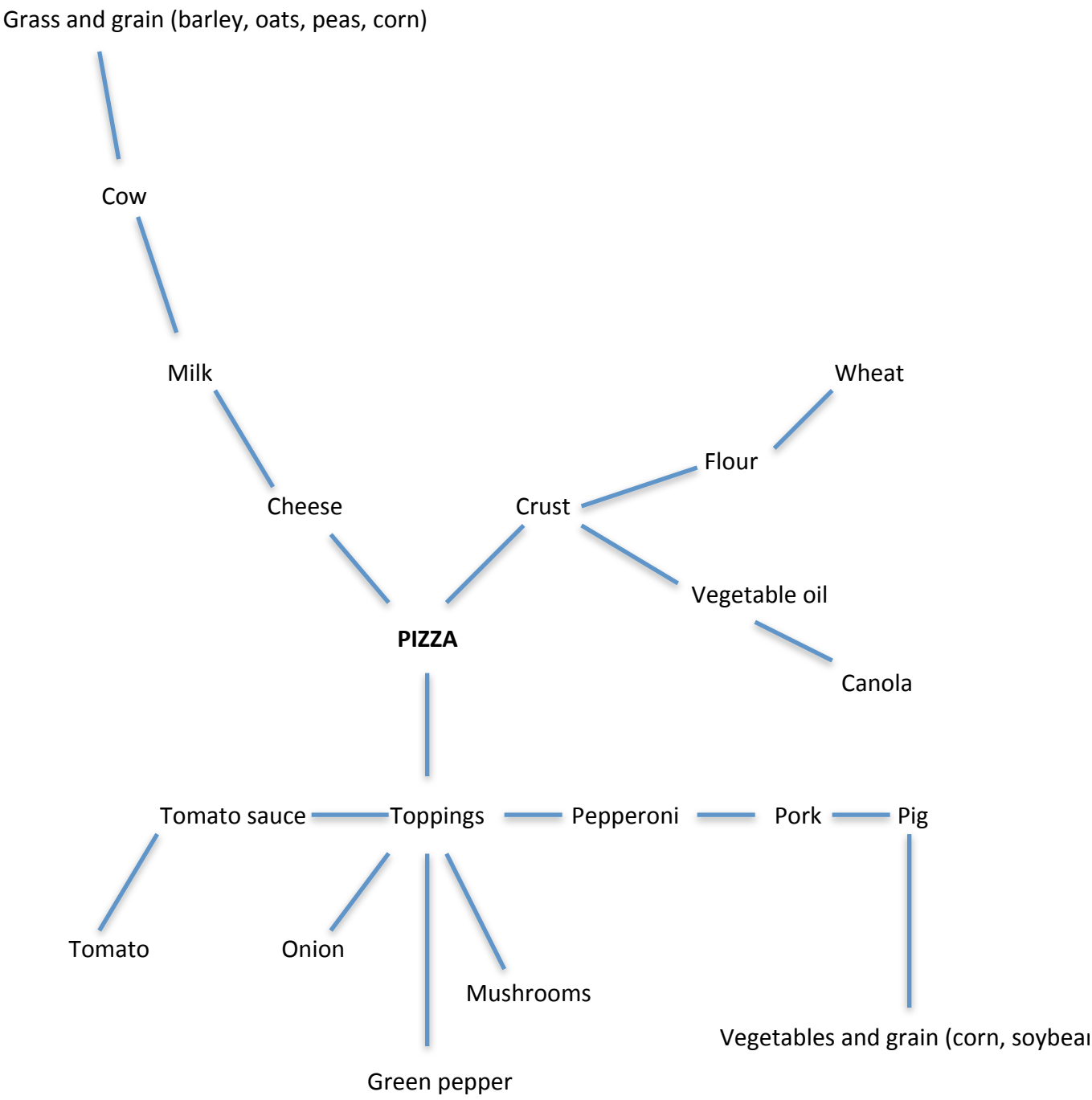
1. Use a picture of a pizza or better a pizza box and display it in front of the students.
2. Ask them to identify all the ingredients that are required to make a pizza.
3. Do a mind-mapping exercise of all the ingredients. Put the word pizza in the center and create branch-outs with all the ingredients –crust, toppings (salami, green pepper, mushrooms, etc.) tomato sauce, cheese. For each ingredient ask students if they know where it comes from (how it is produced), what it contains, or how it is connected to the Earth. The goal is to recognize how plants play a role in each ingredient (i.e. where is the plant?). See *Figure 1* below for a sample pizza mind map.
4. Have students work in groups to take another food product and trace each ingredient to its plant source (allow the students to choose or give them pictures, product labels with the list of ingredients or recipes) on a large piece of poster paper using the same webbing process. Students may use colour for different food groups. Groups will share their findings with the whole class once all groups are done.
5. Highlight the plant source by discussing the following questions as a whole class:
   - What can you conclude from this? All our food comes either directly or indirectly from plants.
   - Why is this important? Plants capture the sun's energy to transfer it to animals and people. We must take care of plants and ensure they can continue to grow to supply us with food energy. Even animal-based foods depend on healthy plant sources and therefore, healthy topsoil.
   - What events must happen to get food from its plant source to our tables? Explain that when we start to consider all the steps it takes to get each plant grown, processed, transported, packaged, sold and onto our table, we are talking about a food system. (See Lesson 5 for a more detailed exploration of food systems).

Reflection/Assessment

In their journals, students can answer the following questions:

Explain the relationship between soil and sun and what we eat.
Choose your favourite meal and trace each ingredient to its plant source using a mind-map

Figure 1: Pizza Mind Map Example



Lesson 3: What's in my Lunchbox?

TIME: 45 min.

Suggested month: Any month

MATERIALS:

- Big world map with Smithers labeled
- Small world map for group work (one for each group of 2-3 students)
- Atlas
- Flip chart paper
- Lunchbox with approximately 5 food items coming from all over the world (e.g. 1 fruit, 1 vegetable, 1 meat/cheese sandwich, 1 juice, 1 chocolate chip cookie)
- 5 sticky-notes with the name of the food item from the lunch box

Objective

Students will be able to:

- Read food labels for information about the origin of the food item
- Identify on a world map which countries our common food items originate from
- Explore the extent to which our diets are international
- Explain that different foods need different climates to grow
- Realize the importance of individual preference in our eating habits

Vocabulary

Food system

Lesson

1. Explain that when you begin to think about it, our *food system* is very complicated. Many resources and energy are used to bring food from the field to one's lunchbox.
2. Introduce the lunchbox (previously packed with food items coming from all over the word). Explain that you are curious to see what is in this lunchbox and where the food came from. Take one food item out at a time and pass it around so children can see what it is.
3. Invite them to look to see if there is a label that states where the food item is from. Ask a student to read if there is a country name and if so, to come place a sticker on the big world map in front with help from the teacher need be.
4. Go through all the items in the lunch box. Limit your exploration to no more than 5 items especially if you are taking the time to break down some items like chocolate or wheat flour in chocolate chip cookies for instance.
5. Invite students to work in groups of 2-3. Hand them a smaller world map (see below) to be used with an atlas. Invite students to look at their own lunch boxes and pick 2-3 items. Float around to help the children read the labels to see where the item has come from (city, country, continent, etc.)
6. Instruct the children to mark the place on their maps with a colourful X – help the students find any country or estimate where a specific location may be. After 10-15 minutes, class comes together for the group discussion.
7. Ask each group to show their maps one at a time. Record 1-2 items from each group on to the large group map. At the end of the presentations show the group map.
8. Ask some of the following questions by using a **Think-Pair-Share** strategy.
    - What surprised you the most?
    - Why do people choose to buy food from far away? (Availability, individual preference, economy, culture…)
    - How would our farmers feel if we kept getting our food elsewhere?
    - What would happen to our local farms if we kept getting our food elsewhere?

9. Explain that modern technology, agricultural practices, and transportation methods have increased the year-round availability of many foods, and many foods that were previously available only at certain seasons or in specific areas are now available almost anywhere, at any time.

10. Discuss how the seasonality of our food is reflected in our culture i.e. Thanksgiving dinners (squash, turkey, brussel sprouts) or Mandarin oranges at Christmas.

11. Ask the group some of the following questions:

    - Were any of you surprised by how many countries across the world are represented?
    - Which foods came from the furthest away?
    - Was any food item from BC, or even Smithers? Why? Which items are or could we have grown in the Bulkley Valley?
    - Do you think we'd find the same results if we did this activity during another season? Why or why not?
    - How does the food arrive here in our grocery stores?
    - Discuss how historically, oranges in Christmas stocking were a treat

Reflection/Assessment

In their journals, students can answer the following questions:

Draw a picture of a lunchbox filled with locally grown food (as discovered in question 11 above).
How does individual preference affect what food we buy and our eating habits?

The World


Arctic Ocean
Asia
Europe
North America
Atlantic Ocean
Pacific Ocean
Africa
Pacific Ocean
Indian Ocean
South America
Australia
Southern Ocean

Lesson 4: Calculating Food Miles

Objective

Students will be able to:

- Read food ingredients labels
- Explore how far our food travels to get to our tables
- Understand the concept of food miles and the connection that food consumption has to oil consumption
- Calculate food miles associated with foods we buy
- Realize we can make different choices about what we buy and where we buy it

TIME: 45 min.

Suggested month: Any month

MATERIALS:

- World map (with Smithers labeled)
- String / tape
- Food wrappers with labels (5-7) with sticky note that has name of food item written on it
- Fruit with stickers
- Sticky notes for flags for kilometers

Vocabulary

Food system
Food miles

Lesson

1. Explain that food we consume, especially fruit and vegetables, often get a lot of attention because of the distances they travel. On average, produce arriving at a food store in Smithers was transported more than 3500 km. These miles (but they really are kilometers here in Canada!) are called food miles. *Food miles* are the amount of miles that food travels from where it is grown to where it is consumed.

2. Hand out food wrappers with associated sticky note. Where did this food item come from? Select a few students to place the sticky on the country of origin on the map of the world.

3. Attach a string from the country of origin to Smithers. Repeat for all food items.

4. Using the distance chart below add a sticky note/flag with the number of kilometers between the country of origin and Smithers.

5. Explain that this way of counting food miles is a simple way to see how far our food comes from. It is important to keep in mind that many foods do not travel a single direct route but move circuitously and take many complex steps along the supply chain from field to plate. For example, processed foods may require dozens of ingredients to be shipped from multiple locations to a processing facility, and grain-finished food animals require truckloads of grain to be shipped in from farms.

6. Discuss with the students some of the following questions. You may wish to use discussion strategies like the **fishbowl tap-out** for older students:

    - What do you think are some of the consequences of transporting large volumes of food over great distances? (Greenhouse gas emissions/carbon dioxide that contribute to climate change).
    - What about refrigeration and packaging? How does the food stay fresh when it travels so far? How does that affect the food we eat? (Grapes may be packed with sulphur dioxide and/or fungicides to prevent mould growth; imported fruit and vegetables may be fumigated with

methyl bromide to comply with quarantine regulations or be grown with insecticides. 1-methylcyclopropene (1-MCP) is increasingly being used to extend the storage life of some fruits and vegetables even more. This chemical blocks some of the biochemical changes that occur as fruit ripens and matures. Produce then looses flavor and remains hard).

- Which foods that we looked at during this activity could have been bought locally? Root vegetables like potatoes, carrots, onions, as well as fruit that can be preserved or frozen or dehydrated; meats, eggs, fish, garlic, micro greens (small sprouts of broccoli, spinach…), and more!
- What could we do during the winter months to still use local produce? (preserve, dehydrate, freeze).
- Do we really need to eat all these imported foods? (We all have food preferences but these can be changed with knowledge of local food alternatives and new interesting diets).
- It is important to understand that we have the choice to buy food that is grown locally or internationally. As consumers, we can make educated decisions about what we buy, and where we buy it.

Extension

1. If you have older students, consider calculating the travel distance in kilometers of the food in a student's lunchbox (or ask them to calculate the km of their last night's dinner) using Google maps or an Atlas. They can then calculate the average distance of the meal once they have calculated all the kilometers of the ingredients and compare with the 3500 km stated in the lesson.

2. For a lesson on calculating Greenhouse Gas Emissions see: http://gardenabcs.com/uploads/foodmiles.pdf

Reflection/Assessment

In their journals, students can answer the following questions:

How does transporting food from far away affect us?

Food Miles Chart

Product	Imported Distance to Smithers (km)	Local Distance (km) (in season)
Apple	New Zealand: 11332	Smithers: 0
Banana	Costa Rica: 8508	Not grown locally
Grapes	California, USA: 2523	Okanagan: 1054
Orange	Florida, USA: 6106	Not grown locally
Mangoes	Guatemala: 8073	Not grown locally
Peas	China: 9718	Smithers: 4
Potatoes	Idaho, USA: 2073	Telkwa: 13
Tomatoes	Vancouver, BC: 1156	Telkwa: 13
Onions	Oregon, USA: 1590	Tyhee Lake: 17
Lettuce	California, USA: 2523	Tatlow Road: 10
Flour	Saskatchewan: 1914	Kispiox Valley: 56
Milk/dairy	Vancouver, BC: 1156	Not available locally
Ham	Manitoba: 2614	Quick: 20

Lesson 5: How did that get in my lunchbox?

TIME: 45 min.

Suggested month: When strawberries are in season or other alternate vegetable or fruit

MATERIALS:

- 2 chairs/stools with a strawberry on each one
- 1 store-bought strawberry with a big label: 'grown in Mexico, 7012 km'
- 1 local strawberry (can be frozen, or in jam) with label: 'grown in Quick, BC 16 km'
- Paper/colouring pencils
- Food system cards to cut out so each student has one
- "Tale of 2 Strawberries" script

Objective

Students will be able to:

- Follow the stages along the food system from field to lunchbox
- Compare elements of the global food system and the local food system
- Illustrate a scene from food systems
- Gain a sense that food can be grown and preserved close to home, rather than imported from a great distance
- Apply their knowledge of the food system to different foods they consume

Vocabulary

Global food system
Local food system

Lesson

1. Before introducing this lesson review briefly that most of the food in our lunchboxes comes from different parts of the world.

2. Ask the students: "But how did all this food get here? To start, let's listen to what these strawberries have to say about how they got here. Listen very carefully as you will be asked to draw parts of what you hear." Make sure students have paper and colouring pencils ready.

3. Teacher can read or act out both scripts or ask two different students to act out the different stories pointing to (or holding) the appropriate strawberry on the chair/stool.

4. Once the 2 tales are read/acted out, ask students to pick a scene they liked or that surprised them from either of the 2 strawberries' stories and to draw that scene. For example, a bunch of strawberries in a basket or a bunch of strawberries in a field (see sample illustrations below).

5. As the students finish, ask students to share their scenes.

6. Teacher hands out Food System Cards so that each student has one (you will need to photocopy each one at least twice depending on the number of students).

7. Ask students to create a chain of events that would represent the stages of the global food system for a particular food. Depending on the number of students in the class, students should form a few chains. To assist students, teacher can display a picture of a food and write on the board the stages along the food system that were involved to get that food to Smithers. Teacher can also call out cards and help place students in a chain. (An example of a global food system chain using the cards: Hand picking strawberry, strawberry in a truck, strawberries at a processing plant, strawberry on an airplane, on a train, at the wholesaler, at a grocery stand and a person eating a strawberry).

8. Ask students to re-do the ordering exercise for the local food system (by removing most of the cards between picking and eating a strawberry).

9. Ask the students what the big difference is between the two food systems. This question is important because it really shows the amount of time it takes to get food to one's table when importing food.

10. Depending on the age of the students, discuss the following questions:

    - What do you think happens when food travels this far? Do you remember when the strawberry from Mexico was picked? What impacts does this have on the fruit? Nutrition, taste? How does the food stay fresh when it travels so far? (Spinach, for example, retains only 53% of its folate and 54% of its carotene after just eight days stored at fridge temperatures. Grapes may be packed with sulphur dioxide to prevent mould growth. Imported fruit and vegetables may be fumigated with methyl bromide to comply with quarantine regulations or be grown with insecticides. 1-methylcyclopropene (1-MCP) is increasingly being used to extend the storage life of some fruits and vegetables even more. This chemical blocks some of the biochemical changes that occur as fruit ripens and matures. Produce then looses flavor and remains hard).
    - What is great about eating things that come from far away? (variety, 'exoticness')
    - What does that mean for people (our health, economy, fair wages)? What about the food pickers' working/living conditions? (long working days, few days off)
    - What does that mean to the planet (carbon emissions through transport, fertilizer, pesticides)?
    - How about the strawberry from Round Lake Farms? What can you tell about how it got here?
    - What are the great things about eating food that comes from the Bulkley Valley? (Freshness, taste, supporting local economy, etc.).
    - Why is it better for us and the environment to get food from local places? (See lesson 6 for advantages of eating local food).

Extension:

1. Students apply what they learned from the tale of 2 strawberries and their new knowledge of the food system to other foods they consume. In groups, students choose a different food item and using a graphic organizer, draw the journey of the food item from its start to its end...with all the stops in between. Look for possible information on the food label, think about the ways in which it traveled, if it arrived by one or more transportation methods, any details to add along the way, if it required inspection, if so what for and at which point or points along the journey.
2. Use dramatic arts to create tableaux of scenes from the tale of 2 strawberries.
3. Hold a class debate on the global food system vs the local food system.
4. Read an article on how fresh our supermarket food really is: http://www.dailymail.co.uk/news/article-1370130/Just-fresh-fresh-food-supermarket.html

Reflection/Assessment

In their journals, students can answer the following question:

List the advantages and disadvantages of eating food that is from far away using a chart.

Tale of Two Strawberries

Strawberry from Mexico:

Growing

Whoa! Am I ever tired! **(panting!)** I've just traveled ALL THE WAY from Mexico to visit with you today. What a LONG journey! Do you know where Mexico is on the map? Well…I had no idea it would take me this long to get here. PHEW…(putting hand on brow to show how tired s/he is)

Harvesting

Let me tell you my story… It all started one Thursday morning when I was taken home from my cozy home in the strawberry bed. What a horrible day! I wasn't ready to be picked. It was WAY to early! It was like being woken up at 5 am in the morning. Do you know how terrible that is? The person who picked me apologized, but said he had no choice. He was just an underpaid farm worker following his boss' orders.

Preparing for transportation

The next thing he had to do was to toss me in a bin and spray me with chemicals. Eek! **(Strawberry raises his/ her arms to 'block' the chemical spray).** That wasn't nice for either of us. He said the chemicals were supposed to keep me fresh for the journey to Canada, but I say YUCK! I just felt sticky. And that bin! It was crammed full of other grumpy, strawberries. I got bumped around and now I think I'm bruised. **(Pokes his/ her side and says "oh!")**

Well once we were crammed in that bin, they put us on a truck and we jiggled all the way to the processing plant (**jiggle up and down**). I got a bit dizzy from the ride. At the plant they dumped us out on a table and pushed us around. Some of my friends were taken away for being just a little small or having a couple of blemishes. Not me! I got stuffed in a plastic bag with a whole bunch of strawberries I didn't even know.

Transportation

They put us on a second truck, a really big truck this time… and then we were put on a big metal bird **(ask students)** what do they call it? I think they called it an 'airplane'? That went on for hours! Then we got onto another big, bumpy truck… and started the long drive to the Bulkley Valley. Do you know how long it takes to drive from Vancouver to the Bulkley Valley??? **(ask students)** 14 hours!!! It took SO long. I feel so deflated. Oh, I'm so tired!

Buying

The worst part is that when I made it all the way to the store, I found out you already have strawberries here! You can grow them right outside your door. I've seen them. So I don't know why I'm here. I'm just going to rest in the corner…

Local Strawberry from Round Lake Farms:

Growing

Well, I just grew up down the road. Like all these students here. **(Looking fresh)**. If you wander down to Round Lake Farms near Telkwa, BC, you'll see a beautiful garden. I grew right in that garden.

Harvesting

Sometime in the middle of July, Amanda said I was perfect for picking. Amanda has been looking after the soil where I grew for a long time. I was a lovely red colour. Amanda lay me and the other strawberries in my family in little baskets. I JUST avoided being eaten by a bear who had been sniffing around the week before. Amanda decided it was time to put me in the fridge.

Preparing for transportation

Oh, I didn't need to be prepared for transportation like the Mexican strawberry. I was just carried across the yard. Amanda decided to put some of my friends in the freezer for smoothies during our winter long. Those of us who had been nibbled at, or were a bit mushy were turned into yummy strawberry jam. Others were put in the compost.

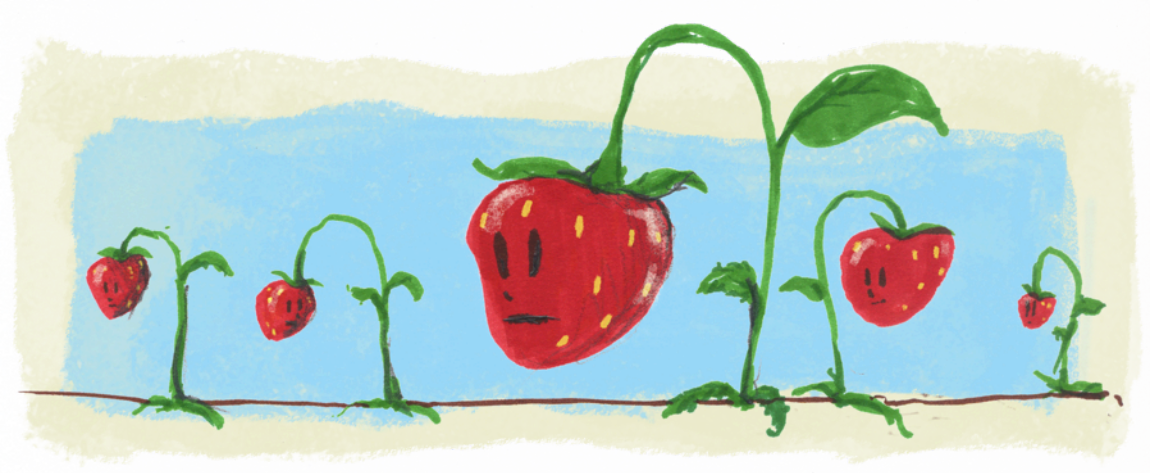
Transportation

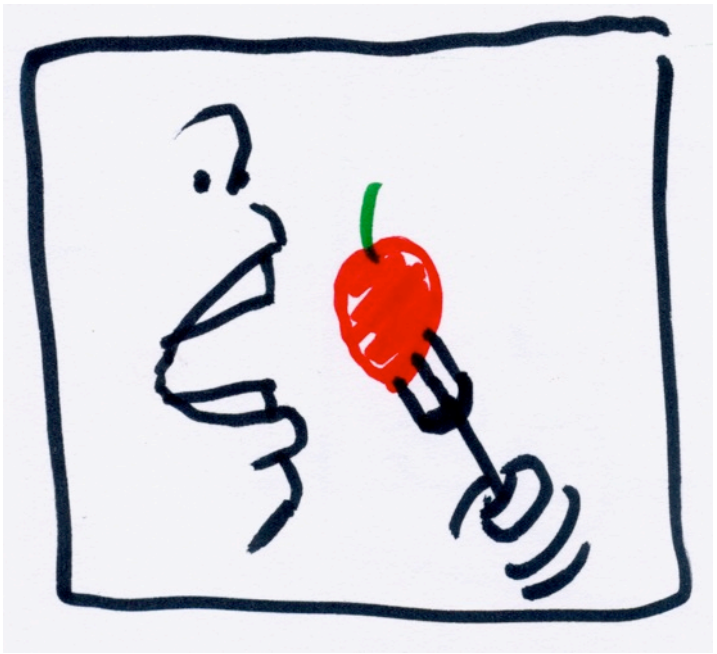
I don't need to be transported anywhere, except if Amanda decides to take me to the Farmers' market in Smithers, in which case she will put me in a little basket with some of my buddies. Until Saturday, I will hang out in the fridge with my buddies.

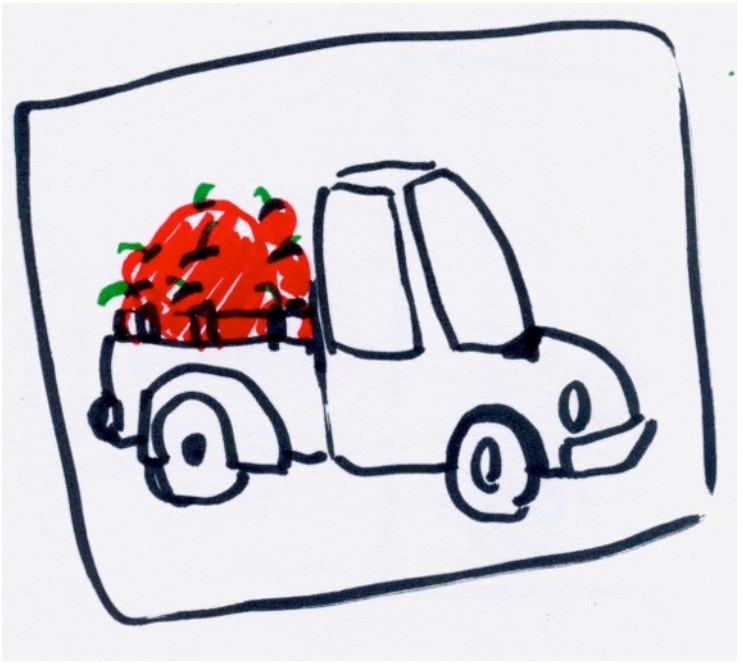
Buying

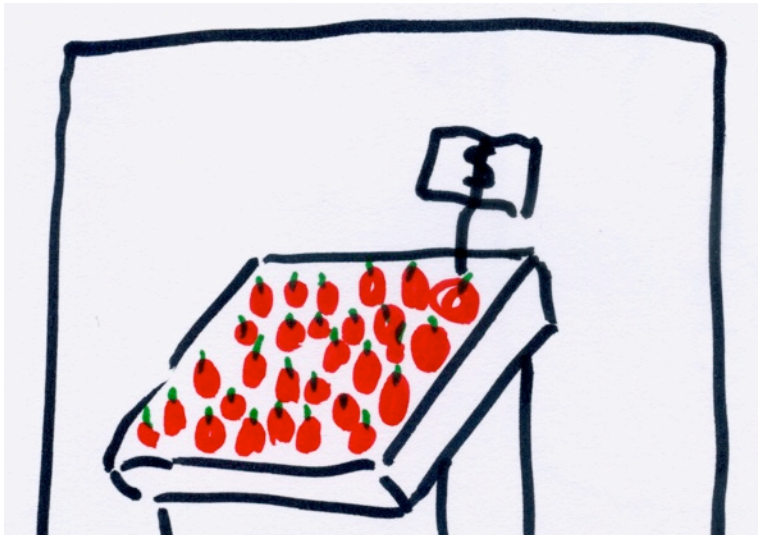
Amanda did work hard, mind you, to keep the garden healthy before she picked us all. She had to add manure, water, and keep the weeds and critters away. There were also a few of my friends who were picked last week and traded for flour from the Kispiox Valley. They call this bartering I think? One of the people who took some strawberries also helped to plant us last spring. Anyhow, I will rest now so I can look nice and fresh for the Farmers' Market.

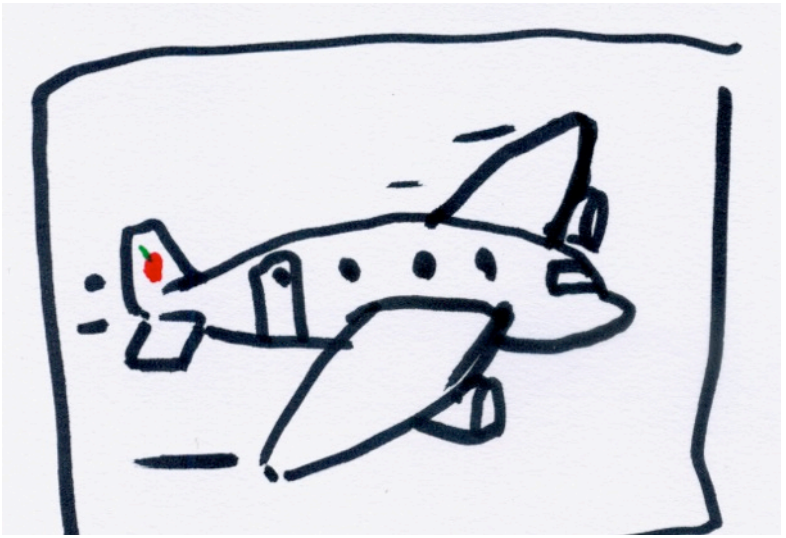
Sample Illustrations

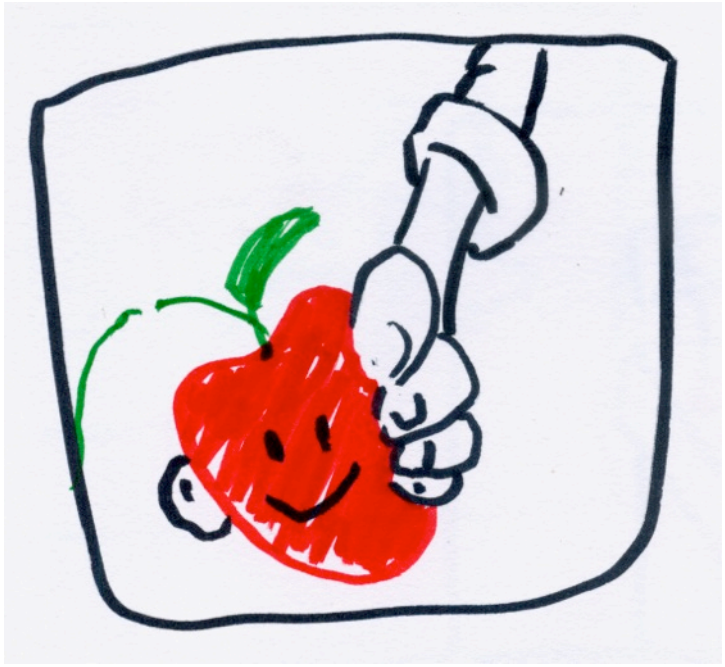


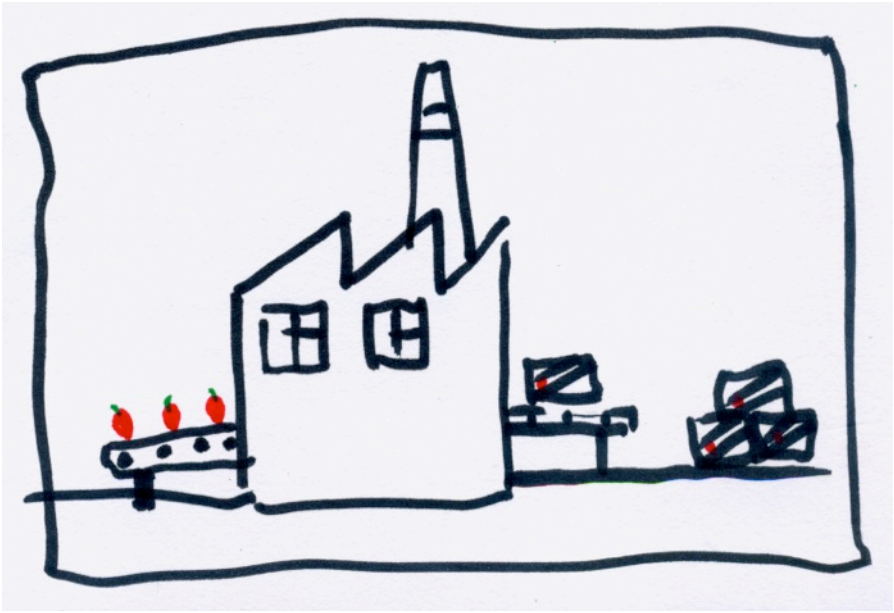


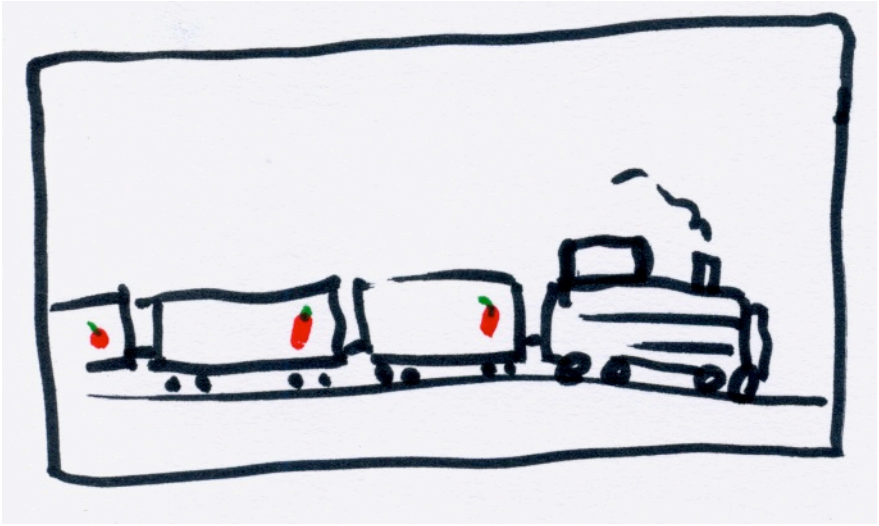













WHOLESALE

Lesson 6: Locally Grown Alphabet Soup

Objective

Students will be able to:

- Explore the benefits of eating locally grown food
- Describe the different kinds of fruit and vegetables grown in the Bulkley Valley
- Discuss the relevance of how local food choices affect the world and relate to the issues surrounding food security

Vocabulary

Local Food Directory

TIME: 45 min.

Suggested month:
Any month

MATERIALS:

- Flip chart/pen
- 24 letters of the alphabet on 24 sheets of paper placed around the classroom
- Tape
- BV Local Food Directory
- Poster board/colouring pencils
- Large container for 'soup'

Lesson

1. Tell students that many people use the motto, "Eat locally." Ask: *"*What do you think they mean by this and why do they think it's a good idea? What do you think about the idea?" Ask the students what they think local food means. Explain that the term local usually describes food that was produced within the geographic region where the consumer lives (roughly 150 km or so).
2. Ask the students to brainstorm the benefits of eating locally grown foods (if you did the previous lesson with them, they should have some ideas…). Write these on the board/flip chart. To help the students, explain some of the benefits that are included below:
    - **Locally grown food is full of flavor.** When grown locally, the crops are picked at their peak of ripeness versus being harvested early in order to be shipped and distributed to your local retail store. Many times produce at local markets has been picked within 24 hours of your purchase.
    - **Local food has more nutrients.** Local food has a shorter time between harvest and your table, and it is less likely that the nutrient value has decreased. Food imported from far-away states and countries is often older, has traveled and sits in distribution centers before it gets to your store. (Produce such as spinach, green beans, kale, red peppers, tomatoes, apricots and peaches are susceptible to nutrient loss when harvested and transported from longer distances, while those that are heartier such as apples, oranges, grapefruit and carrots keep their nutrients even if they travel long distances. Spinach, for example, retains only 53% of its folate and 54% of its carotene after just eight days stored at fridge temperatures. Some farmers pick their produce while they are still green, particularly tomatoes. The ripening process is then induced by spraying the fruits or vegetables with ethylene gas when they reach their destination. For long hauls, fruits and vegetables are refrigerated and often sprayed with fungicides or other chemicals to prevent damage and delay their ripening but this makes them lose their quality.)
    - **Local food supports the local economy.** The money that is spent with local farmers and growers all stays close to home and is reinvested with businesses and services in your community.
    - **Local food benefits the environment.** Local food doesn't have to travel as far to arrive on your plate, so it helps reduce greenhouse gas emissions and contributes to improving our carbon footprint. Also, by purchasing locally grown foods you help maintain farmland and green spaces in your community.

- **Local foods promote a safer food supply.** The more steps there are between you and your food's source the more chances there are for contamination. Food grown in distant locations has the potential for food safety issues at harvesting, washing, shipping and distribution.
- **Local growers can tell you how the food was grown.** You can ask what practices they use to raise and harvest the crops. When you know where your food comes from and who grew it, you know a lot more about that food.

3. Explain that today, the class will learn about what produce grows in the Bulkley Valley. Tell students that they will write these items down next to each letter of the alphabet. Besides the Round Lake Farm strawberry, there are many other food items that grow in the Bulkley Valley.

   Phase 1: Ask the students if they grow food at home and what they grow, or if they know someone in the Bulkley Valley that grows food and what that is. Depending on writing ability, students go to a letter and write these food items next to the appropriate letter. If they are younger students, teacher can ask them to stand next to the letter and teacher will write the name of the veggies/fruit for them.

   Phase 2: In order to more easily complete all the letters around the classrooms with local food, in groups of 2-3, older students will get a *Bulkley Valley Local Food Directory*. Flipping through the directory, they will find more fruit and vegetables that are grown locally and inscribe them on the alphabet sheets.

   N.B. If there are letters left blank, use creative adjectives to complete them. See the Sample List of Food Grown in the Bulkley Valley below.

4. Once all the letters have been filled in, the class can count how many food items can be grown here. The class can also remove the completed sheets and toss them together in a big pot/storage container to pretend you are making an alphabet soup. The class can talk about their favourite vegetables or about the ones they had never heard about.

Extension

1. Ask the students to prepare a local food promotional poster exposing the benefits of eating local food. Alternatively, students can use dramatic art to prepare a commercial.

2. Students can create a meal using ingredients found in the Bulkley Valley Local Food Directory.

3. Class can visit a farm or the Community Garden as part of a local field trip.

4. Invite a farmer or the representative of the Ministry of Agriculture to your classroom.

5. Check out the local producer descriptions and their pictures on the Groundbreakers Website at http://groundbreakerscollective.ca/

Reflection/Assessment

In their journals, students can answer the following question:

What are the advantages and disadvantages of eating food that is local?

Sample List of Food Grown in the Bulkley Valley

Apple, asparagus

Beets, beans, bok choy, broad beans, broccoli, brussel sprouts, blueberry, basil, beef

Carrot, corn, cabbage, cantaloupe, cauliflower, celery, celeriac, chili peppers, cucumber, cilantro, cherries, chicken

Dill

Endive, eggplant, eggs

Fennel

Garlic, green onions

Herbs, ham, honey

Iceberg lettuce, Italian red onion

Jalapeno pepper

Kohlrabi, kale

Lettuce, leek, lo bak, lamb

Mushroom, mustard greens

New potato

Onions, okra

Parsley, parsnips, peas (pod), peas (shelled), peppers, potatoes, pumpkins, plums

Quite yummy cherries

Radiccio, radishes, rhubarb, raspberry

Shallots, spinach, squash, suey choy, strawberry

Tomatoes, cherry tomatoes, turnips, thyme, turkey

Unbelievably delicious berries

Very tasty mixed greens

Watercress, watermelon, white radish, wild leek

X-cellent pumpkin

Yow choy

Zucchini

Lesson 7: Can You Taste the Difference?

TIME: Part 1: 30 min. (includes harvesting)

Part 2: 45 min.

Suggested month: June/September/October

MATERIALS:

- 2 local food items. (same item from 2 different gardens or 2 different varieties). Enough for whole class to sample
- 1 store-bought item from far away
- Plates (3)
- Napkins (enough for whole class)
- Toothpicks
- Knife/cutting board
- Student notebook/paper, pencils
- Flip chart/board
- Handout, pencils

Objective

Students will be able to:

- Use scientific inquiry to co-design a local food taste test
- Predict the outcome of the taste test
- Use their senses to investigate if locally grown foods taste better
- Compare predictions with their actual results
- Review the benefits of eating locally grown products

Vocabulary

Global food system
Local food system

Lesson

Part 1: Choosing the food item

1. Explain that students will be using scientific inquiry to co-design a local food taste test to investigate if locally grown foods taste better, and what other factors might play a role in flavor. They will also be able to review the benefits of eating locally grown products.
2. As a class, select a local vegetable or fruit that they would like to offer as part of a taste test. Select a food item that can be easily cut and eaten raw. Ideally, suggest veggies that will be growing in the school garden like carrots, tomatoes or peas or other good taste test produce from the neighbourhood like apples or strawberries.
3. Depending on the age of the students, you need to determine if you or your students should be responsible for purchasing and bringing in the fruits and veggies for this activity. If you plan on harvesting from the school garden, allow time for the actual harvesting, cleaning, etc. (See page 36 for food safety tips on harvesting produce). Make sure the students wash their hands and the produce thoroughly.
4. Depending on the chosen food item, cut each into small pieces and remove any dry seeds or pits. Make sure to have enough for each student in your class to taste one of each sample.

Part 2: Setting up the Test

1. On flip chart paper, create a graphic organizer that the teacher and students will fill out before and after sampling. See *Figure 2* below for a sample graphic organizer.
2. Before sampling, ask the students to complete *Section A* of the Taste Test Worksheet. In addition to completing the worksheet, older students can make predictions in terms of percentage or ratio including what they think the final results will be (e.g.: 80% or 20/25 of the students will prefer one over the others).
3. Teacher will fill out the columns on the flip chart paper by asking students to answer the questions.
4. Ask a group of students to place the samples on 3 different plates with toothpicks. Make sure to label

the three plates A B or C and keep track of which letter goes to each of your three samples.

5. With their worksheet and pencil in hand, have the students come try the food samples. Each student will take one of each sample and place it on a napkin and return to their desk to complete Section B of their worksheet as they sample. Encourage them to use all their senses to note details including visual appeal, smell, ripeness, color, etc. Make sure each student gets to taste all 3 samples.
6. Once all the sampling is done, teacher or a student can tally the results of Section B on the flip chart paper under the appropriate columns of the graphic organizer.
7. Discuss how students' answers may have differed from their predictions.
   - Were the final results different than you expected? If yes, why do you think that was?
   - Based on experience do you think local produce tastes better? Why or why not?
   - What other factors may influence produce flavor?
   - What are the advantages of eating local produce?

Extension

1. Compare and contrast the three different samples using a Venn diagram. What do all 3 samples have in common? What do 2 of the samples have in common?
2. Older students could design their own questionnaires complete with data tables to organize answers to help keep track of each tester's answers to the questions and bar graphs to illustrate results.

Reflection/Assessment

In their journals, students can answer the following questions:

Summarize the results/conclusion of your inquiry.
What taste test results surprised you? Why?

Student Handout **Name:** _____

Taste Test Worksheet

Section A: Hypothesis/Prediction exercise (To complete before sampling)

1. How do you think the local ones will compare with the one grown far away? Why?

   _____

2. Which one do you think will have the best flavour? Why?

   _____

3. Which one do you think will have the best appearance? Why?

   _____

4. Which one do you think will have the best texture? Why?

   _____

Section B: Observation (To complete during sampling)

1. Which sample has the best flavor? _____
2. Which sample has the best appearance? _____
3. Which has the best texture? _____

Section C: Conclusion

Use your journal to summarize what you concluded from this activity

Figure 2: Taste Test Tallying Chart

Samples	Prediction Best Taste	Best Taste	Prediction Best Appearance	Best Appearance	Prediction Best Texture	Best Texture
Sample A						
Sample B						
Sample C						

Lesson 8: What if the Food Truck Stopped Coming?

Objective

Students will be able to:

- Identify how much food is available in the Bulkley Valley
- Experience a dramatic interpretation of the vulnerability of our food supply
- Critically think about how to support local agriculture

TIME: Inside: 45-60 min.

Suggested month: Any month

MATERIALS:

- Cards/pencils
- Letter from Local Food Association in an envelope (you can use this lesson plan and put it in an envelope)

Vocabulary

Food supply
Self-reliant

Lesson

1. Explain that today we will learn about the Bulkley Valley food situation. Why do you think it is important to look at our current food situation? Use teacher prompts as needed. What factors could force us to become self-reliant in the Bulkley Valley? What might force us to find our own food? Does the Bulkley Valley have enough land to be able to produce enough food for all the people that live here (12,000 people)? After a 5-minute discussion about this teacher explains the activity.
2. The idea is to come up with a personal estimate, or guess a number that will answer the following question:

   If the Bulkley Valley had to all of a sudden, starting today, rely completely on the food that we have in the valley – that which we have in stores, and that which is being grown – and given the number of people that live in the Bulkley Valley – HOW LONG DO YOU THINK OUR FOOD SUPPLY WOULD LAST?
3. Each student makes an estimate, writes their number of days or weeks or months or years on a card.
4. On one end, the student with the shortest estimate will stand, and will place him/herself in a line, placing each student in order of estimated amounts, until the person with the longest estimation at the end. You can ask that this be done in silence. When finished, the students will be arranged in a time-line.
5. One by one, the students will say the number on their card. Ask the students if they want to change their estimate now that they have seen the others. Students can change their place in the line, still silently. If they are happy with their original estimate, they stay put. Teacher can ask why certain students changed their minds.
6. Teacher can take on more of a dramatic role: This is so very interesting. Do we think that this is valuable information to know or is it not? Why might it be of interest? What influence could this information have? (A discussion ensues.)
7. Teacher continuing in role: Well, since I knew that we were going to be gathering here today to discuss this very issue, I asked the Smithers representative of the Local Food Association if he would be able to give us any indication of a possible answer and highlight some information. Unfortunately, he was unable to attend today, but I did receive a letter, which hopefully contains the information...so I thought it best to open it and share it with you all. Shall we see what it says?

8. Letter opened, displayed, and read aloud:

   According to our research, the estimated amount of the Bulkley Valley's food supply is approximately 2 days worth in total, with a possibility of as much as 2 weeks worth of food during the summer months.

9. Teacher: Wow! That is what the actual, real-life scientists and researchers are supposing...roughly 2 days worth of food in the Bulkley Valley, with a brief window of possibly upwards to two weeks. Were our estimates close? (Teacher compares estimates with students).

10. Teacher continues reading the letter:

    The number of farms in the Bulkley Nechako Regional District is roughly 840. Most of these farms are small. The Bulkley Valley produces less than 10 % of the food it eats. Fifty years ago, the valley produced approximately 50% of its own food. The rest of the food comes from elsewhere in Canada, North America and the rest of the world.

11. Teacher: Less than 10% of the food we eat in the Bulkley Valley originated from here...let's quickly have 10 of you stand in front of the rest of us...if the 10 of you represent ALL the food that is eaten in the Bulkley Valley...then how many of you represent the amount of food that is **produced** here?" Students answer or are aided in finding the answer.

12. Yes...so let's have 9 of you sit down, and just leave one of you standing. Together these 10 people represent the food that residents of the Bulkley Valley eat, and you (the one student standing) are showing us how much food we generate ourselves….10% hmmm. Now, just stay where you are for a moment, and I'll continue the letter.

    We, at the Local Food Association, would be interested in hearing your reaction to these findings.

13. Teacher: Let us respond to these findings! Let's create a 'Spectrum of Difference'. Let us imagine that this end of the line represents **Total Shock**...and this end (teacher goes to the other end) represents the other extreme of **Not Surprised in Any Way**. The very middle is **Neutral**. In one moment I am going to ask you to place yourself where your reaction falls.

    For example if you were just a little bit surprised, but not too much, you might place yourself here or if you figured this was the state of affairs pretty much, and aren't surprised you might place yourselves here. Let's give it a go!

14. A 'Spectrum of Difference' is created by students.

15. Teacher: Now, just stay where you are for one more moment, and I'll finish the letter."

    And please let us know if you have suggestions on what we can do to be more self-reliant or to be less dependent on food coming from other places. We appreciate your thoughts on this matter.

    Sincerely,

    Johnny Appleseed, P.ag

16. Teacher reiterates question: Can you suggest what we can do to be less dependent on food coming from other places? What can we do to support the farmers who are already growing food?

17. Students will try to answer the previous questions using a **Think-Pair-Share** strategy.

18. Here are some ways to be less dependent on food coming from other places and to support local farmers:

- Shop at the Farmer's Market
- Check food labels to know where your food comes from and choose local foods whenever possible
- Plant a garden at home
- Support local farmers by buying directly from them
- Join a Community Garden and grow your own food
- Encourage grocers to carry local foods
- Buy local food in the summer and preserve food for the winter
- Avoid wasting food

Related Resources

1. Visit http://www.worldwithoutoil.org/metateachers.htm for lessons that provide an in-depth understanding of the role that energy has played in our economy, culture, policy and identity, its connections to our lifestyle and affluence, and ways to evaluate its role in our future.
2. For a lesson called 'clean your plate' on food wastage and how that affects our local food situation visit: http://learning.blogs.nytimes.com/2008/05/19/clean-your-plate/?_php=true&_type=blogs&_r=0 The lesson is based on the Time Magazine photo essay 'What the world eats' http://www.time.com/time/photogallery/0,29307,1626519,00.html
3. Students can read a New York Times article about food waste (US article but highly relevant to Canada): http://www.nytimes.com/learning/teachers/featured_articles/20080519monday.html

Reflection/Assessment

In their journals, students can answer the following questions:

How would the Bulkley Valley be different if every family had a garden?

Older students can organize their ideas to this question by placing them on a line that goes from BETTER to WORSE in terms of impact that the changes would have on the Bulkley Valley.

**Adapted from Bronwyn Preece's Food security-into-drama workbook found at:*
http://lifecyclesproject.ca/resources/downloads/Food%20Security-into-Drama%20Workshops.pdf

Gardening Unit

Unit on Gardening

The 10 lessons in this garden unit are designed to offer relatively quick, fun, and relevant ways to help teachers use your school garden on a weekly basis. These lessons aim to connect the students with the land and the seasons, and help them to experience where food really comes from.

Why you and your students should use the school garden as a learning ground:

- Gardening offers hands-on, experiential learning opportunities in a wide array of disciplines, including the natural and social sciences, math, language arts, visual arts, and nutrition.
- Gardens are often the most accessible places for children to learn about nature's beauty, interconnections, power, fragility, and solace.
- Gardens help children learn about environmental stewardship and provide a connection with nature.
- Gardening with kids is a great way to encourage children to learn about healthy foods and where they come from.
- Students learn focus and patience, cooperation, teamwork and social skills.
- Students gain self-confidence and a sense of "capableness" along with new skills and knowledge in food growing — soon-to-be-vital for the 21st century.
- Garden-based teaching addresses different learning styles and intelligences; non-readers can blossom in the garden!
- The garden diversifies and beautifies the schoolyard and encourages school pride.

Safety in the Garden

Preparation is important in creating a safe gardening experience. Unsafe situations can occur when students are not aware of the expectations, lack basic gardening skills, and/or are unfamiliar with safe use of gardening tools. There are many ways to promote safety in the garden; much of this preparation can take place indoors and involve student input.

Create a list of Garden Ground Rules with students:

- Teach students about each and every gardening tool.
- Use proper tool names, describe what the tool is used for, demonstrate how to safely use and transport the tool.
- Talk about why tool safety is important.
- Review tool use and safety before every gardening activity
- Designate one location for tools during a garden activity. Every student uses one tool at a time and replaces tools to the designated place when finished. Be aware of the dangers associated with a large group of excited children working close together using long handed tools.
- Know your students‘ allergies to plants and insects (bees, ants). Know the severity of these allergies and have a plan to get immediate assistance for students experiencing an allergic reaction.
- Have a plan if injuries occur.
- Review garden safety concerns with your school administration as needed.

Hand and foot hygiene

Hygiene and sanitation practices are critical to safe gardening.

Staff working with youth gardeners must work diligently to ensure fruits and vegetables are handled in the most hygienic manner possible. Hand washing and shoe cleaning are two of the most important areas to minimize this. Hands should be washed with warm water 20 seconds and dried with a paper towel before vegetables are picked, prepared or served.

Hands should also be washed after students have worked in the garden area. Cover wounds of anyone who may touch vegetables with gloves. Do not let anyone with an illness handle food.

When working in the soil, it is recommended that garden shoes or at the very least outdoor shoes be worn in the garden. Bare feet, sandals, or flip-flops should not be allowed.

Harvesting

Use clean containers that are made from materials designed specifically to safely hold food.

Use clean hands or gloves (that have not been used to stir compost or pull weeds) when picking produce.

Brush, shake or rub off any excess garden soil or debris before putting the produce into the harvest container or bringing produce into the classroom/kitchen.

Consuming produce from the garden

Food grown in school gardens may be prepared and consumed by the students in the classroom and at lunch. When in the garden, students should always consult with an adult before they consume something picked from a plant. For example the rhubarb and potatoes leaves are poisonous.

Classroom Management in the Garden

Exploration in outdoor settings can provide meaningful educational experience for students. However, exploration in outdoor settings does not have to mean an unfocused free for all.

For effective classroom management in an outdoor setting, students must know the expectations, rules, and feel comfortable learning new skills. Outdoor classrooms need reasonable limits the same way indoor classrooms do. Make sure students feel comfortable and familiar with the garden space before jumping into work. Spend time outside just observing the sights and sounds of the garden. Discuss the gardening activity before going outside. Review gardening rules and tool safety before any gardening activity. To build skill levels and confidence, practice gardening skills like seed planting/transplanting indoors at first.

Do not assume all students have experience planting seeds in the ground! Start with larger seeds first. Then, advance to working with trickier smaller seeds as manual dexterity is mastered.

Recommendations

We encourage the use of emergent curriculum within the garden setting. For example, let the students decide what they want to learn about, what they want to grow and follow their lead when possible. Try to leave behind adult ideas about gardening. Straight rows of broccoli, potatoes and onions may be your idea of the perfect garden, but may be far from what a child finds inviting.

Please note that some garden lessons would ideally be conducted with more than one adult in order for the students to experience the garden activities in smaller groups. This is where assistance might be needed from parent helpers or Educational Assistants (EAs).

What (in earth) to Grow!?

A brief guide to planning Food Gardens for Bulkley Valley schools

This is a progressive document, with the following just being the starting point of recommendations for food plants to grow with classes and to establish in the school garden. These recommendations will be updated as Groundbreakers learns about the successes and challenges of yours and other school gardens. This document can be used in conjunction with the lessons of the Gardening Unit; in particular Lesson 5 Planning Your Food Garden, which discusses the following four elements in garden planning:

Timing: when plants mature for harvest and therefore when to sow seeds

Sun Exposure: optimum warmth and soil temperatures, and shade preference

Space: optimum spacing for each plant and vertical requirements (e.g. peas are climbing plants)

Aesthetic: elements of beauty and smell of plants, and patterns and arrangement of garden bed

The list below also offers some suggestions for **companion planting**: When choosing varieties to plant it is always a good thing to consider beneficial companion plants some of which attract pollinators, deter pests, and provide nutrients for the benefactor plant.

Please note that this is a brief discussion of some recommended garden vegetables to start your planning and to help direct the ideas of your students. Please refer to a gardening book and seed packages for more details.

Beans, bush: Fun to pick and can be bountiful, harvest ready in late August, *need warm soils for germination so don't plant until June!* Could start indoors in May for transplanting. Sun loving. Individual plants are not space takers. Colourful varieties. Make sure not to handle when damp.

Beets: Easy seed to plant and greens can be picked in late June (possibly) with the mature beets waiting in the garden for September harvest. Direct seed in garden in early May. Good for compact planting.

Broccoli: Good for continual harvest at end of summer. Can start seedlings in class and transplant at end of May and can also direct seed at same time for comparison. Space takers – 10 plants would fill a 4'x10' box. Very popular with kids for snacking on. Consider companion planting colourful marigolds for all brassicas.

Brussel Sprouts: Good for a late fall harvest and for whole class eating. Start seedlings in class for transplant at end of May. Space taker like broccoli. Companions include nasturtiums and basil, marigolds and garlic.

Cabbage: Good for a late fall harvest and for whole class eating. Can start seedlings in class and transplant at end of May and can also direct seed at same time for comparison. Space takers – 10 plants would fill a 4'x10' box.

Carrots: Unfortunately not recommended because the carrot fly is rampant in Smithers and Telkwa which causes carrots to go mushy upon harvest. (There are some carrot fly resistant varieties and it may be a positive challenge to experiment with companion plants and the timing of planting).

Cucumbers: Only for larger cold frames or green houses. Roots are sensitive to transplanting so start seedlings in class in degradable containers that can go directly in ground (e.g. peat pots). Sun loving. September harvest if well watered in summer. Climbing vine – needs space and trellis. Has good flowers. Cucumbers are also great for hanging baskets in greenhouses.

Herbs (Oregano, Thyme, Mint, Chives): Easy to grow low shrub type perennials (will grow back the following year), but can also take over garden beds if not in check. Great fun for tasting, teas, adding to class cooking. Can add good scents in garden. Can have huge success with basil when planted late and in cold frames, no worries about it spreading anywhere. Stevia is a neat herb to show kids because of the sweet taste.

Kale: Good for continual harvest in fall. Can start seedlings or direct seed in late May. Tallish plant like broccoli but can be planted compactly. Can be colourful.

Kohlrabi: Something most kids haven't tried and can be cut up for raw eating. Leaves can be eaten too. Harvest in September. Direct seed in June for September eating. Needs moderate amount of space – not as much as broccoli and cabbage.

Lettuces, Spinach, and Greens: Good for late June eating – fully harvest plant by July. Can start seedlings for early transplanting and direct seed in early May. Can plant in rows between where larger fall harvest plants will go. Head lettuce varieties take more room than leaf varieties that can be planted compactly. Remember a little goes a long way. Many varieties of Asian greens and peppery greens that are fun to taste and grow in 6 weeks. Can be shaded

Nasturtiums: Great eating flower in later summer. Sprawling plant, only 1 or 2 per box, good for overflowing over edge of bed. Seed heads are good eating too (very peppery). Easy seeds to plant in class for June transplanting or direct seed in warm soils.

Onions, green/scallion: Take up little space and can be left in for late fall harvest too. Direct seed in June. Sun loving.

Pansies: Really easy and bright colours that can also be used for salads. May spread as they reseed themselves.

Peas, snap (not shelling): Easy seed to plant in early May. Need trellis and think how it could shade garden bed. Thin in late June and little shoots can be eaten . Good for continual harvest. Another veggie that is hugely popular and the more you harvest the longer it produces.

Potatoes: Good wow factor for late fall harvest. Easy to plant in late May. Takes up lots of room and will shade out everything by August including weeds! Need deep soil (18") and max 10 plants in 4'x10' bed. Fun variety for planting would be the banana potatoes. You can also play with colour with the blue or purple varieties and different coloured skins.

Radish: Fast growing – late June harvest. Direct seed in early May. Good for planting in between rows of transplants and larger fall harvest plants. Can be shaded.

Squashes & Pumpkins: Fun for late fall harvest, but need long season, warm and fertile soils, and lots of space. 3 plants would fill a 4'x10' bed. Easy seeds to plant in class in late April for June transplanting.

Sunflowers: Great for beauty, and seed varieties for a little tasting and sharing with birds in winter. Easy seeds to plant in class in late April for June transplanting.

Swiss Chard: Good for continual harvest and compact planting. Beautiful colours available. Seed directly in early May. A little goes a long way as plants will keep producing leaves.

Tomatoes: Only for larger cold frames or greenhouses. Seedlings need to start in March for June transplant. Some companions include onions, garlic, leaf lettuce, basil, nasturtiums and marigolds.

Turnips: Young thinnings can be eaten. Direct seed in early May for little seedling harvest in late June. Plant more seeds in June for fall harvests.

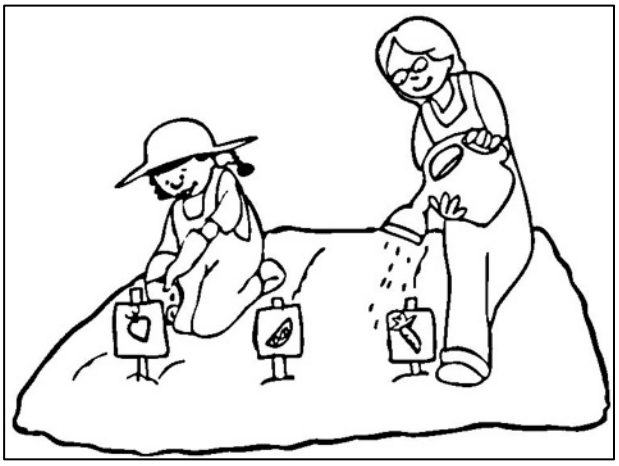
Zucchini: Good for early September harvest and for studying flowers & pollinators. Space takers. Easy seeds to plant in class in late April for June transplanting.

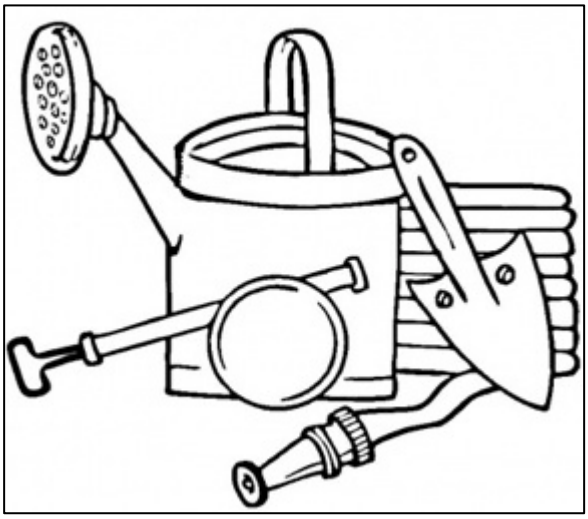
Notes:

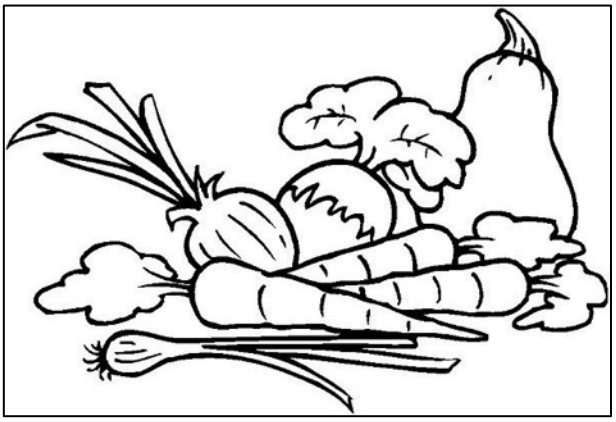
- Berry plants are not recommended because of summer harvest times.
- Specializing some garden beds, that is with no more then 3 plants for harvest, has the benefit of allowing class to focus and learn about a couple of plants, allows enough for a usable harvest and considering there could be losses, allows for the potential for spring focused plants (i.e. greens, radishes) to be interspaced with plants that need bigger space come summer.
- Overwintering crops (e.g.: garlic and bulbs) and perennials (e.g.: mint, oregano) will likely be walked on over the winter and would need to be fenced off for protection.

My Food and Garden Journal

Name: _____







Lesson 1: Dirt Detectives

Objective

Students will be able to:

- Identify and sort the different components of soil using a magnifying glass and sifters through garden exploration
- Make observations about soil texture using their senses
- Explain why healthy soil is important to plants
- Practice recording observations in journals

Vocabulary

Sand
Silt
Clay
Organic matter
Soil texture

TIME:

Inside: 10 min.

Outside: 30-45 min.

Suggested month: April/May

MATERIALS:

- Basketball, baseball, penny
- Student handout
- Newspaper
- Trowels
- Magnifying glasses
- Sifters

Lesson

In the classroom:

1. Have a class discussion to generate a definition of the term *soil*. (Soil is the top layer of the Earth's surface, like the peel of an apple or the frosting on a birthday cake). (You may wish to offer a demonstration of 'Earth as an Apple' from the previous unit (Lesson 1) to reinforce the limited availability of topsoil).
2. Explain the importance of soil for plants: Soil holds the plant's roots and stores nutrients. The type of soil in which you choose to grow your garden plants can determine whether they will flourish or die out.
3. Have students think of things that make up soil.
4. Explain how soils are a combination of *sand*, *silt*, *clay* and *organic* matter. Soil type, and its capacity to grow plants, is dependent on the mixture of the four components.
5. Sand, silt and clay are all different sizes. Sand contains the biggest particles of the three and feels 'gritty.' Silt is the second largest. It feels soft or 'floury.' Clay, the smallest of the three particles, feels sticky. To understand how the three particles compare in size, tell the students to imagine a grain of sand as a basketball, silt as a baseball, and clay as a penny. Soil contains much more than just the types of sediment (sand, silt, and clay). It also contains organic matter —like twigs and dead leaves. Organic matter comes from living things such as plants and animals. When organic matter rots or decays, it puts nutrients into the soil that plants need to grow.
6. The way a soil "feels" is called the *soil texture*. Soil texture depends on the amount of each size of particle in the soil. Why does soil need sand and small pebbles? Sand creates space that allows for water drainage and contributes to oxygen distribution since roots need oxygen (just like animals). If there is too much sand, the soil will not be able to hold water and soil with an appropriate humidity and

having a correct balance of nutrients and minerals is one of the important factors for the growth and survival of a plant.

7. Explain that what we are ideally going for in terms of soil to grow vegetables is called a *sandy loam*, which is a balanced combination of sand, silt, clay and organic matter. It should be light and allow for air and water movement, have a kind of fine breadcrumb like texture, which usually occurs when there is plenty of organic matter in the soil.

In the garden:

1. Place students in pairs in different areas around the garden.
2. Give each pair of students a trowel and a piece of newspaper. Have some sifters and magnifying glasses available.
3. Have students dig a small soil sample and put it on their newspaper.
4. Have them examine it, identifying and sorting the soil into different groups of things that were alive (grass, twig, root), bigger rocks, small rocks, silt, leaves and perhaps living things, etc.
5. Have students do a walkabout to see what things their classmates found.
6. Next, hand students a Soil Evaluation Worksheet and encourage students to use their sense of touch, sight, and smell to explore the soil.
7. Have the students do a texture test. Can they make a ball with the soil? Does the soil feel gritty? If it is too gritty it means there is too much sand and the soil cannot hold water. Is the soil sticky? If it is sticky, it means there is too much clay and the soil does not allow the water to pass through.
8. Students will then record the results of their texture test in their journal or following worksheet.

Review

Come back together as a class and select several students to report on their soil texture findings.

Reflection/Assessment

In their journals, students can answer the following questions:

1. Draw and label individual soil components (show their size in relation to one another).
2. What is healthy soil? Use words to explain.

Student Handout **Name: _____**

Soil Evaluation Worksheet

Eyes 	What colour is your soil?	What does this mean?	What do you need to do to help plants grow well?
Touch 	What is your soil's texture? Put some soil in your hand and squeeze it and roll it around.		
Smell 	What does your soil smell like?		

Colour

The darker the colour of your soil the more organic matter is contains. Most vegetables grow well in soil that is high in organic matter.

- **Reddish brown** - the soil has enough air and drains well.
- **Grayish or Blue-green** - the soil is continuously wet and may have high clay content. That's not good for most garden plants so you'll need to add some sand for better drainage.
- **Yellowish** - the soil is imperfectly drained.

Texture (how it feels when you hold it in your hand)

Soil should feel loose and spongy and crumble easily in your hand

- If it feels like fine breadcrumbs, the soil is healthy.
- If soil stays balled then it is too wet or contains too much clay. To solve this problem, you'll need to add some sand for drainage.
- If it feels porous like beach sand then you'll need to add more organic matter.
- If it feels too sticky like modeling clay then you'll need to add both organic matter and sand.

Smell

Healthy soil has a rich earthy smell. It does not smell bad.

- If it smells bad it usually means that the soil is not getting enough air and/or the water is not draining so it becomes stagnant and smelly so adding sand will help.

Lesson 2: Soil Shake

Objective

Students will be able to:

- Experiment with different samples of soil
- Identify and measure soil layers
- Report and analyze results of soil experiments (what does this say about our soil?)

Vocabulary

Sand
Silt
Clay
Organic matter
Sandy loam

TIME:

Inside: 5 min.

Outside: 45 min.

Inside: 20 min. (Once all the layers have settled; the silt and clay layers of the jar will not settle until the next day or 2).

Suggested month: April/May

MATERIALS:

- Shovels
- 1 litre jars (3)
- Newspaper
- Water
- 1 Tablespoon powdered dishwashing detergent
- Labels/pencil

Lesson

In the classroom:

Review that soils are not just "dirt." Instead, they are made up of a variety of materials, including *sand*, *silt* and *clay*, and *organic matter* (dead leaves, twigs, stems and even parts of animals and plants). Different soils have different amounts of each of these things. This is why some soils are better for growing some plants or vegetables than others. Tell the students you are going to be soil scientists, and go around the school digging small holes to bring back samples for us to study.

In the garden:

Have students divide into three groups and each group will take 3 soil samples from your school garden, field and play area, in 3 different 1-litre jars. Remove surface debris or sod and dig about 4 - 6" down. Label the jars with the name of the location.

In the classroom or outside:

1. Keeping samples separate, have each group spread the soil on newspapers. Crush any lumps and remove large rocks or sticks.
2. For each soil type, fill a jar, one-quarter full with soil. Label and add water until the jar is three quarters full.
3. Add one tablespoon of powdered dishwashing detergent. Close the lid and shake for 3 minutes to combine the soap, soil, and water and to make sure no soil is stuck to the bottom or sides of the jar. Different students can take turns to shake the jar.
4. Let the jar stand for several minutes. Students will see that the mixture separates into layers. The larger particles, such as coarse sand or rocks, will settle to the bottom of the jar after about a minute. Silt is the next heaviest particle and will settle out after about an hour. The silt layer is darker than the sand. Clay, the lightest particle in the mix can take from one to two days to settle. The clay layer that settles

on top is fine textured and light in colour. The material left floating on the top of the water is organic matter. It is made up of dead leaves, twigs, stems and parts of animals and plants.

5. Once all the jars have settled (this can be done the following day), discuss how long it took for all the particles to settle. Did some soil samples take longer to separate than others? What do you think caused this to happen? Which soil had the most organic matter? Which soil had the most rocks? The most clay? What does this say about our soil?
6. Explain that what we are ideally going for in terms of soil to grow vegetables is called a *sandy loam*, which is a balanced combination of sand, silt, clay and organic matter. It should be light and allow for air and water movement, have a kind of fine breadcrumb like texture, which usually occurs when there is plenty of organic matter in the soil.
7. Students can also measure the bottom layer (sand), second layer (silt) and top layer (clay).

Extension

Students can calculate the percentages of sand, silt and clay in the jars and compare. If there is 5cm of soil in total, every .5cm would be 10% (2.5cm = 50%, 3cm=60%)

There is a 'soil texture triangle' that can help describe the soil when you type in your percentages of sand, silt, clay. See www.pedosphere.ca/resources/bulkdensity/triangle.cfm for more information.

Reflection/Assessment

In their journals, students can answer the following questions:

1. Draw a picture of one of the soil jars labeling the different layers and using colour. (This can be done once the clay has settled, which can be up to a day or 2 later).
2. What conclusions can you reach about the quality of your soil?
3. Which jar has soil that you think plants would grow best in?

Lesson 3: Garden Superheroes

Objective

Students will be able to:

- Name examples of decomposers
- Explain how decomposers help the environment and garden
- Describe that decomposers help break down dead plants and animals to make one part of soil: humus
- Observe worms in their habitat

Vocabulary

Decomposition
Decomposers
Bacteria
Fungi
Humus
Compost

TIME: Inside: 15 min.

Outside: 45 min.

Suggested month: April/May

PREPARATION:

Find a good site of decomposing plant material (under woody debris). You may need to introduce worms prior to lesson!

MATERIALS:

- Overripe fruit (e.g.: banana, pear)
- Containers (like yogurt)
- Magnifying glasses
- Newspaper

For the worm hotel:

- Large glass jar
- Sand
- Potting soil
- Dark coloured construction paper
- Tape
- Sparkly gel markers/glitter glue that can be used on dark paper
- 3-4 healthy earthworms
- Water
- Fruit, leaves, compost

Lesson

In the classroom:

1. Review what's in the soil (clay, silt, sand, organic matter). In the soil exploration activity, certain students may have come across living things like worms. Today we will discuss who's in the soil and find out more about what they do and why that is important.
2. Place the overripe fruit in front of the class. What would happen if you left a fruit out on your kitchen table for a year? What if you left it on the ground for a year instead? Would any animals visit it? What would they be doing?
3. Define *decomposition* as the breaking down of something in nature into small pieces. Explain that plants, animals and people depend on good soil and decomposers. Without decomposers, soil would not have the nutrients plants need to grow, and we would not have the food we get from plants (almost all of our food).
4. Name some *decomposers* or garden superheroes: *Bacteria*, *fungi* and worms. Bacteria are very small microorganisms that are difficult to see with a naked eye but play a crucial role in decomposition and returning nutrients to the soil. One gram of soil typically contains about 40 million bacterial cells. Fungi, like mushrooms, are neither plant nor animal but still work hard as decomposers.
5. Ask them if they think a worm can eat a robin? Or is it a Robin that eats worms? Tell them to think about how, when a robin dies, its body decomposes and becomes part of the soil. The worm eats the rotting material in the soil and so consumes the robin. Thanks to worms and other decomposers, nothing gets wasted and rotting plants and animals get turned into nutrient-rich soil for other plants to grow in.

6. Tell students they will be looking out for these superheroes outside.

Outside:

1. Take students to the garden. Ask them where they predict garden superheroes would live? Put students in groups of 3 and give them trowels and newspaper. Direct the groups to a natural area that is covered with fallen leaves, preferably wet and rotting ones. (If you have young students, you can all go to three sites). Have them take a container full of leaves and soil and put it on their newspaper. Examine the pile by spreading it out. Using magnifying glasses, watch closely for small living things (such as worms, insects, spiders, etc.). Encourage careful observation. (You can also use the school compost to examine decomposers if the compost pile is well decomposed).
2. When the students discover living things in the samples, stress that we can study these animals, but we need to respect them. Be sure to tell the students to leave any worms, insects or spiders they find in the garden.
3. Explain that healthy soil should contain lots and lots of decomposers, particularly worms. Worms break down raw materials like dead leaves, ventilate the soil as they move through it, and build it up with their casings. Unfortunately, worms do all this underground, in the dark so we can't see what they are actually doing!
4. This is why we will build a worm hotel. Depending on grade level, teacher or students in groups can build the worm hotel. Start by pouring about 5 cm of sand onto the bottom of the jar. Alternate between layers of sand and soil—4 or 5 layers in all—until the layers reach the top of the jar.
5. Dampen the whole mixture with some water, and then put the earthworms on top. They will begin to burrow their way into the soil almost immediately.
6. Earthworms don't like bright sun, so now you need to give them a little privacy. Cut the dark construction paper so that it will fit around the jar, and write a title on it with a glitter or a gel pen. Then tape the paper around the edge of the jar, taking care to leave the jar top off so that the worms get air. Leave the jar in a corner of the class away from high traffic.
7. After 3-4 days, pull the paper off. You'll see that the worms have been very busy: even though you didn't move the jar, the worms have traveled all around and mixed all the layers together!
8. You can continue to watch the worms explore for a few days, but after that, be sure to return them to their natural habitat. Those little worms are a major part of our ecosystem, constantly digesting and composting and enriching the nutrients in the soil.

   Worm hotel adapted from http://www.education.com/activity/article/make_a_worm_hotel_kinder/

Extension

Play a game of decomposition tag:
http://www.cvswmd.org/uploads/6/1/2/6/6126179/do_the_rot_thing_cvswmd1.pdf

Identify and label worm anatomy:
http://www.cvswmd.org/uploads/6/1/2/6/6126179/do_the_rot_thing_cvswmd1.pdf

Reflection/Assessment

In their journals, students can answer the following question:

Draw a diagram of a worm hotel and label it to show how worms help the garden.

Lesson 4: Soil Boosters

Objective

Students will be able to:

- Identify different types of soil amendments such as **compost**
- Explain why we add amendments to the soil
- Review what goes in the compost bin
- Spread, mix and rake amendments into the soil

TIME:

Inside: 10 min.

Outside: 30 min.

Suggested month: April/May

MATERIALS:

- Ball
- Shovels
- Soil amendments
- Buckets/containers
- Trowels

Vocabulary

Organic
Inorganic
Compost
Amendments

Lesson

In the classroom:

1. What is healthy soil? What does it look like, smell like, feel like? Healthy soil helps roots to expand and thrive, and the happier the roots, the happier the plant! Healthy soil contains food and nutrients for the plants and also for all of the insects, worms, bacteria and fungi.
2. Ask students why we need to add things to the soil. Record their answers on the board.
3. Explain that in Lesson 2, in our soil shake test we discovered that our soil was a certain way (more clay or more sand) and we are aiming for a sandy loam, which is the best soil in which to grow vegetables. It's up to gardeners to build the nutrients in the soil and to create healthy, living soil so that plants can thrive.
4. How can we make healthy soil? Explain that to make healthy soil we have to add different kinds of materials to the garden beds and that is what the class will be doing in the garden today.

In the garden:

1. Explain the meaning of the word amendment or soil booster. A soil amendment is any material added to a soil to improve its physical properties, such as water retention, water infiltration, drainage, aeration and structure. The goal is to provide a better environment for the plant's roots.
2. Explain the two types of soil amendments - *organic* and *inorganic*. The former are made from natural products. The most common ones are *compost* (you can point to the school's compost bin) and manure. Inorganic amendments are of two types: manufactured (man-made) and mined. They include certain chemicals that make the soil fertile. However, they can also reduce the percentage of natural nutrients in the long run, if used for a long time and in large quantities.
3. Tell students that today we will use some of the contents of the compost bin and add some of it to our garden beds because *compost* is filled with decomposers or garden superheroes (Lesson 3) and it

improves the structure and texture of the soil. This helps the soil to better retain nutrients, moisture, and air so the plants grow better.

4. Review what goes into the school compost bin. (Most schools compost lunch scraps and so students usually know a few things about composting). Vegetables, garden trimmings, manures are all examples of raw materials, which can be composted.
5. To aid with the review, have students stand in a circle. To start, the teacher calls out something that can be composted or lives in the compost (like decomposers) and then calls out a student's name and tosses the ball to them. Once students get the hang of it, put someone in the middle of the circle, whose goal is to tag the person with the ball before it is tossed. If tagged, that person changes places with the one in the middle. To make sure all the students get a turn, students can sit down after they have named something they can compost and tossed the ball to another student.
6. Bring students to the compost bin. Students will use their trowels to remove a few large scoops of compost and place them in small buckets. Students will transport the buckets to the garden bed(s).
7. Arrange students evenly around the garden bed.
8. With their trowels, students should mix it into the upper 15 cm of the soil in the garden bed. It is necessary to mix the amendments well with soil, for effective movement of air and water, thereby increasing the nutrient dispersal. The basic purpose of this technique is to increase the absorption rate of nutrients by the roots, and to maintain the plants as healthy as possible.
9. When finished, collect buckets and demonstrate how to use a rake to blend compost into the soil and to smooth out the soil surface. Select a few students to give it a try.

   Note: Once the seeds or seedlings are planted, amendments like compost tea (see recipe in Extensions below) can be added to the base of the plant to help boost plant growth on a monthly basis.

Extensions

1. Students can use thermometers to measure the temperature outside and inside the compost bin.
2. Students can make compost tea: http://oldworldgardenfarms.com/2013/04/02/how-to-make-and-use-compost-tea-the-ultimate-organic-fertilizer/
3. If the class will be adding bagged manure or bagged organic fertilizer older students can read the instructions and calculate the volume of the amendment needed for the garden bed.

   e.g.: garden bed is 2 meters wide by 4 meters long and we want 5 cm of manure spread on top the garden. Divide 5cm by 10 to get meters = 0.05 meters. We will need 0.05 X 2 X 4 = 0.4 square meters from the bag.

Reflection/Assessment

In their journals, students can answer the following questions:

Draw a soil superhero (a cartoon image of a soil character out of your own imagination). Draw and label the things that this type of soil superhero eats.
Why do we need soil boosters?

Lesson 5: Planning your Food Garden

TIME:

Inside: 20 min.

Outside: 30-45 min.

Suggested month: April/May

MATERIALS:

For the teacher:

- Flashlight/headlight
- Student handout
- Paper
- Ruler
- Coloured pencils
- Wooden craft sticks
- Permanent markers
- Camera

Objective

Students will be able to:

- Apply their knowledge of sun exposure, space and timing to prepare a garden plan
- Use imagination and creativity to design an aesthetically pleasing garden

Vocabulary

Sun loving
Shade tolerant
Aesthetic

Lesson

In the classroom:

1. Explain that there are a few elements to consider before we plant in order to have a successful garden such as:

   A) *Timing*: This is the essence of what you plant. It will determine when you can plant it and when you can eat it. Some vegetables can be planted in colder soil temperatures while others cannot. And some plants take longer to mature than others before being edible. Consider interplanting as a way to maximize your planting space. Plant quick-maturing crops, such as lettuce and radishes, around slow growers, such as broccoli. The lettuce will be harvested by the time the broccoli needs the space.

   B) *Space*: Some plants grow taller and wider than others so we need to be mindful of the space that each mature plant will occupy. We need to plan our garden as if we were taking a picture - tall plants in back and shorter ones up front. To demonstrate this, arrange a few students so that a tall student is in front of a smaller student. Using a flashlight to model the sun's trajectory, demonstrate that taller plants cast shadows over smaller ones over the course of a day. Ask student how shadows might affect certain plants.

   C) *Sun exposure*: Some plants are sun loving while some are shade tolerant. Therefore, it's important to know each plant's unique sun exposure preferences before designing your garden layout. Tomatoes for example, require consistently sunny and hot conditions in order to produce an abundance of fruit. Other heat-loving plants are squash and peppers. Some garden plants are more adaptable and can do well in sun or partial shade. Bush beans and lettuce can succeed in a variety of growing conditions. We need to give sun-loving plants priority before thoughtfully placing the more adaptable plants throughout the garden.

   D) *Aesthetic*: Gardens often include a variety of shapes and colours to be aesthetically pleasing. A beautiful garden is enjoyable to look at, touch, smell and taste. Will our garden look best planted in rows, clusters or squares?

2. If you have pre-selected the vegetables your class will be growing, have the list of these vegetables available to the students. If you have not pre-selected vegetables, and prefer to let students choose

what they might like to plant you may need to offer suggestions (refer to page 37 for recommendations).

3. Place students in groups of 3-4 and give each group a Garden Plant Activity handout. Teacher circulates and helps students as needed. Page 37 of this document as well as seed packets can also help answer the questions in the handout (see Lesson 8 for more details on reading seed packets).

In the garden:

1. With their completed handout, students will draw their garden bed (to scale for older students 2.5 cm = 30 cm) on a blank sheet of paper or their journals and indicate directions (with North at the top). Alternatively, different groups of students can use available empty garden beds (or use chalk to delineate a garden bed and to draw different plants within the bed) and props (see Extension 1.) for a more visual and kinesthetic garden planning activity.
2. Have students work together to decide where each veggie should be planted with their new knowledge of sun exposure, vertical space, aesthetic and timing.
3. Cycle from group to group and have students explain their garden layouts. Have students use the flashlight as needed to illustrate sun exposure throughout the day.
4. Students display their garden plans for all to see.
5. The class can choose one of the plans or pick elements from each plan to decide where the chosen veggies will be planted.
6. Have different students write the names of the chosen vegetables on wooden craft sticks and plant them according to their plan (you can do this the day you plant if you are afraid the sticks will be moved).
7. If you are using props to help with the visual planning of the garden, take pictures of the different designs, which you can later print, and use on another day to pick the best of each design.

Extension

1. Your class can create cardboard cut outs of the vegetables you will plant in order to see how tall and wide they will be and place them in your garden to help decide how many of each to plant and where.
2. Visit http://www.thecraftycrow.net/garden/ for garden marker ideas
3. Visit http://www.parentmap.com/article/15-garden-crafts-for-kids?page=15 for garden design ideas

Reflection/Assessment

In their journals, students can answer the following question:

Explain the reasons behind the garden design choice you made.

Student Handout **Name: _____**

Garden Plants Activity Sheet

Plant name	A) Timing: Days to maturity	B) Space Small, medium, big?	C) Sun loving or shade tolerant?	D) Colour, shape, smell?
e.g. Tomato	65 days	Medium	Sun loving	Red, staked, fragrant

Lesson 6: Soil Temperature

TIME:

Inside: 20 min.

Outside: 30 min.

Suggested month: April/May

MATERIALS:

For the teacher:

- Thermometers
- Wooden skewers marked at 5 and 15 cm
- Clipboards
- Soil temperature chart
- Pencils
- Watch

Objective

Students will be able to:

- Gain understanding of changes that occur throughout the seasons
- Use thermometers to measure soil temperature
- Interpret data collected to determine if the soil is warm enough to support plant growth

Vocabulary

Weather

Lesson

In the classroom:

1. Ask students "What is *weather*?" Write some of their defining words on the board. What do students know about weather in each of our seasons?
2. What months are hot, cold, warm, cool, snowy, or rainy? Write the seasons on the board and record the students' answers next to the season's name.
3. What are average temperatures in the winter, summer, fall, and spring? (winter: -7 degrees Celsius, spring: 4 degrees C, summer: 18 degrees C, fall: 2 degrees C.) Include example temperatures next to descriptive words for the seasons like hot, cold, warm, cool.
4. Explain to students that soil temperatures change in the seasons, just like air temperatures change. So when the air feels cold, the soil is cooling too. What seasons are best for growing plants? What does it feel like outside during those months?
5. Tell students that before gardeners plant, they often measure the temperature of their soils. Explain that we want to be sure the soil temperature is correct before we plant our garden because soil temperature has a significant role in helping to determine the rate of plant growth, and whether a plant will even survive. Make sure to check seed packets for recommended temperatures.
6. Draw the chart below on the board and explain it to students. Come back to this chart once the temperature readings have been recorded.

Soil temperature	Conditions during growing season
Less than 4 degrees Celsius	No growth
4-16 °C	Some growth
16-21 °C	Fastest growth
21 to 29 °C	Some growth
Above 29 °C	No growth

1. Divide the class into groups of 3-4 students. Give each group a clipboard with a pencil and a Soil Temperature Chart hand out. Tell them that they are going to record the temperature of the soil in different areas of the garden on the chart.
2. Explain that they will measure the soil temperature at different depths. Do they think the soil temperature will be warmer or cooler as they measure the temperature deeper into the ground?

In the garden:

1. Using a thermometer, demonstrate how to measure soil temperature. First measure the air temperature at shoulder height. Then, measure the temperature at the surface of the ground. Is there any difference?
2. Distribute thermometers to the groups.
3. To determine the soil temperature, use the skewer that you have marked at 5cm and 15cm (we use a skewer to push through the soil in case there might be rocks that could damage the thermometers. Push the skewer into the ground until you reach the 5cm mark. Remove the skewer and insert the thermometer for one minute (this is where the watch comes in handy!), then remove the thermometer.
4. Demonstrate how to record the data on the chart. Repeat the same measuring process at 15cm.
5. Ask each group of students to measure and record the soil temperature at three locations, and at two depths (5cm and 15cm) per location. Consider recording temperatures at different times of the day. Help the groups identify three distinct locations for their measurements (an example of three measurement areas might include a raised bed, in a grassy area, under mulch).

Review

1. After the students measure the temperature in three locations, gather them together and ask each group to report their findings.
2. Ask students to refer to the temperature chart (above) to determine if the soil temperatures are good for planting. If the soil is warm enough, plant with your students in the garden within the next few days.

Extensions

As students most likely discovered, the soil temperatures change with soil depth. Ask students to compare the temperatures they recorded at different depths. At which depth is the soil the warmest? Which is the coolest? Guide students in subtracting the coolest temperature from the warmest temperature to determine the difference in degrees.

Reflection/Assessment

In their journals, students can answer the following questions:

Draw the growing cycle of a plant. Include the four seasons and pictures of what the plant is doing. E.g.: You could draw a picture of a plant sleeping under a bed of snow for winter.

Student Handout **Name: _____**

Soil Temperature Chart

Date: _____

Location	Time of day	Temperature (°C) at 5 cm	Temperature (°C) at 15 cm
e.g.: Under leaves, in cold frame			
Location 1:			
Location 2:			
Location 3:			

Lesson 7: Growing, Germinating and Transplanting Seedlings

Objective

Students will be able to:

- Estimate various measures by using fingers and hands
- Explain and create conditions for germination
- Observe germination
- Illustrate parts of a seedling
- Identify conditions necessary for plants to be transplanted
- Demonstrate care in transplanting seedlings

TIME:

Inside: 60 min. (+ daily observation time)

Outside: 45 min.

Suggested month: May/June

MATERIALS:

- Clean containers with drainage hole
- Seeds
- Wooden craft sticks
- Spray bottles filled with water for misting
- Started seedlings
- Permanent markers
- Garden maps
- Watering can/hose
- Bucket filled with water

Vocabulary

Germination
Seedling
Seed coat
Embryo
Cotyledons
Plumule
Radicle
Hardening off
Photosynthesis

Lesson

A) Growing seedlings

In the classroom:

1. Choose containers that are clean and have a drainage hole. Fill the containers with potting soil to about 1 cm from the top.
2. Provide students with seeds for the plants and review with them the appropriate depth to plant the seed (twice the depth of the seed's length).
3. Once the students know the depth to plant their seed, have them measure that distance on their finger. With their finger as a measure, they should poke 2 or 3 holes in the potting soil to the appropriate depth.
4. Instruct them to drop one seed in each hole, carefully cover the hole with soil and tamp gently to slightly decompress the soil.
5. Mist the soil gently with a spray bottle and continue to water the seeds whenever the soil is dry.
6. Label each pot by writing on a wooden craft stick the type of plant and the date planted.
7. Once the seedlings have their first true leaves (the leaves that grow after the cotyledons (see definition below) have begun photosynthesizing), make sure you go through the *Hardening Off* process. In the week prior to transplanting, begin to gradually increase seedlings' exposure to the elements. This

process is referred to as *hardening off*. Seeds started indoors will be hardier if they are introduced slowly to the climate outdoors. Just as athletes train for the big event, developing seedlings must go through their own training regimen in order to successfully survive outdoors.

8. Find a location in the garden or around the outside of the school that will provide shelter and shade for a few hours every day. (High traffic areas or spots close to the playground are not ideal.) Bring them indoors at night. Each day, leave them out a bit longer. After about a week, put them in the sun during the day but keep bringing them in at night. Then leave them outside day and night for about a week.
9. Continue to water them but only after the top of the soil has dried out (about every other day with a watering can). Bringing in the seedlings over the weekend is recommended.
10. Once the seedlings have gone through the hardening off process and soil temperatures are warm enough (see Lesson 6) you may safely transplant most spring vegetable seedlings.

B) Observing germination

1. Explain the germination process: Seeds remain dormant or inactive until conditions are right for germination. All seeds need water, oxygen, and proper temperature in order to germinate. Some seeds require proper light also. When a seed is exposed to the proper conditions, water and oxygen are taken in through the seed coat. The embryo's cells start to enlarge. Then the seed coat breaks open and a root or radicle emerges first, followed by the plumule.
2. Many things can cause poor germination. Overwatering causes the plant to have too little oxygen. Planting seeds too deeply causes them to use all of their stored energy before reaching the soil surface. Dry conditions mean the plant doesn't have enough moisture to start the germination process and keep it going.
3. Have students observe the plants daily. In their journals, they should note the date that sprouts are visible, height of seedlings, the care they give the seedlings, and growing conditions until the seedlings are planted outdoors.
4. Ask students to identify the parts of the seedlings as they begin to sprout and draw diagrams in their journal. You can draw the diagram in Figure 3 below on the board to help students. They should be able to observe and label the following things:
    - *Seed coat*: protective covering of the seed
    - *Embryo*: inside the seed coat is the baby plant
    - *Cotyledons*: leaves stored in a seed. Plants use cotyledons to make sugars through photosynthesis. (See extension for lesson on photosynthesis).
    - *Plumule*: the first true leaves
    - *Radicle*: the part of the embryo plant that forms roots

C) Transplanting seedlings

1. Arrange students around the garden bed where you will be transplanting. Remind them of the conditions that are necessary for seedlings to be transplanted. (Warm soil, healthy and mature seedlings, appropriate spacing and water.)
2. Place a row marker at the end of the row where the students will be planting (refer to your garden map if you created one from Lesson 5).

3. Each student will water (using watering can or hose) their seedling in its original pot and prepare a hole for the new seedling. Instruct students to leave plenty of space (as this is one of the conditions for a successful transplant). The hole should be double the size of the root bulb and deep enough to bury the entire root mass just below the surface of the ground.
4. Students will add a couple handfuls of compost or organic soil amendment to the hole to give nutrients to the seedling.
5. In a bucket filled with water, students will immerse the seedling's entire pot in water (above the dirt line), and keep it under water until no more bubbles rise to the surface.
6. Students will then turn the pot upside down and carefully remove the plant into their hand. Advise students to not pull on the plant to get it out. Instead, tell them to gently shake or squeeze the pot from the bottom.
7. Students will gently place the seedling in the hole and fill it in with dirt and pack the soil loosely.
8. Finally students will add another spray of water (using a spray bottle) so it is not saturated.
9. Follow Lesson 10 for garden maintenance.

Extension

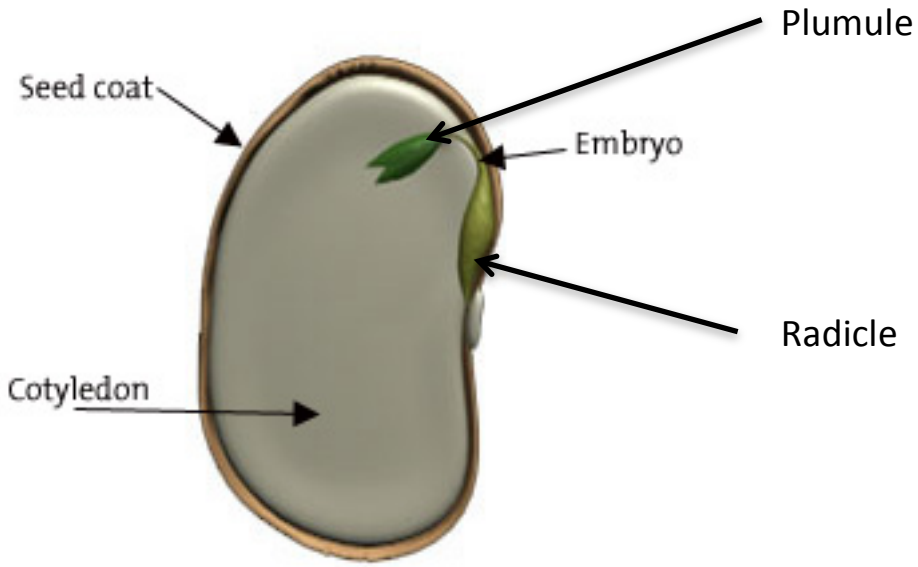
1. Plant seeds using eggshells: http://www.17apart.com/2012/01/how-to-plant-seeds-using-eggshells.html
2. Lesson on Photosynthesis: See http://www.brighthubeducation.com/lesson-plans-grades-3-5/88993-photosynthesis-lesson-plan-for-5th-grade/ for a kinesthetic learning experience.

Reflection/Assessment

In their journals, students can answer the following questions:

Draw the parts of the seedlings you are growing as they begin to sprout. Label the following parts: Seed coat, embryo, cotyledons, plumule, radicle.

Figure 3: Parts of a Seed



Lesson 8: Planting Seeds in the Garden

TIME:

Inside: 20 min.

Outside: 45-60 min.

Suggested month: May/June

MATERIALS:

- Rulers
- Seeds in seed packets
- Wooden craft sticks
- Two sticks and a length of string per group if planting in traditional rows
- String if drawing a shape
- Garden maps
- Watering can/hose

Objective

Students will be able to:

- Interpret information on seed packets
- Determine the spacing and depth to plant seeds
- Estimate various measures by using fingers and hands
- Demonstrate care in planting seeds

Vocabulary

Broadcasting
Planting depth
Seed spacing

Lesson

In the classroom:

1. Together as a class, use a Know-Wonder-Learn strategy (K-W-L). On the board/flipchart, divide paper in 3 columns and label the left column "K", the middle "W" and the right "L." Ask students what they know about seeds and planting seeds. Record these in the first "K" column. Then ask them what they have often wondered about. Record these in the "W" column.
2. Explain that seed packets contain an unbelievable amount of information about plants. But you still need to understand what the information on the packet means, and how to use it to your advantage. Give a pair of students a seed packet to examine using the student handout on "Reading Seed Packets".
3. Once students have completed the handout, conclude by asking students what they learned about seeds and write it in the "L" column on the class KWL chart.

In the garden:

1. With the seed packets and your garden plan (from Lesson 5), bring students to the garden bed where they will plant.
2. If the students did not design a garden plan, make sure you explain the importance of timing, sun exposure, vertical space, and aesthetic. (See Lesson 5 for explanations).
3. Explain how every seed has enough stored food to allow it to grow to the surface if it is not planted too deeply. Discuss with the students that not all seeds are planted the same depth.
4. Using the seeds in the seed packets, compare some seeds of different sizes and ask students to suggest which can be planted deeper in the soil.
5. Explain that a general rule for planting seeds is that they should be planted two times as deep as they are long. For example, a seed that is 1 cm long should be planted 2 cm deep.
6. Demonstrate using a ruler and your finger how deep a 2 cm hole will be. Select 2-3 students to measure with a ruler what two times the size of a seed would be (you can use the same seeds as you did earlier). Then, place the ruler on a finger and see how far from the tip of the finger that would be.

7. Depending on your garden design, you may decide to divide the class in 3 groups (this is where adult volunteers would be useful):

   - Students will plant in a row
   - Students will broadcast seeds
   - Students will plant in a specific shape

8. Give each group their seed packets according to the garden plan and instruct them depending on their group:

   A) If they are planting in a row:

   - Place a row marker at the end of the row where the row(s) will be planted.
   - Use two stakes and a piece of string long enough to stretch the length of the row. Stretch the string where you want the row to be and tie each end to a stake. Place the stakes in the ground equal distance from the sides of the bed so that the string forms right angles to the front and back of the bed. Alternately, a straight line can be drawn in the ground to form a trench for planting.
   - Plant the seeds according to the depth and spacing requirements. Water well. (Do a 'poke' test by pushing an index finger into the soil up to the second knuckle. If it feels dry, or if your finger isn't muddy the plants should be watered some more.)

   B) If they are broadcasting seeds:

   - When planting small seeds like spinach or lettuce, it is sometimes easier to sow seeds by scattering (*broadcasting*) them on the surface of the soil. Rake the soil well, broadcast the seeds, gently rake again and then pat the soil to pack it. The plants will need to be thinned once they are larger (see Lesson 9 on garden maintenance).

   C) If they are planting seeds in a specific shape:

   - Draw the specific shape using a string or a line drawn in the ground to form a trench.
   - Plant the seeds according to the depth and spacing requirements. Water well.

Extension

Math lesson on reasoning and proof: Once the seeds are planted, find out the number of days it should take for them to germinate (as per information on the seed packet). Chart the researched data, then track the actual time for germination and compare the results. Discuss the accuracy of the researched information and how seed producers may have come to their conclusions.

Review/Reflection/Assessment

In their journals, students can answer the following questions:

Talk to another student about what you learned about gardening so far. When you learn something new or hear something interesting from your partner, write it down. Then, it is you turn to speak until your partner learns something new or hears something interesting.

Student Handout **Name:** _____

Reading Seed Packets

1. What is the name of the plant? _____
2. What is the botanical name? _____
3. Number of seeds? _____
4. How deep to plant? _____
5. Row spacing? _____
6. Seed spacing? _____
7. Days to germination? _____
8. When to plant? _____
9. Where to plant? _____
10. How tall will it grow? _____
11. Days to Maturity (when can it be harvested) _____
12. Can you draw a picture of the plant in the box below?

Lesson 9: Garden Detectives

TIME:

Inside: 10 min.

Outside: 45-60 min.

Suggested month: May/June

Inside: 10 min.

Outside: 45-60 min.

MATERIALS:

- Inspection form (to be photocopied for each day of inspection)
- Rain gauge http://theimaginationtree.com/2012/04/homemade-rain-gauge.html
- Measuring tools (rulers, measuring tape, string, unit blocks)
- Magnifying glasses
- Camera

Objective

Students will be able to:

- Review the basics needs of a plant
- Use tools to gather data
- Track weather patterns and plant growth
- Use senses to assess garden needs
- Demonstrate care of growing plants through watering, weeding and thinning

Vocabulary

Thinning
Weeding

Lesson

In the classroom:

1. Explain to the students that the school garden is going to need plant detectives that will inspect the garden to make sure as the plants grow that they are being properly taken care of. A plant detective must know what a plant needs in order to grow. Ask the students if they know what the three basic needs of a plant are. (Sunlight, nutrient rich soil, water and space).
2. Now that the students are aware of the plant's needs and its growth process, explain that plant detectives need a plant detective kit including the following items:
    - inspection form
    - rain gauge
    - measuring tools (rulers, measuring tape, string, unit blocks)
    - magnifying glasses
    - camera
3. Discuss with the students each item's function and how it will be a useful tool. Explain that students will place the rain gauge outside to collect and observe rainfall activity. The measuring tools can be used to assess plant growth (length, height, and circumference). Magnifying glasses can be used to observe garden activity, germination and the parts of a plant more closely. The camera and garden journals can be used to record observations and changes of growth over a period of time. Each time, the class will fill out the inspection form to help decide what care needs to be given to the plants.
4. Explain that they can also use their senses to assess garden needs. Students can use their sense of touch to see if the soil needs watering or not. Students can use their eyes to see if certain plants need to be thinned (like those whose seeds were sown by broadcasting) or if there are weeds that need to be picked (teacher can help to identify weeds).

In the garden:

1. Take the students outside. Fill out the garden inspection form each day you go out to assess the garden plants' watering needs.
2. Explain that not watering enough is the biggest mistake people make in their garden. When plants are not adequately watered, their roots stay near the surface where they are vulnerable to heat, wind and other weather conditions. Deeper roots create more sturdy plants, and roots will only go where the water is. Allowing plants to go too long without water stresses them, stunts their growth, makes them vulnerable to diseases and pests and will reduce the harvest. Research shows that the best time to water is in the early morning when humidity is high but temperatures and wind speed are low.
3. Consider that some plants, such as those in the cabbage family, like water on their leaves. Others such as tomatoes, peas, and members of the squash and melon families, can suffer from mildew or rot when their leaves are wet.
4. *Weeding*: Once the garden inspection form has been filled out, ask students to look for weeds. Ask students why gardeners and farmers remove weeds. Explain that weeds lower crop yields when they compete with plants for water, sunlight and nutrients. They may also create habitat for insects and other pests that can harm the plants. Most weeds need to be removed by extracting the entire root ideally by hand. Wearing gloves is a good idea for weeding.
5. *Thinning*: Ask students to think about what happens to plants when they get crowded in a garden area. Ask them what can be done to prevent this. Explain (if this idea doesn't emerge) how crowding can be solved when plants are thinned. Thinning provides more space for roots and more access to sunlight for leaves. The seed packet will have information about thinning. For example, if the packet says to thin to 8 cm, save one strong, healthy plant every 8 cm and remove the ones in between.

Extension

1. Thinned greens can be used for a spring salad. Be sure to wash the greens well and dry them before tearing them in bite-sized pieces.

2. Did you ever wonder what your class garden looks like through the eyes of your students? Do they see the weeds (that you inevitably notice) or do they notice the sunflowers or the broccoli shoots. Find out by spending time in the garden by encouraging students to draw something they see in the garden in their garden journals.

Review/Reflection/Assessment

In their journals, students can answer the following questions:

Why is it important to weed our garden?
Why do certain plants need to be thinned?

Garden Inspection Form

Date: _____

	How many sunny days this week? _____ How many cloudy days this week? _____
	How does the soil feel? Do a 'poke' test by pushing an index finger into the soil up to the second knuckle. If it feels dry, or if your finger isn't muddy the plants should be watered. ☐ Dry ☐ Moist
	How many rainy days this week? _____ Is there any water in the rain gauge? Yes/No Are the plants getting enough rainwater? Yes/No If not, the plants should be watered.
	Measure the height and width to determine plant growth. (Choose one or two plants to measure each time). _____ cm tall _____ cm wide Have the plants grown since the last inspection? Yes/No

Lesson 10: Eating What We Grow!

TIME:

Outside: 30 min.

Inside: 45 min.

Suggested month: May/June - September/October

MATERIALS:

- Recipe
- Baskets or buckets for harvesting
- Knives
- Cutting board
- Mixing bowls
- Measuring cups
- Spoons
- Lettuce spinners
- Plates
- Forks

Objective

Students will be able to:

- Identify the different parts of plants that we eat
- Describe the taste and texture of raw vegetables
- Participate in creating simple, nutritious dishes with fresh vegetables
- Explain the advantages of eating fresh vegetables rather than heavily processed food

Vocabulary

Food safety
Processed food

Lesson

In the garden:

1. As plants grow, check the seed packets for harvest time. It is usually given in days from planting, but of course it will be approximate. Inspecting the vegetables on a regular basis will also provide visual information as to whether or not they are ready to be harvested.
2. Inspect the vegetables for proper color and size. If they look ready, they probably are.
3. Teach the students the proper ways to harvest the vegetables. Some plants we grow and harvest for their stems, roots, flowers, seeds, or fruits. Different vegetables need to be harvested using different techniques. Some need their leaves to be picked one at a time while some will require the use of a sharp knife. Potatoes will need to be dug. Make sure there is an adult to monitor knife use.
4. Instruct the students to pick carefully and avoid stepping on any plants or plant parts. Vegetables should be carefully placed in baskets or buckets, making sure heavy vegetables aren't placed over lighter ones. Vegetables should be placed in a cool dry place or refrigerator before being processed.

In the kitchen:

1. Before processing the vegetables, make sure students understand the basic *food safety* rules (i.e. clean hands, hair up, etc.)
2. Help students wash the vegetables and process them to suit a chosen recipe. Veggies and dip or garden salads with a simple dressing are great examples of easy dishes to serve.
3. While students are preparing the dish, or while they are eating, discuss the health benefits of eating vegetables (low fat, few carbohydrates, lots of vitamins, minerals and fibre) rather than highly processed foods that have been changed from their natural state and might contain sugar, preservatives, salt and fat.

Extension

1. Whole foods vs. Processed foods lesson at: http://www.nyc.gov/html/doh/downloads/pdf/cdp/cdp-pan-programs-schoolwellness-lesson03.pdf
2. A variety of very interesting and visual nutrition lessons to promote good health ('Eat Real', 'Mostly Plants', and 'Not too much') at: https://d3n8a8pro7vhmx.cloudfront.net/foodday/pages/24/attachments/original/1341610970/Food_Day_School_Curriculum_2012_NO_BRAND.pdf?1341610970
3. Sing the song 'Oats, peas, beans and barley grow' (See lyrics below) and students can act out the different actions as they sing the song. For the melody go to: http://bussongs.com/songs/oat-and-peas-and-barley-grow.php

Review/Reflection/Assessment

In their journals, students can answer the following questions:

Write about your experience picking vegetables.
Write about your experience eating the salad (think about texture of the vegetables, the colours)

Song: Oats, peas, beans, and barley grow

Oats, peas, beans, and barley grow
Oats, peas, beans, and barley grow
Do you, or I, or anyone know
How oats, peas, beans, and barley grow?

First the farmer plants the seed
Stands up tall and takes his ease
Stamps his feet and claps his hands
And turns around to view the land

Oats, peas, beans, and barley grow
Oats, peas, beans, and barley grow
Do you, or I, or anyone know
How oats, peas, beans, and barley grow?

Then the farmer waters the ground
Watches the sun shine all around
Stamps his feet and claps his hands
And turns around to view the land

Oats, peas, beans, and barley grow
Oats, peas, beans, and barley grow
Do you, or I, or anyone know
How oats, peas, beans, and barley grow?

After weeks of sun and air
The farmer picks the crops right there
Stamps his feet and claps his hands
And turns around to view the land

Oats, peas, beans, and barley grow
Oats, peas, beans, and barley grow
Do you, or I, or anyone know
How oats, peas, beans, and barley grow?

http://bussongs.com/songs/oat-and-peas-and-barley-grow.php

Resources for Further Exploration

http://aitc.ca/bc/resources/ BC Agriculture in the Classroom Foundation

http://www.bcfoodsecuritygateway.ca/modules.php?name=Content&pa=showpage&pid=8762 Farm to School activities

http://www.growinggardeners.net/garden-based-curriculum-1st-5th/ Sequenced set of lessons for pre-K through 5th grade to use in a school garden

http://www.jmgkids.us/ Master gardener kids

http://www.lifelab.org/for-educators/schoolgardens/ School garden resources

http://lifecyclesproject.ca/resources/downloads/Food%20Security-into-Drama%20Workshops.pdf Four dynamic workshop models for teachers to engage with children on the topic of Food Security

http://www.nourishinteractive.com/nutrition-education-printables/category/9-kids-gardening-growing-healthy-food Kids gardening activities, learning and colouring sheets

http://www.foodsecurityresearch.ca/resources/tasting_rainbows.pdf Lakehead University lesson plans on Food security

http://www.growinggardeners.net/garden-based-curriculum-1st-5th/Farm to school lesson plans

http://www.kidsgardening.org/node/12134 Math lessons in the garden

http://www.cornell.edu Garden-based lessons

http://lifecyclesproject.ca/resources/where_in_the_world.php Our global food system and local food alternatives.

Jolie Mayer-Smith and Linda Peterat, *Get Growing! Activities For Food And Garden Learning, A Teacher Resource For Elementary And Middle Grades*: Really Small Vernon Press, 2010.

Dave Havard, *Gardening Between Frosts*, 1996.

Sarah Garland: *Eddie's Garden: How to Make Things Grow*, 2004

Steve Tomecek, Nancy Woodman, *Dirt: Jump into science*, 2003

Edith Hope Fine, *Water Weed and Wait*, 2010

Ken Robbins, *Food For Thought*, 2009

Michael Pollan, *The Omnivore's Dilemma: The Secrets Behind What You Eat* (Young Reader's Edition), 2009