DPSCD Go Green Challenge Green Week Activity: Detroit School Garden Collaborative Do Nows

Objective:

These activities will help you connect your classroom to what is happening in gardens outside! Choose any of the included activities to do with your classroom during Green Week.

Grades: Varies

Time: Varies

Materials: Varies (see individual project options)

Procedure:

Choose one or more of the following activities about gardening to do with your classroom during Green Week:

- School Garden Prep Lesson (K-12)
- Starting a Seed Lesson (K-8)
- Plant Parts and Photosynthesis (K-8)

Here are some additional suggestions you can find online:

- Michigan Agriculture Lesson (5th gr. +)
- Milk Jug Water Cans Activity
- Shredded Paper Seed Starters Activity
Seeds come in different colors, shapes and sizes. All seeds have three basic parts. An embryo, seed coat and endosperm. An embryo is the baby plant inside of the seed and will grow into a plant under the right conditions (moisture and warmth). It has several parts that include an immature root, shoot and leaves. The seed coat is a paper thin layer that protects the embryo from injury and from drying out, and the endosperm is a temporary food supply for the developing plant. The endosperm is found packed around the embryo in the form of special leaves called cotyledons (seed leaves). These parts become visible once seeds begin to germinate. Germination is the beginning growth of a plant. There are certain factors that affect a seeds ability to grow, general factors include water, adequate light (artificial or sunlight), nutrients, space to grow and time. Seeds can be started in a variety of inexpensive and recyclable containers. Some of these may include:

Once a seed starting container has been determined, the next step is using the right type of soil to plant seeds in. Avoid using topsoil (garden soil) from the ground. Garden soil may contain insects or disease which can bring harm to young seedlings or cause them to die. The best medium to use when starting seeds are commercially made potting mixes or hand made soil mixes (see recipe inside lesson for hand made potting soil) Potting mix may be purchased at most garden or hardware stores. Common ingredients found inside potting soil may include sand, peat moss, vermiculite, perlite, compost and fertilizers.

OBJECTIVES
- Identify and name the basic parts to a seed
- Understand that organisms have basic needs
- Determine that plants require air, water and a source of energy, and building material for growth and repair. Recognize what separates a plant from an animal
- Generate scientific questions about plant growth based on observations, investigations and research

MATERIALS
- Bean Seeds
- Seeds (of your choice)
- Misting bottle (water bottle)
- Magnifying Glas
- Ruler
- Seed Trays , cups or egg cartons
- Garden Journal
- Crayons, markers or colored pencils
- Potting Mix

RECIPE MATERIALS
- Sunflower Seeds
- Quick Oats
- Honey or Maple Syrup
- Chocolate Chips
- Raisins
- Olive or Canola Oil
- Sesame Seeds
- Vanilla

STARTING SEEDS OVERVIEW

Seeds come in different colors, shapes and sizes. All seeds have three basic parts. An embryo, seed coat and endosperm. An embryo is the baby plant inside of the seed and will grow into a plant under the right conditions (moisture and warmth). It has several parts that include an immature root, shoot and leaves. The seed coat is a paper thin layer that protects the embryo from injury and from drying out, and the endosperm is a temporary food supply for the developing plant. The endosperm is found packed around the embryo in the form of special leaves called cotyledons (seed leaves). These parts become visible once seeds begin to germinate. Germination is the beginning growth of a plant. There are certain factors that affect a seeds ability to grow, general factors include water, adequate light (artificial or sunlight), nutrients, space to grow and time. Seeds can be started in a variety of inexpensive and recyclable containers. Some of these may include:

Once a seed starting container has been determined, the next step is using the right type of soil to plant seeds in. Avoid using topsoil (garden soil) from the ground. Garden soil may contain insects or disease which can bring harm to young seedlings or cause them to die. The best medium to use when starting seeds are commercially made potting mixes or hand made soil mixes (see recipe inside lesson for hand made potting soil) Potting mix may be purchased at most garden or hardware stores. Common ingredients found inside potting soil may include sand, peat moss, vermiculite, perlite, compost and fertilizers.
ANATOMY OF A SEED

Image taken from http://www2.puc.edu/Faculty/Gilbert_Muth/botglosc.htm

Image taken from: http://burgler.wikispaces.com/3rd+grade+unit+4
TEACHER GUIDE

SEED COAT

PLANT LEAVES

EMBRYO

COTYLEDON (FOOD STORAGE)

Image taken from: Oncecoursesystems.com
WHAT IS INSIDE A SEED?

[Diagram of a seed with labeled parts]

Image taken from: Oncecoursesystems.com
ACTIVITY 1: DISSECTING A SEED (GRADES ALL)

IS THERE LIFE INSIDE A SEED?

Learning Objectives: Observe what is inside a seed. Identify and name parts inside a seed: Seed embryo, cotyledon, endosperm, plant leaves, and seed coat. Know how plants are able to produce seeds.

Materials: Lima Beans (enough for entire class - 2 per student), glue sticks or tape, magnifying glass, medium to large sized container, colored pencils, crayons, or pencils. Soak bean seeds in warm water for 30 minutes prior to lesson.

Introduction: Let students know that inside every seed is a tiny living thing. Ask students if they can name parts found inside of a seed. Pass out student guide on seed parts. Share with students the names of each part and their function. Explain to students that all seeds have 3 basic parts: A seed coat (protects the inside of the seed), food for the plant to grow (endosperm), and a baby plant (embryo). Let students know that they are getting ready to dissect a seed and that they will be indentifying the embryo, endosperm and seed coat located inside the seed. Explain to students that there are two groups of flowering plants, monocots and dicots. Let students know that monocots have one seed leaf and that dicots have 2 seed leaves. Share examples of crops that are classified as monocots to students (grass, lilies, corn, wheat, asparagus, bananas, rice, onions, and garlic) and share examples of plants that are considered to be dicots (beans, peas, broccoli, yams, turnips, roses, and geraniums).

1. Depending on class size break students off into 4-6 groups of 6.
2. Pass out 6 soaked lima beans and 6 non-soaked lima beans, magnifying glass, seed worksheet, and glue sticks or tape to each table.
3. Have students examine soaked bean seed. Grades K-3: Have students draw seed appearance on seed worksheet.
   Grades 4-8: Have students write out how soaked beans look in comparison to beans that have not been soaked.
4. Have students glue or tape unsoaked bean seed to worksheet.
5. Instruct students to examine soaked bean. Have them examine soaked bean and the wrinkled seed coat. Explain to students that the embryo is inside of the seed and that it is being protected by the endosperm. Let students know that they are getting ready to look inside bean seed. Students should use a toothpick to pull apart wrinkly seed coat. Have them examine the inside of the seed closely. Once coat has been removed have students pull apart seed gently along its natural seam. Ask students what they see? Have students share what they see inside of seed. Ask them if they see the embryo inside. Encourage them to use their magnifying lens to take a closer look.
6. Grades K-3: Have students draw seed embryo on seed worksheet and tape or glue opened bean seed onto worksheet.
   Grades 4-8: Have students write a summary of parts found inside of soaked bean seed onto worksheet, and have them tape opened bean seed onto bean worksheet.
7. Class Discussion: Review with students seed parts. Have them name each part and describe their function.
1. Write out seed parts found inside of bean seed and explain their function.
2. Draw a picture of opened bean seed and parts found inside.

1. Have students write a scientific explanation to the question “Is there life inside of a seed?”
   Note: Explanation should include claim, evidence, and reasoning from activity.
SEED WORKSHEET

Glue or tape bean seed here

Glue or tape soaked bean seed here

Have students draw opened bean seed and seed parts in this box.
ACTIVITY 2: SEED STARTING (GRADES ALL)  

HOW DOES A SEED COME TO LIFE?

Learning Objectives: Recognize and describe different types of earth materials. Using earth's materials. Understand that organisms have basic needs. Determine that plants require air, water and a source of energy, and building material for growth and repair. Make purposeful observations of earth materials to describe them in terms of color, particle, size, texture, and ability to hold water. Generate questions based on observations of earth materials. Generate scientific questions about plant growth based on observations, investigations and research. Use metric measurements in an investigation of plant growth. Construct charts and graphs from data and observations such as growth in leaf size or height of plants growing under different environmental conditions.

Materials: Potting mix (store bought or homeade), seeds, misting spray bottle, seed starting containers (seed trays, egg cartons, milk jugs, margerine tubs, newspaper planters, foam or paper cups)

Introduction: Let students know that inside every seed is a tiny living thing. Discuss the three basic seed parts and their function. Explain to students that seeds are asleep (dormant) and that they need certain conditions to be awakened. Share with students that certain factors will affect a seeds ability to grow. General factors include: water, adequate light (artificial light or sunlight), nutrients, space to grow and time. Explain to students that plants need oxygen, water, light, source of energy, food and nutrients for growth and repair. Let students know that they are getting ready to plant seeds and that they will be conducting an ongoing observation on the growth of seedlings.

1. Get materials ready. Pass out pre-selected seed packs to students. Have students read instructions on seed pack before planting. Discuss the process of germination with students. Let them know that germination is the process in which a plant grows from a seed. An example of germination is the sprouting of a seedling from a seed. Explain to students that water, oxygen, temperature, light and darkness are all conditions that affect a seeds ability to successfully germinate.

2. Have students fill planting containers with potting mix. Potting mix may be store bought or homeade (see recipe for homeade potting mix on page 9)

3. Explain to students that the size of their seed will determine how deep the seed should be planted into the soil. A general rule of thumb for planting seeds is that they should be planted 3 times the diameter of the seed. Using seed size as a guide have students place seed into planting container. If using a seed tray, egg carton, newspaper planters, and foam or paper cups have students plant 2-3 seeds in each space. Let students know that not all seeds germinate. Explain that planting multiple seeds in each space will help to ensure that one plant will germinate. If using a large planting container have students plant seeds 2-4 inches apart. Be sure to number or name each of the planting containers. This will help students to specifically identify plants growing in containers and monitor and track data efficiently.

4. Let students know that light and warmth are essential in a seeds ability to germinate and grow. Newly planted seeds should be placed near a radiator or in a place that is consistently warm (e.g. on top of a refrigerator). Growing seedlings will need much light to thrive. It is recommended that they be placed near a sunny window or under artificial lighting (grow lights) throughout the day. If using grow lights, plants should be kept at least 3-4 inches away from the light. If possible have students grow some seedlings under grow lights and another set of seedlings near a sunny window. Have them conduct an experiment and investigation to compare plant growth using artificial light versus real sunlight.

5. As plants begin to grow have students observe growing seedlings each week. Students Grades K-3 should use garden journals to draw weekly observations. Students grades 4-8 should use Seed Starting worksheet to observe, record and measure plant growth weekly.

6. Have students grades 4-8 answer the scientific question “How Does A Seed Come To Life”? using claim, evidence and reason.

Special Note To Teachers: If students are growing transplants for their school garden it is important that plants be timed out accordingly. Cold Crops seedlings such as collard greens, lettuces, and broccoli should be started 6-8 weeks before transplant date. It is recommended that cold crops transplants be planted 2 weeks before the last Michigan frost date (May 17). Hot Crop seeds such as tomatoes, eggplant and peppers should be started 6-8 weeks before transplant date. Plants should be transplanted 1-2 weeks after the last frost date. An online garden calculator will help you to know when to start growing certain types of crops and when to transplant them outside into the garden. For more information check out website: http://awaytogarden.com/when-to-start-seeds-calculator/
Potting mix maybe purchased at most hardware and garden stores but students may find it much more fun to prepare a homemade batch potting for seedlings. Outlined below is a simple recipe for basic potting mix with. This mix should work well with most seedlings. Ingredients for potting mix can be found at most hardware and garden stores.

**INGREDIENTS:**
- 2 Parts Compost
- 2 Parts Peat Moss
- 1 part Vermiculite (Pre-Wet)

**DIRECTIONS:**
1. Have students put on plastic gloves.
2. Using a large 5 gallon bucket or large plastic tub combine 2 parts of compost and 2 parts of peat moss together. With gloved hands mix compost and peat moss together well.
3. In a separate container pre-wet vermiculite. Make sure vermiculite is dampened well. Be careful to not oversoak.
4. Add pre-wet vermiculite to compost and peat moss, mix well.
5. Use mix to fill up seed trays or pots.
6. Plant seeds. Enjoy!

### SEED STARTING OBSERVATION

**CONTAINER NUMBER/NAMESPACE:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Plant Type</th>
<th>Leaf Growth/Leaf Color</th>
<th>Height of plant (cent.)</th>
<th>Sunlight or Artificial Light</th>
<th>Watered</th>
<th>Soil Temperature</th>
<th>Date Transplant Planted Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Write a scientific explanation to the driving question “How does a seed come to life?” Note: Explanation should include claim, evidence, and reasoning from activity.
PLANT OBSERVATION

SEED TRAY 1 (Direct Sunlight): Observe plants growing in sunlight. Draw or describe plant growth. Record date next to observation.

SEED TRAY 2 (Artificial Sunlight): Observe plants growing in artificial light. Draw or describe plant growth. Record date next to observation.

Have students write a scientific explanation to the question “How does certain types of lighting affect plant growth?” Note: Explanation should include claim, evidence, and reasoning from activity.
### VOCABULARY

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Seed</strong></td>
<td>a small object produced by a plant from which a new plant can grow.</td>
</tr>
<tr>
<td><strong>Embryo</strong></td>
<td>An organism at any time before full development, birth, or hatching.</td>
</tr>
<tr>
<td><strong>Endosperm</strong></td>
<td>a food-containing tissue formed within the seed in seed plants</td>
</tr>
<tr>
<td><strong>Seed Coat</strong></td>
<td>protective outer covering on a seed</td>
</tr>
<tr>
<td><strong>Shoot</strong></td>
<td>new plant growth</td>
</tr>
<tr>
<td><strong>Root</strong></td>
<td>anchors plant into ground</td>
</tr>
<tr>
<td><strong>Seed Leaves (Cotyledon)</strong></td>
<td>important part of the embryo.</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td>complex mixtures of minerals, water, air and organic matter and countless organisms.</td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td>A clear liquid that has no color, taste, or smell, that falls from clouds as rain, that forms streams, lakes, and seas, and is also used for drinking.</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>A measure of how much matter is in an object</td>
</tr>
<tr>
<td><strong>Weather</strong></td>
<td>describes the condition of the air at a particular time and place. Weather also tells how the air moves (wind) and describes anything it might be carrying such as rain, snow or clouds. Thunder, lightning, rainbows, haze and other special events are all part of weather.</td>
</tr>
</tbody>
</table>
**Project: GROW AND REPORT (Grades 4-8)**

**Learning Objectives:** Develop research strategies and skills for information gathering and problem solving for plant growth using information technology to compare and compile data. Identify patterns in data and relate them to theoretical models. Describe a reason for a given conclusion using evidence from an investigation. Evaluate scientific explanations in a peer review process or discussion format.

**Introduction:** Let students know the importance of observing and tracking plant growth. Explain to students that data compiled may help them to solve problems and identify ways to improve future plant performance.

1. Explain to students that they will be using seedling data worksheets to transfer data into an Excel or Open Space spreadsheet. Let students know that this is a great way to record and manage ongoing data.

2. Students can use data worksheets as a model to help shape and create spreadsheet. Explain to students that their “Grow and Report” spreadsheet can help them identify growing challenges and successes.

3. Have students take plant data worksheets and encourage them to create a spreadsheet that will help them record and capture all plant data compiled.

4. Once spreadsheets have been completed print them out and have students partner off to examine and study spreadsheet data. Have them examine growth patterns, conditions (atmosphere, water, lighting etc.), and check for patterns in data recorded.

5. Upon data review have students write out a basic summary based on data report. Questions to consider: Was seed given enough space to grow? How many plants survived and were able to be transplanted into garden beds? How did seedlings grow under certain light conditions? What type of light proved best in growing seeds? Sunlight or Artificial?

6. **Group Share:** Have students read their Grow and Report to class. Encourage a group discussion on seed starting project. Have students share what they feel worked well and what may have not worked well. Discuss ways to improve and encourage plant growth for future class plantings.
ACTIVITY 4: SEED NUTRITION (GRADES ALL)

HOW DOES A SEED PROVIDE NUTRITION TO MY BODY?

Learning Objectives: Seed Nutrition activity will help students learn what nutrients can be found in a sunflower seed and the positive impact sunflower seeds have on the body.

Introduction: Ask students if they have ever eaten raw seeds before. Share with students some examples of edible seeds what they look like and taste like. Edible seeds may include pumpkin/squash, sunflower, flax, and sesame. Ask students if they have ever tasted an edible seed before. Let students know that they are getting ready to prepare a healthy and delicious no-bake cookie using sunflower seeds. Share nutrients commonly found in sunflower seeds with students and the positive impact that they have on their bodies.

Fiber: Creates a full feeling, which helps to keep youth from overeating, preventing obesity. Passes through the digestive tract quickly, acting as a cleanser, which helps to rid the body of toxins.

Vitamin C: Vitamin C is an important part of the development and maintenance of youths bodies, helping to form bones, repair tissues, strengthening blood vessels, maintain healthy gums, healing cuts and wounds and helps the body to absorb iron.

Iron and Calcium: Iron is an essential nutrient for youth, helping their body to grow and develop. Iron also helps red blood cells to carry oxygen to the bodies tissues, which provides energy to the body, and gives skin a nice healthy color. Calcium is an important mineral helping to form and maintain healthy teeth and strong bones.

ACTIVITY 4: NO BAKE SUNFLOWER OAT COOKIES

Cook Time: 30 minutes
Prep Time: 15 minutes
Servings: 30-35 small cookies

Ingredients
- 3 cups of quick oats
- 1 cup of raisins
- 1 cup of sesame seeds
- 1/2 cup of chocolate chips
- 1 cup of sunflower butter
- 1 cup of pure maple syrup or honey, or agave syrup
- 1 teaspoon of vanilla

Directions
1. Stir dry ingredients all together
2. Mix freshly made sunflower butter with maple syrup, honey or agave syrup together
3. Mix with dry ingredients until well combined.
4. Roll into 1 inch balls

Sunflower Butter Recipe

Ingredients
- 1 pound roasted sunflower seeds (Sunflower seeds can be roasted in oven at 350 degrees for 15 minutes)
- 1 -2 tablespoons of honey, pure maple syrup, or agave syrup
- 1 teaspoon of salt
- 1 tablespoon of olive oil, canola oil, or coconut oil.

Directions
1. Place roasted sunflower seeds inside blender or food processor
2. Ground up seeds for approximately 10 minutes, add 1 -2 tablespoons of honey, maple syrup or agave, and continue to process for an additional 5 minutes.
3. Add 1 tablespoon of oil to mixture, till blended well.

Have students write a scientific explanation to the question “How does a seed provide nutrition to my body?” Note: Explanation should include claim, evidence, and reasoning from activity.
The quality of garden soil plays a large role in the future life of seeds and transplants. Engaging students in spring garden bed preparation will give them a greater appreciation for their school garden and the plants growing inside garden beds. Preparing school garden beds for spring planting will help to improve soil quality and will contribute to the overall health of garden plants. Soil that is fertile and nutrient rich will enable plants to grow successfully. However, soil that is poor in quality will hinder the life of future plants.

Soil consistency can be judged as sandy, silty, clay, loam or chalky. Each of these soil types has its own identity, and can be improved in different ways. Soil that is clay-like, sandy or chalky can be amended with organic matter such as grass clippings, compost, animal manure, dead leaves and sawdust. Adding organic matter to soil will enrich soil with nutrients and help transform soil texture.

Garden bed preparations for existing garden beds can vary depending on how they were treated last fall. Garden beds that were "put to bed" properly in the fall ("putting to bed" means all plants were pulled from beds and covered up with organic materials such as leaves or straw through the winter months) should have all organic materials raked back, and soil aerated with a garden fork, broad fork or shovel. Garden Beds that were not prepared last fall will most likely need to be turned over by hand. Pull out all existing plant materials, grass and weeds. Turn over soil with shovel and aerate with garden fork or broad fork.

Once garden beds have been prepared, the final step is creating a smooth planting area for seeds to grow in. Seeds grow best in soil that is fine in consistency. A hard rake can be used to transform coarse and clumpy soil into smooth fine soil. Using the teeth of the hard rake, push and pull soil across garden bed until all hard clumps are broken up and bed has been smoothed out.
GARDEN TOOLS

FORK

SHOVEL

GARDEN RAKE

BROAD FORK

SPADE SHOVEL

WHEEL BARROW

HAND SHOVEL

HAND FORK
ACTIVITY 1: SPRING GARDEN BED PREP

HOW DO WE GROW HEALTHY PLANTS?

Learning Objectives: In this activity students will learn how to properly prepare garden beds for spring plants by using simple garden tools and organic matter. Use tools and equipment appropriate to scientific investigations of environmental influence on characteristics and traits and characteristics improving survival rate (research materials, plants, soil of varying nutrient levels). Make purposeful observations of earth materials to describe them in terms of color, particle, size, texture, and ability to hold water. Generate questions based on observations of earths materials. Share ideas about earths materials through purposeful conversation in collaborative groups. Make purposeful observations of daily weather. Demonstrate weather and/or season concepts through various illustrations, performances, models, exhibits, and activities. Identify the needs of plants. Make purposeful observations of the movements of objects in response to pushes and pulls. Demonstrate the effect of pushes and pulls on the motion of objects through various illustrations, performances, models, exhibits or activities. Generate scientific questions based on observations, investigations and research.

Lesson Materials: Garden tools, wheel barrow or a few empty buckets, 6 buckets full of organic matter (compost, grass clippings, rabbit manure) garden journals.

Introduction: Pass out “Garden Tools” guide to students. Let students know the importance of preparing garden beds for spring plants. Explain to students the process of preparing garden beds and the tools and materials that can be used to get garden beds ready for spring transplants. Review garden tools with students and let them know that they are getting ready to go outside to perform “Spring Garden Bed Prep” activity. Explain to students that garden beds cannot be prepared for spring plants until winter weather has passed and soil has thawed out completely.

Grades K-5: Have students bring garden journals outside, wheel barrow or a few empty buckets, hand shovels, hand trowels and 6 buckets of organic matter (For 6 DSGC garden beds) outside to garden area.

1. Have students first observe the weather. Ask students to describe the weather outside. Is it warm or cool? Windy? Sunny, cloudy or partly cloudy? Give students time to observe and share their observations. Grades K-3 can draw their weather observation inside garden journals. Grades 4-5 can write and draw weather observation and current date.

2. Have students draw 6 garden beds inside their journal to represent DSGC garden beds. Have students walk to each bed and observe garden beds. Ask them what do they see? Were garden beds put to sleep? If garden beds were put to sleep have students remove burlap bags. Encourage students to touch garden bed soil. Ask them how it feels? What color is garden soil? Is soil thawed out completely? Are there any weeds or old plants inside garden beds? Have grades K-3 draw garden soil inside journals. Grades 4-5 can write out soil observation inside garden journals and draw condition of soil inside garden journals.

3. Once students have completed observations inside garden journals they can begin the spring garden bed prep activity. Have students grab hand shovel and hand trowels. Depending on class size break students into 6 groups with 4-8 students per group. Assign each group to a garden bed and have them take a bucket of organic material to their assigned garden bed.

4. Let students know that they will be using their hand shovels to dig up soil and break it up. Have students dig up soil inside garden beds for 10-15 minutes, breaking up soil and removing old plants and weeds. Students should put weeds or old plants inside wheel barrow or empty buckets. Once students have broken up soil well, have them pour the bucket of organic material into soil. Let students know that they are adding nutrients back into the soil and that this will help spring plants grow healthy and strong. Once organic matter has been poured into the soil have students use hand trowels to rake garden soil back and forth, mixing organic material into the soil evenly. Let students know that once organic material has been mixed into garden beds they should use hand trowels to smooth out garden soil. After students have completed spring garden bed prep activity have students draw finished beds inside their garden journals.

Grades 6-12: Have students bring garden journals outside, garden tools (shovels, garden rakes etc.) and 6 buckets of organic matter (For 6 DSGC garden beds) outside to garden area.

1. Have students observe weather, and condition of garden beds. Make sure soil is completely thawed out. Students can use garden journals to record observations.

2. Ask students if garden beds were put to sleep in the fall? If yes have students remove coffee bags from garden beds.

3. Explain to students why it is important to prepare garden beds for spring plants. Discuss organic matter with them and ask them why they think organic matter should be put inside garden beds? Have students use shovels to dig and break up soil inside garden beds. Make sure they are turning the soil over as they break it up. Once soil has been turned over have students add organic matter to garden beds. Have them use the back of a garden rake to smooth out garden soil. Once garden beds are complete students can record how garden beds were prepared inside garden journals.
1. What was the condition of garden beds? Soil texture and color? Describe.

2. Was garden put to bed in the Fall? If yes please explain how beds were put to sleep.

3. How did you prepare garden beds for spring plants? What types of tools and organic materials did you use?

4. Did soil texture and color change after garden beds were prepared? Describe.

1. Write a scientific explanation to the driving question “How do we grow healthy plants? Note: Explanation should include claim, evidence, and reasoning from activity.
**ACTIVITY 2: SOIL MATTERS (GRADES:3-6)**

**WHY DOES SOIL MATTER?**

**Learning Objectives:** This activity will help students understand the importance of soil, learn the components of soil and characteristics of these components. This activity will show students how to perform a simple soil test to identify soil type. Make purposeful observations of earth materials to describe them in terms of color, particle size, texture, and ability to hold water. Generate questions based on observations of earth's materials. Plan and conduct simple and fair investigations to determine earth materials to hold water. Communicate and present finding of observations and investigations into earth's materials. Use evidence when communicating findings from earth material investigations.

**Lesson Materials:** Newspaper, sand, topsoil, clay, eyedropper and “Soil Matters” worksheet and soil diagram.

**Introduction:** Explain to students that soil is one of the most important natural resources on the earth. Most life on earth is dependant on soil as a direct or indirect source of food. Plants get nutrients from soil and animals also get nutrients from the plants planted inside soil. There are many organisms that make soil their home such as seeds, spores, insects, and worms. There are many different types of soil and it is always changing. Because soil is destroyed easily it must be conserved so that it can continue to support life. Let students know that soil is made up of four parts: air, water, minerals, and organic material.

**Air and Water:** Provides nutrients to plants, helping them to make food for themselves.

**Organic Matter:** Humus, is made of plant and animal remains in various stages of decay.

**Minerals:** Clay, sand, and silt particles. The mineral content determines the soil type. Sandy soil has mostly sand and no organic matter. Sand is the largest of the soil particles, feels gritty, is the heaviest, and allows water and air to move easily through it. Clay soil has mostly clay, a little organic matter, and sand. Clay particles are very fine and are the smallest of the three soil particles. Clay is sticky when wet and hard and brick-like when dry. Silt is the soil particle that falls between sand and clay in texture. It is considered a medium-sized soil particle. It feels like flour and is very smooth when you rub it in your hands. Silt particles keep the soil rich and loose. *(Information taken from “Layer Away” http://www.michigan.gov/mdard)*

1. Have students answer the following questions on their soil matters worksheet: What is soil? Name colors associated with soil. Are there different types of soil? How do they differ from each other? Why do plants need soil?
2. Pass out 1 teaspoon of clay, sand, and topsoil to each student. Have students make observations of dry soil using their senses. Students should record findings on worksheet.
3. Once dry soil has been observed and recorded wet soils with eyedropper filled with water.
4. Ask students the following questions and have them record observations on worksheet: What is the color of wet soil? Does wet soil feel different then dry soil? What other materials do they feel like? (sugar, flour, powder, etc.) See if students can make a ball with wet soil? Which soil holds together best?
5. Pass out soil diagram to students. Discuss.

Lesson adapted from “Soil...It’s More Than Just Dirt” by Members of Michigan Farm Bureau
SOIL DIAGRAM

Soil Components with Overall Averages

- Pore space ~ 40-60%
- Soil solids ~ 50%
- Air ~ 20-30%
- Water ~ 20-30%
- Mineral ~ 45%
- Organic ~ 5%

©The COMET Program
1. What is soil? What is the color of soil? Describe.

2. Are there different types of soil? How do they differ from each other? Explain.

3. Why do plants need soil?

4. What is the color of wet soil? Does it feel different then dry soil? What does wet soil feel like? Describe.

5. Write a scientific explanation to the driving question “Why Does Soil Matter? Note: Explanation should include claim, evidence, and reasoning from activity.
ACTIVITY 2: GARDEN SOIL TEST (GRADES: K-6)

Learning Objectives: This activity will show students how to perform a simple soil test to identify soil type. Make purposeful observations of earth materials to describe them in terms of color, particle size, texture, and ability to hold water. Generate questions based on observations of earth materials. Plan and conduct simple and fair investigations to determine earth materials to hold water. Communicate and present finding of observations and investigations into earth materials. Use evidence when communicating findings from earth material investigations.

Introduction: Explain to students that soils are made up of various amounts of loam, sand, and clay. The amount of loam, sand and clay in soil will affect the ability of soil to store water and nutrients, the speed that water passes through water, how air can flow through soil, how certain types of plants will grow and how deep plant roots can grow. Let students know they are getting ready to test garden soil type.

1. Break students off into 6 groups of 5-8. Pass out 1 large jar, lid and hand shovel to each group.
2. Assign each student a DSGC garden bed. Have students fill up jar halfway.
3. Once all jars have been filled with soil have students return to classroom. Once inside have students fill up jars with clean water and place lids back onto jars tightly. Let students know that it will take 24 hours for the soil test to be complete.
4. Have students check on their soil test the next day. Pass out jar diagram to students. Have them use diagram as a guide to check for soil type. Ask students what soil type garden soil is. Have students complete worksheet and answer scientific question “How Do We Test Garden Soil?” Using claim, evidence and reasoning.

Lesson and image adapted from: http://www.small-farm-permaculture-and-sustainable-living.com/
Directions:

Have students compare soil jars with guide below and identify which jar matches their soil test best. Using the blank jar below have students color actual soil type test results.

Why Do Gardeners Need To Know Garden Soil Type?

1. Examine soil layers inside jar. Using the diagram above identify which jar matches garden soil tested. Is garden soil tested sand, loam or clay?


3. Write a scientific explanation to the driving question “Why Do Gardeners Need To Know Garden Soil Type”? Use claim, evidence and reason.
Plants and animals are both living organisms. What separates a plant from an animal is that most plants (autotroph) have the ability to make their own food through a process called photosynthesis. Photosynthesis is the process in which plants take energy from the sun and use it to transform carbon dioxide and water into food and oxygen. Carbohydrates are made in the leaves through this process. To get a better understanding on the process of photosynthesis it is important to know the basic parts of a plant and how they function. There are six basic parts to a plant. These six parts include the root, stem, leaf, flower, fruit and seed.

**Root** - The root helps to firmly secure plant into the soil, preventing it from falling over, helps to absorb water and minerals from soil, and stores food for future use. Roots may also reproduce new plants.

**Stem** - The stem helps to support plant leaves so that they can get sunlight, and similar to a pipe, stores and transports food and water to plant.

**Leaf** - Leaves capture sunlight, energy drawn from the sun helps plant leaves make food (photosynthesis). Some leaves are able to reproduce plants and are edible, playing an important part of the human diet.

**Flower** - A flower is the reproductive part of many plants, containing pollen and tiny eggs that are called ovules. The ovule develops into fruit.

**Fruit** - The fruit is a covering for seeds, acting as a seed holder, and a seed transporter.

**Seed** - Seeds form inside the fruit of a plant, and contain the future life of a plant inside.

Most plants will need at least three main things to live; sunlight, water, and carbon dioxide. Plants drink water and breathe in carbon dioxide and breathe out oxygen. Plants are critically important to the earth and to our own personal health because they provide food and oxygen to us.

**LESSON SNAPSHOT**
Plant Parts and Photosynthesis,
Eating Edible Leaves

**GRADE LEVEL K-8**

**MICHIGAN SCIENCE GRADE LEVEL CONTENT**
Check grid for grade level content.

**CROSS CURRICULAR CONNECTIONS**
†English  Scientific Explanations

**KEYWORDS**
Plants
Algae
Bacteria
Photosynthesis
Autotroph
Root
Stem
Leaf
Flower
Fruit
Seed
Oxygen
Carbon Dioxide
Water (H2O)
Sunlight

**RESOURCES**
“National Gardening Association”
“Biology For Kids: Photosynthesis”. Ducksters. Technological Solutions, Inc” Mayo clinic.com

**OBJECTIVES**
- Identify and name the basic parts of a plant
- Learn the process of photosynthesis and how it connects to students bodies nutritionally
- Identify what living things use the process of photosynthesis
- Recognize what separates a plant from an animal
- Observe the life cycle of a plant
- Prepare and sample edible leaves salad

**MATERIALS**
- Pad of Sticky Notes
- Pencil
- Paper
- Salad bowl
- Forks (enough for entire class)
- Plates or Cups (enough for entire class)
- Garden Journal
- Crayons, markers or colored pencils

**RECIPE MATERIALS**
- Edible leaves (spinach, kale, spring mix lettuce)
- 1 cup of yogurt
- 1 packet of hidden valley ranch dressing
ACTIVITY 1: THE BASICS OF PLANT PARTS (GRADES K-3) †

Learning Objectives: The basics of plant parts activity will use the art of role playing to help students identify and name the basic parts to a plant (roots, stem, leaves, fruit and flower) and their function.

Introduction: Have students name important organs or parts that are found on or inside their body. Explain to students that plants have important parts and organs too. Ask students if they can name the basic parts to a plant. Share with students the basic parts of a plant (roots, stem, seed, leaves and flower). Tell students that plants are alive, and that they have the ability to breathe and drink. Explain to students that humans need to breathe in oxygen to survive and that they breathe out carbon dioxide, and that plants breathe in carbon dioxide and breathe out oxygen which helps to provide the oxygen that they need to survive. Let students know that they are getting ready to act out the basics of a plant part and they will be working together as a group to become a life size plant.

1. Depending on class size create 5-7 sets of sticky notes with plant parts and sun listed on each note. Each set should also have an image (Have students draw or sketch small images of the root, stem, leaves, flower and sun on labeled sticky note, this will help students to make a visual connection to each plant part.

2. Have students break off into 5-7 groups of 6. Give each group a set of plant part sticky notes. Have students take one note. Students should place sticky note somewhere on the front of their body.

3. Ask students to raise their hand if they are labeled as a “root”. Have all root students sit on the ground with their legs out in front of them. Let students know that roots help to keep plants in the ground and bring water to plants. Have roots make a sucking noise like they are drinking through a straw. Instruct students labeled as stems to stand behind the roots, have them move their hands up and down to demonstrate how water travels up and down the stem. Have students labeled as leaves raise their hands. (There should be two leaves in each group.) Students labeled as leaves should stand on each side of the “roots”. Explain to students that leaves make food for plants through the process of photosynthesis. Let students know that photosynthesis is a process in which plant leaves take energy from the sun and use it to transform carbon dioxide and water into food. Have students labeled as sun stand in front of plant leaves. Tell students labeled as leaves to shake their hands at the sun and say “yummy yummy delicious sun energy!” Last but not least have all students labeled as flowers stand directly behind the stem. Explain to students that flowers attract beneficial insects like bees and butterflies that help them to create new seeds by moving pollen from plant to plant. Have flowers make buzzing bee noises. Close out the activity by having all students gather into one large group. Tell students that plants have important parts and organs too. Ask students if they can name the basic parts to a plant. Share with students the basic parts of a plant (roots, stem, leaves, flower and sun) and their function.

ACTIVITY 2: THE BASICS OF PLANT PARTS (GRADES 4-8)

Learning Objectives: The basics of plant parts activity will help students identify and name the basic parts to a plant (roots, stem, leaves, and flower) and their function.

Introduction: Have students name important organs or parts that are found on or inside their body. Explain to students that plants have important parts and organs too. Ask students if they can name the basic parts to a plant. Share with students the basic parts of a plant and the unique function of each part. (Roots help to keep plant in the ground and bring water to the plant, stem carries water up and down through plant, leaves capture energy from the sun transforming carbon dioxide and water into food through the process of photosynthesis, flowers attract beneficial insects such as bees and butterflies that help to pollinate flowers transforming them into fruit and creating new seeds that will sprout into new plants.) Let students know that plants and animals are living organisms, and that plants are also called autotrophs. Ask students if they know what separates a plant from an animal. Explain to students that plants are able to make their own food, but most plants do through a process called photosynthesis. Discuss with students three main things plants need to live (water, sunlight and carbon dioxide). Let students know that plants breathe just like humans do, however plants breathe in carbon dioxide and breathe out oxygen. Humans breathe in oxygen and breathe out carbon dioxide. Share with students the important role that plants play on earth.

1. Pass out the basic plant structure worksheet and basics of plant parts worksheet to students (student handout page 6 and 7). Have students complete worksheets and answer the driving question “How do garden plants eat from the sun?”
CUCUMBER SEEDS

APPLE SEEDS

TOMATO SEEDS
1. Name the basic parts of a plant and describe the unique function of each part.

2. How do butterflies and bees help some plants to make food?

3. Plants and animals are both living organisms. What separates a plant from an animal? Explain

4. What are three main things plants need to survive?

5. What do plants breathe in and out? What do humans breathe in and out?

6. Write a scientific explanation to the driving question “How do garden plants eat from the sun”? Note: Explanation should include claim, evidence, and reasoning from activity.
ACTIVITY 3: THE INCREDIBLE PROCESS OF PHOTOSYNTHESIS

How does the process of photosynthesis affect plant growth? (GRADES ALL)

Learning Objectives: In this activity students will participate in an ongoing experiment and investigation on the effects of plants grown in direct sunlight, artificial light and no light. The main objective of this lesson is to show students how the process of photosynthesis affects overall growth and outcome of garden plants.

Introduction: Ask students what they do when they get hungry? Give students time to share what they do when they are hungry. Let them know that plants get hungry too. Explain to students the process of photosynthesis and how plants are able to eat from the sun. Let students know that they are getting ready to participate in an ongoing investigation of plants growing in direct sunlight, artificial light and no light.

1. Have students fill 3 egg cartons with potting soil. Using bush bean seeds, have students push seed down about 1/4 inch into soil, have them sprinkle soil on top of where seed was planted.

2. Explain to students the process of watering freshly planted seeds, and that it is important to not over water. Let students know that over watering can rot seeds, and cause them not to grow. Have students use a spray bottle to water seeds.

3. Students should place 1 seed tray in direct sunlight, a 2nd seed tray should be placed near artificial light, and the 3rd seed tray should be placed in an area that receives no light (a closet, inside a desk or under a table).

4. Have students check on seed trays every 3 days for 3 weeks. Grades K-3 can use garden journals to draw ongoing plant investigation. Grades 4-8 can use the student worksheet on page 8 to record ongoing plant observation.

5. At the end of the 3rd week have students answer the driving question “How does the sun affect plant growth”, using claim, evidence and reason to explain.

DETROIT SCHOOL GARDEN COLLABORATIVE NUTRITION EDUCATION STUDENT GUIDE
PLANT OBSERVATION

SEED TRAY 1 (Direct Sunlight) Date and record observations.

SEED TRAY 2 (Artificial Sunlight) Date and record observations.

SEED TRAY 3 (No light) Date and record observations.

Have students write a scientific explanation to the question “How does the process of photosynthesis affect plant growth?” Note: Explanation should include claim, evidence, and reasoning from activity.
ACTIVITY 4: EATING EDIBLE LEAVES (GRADES ALL)

**HOW IS THE SUN A PART OF MY SALAD?**

**Learning Objectives:** Eating edible leaves activity will help students learn what plant leaves are edible and how leaves can positively impact their bodies nutritionally.

**Introduction:** Ask students if they have ever eaten plant leaves. Share with students what edible leaves may look like and taste like. Review the process of photosynthesis with students and share with them how photosynthesis plays a critical part in the nutritional value of a salad. Share with students the important nutrients inside edible leaves, such as fiber, vitamins A and C, and minerals including calcium and iron. Using descriptions of nutrients listed below explain how important edible leaves are to their body. **TEACHERS PLEASE NOTE:** Before beginning edible leaves recipe ask students if they have any food allergies. For students with dairy allergies recipe may be modified by using soy yogurt in the place of regular yogurt.

**Fiber:** Creates a full feeling, which helps to keep youth from overeating, preventing obesity. Passes through the digestive tract quickly, acting as a cleanser, which helps to rid the body of toxins.

**Vitamins A and C:** Vitamin A is important for normal vision and a strong immune system which helps the body to resist colds, flus and disease. Vitamin C is an important part of the development and maintenance of youths bodies, helping to form bones, repair tissues, strengthening blood vessels, maintain healthy gums, healing cuts and wounds and helps the body to absorb iron.

**Iron and Calcium:** Iron is an essential nutrient for youth, helping their body to grow and develop. Iron also helps red blood cells to carry oxygen to the bodies tissues, which provides energy to the body, and gives skin a nice healthy color. Calcium is an important mineral helping to form and maintain healthy teeth and strong bones.

**ACTIVITY 4: PREPARING EDIBLE LEAVES (ALL)**

**Cook Time:** 0 minutes  
**Prep Time:** 10 minutes  
**Servings:** 25-30 small samples

**INGREDIENTS**
- 1 pound of lettuce, spinach, spring mix lettuce or kale from school garden, or grocery store. Washed and rinsed thoroughly.

**DRESSING “Healthy Ranch”**
- 1 cup of plain yogurt or greek plain yogurt or plain soy yogurt
- 1 packet of hidden valley ranch dressing mix
- 1/2 cup of 1% or 2% milk or soy milk

**DIRECTIONS**
1. Let students know that they are able to eat leaves on some plants and that they are getting ready to enjoy a delicious fresh salad made up of edible leaves. Ask students if they know of certain plant leaves that they can eat. (Lettuce, kale, and spinach are great examples of edible leafy plants.) Have students wash their hands.
2. Wash edible leaves and place in a large bowl. For kale leaves, have students tear them into small pieces.
3. Mix dressing ingredients together inside a small bowl or large measuring cup, pour dressing over edible leaves. Have students place gloves on and mix leaves and dressing together inside bowl.
4. Place small salad samples into bowls or small cups. Ask students how what they think about eating edible leaves. What would they add or change? Have them think about other dressings that they would enjoy with edible leaves.
5. Ask students if they can name some of the vitamins and minerals that are inside of the edible leaves. Have students explain why nutrients found inside edible leaves are essential in helping their bodies to grow and develop properly.
6. Have students grades K-3 draw a picture inside their garden journal on how the sun is a part of their salad. Students in grades 4-8 should give a scientific explanation the question “How is the sun part of my salad”, using claim, evidence and reason.