LEADER GUIDE

4-H Growing Things Series
Exploring Gardening

Welcome 4-H Leaders!

This guide provides you with project meeting plans (Skill Builders) that include a skills list, background information, activity suggestions, and ways to determine if your members have learned the skills identified. In short, all the information and tools necessary to make this project a rewarding one for you and your members are included in this guide.

In this project, members will examine, by learning to do by doing, the steps and skills required to grow a variety of plants. The Leader Guide is written with the expectation that the project leader(s) will have a working knowledge of the project topics. If not, you may need to do some pre-work / research on the activities, or recruit assistance for certain sections.

There are activities listed and instructions provided in the Leader Guide. You may substitute activities depending on member interest and availability of supplies. Be sure to try out activities, demonstrations, or hands-on work ahead of time to ensure you have an understanding of each Skill Builder - this also allows for any adjustments should an activity not work for you or if any equipment or supplies are unavailable.

The 3D’s of Learning - Each Skill Builder has three sections of learning called “Dream it!”, “Do it!” and “Dig it!”. Below is a description of each.

**Dream it! Plan for Success** - this gives members a chance to help plan their activities. A skills checklist, background information, important words, and activating questions are included in the Member Manual so they will be able to think about the topic and activity and decide how they will approach it. The Leader Guide contains in-depth background information on the topics, material lists, suggestions, time requirements for activities, and activating, acquiring, and applying questions to engage members’ thinking through each step of the learning process.

**Do it! Hands on learning** - this is where members are engaged in the activity planned / discussed in the Dream it! Section. Here members are doing the activities and leaders are observing, recording, and providing feedback on how well they are doing. Allow as much individual practice as required; you are assessing the progress and understanding of individual members.

**Dig it! What did you learn?** - this simply means that members and leaders need to ‘dig into their learning’. For the learning cycle to be completed, both need to reflect on how things went and how well they did. For members, this involves self-assessment, giving feedback, creating meaning from their experiences, and thinking about what they would do differently next time. Once this is done they will be in a good position to apply what they have learned to the next experience.

The sequence of project meetings and specific skills building outcomes for members in this project are on the chart on the following page.
**What Skills Will The Member Learn?**

Each section or Skill Builder (or Builder) in this project has activities that will help your project group learn to do by doing while learning new skills and having fun!

To complete this project, members must:
- Complete the activities in each Skill Builder OR a similar activity that focuses on the same skills, as you and your leader may plan other activities.
- Plan and complete the Showcase Challenge.
- Complete the Portfolio Page.
- Participate in your club's Achievement (See the inside back cover for more information about 4-H Achievements).

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<thead>
<tr>
<th>Skill Builder</th>
<th>Members will be able to...</th>
<th>Activities</th>
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<td>• Identify uses of plants&lt;br&gt;• Explain seasonal changes in plants&lt;br&gt;• Prepare to grow a variety of plants</td>
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<td>5 What’s Going On Inside?</td>
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<td>6 Flowers</td>
<td>• Identify the main parts of a flower&lt;br&gt;• Explain the process &amp; importance of pollination&lt;br&gt;• Name jobs &amp; hobbies relating to plants &amp; nature</td>
<td>• Parts of a Flower&lt;br&gt;• The Cheesy Bee&lt;br&gt;• Beautiful Bouquet&lt;br&gt;• Jobs &amp; Hobbies&lt;br&gt;• More Flowers</td>
<td>40 41 41 42 42</td>
</tr>
</tbody>
</table>

When you successfully complete your builders, you will showcase what you have learned.

| Showcase & Portfolio | • Explain success in using the skills listed above | • Showcase Challenge<br>• My Portfolio | 47 49 |
**Showcase Challenge and My Portfolio Page**

At the end of the members’ section are the “Showcase Challenge” and “My Portfolio Page”. The Showcase Challenge page encourages members to think about their accomplishments and explain or demonstrate how they were successful. There is information to help them decide how they will best “showcase” their learning to family and friends.

Record keeping is an important part of every 4-H project. “My Portfolio Page” is used to keep track of members’ 4-H experiences. As each member learns skills they are recorded on the Portfolio Page. When the Portfolio Page has been completed and confirmed by the leader, then it becomes a record of the member’s completion of the project and participation in other 4-H activities beyond the project.

**4-H leader assessment** of members will occur throughout the project as you observe the progress and learning of each member. Record what you see and hear. Your feedback should be positive and specific (not just “well done”). Share feedback with members often so they can act on your suggestions. How you choose to observe and record is up to you. Remember that members may improve over the project year and that records should be updated to reflect when they showed their best learning. You are discussing how well members are meeting the skills checklists that are at the beginning of each of the project books, in each Builder and on the Portfolio Page.

Projects promote technical, communication, meeting management, and leadership skills, as well as community involvement and real-world experiences. In addition to the specific skills members are to learn in each Builder, these learning goals for members are important: Following instructions - Working with others - Using supplies safely - Using the key words - Improving with practice - Respecting timelines.

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**4-H Project Series Skill Development Levels**

Each project topic series contains three levels of skill development: explore, discover, and master.

**Explore** - each project series has one manual outlining the basics. All members will be expected to complete the Explore level before moving into the Discover level. It introduces the basic skills and terms needed by members for other projects in that series.

**Discover** - each project series has several project options and members are encouraged to take as many as they would like. At this level, members practice specific techniques and gain related skills.

**Master** - project options encourage members to specialize. The Leader’s role is to look for opportunities for their members to have more in depth experiences.
4-H LEADER TIPS FOR SUCCESS!

- Pages 2 and 3 in each leader guide summarize what the member must do to complete the project.
- Depending on time available, group size, and member abilities, you may wish to break the Skill Builders into more than one project meeting.
- The internet has many interesting websites and educational activities. We do not endorse any website or any products they may sell. Information/products will be used at your own discretion.

- Safety is a number one priority. Care has been taken to create safe, age appropriate activities throughout this manual. As leaders, it is important for you to emphasize safety rules and adapt activities to safely match your members’ abilities. Ensure members have a good understanding of safe practices when using tools, that they use the right safety equipment when necessary, and that good supervision is provided. A quality experience needs to be a safe experience.

- The multiple intelligences theory teaches us that people learn in at least 8 different ways. All individuals will be stronger in some ways of “intelligences” and weaker in others. It follows that the more ways we teach, the more members we will reach. Throughout this project, you will find a mix of teaching and learning methods. Teaching projects using a broad blend will help increase the learning potential of all members.

- Projects are designed to teach many skills, but the 4-H member is always more important than the subject matter. Stress cooperation in the activities to develop teamwork and cooperation skills. These are valuable life skills. Ensure the work is completed in a manner that members feel good about themselves and their efforts. This can be done by assigning tasks based on member’s individual abilities. Modelling and expecting supportive behaviour (i.e. no “put-downs”) in the group also contributes to a positive experience.

- There will be opportunity for experimentation and applying skills that members have learned throughout this project. Experimenting can be frustrating, but learning through trial and error is an important life skill. Explain to members that it is alright to either go on to the next Builder or do the Builder again if they need the practice. Help the members work through their challenges until they are satisfied with the final results. Creating inventive 4-H members will be very rewarding.

- Celebrating success is an important but sometimes overlooked part of our lives. We encourage you to use the final section to empower the members by celebrating all they have learned in a fun manner. Anything that you do to add to the spirit of fun and the sense of accomplishment of each member will likely be remembered as the highlight of their 4-H year.

Have fun and thanks for your belief in young people!
Skill Builder 1: Plants Are Everywhere

Skills Checklist

- Identify uses of plants
- Explain seasonal changes in plants
- Prepare to grow a variety of plants

Dream it!

Background for Leaders

A plant is a living thing that makes its own food from the Sun’s energy. Plants are important for many reasons. They provide us with food, feed for livestock and pets, fibres for clothing, and building materials for homes. They make the Earth beautiful. Plants are everywhere.

In Manitoba, vegetation varies seasonally. Some plants only grow during the summer months when the weather is warm. Other plants grow all year. Deciduous trees are trees that produce leaves in the spring and lose their leaves in the fall. Conifers, such as evergreens, keep their needles year round.

Many plants can be grown indoors in the winter months. Members will have the opportunity to grow plants for food (such as lettuce, herbs, or cherry tomatoes), plants from food (such as seeds from citrus fruits or apples), and flowering plants. It is important that the flowering plant is planted early in the 4-H year so its flowers can be studied in Skill Builder 6.

Information on fruits and vegetables grown in Manitoba can be found at https://www.gov.mb.ca/agriculture/local-food/local-produce-guide.html. Learn more about local Farmers’ Markets by visiting http://fmam.ca/.

Basic gardening tools and materials will be required for this project. These tools include good quality soil, trowel, spade, rake, pruners, gardening gloves, pots or containers, and watering can. Consider using small, hand-held tools for indoor gardening projects.

Important Words

Help members define the following words and listen for them using these words in their discussions. To increase the members’ understanding, try providing a synonym members know or provide examples. The more personalized the examples, the better.

<table>
<thead>
<tr>
<th>Vegetation</th>
<th>The plants of an area or region.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deciduous</td>
<td>A plant that loses its leaves at the end of the growing season.</td>
</tr>
<tr>
<td>Conifer</td>
<td>A plant that bears cones and needles. These plants do not lose all of their needles at one time.</td>
</tr>
<tr>
<td>Trowel</td>
<td>A small, hand-held tool with a curved scoop for lifting plants or earth.</td>
</tr>
</tbody>
</table>

Age Considerations

- 8 +
Thinking Ahead

- What will you discuss with members? Gather observations and think of examples that will help support your decision.

Preparing for Success

- Linking back to the Skills Checklist, help members identify how they will know they have been successful in learning from this Skill Builder. Discuss what success in these activities might look like, sound like, or feel like.

Activating Strategies

To get members thinking about this topic, ask them the following questions:
- What plants grow here?
- Why do plants grow?
- How do you grow a new plant?
- When is the last time you ate a plant?

Plant Scavenger Hunt

Time Required: 30 minutes

Supplies:
- Pencil
- Outdoor and indoor vegetation

Directions:
Members will look around their home and community to learn about the variety of vegetation around them. Members should attempt to locate as many of the following as possible. They may find more than one example of each type of plant. Ask members to record where they found the plant and to identify the plant if possible.

- Tall ex. Tree in backyard
- Short ex. Moss on a log
- Deciduous ex. Maple tree in front yard
- Coniferous ex. Evergreen shrub
- Flower ex. Bouquet in kitchen
- Fern ex. Fern in flowerbed
- Agricultural Crop ex. Wheat in the field on the edge of town
- Used as food ex. Lettuce in a salad

Other categories may include fabrics, home decorations, etc.
Then discuss seasonal changes in some plants. Deciduous trees lose their leaves in the fall and shoot new leaves each spring. Discuss the impact of the seasons on the opportunities for plants to grow in the summer vs. the winter.

Ask members to draw an example of a deciduous tree in the summer and in the winter.

**Do it!**

**Tools for Planting**

**Time Required:** 10 minutes

**Supplies:**
- Pencil

**Directions:**
1. Brainstorm different tools that are used in gardening.
2. Ask members to draw or list 3 tools that are used in gardening.
3. Discuss some safety considerations relating to gardening. Members should record two ways that they will stay safe while they are gardening.

Some safety tips to remember when gardening include:
- Wash your hands after touching soil. There are more microorganisms in a teaspoon of soil than there are people on Earth.
- Wear gloves. This can help lower the risk of skin irritations and cuts.
- Be careful with chemicals. Follow the instructions on the label. Do not consume them.
- Carry and use sharp tools carefully.
- Use tools appropriate for your age and skill level.
- Don’t eat any plant parts if you don’t know what they are. Some plants and plant parts are poisonous.
Where Will You Plant?

Time Required: 45 minutes

Safety Considerations: An adult should cut the container to the desired shape or size. Members should use caution when using a hammer and nails. Beware of sharp edges on tin cans and plastic containers.

Supplies:
- Recycled containers (plastic bottles, tin cans, old rubber boots, etc.)
- Decorative items (paint, pipe cleaners, foam, hot glue, markers, etc.)
- Sharp knife or heavy duty scissors
- Hammer and Nail

Directions:
Members will design a creative, environmentally-friendly planter for this project. In addition to this creation, flower pots or simple recycled containers such as margarine tubs or yogurt containers can also be used.

1. Clean a recycled container.
2. Cut the container to the desired shape or size. *A leader should complete this task.
3. Make drainage holes in the bottom of the container using a hammer and nail as a punch.
4. Add decorative items to the container.

Some photos have shown containers decorated as a person. The growing plant will be the hair.

Plant It

Time Required: 45 minutes

Supplies:
- Pencil
- Planters (created in “Where Will You Plant’ activity, purchased, or recycled)
- 3 different plant seeds (note categories on the following page)
- Soil
- Gardening tools (gloves, hand-held trowel)
- Tape
- Marker

Directions:
Discuss the process of planting. Ask members to place the steps in the correct order.

3. Pour soil into a pot until it is near the top.
7. Wait for the plants to grow. Gardening takes patience.
5. Cover the seeds with a thin layer of soil.
4. Place seeds in the soil. Sow them near the centre with even spacing.
1. Get your supplies ready.
2. Poke holes in the bottom of the pot. Place stones in the bottom of the pot for drainage.
6. Water. Give the seeds some water so the soil is moist. Continue watering as needed.
Begin planting the seeds for the following three categories:

- Plant a plant that you can grow for food. Lettuce, herbs, or cherry tomatoes are good choices for indoor gardens.
- Plant a seed that comes from a food item. Citrus fruits (oranges, grapefruit) or apple or pepper seeds work well.
- Plant a flowering plant. The flowers that are produced will be used in Skill Builder 6. You might choose sunflowers. Flowers that grow from a bulb, such as tulips or amaryllis, will add variety to the planting process.

Label each pot and record the date it was planted.

To produce fruit (or veggies), some plants need to be fertilized. This means that the pollen from one flower needs to be transferred to another flower or within a flower. Pollination is discussed in Skill Builder 6 (Flowers). You can manually transfer pollen by shaking the flower or using a soft brush to move the pollen.

While you are planting, encourage members to feel and mix the soil with their hands. It is quite soft and if it feels dirty it will wash off.

**Dig it!**

Discuss the following questions with members:

- Why are plants important to us?
- Why are recycled planters a healthy choice for the Earth?
- How soon do you predict you will see the first signs of your plants growing?

**What’s next?**

Skill Builder 2 introduces the parts of the plant and the life cycle. Members will observe plant growth through a Germination Window.
In the Member Manual

Skill Builder 1: Plants Are Everywhere

Larry Says...
The Earth is covered in plants. It is estimated that there are at least 300,000 different species of plants spread around the world. Let’s look at the plants in your home and in your community first!

Skills Checklist
- Identify uses of plants
- Explain seasonal changes in plants
- Prepare to grow a variety of plants

Important Words
Watch for these important words throughout this Skill Builder: Vegetation, Deciduous, Conifer, Trowel

Dream it!

Plant Scavenger Hunt
Look around your house and your community. What vegetation do you see? Try to find the following. Record where you found it and what kind of plant it is if you can identify it. How many can you find?
- Tall
- Short
- Deciduous
- Coniferous
- Flower
- Fern
- Agricultural Crop
- Used for food

Deciduous plants change with the seasons. Draw pictures of a deciduous tree in the summer and in the winter.

Do it!

Tools for Planting
As you begin growing things, you will learn about some of the tools you might need to be a successful gardener. Brainstorm some of the tools you think you will need. Draw or list three of these tools.

Larry Says...
What are two things you can do to stay safe while you are gardening?
1. ________________________________
2. ________________________________

Where Will You Plant?
There are many different places that plants grow. Outdoor planting may not be a good choice due to seasonal temperature changes. Think about different containers you could use to plant your plants indoors for this project.

Find a container that you can use for this project. Look for materials that you can recycle into a planter. Then, put your creative skills to work to create a decorative planter to show off your plants. Here are some creative ideas. Follow your leader’s instructions.

http://www.1001gardens.org/2015/03/lovely-planters-for-kids-from-recycled-plastic-bottles/
http://blog.dannice.com/kids-crafts/recycled-crafts-can-planters/
In the Member Manual

Do it!

Plant It

Number the following steps in order for planting a seed.

1. Pour soil into a pot until it is near the top.
2. Wait for the plants to grow. Gardening takes patience.
3. Cover the seeds with a thin layer of soil.
4. Place seeds in the soil. Sow them near the center with even spacing.
5. Get your supplies ready.
6. Poke holes in the bottom of the pot. Place stones in the bottom of the pot for drainage.
7. Water. Give the seeds some water so the soil is moist. Continue watering as needed.

It’s time to start planting. Get your hands dirty as you tackle this part of the project. Select three different things to grow and record the date you plant them.

1. A Plant That You Can Grow For Food:
2. A Plant That Comes From a Food Item:
3. A Flowering Plant:

Remember to label each pot and record the date the seeds were planted.

Larry Says...

Once you have planted the seeds, remember to water your plants regularly!

More Leaves...

Play some online gardening games at http://www.gardeningwithchildren.co.uk/kids-zone/fun-and-games/items.cfm?id=7.

Find a list of Manitoba’s Farmers’ Markets here: http://fmam.ca/ You can find all kinds of fruits and vegetables at Farmers’ Markets.

Dig it!

Why are plants important to us?

Why are recycled planters a healthy choice for the Earth?

How soon do you predict you will see the first signs of your plants growing?

What’s next?

In Skill Builder 2 you will learn about the different stages of growth of plants. You can see the entire process through a Germination Window.
Skill Builder 2: Seeds, Roots, & Shoots

Skills Checklist

- Describe the life cycle of a plant
- Define seed germination
- Explain the growth of a seed

Dream it!

Background for Leaders

Skill Builder 2 focuses on the plant life cycle and plant growth. For purposes of this Skill Builder, the explanation of the life cycle will begin with the planting of a seed. Seeds are all around us. They are in plants, on the ground, buried deep in the soil, and in food we eat.

In flowering plants, the seed is the basic unit of life. It contains the embryo, which will become the growing plant, and a storage of energy that is used until the plant can produce its own food. The seed needs water to grow. As the seed absorbs water, it swells in size. Germination is the stage of initial growth or life in the seed. From the seed, the root grows downward to pick up water and nutrients. Roots grow downward because they can sense gravity. Then, the shoot (or stem) grows upward toward the soil surface. Next, the first leaves will develop and the plant is called a seedling. The leaves can collect energy from the Sun and make food for the plant. The plant will continue to grow and produce more leaves. The roots will grow larger and deeper. Eventually, the plant will mature and produce a bud that will form into a flower. The flower needs to be pollinated to be fertilized and produce seeds. Some plants produce fruit that contains the seeds (ex. beans). Seeds that are produced on the flower will dry. Seeds in fruit must become exposed and dry. These seeds can be transported by wind, water, or animals to a new location where they can grow into a new plant and the cycle will continue.

Important Words

Help members define the following words and listen for them using these words in their discussions. To increase the members’ understanding, try providing a synonym members know or provide examples. The more personalized the examples, the better.

<table>
<thead>
<tr>
<th>Seed</th>
<th>A plant structure containing the materials necessary for germination enclosed in a seed coat. Seeds are often produced in the flowers or fruits of flowering plants.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germination</td>
<td>The development of a plant from a seed or spore.</td>
</tr>
<tr>
<td>Root</td>
<td>Part of the plant that attaches it to the ground or to a support. Roots collect and carry water and nutrients to the rest of the plant.</td>
</tr>
<tr>
<td>Stem</td>
<td>The main body or stalk of a plant that rises above the ground.</td>
</tr>
</tbody>
</table>

Age Considerations

- 8 +
Thinking Ahead
- What will you discuss with members? Gather observations and think of examples that will help support your decision.

Preparing for Success
- Linking back to the Skills Checklist, help members identify how they will know they have been successful in learning from this Skill Builder. Discuss what success in these activities might look like, sound like, or feel like.

Activating Strategies
To get members thinking about this topic, ask them the following questions:
- Where have you seen seeds?
- What do seeds do?

Plant Life Cycle

Time Required: 10 minutes

Supplies:
- Pencil
- Printed Life Cycle Cards (optional)

Directions:
Ask members to place the stages of the plant life cycle in the correct order beginning with the seed.

Cards with the stages of the plant life cycle are included in order on the following page. Rearranging the cards will help members understand the continuous process of the plant life cycle.

1
5
4
2
6
3
7

Note: The bean pods that have formed from the flowers.
**Do it!**

**Seed Identification**

**Time Required:** 15 minutes

**Supplies:**
- Pencil
- Seed images or real seed samples

**Directions:**
This activity can be completed in various ways depending on the supplies that are available.

1. Ask members to identify the seeds based on the images in their Member Manual. Members can choose from the types of seeds listed in the box below the images.

OR

2. Gather seeds from a seed collection or purchase seeds.
   - Remove seeds from packaging.
   - Ask members to identify seeds or to match the seeds based on the plant names provided.

**Seed Bombs**

**Time Required:** 30 minutes

**Supplies:**
- Red clay (helpful, but not essential; can be purchased at a craft/hobby/pottery store)
- Dry, organic compost or soil
- Seeds (any seeds similar to cilantro, parsley, lettuce, peas, poppies, etc.)
- Water

**Directions:**
1. Mix 5 parts clay, 2-3 parts compost or soil.
2. Gradually add 1-2 parts water.
3. Knead mixture to the consistency of cookie dough.
4. Roll into small to medium sized balls about the size of cookie balls. They should fit in the palm of your hand. Add 4-5 seeds to the mixture in each ball.
5. Set seed bombs out to dry for a day or two. They will dry more quickly if they are set in the sun.
Seed bombs can be stored for later use. They can be frozen for a few months or placed in a cool, dark, dry place for a few weeks. In the spring, place the seed bombs in the garden. Remind members that some seeds and plants can be harmful to pastures and farmers’ fields. Members should ask for permission before planting their seeds.

Seed bombs can also be made in ice cube trays or egg cartons. This method allows easier shaping and storage.


Granola

Plant products are very healthy. Flax (and chia) seeds are high in fibre and Omega-3 fatty acids. Sunflower seeds contain lots of vitamin E, magnesium, and selenium. Additionally, hemp seeds are a complete protein containing omega-3, omega-6, and all 19 essential fatty acids. These seeds can be added to the following recipe.

**Time Required:** 20 minutes prep + 20 minutes baking

**Safety Considerations:** Use caution when stirring hot pots and around a hot oven. The leader should insert and remove the pan from the oven.

**Supplies:**
- 2 cups (475 mL) rolled oats
- 1/4 cup (60 mL) raw sunflower seeds
- 1/2 cup (120 mL) dried cranberries
- 1/4 cup (60 mL) wheat germ
- 1/2 cup (120 mL) sliced almonds (optional)
- 1/4 tsp (1 mL) salt
- 1/2 cup (120 mL) peanut butter (or soy nut butter)
- 3/4 cup (175 mL) honey
- 1 tbsp (15 mL) cooking oil
- 3 tbsp (45 mL) brown sugar
- Mini chocolate chips (optional)

**Directions:**
1. Preheat oven to 350° F (175° C). Grease a ceramic or glass 9x13” baking dish.
2. Mix oats, sunflower seeds, cranberries, wheat germ, and almonds together in a bowl. Spread mixture on a sheet pan and toast in preheated oven for 8 minutes. Return mixture to a large bowl.
3. In a medium saucepan, combine salt, peanut butter, honey, cooking oil, and brown sugar.
4. Melt over medium heat. Remove from heat when melted. Pour over oats mixture and combine until dry ingredients are evenly coated. Stir in chocolate chips (optional).
5. Pour into baking dish. Press mixture down into pan.
6. Bake for 20 minutes.
7. Let cool for at least 2 hours before serving.
Germination Window

Time Required: 30 minutes

Supplies:
- Jar
- Wet Paper Towel
- Seeds (beans or peas work well)

Directions:
1. Squeeze excess moisture from paper towels. Place damp paper towels in the jar until it is nearly filled with loosely stuffed paper towels.
2. Place 4-6 seeds along the edges of the jar about halfway down.
3. If you are using multiple types of seeds, label the jars.
4. Keep a record of the date of planting.
5. Watch for plant growth. Record any growth or changes.

* Don’t seal the top of the jar. Leave it open without a lid or poke holes in the lid before covering.
* You may need to remoisten the paper towels as plants begin growing.

Tip: Place the germination window in a dark place until leaves emerge at the top of the jar. Plants usually grow in the darkness of the soil until the leaves emerge.

Through the germination window, members should be able to see the root growing down from the seed. The root will develop branches as it stretches for more moisture. Then, the shoot will begin growing upward. The shoot often is curved until it breaks through the surface. Once the plant is established, members can transplant it to a more permanent container to see if it will flower and fruit.

Members can also experiment by inverting the container for a day or two to see if the root will grow in the opposite direction.

Dig it!

Review the following questions with members:
- Why is it important that the plant life cycle continues?
- What part of the plant life cycle starts a new plant?
- Did the root or the shoot grow more quickly in your Germination Window? Why?

What’s next?

Plants need many things for survival including sunlight, food, pest protection, air, and appropriate temperatures. Members will learn about some strange places where plants are still able to grow.
Skill Builder 2: Seeds, Roots, & Shoots

Larry Says...
Plants grow up and down. While the plant is getting taller, the roots are also growing larger. Let’s learn about how all of this growing gets started.

SKILLS CHECKLIST
- Describe the life cycle of a plant
- Define seed germination
- Explain the growth of a seed

Dream it!

Plant Life Cycle
Where have you seen seeds?
What do seeds do?

Place the following pieces of the plant life cycle in order. Begin with the planting of a seed.

---

Do it!

Seed Identification
Look at the pictures below or at a collection of seeds provided by your leader. Match the name of the plant to its seed.

Select from the following:
- Potatoes
- Carrots
- Corn
- Flowers
- Beans
- Peas

Seed Bombs
Seed bombs are small balls of soil and seeds. Make these any time of the year and save them for spring. Throw them into your garden and wait for them to grow.

Supplies:
- Red clay
- Dry, organic compost or soil
- Seeds (any seeds - flowers or vegetables such as cilantro, parsley, lettuce, peas, etc.)
- Water

Directions:
1. Mix 5 parts clay, 2-3 parts compost or soil.
2. Gradually add 1-2 parts water.
3. Knead mixture to the consistency of cookie dough.
4. Roll into small to medium sized balls about the size of cookie balls. They should fit in the palm of your hand. Add 4-5 seeds to the mixture for each ball.
5. Set seed bombs out to dry for a day or two. They will dry more quickly if they are set in the sun.

In the spring, place the seed bombs in your garden. Ask permission before planting any seeds.

http://2lo.blogspot.com/2010/01/whats-in-white-decker.html?m=1
In the Member Manual

Granola Bars
Many years ago people survived by collecting seeds and fruits in the wild. Make your own granola bars. They are a healthy snack choice.

Ingredients:
• 2 cups (475 mL) rolled oats
• 1/4 cup (60 mL) raw sunflower seeds
• 1/2 cup (120 mL) dried cranberries
• 1/4 cup (60 mL) wheat germ
• 1/2 cup (120 mL) sliced almonds (optional)
• 1/4 tsp (1 mL) salt
• 1/2 cup (120 mL) peanut butter (or soy nut butter)
• 3/4 cup (175 mL) honey
• 1 tbsp (15 mL) cooking oil
• 3 tbsp (45 mL) brown sugar
• Mini chocolate chips (optional)

Directions:
1. Preheat oven to 350° F (175° C). Grease a ceramic or glass 9x13" baking dish.
2. Mix oats, sunflower seeds, cranberries, wheat germ, and almonds together in a bowl. Spread mixture on a sheet pan and toast in preheated oven for 8 minutes. Return mixture to a large bowl.
3. In a medium saucepan, combine salt, peanut butter, honey, cooking oil, and brown sugar.
4. Melt over medium heat. Remove from heat when melted. Pour over oats mixture and combine until dry ingredients are evenly coated. Stir in chocolate chips (optional).
5. Pour into baking dish. Press mixture down into pan.
6. Bake for 20 minutes
7. Let cool for at least 2 hours before serving.

What other seeds do you like to eat?

Germination Window
In this activity you will see how plants begin their growth below the ground.

Supplies
• Jar
• Wet Paper Towel
• Seeds (beans or peas work well)

Directions:
1. Squeeze excess moisture from paper towels. Place damp paper towels in the jar until it is nearly filled with loosely stuffed paper towels.
2. Place 4-6 seeds along the edges of the jar about halfway down.
3. If you are using multiple types of seeds, label the jar.
4. Keep a record of the date of planting.
5. Watch for plant growth. Record any growth or changes you notice.

What's next?
In Skill Builder 3 you will learn about the many things that plants require for growth.

Record your observations of your Germination Window. Do you notice any new parts, changes in size, or changes in colour?

<table>
<thead>
<tr>
<th>Date</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Dig it!
Why is it important that the plant life cycle continues?

What part of the plant life cycle starts a new plant?

Did the root or the shoot grow more quickly in your Germination Window? Why?
Skill Builder 3: Plant Needs

Skills Checklist
- Identify plant needs
- Explain the differences in plant growth
- Understand how plants grow in different parts of the world

Dream it!

Background for Leaders

Plants require many things for growth. Water is essential for plant growth. Water is absorbed by the roots and transported to the rest of the plant. Water can carry nutrients from the soil, too. Soil contains the nutrients plants require. Fertilizers containing nitrogen, phosphorus, and potassium can be added to soil to improve plant growth or to encourage flowering. Plants need a surface that can support their roots. Sunlight is crucial for plants. Plants use the Sun’s energy to produce food. Plants need space. If plants are too crowded there won’t be enough sunlight reaching their leaves. Plants need fresh air. Plants use carbon dioxide and release oxygen. Plants can only grow at certain temperatures. Some plants love hot climates while other plants prefer cool, wet weather. In Manitoba, many plants limit their growth after the first frost in the fall. Then, in the spring, plants begin producing new leaves and growing bigger as the temperatures warm up and there is more sunlight and rain. Pests, such as weeds, insects, and diseases, also limit plant growth and can make plants sick.

Plants can adapt to the region they live in. Plants in the desert are good at storing water. Cacti store lots of water. Desert plants also have large roots that can reach water deep in the sand. There are many different kinds of plants in a rainforest. Plants near the forest floor like shady areas. Very little sunlight reaches deep into the forest. Tall trees stretch toward the sun. These trees shade the plants below. There are also some plants that grow on the tall trees. These plants are called epiphytes. Their roots are attached to the trees rather than to the soil of the forest floor.

Important Words

Help members define the following words and listen for them using these words in their discussions. To increase the members’ understanding, try providing a synonym members know or provide examples. The more personalized the examples, the better.

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>The black or dark brown upper layer of the earth where plants grow. Soil is typically composed of organic materials, clay, and rock particles.</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>A chemical or natural substance added to soil to improve plant growth.</td>
</tr>
<tr>
<td>Pest</td>
<td>An insect or other animal or substance that attacks crops.</td>
</tr>
<tr>
<td>Growth Rate</td>
<td>The increase in size of a plant or other living thing over a period of time.</td>
</tr>
</tbody>
</table>

Age Considerations
- 8+
Thinking Ahead

- What will you discuss with members? Gather observations and think of examples that will help support your decision.

Preparing for Success

- Linking back to the Skills Checklist, help members identify how they will know they have been successful in learning from this Skill Builder. Discuss what success in these activities might look like, sound like, or feel like.

Activating Strategies

To get members thinking about this topic, ask them the following questions:

- What do plants need?
- Why do some plants grow in the desert while others cannot? Rainforest? Arctic?

Plant Needs

**Time Required:** 10 minutes

**Supplies:**
- Pencil

**Directions:**
Ask members to name or draw a picture showing plant needs.

**Do it!**

**Sponge Sprouts**

**Time Required:** 20 minutes

**Supplies:**
- Household Sponge
- Seeds (lettuce, spinach, or broccoli)
- Spray Bottle with Water
- Shallow Plate
- Scissors

**Directions:**

1. Cut the sponge into the desired shape. It may be easier to cut if wet.
2. Soak the sponge so it is damp, not dripping.
3. Scatter the seeds across the top of the sponge. You can poke the seeds into the little holes of the sponge.
4. Place in a sunny window.
5. Mist with water to keep the sponge moist.
6. Watch the plants sprout.

Tip: Cover the sponge with a clear plastic container overnight to help maintain the moisture.

Plants are able to grow without soil as the sponge holds moisture and is a surface that plant roots can attach to. Members are able to provide water, sunlight, air, and space for the plants to grow.

Growth Rate Race

Time Required: 30 minutes + ongoing observation

Supplies:
- Pots or Containers for Planting
- Soil or Sand (for experimental purposes)
- Seeds (anything members would like to grow, beans or peas will work well)
- Plant Stakes or Labels (members can decorate these pieces to ‘cheer’ for their plant)
- Measuring Tape

Directions:
Each member should plant two seeds. These plants will race against each other in an attempt to be the tallest plant. Members can also race against each other by comparing plant heights.

1. Plant two plants. Use separate containers and label each.
2. Encourage members to experiment with plant growth. Members may plant one in rich soil and the other in sandy soil, over or under water, or place the plant in a dark, shady place.
3. Ask members to record what they planted and to predict which plant will grow most quickly and why.
4. Record and compare plant heights.

This activity will continue over multiple days or weeks. Members will need to bring their growth records to project meetings. Discuss differences in plant growth. Ask members at what point their plant grew most quickly. Healthier plants that have everything they need for growth will grow faster than plants lacking nutrients, sunlight, moisture, or warmth. Learn more at http://www.whatdowedoallday.com/2014/03/plant-science-activity-kids.html

Dig it!

Review the following questions with members:
- What happens if a plant’s needs are not met?
- Why do some plants grow better in some places than others?
- Why do some plants grow faster than others?

What’s next?

Leaves are the focus of the next Skill Builder. Members will learn how a leaf can grow into a complete plant and how leaves are an important part of our diet.
In the Member Manual

Skill Builder 3: Plant Needs

Larry Says…
Humans need food and water to stay alive. Plants require many things to grow big and strong. They need fresh air, water, sunlight, energy, and protection. If plants don’t get everything they need, they might get sick.

SKILLS CHECKLIST
- Identify plant needs
- Explain differences in plant growth
- Understand how plants grow in different parts of the world

Important Words
Watch for these important words throughout this Skill Builder: Soil, Fertilizer, Pest, Growth Rate

Dream it!

Plant Needs
List or draw a picture of things that plants need to be able to grow. What can slow or stop plant growth?

Plants don’t have legs; they can’t move around. Think about what it would be like if you were a plant. How would you find all of the things you need?

More Leaves...
Learn about 5 plant needs (Water, Soil, Space, Sunlight, and Air) with this catchy song. https://www.youtube.com/watch?v=dUBIQITRzI

Do it!

Sponge Sprouts
Supplies:
- Household Sponge
- Seeds (lettuce, spinach, or broccoli)
- Spray bottle with water
- Shallow plate
- Scissors

Directions:
1. Cut the sponge into the desired shape. It may be easier to cut if it is wet.
2. Soak the sponge so it is damp, not dripping.
3. Scatter the seeds across the top of the sponge.
4. Poke the seeds into the little holes of the sponge.
5. Place the sponge in a sunny window.
6. Mist with water to keep the sponge moist.
7. Watch your plants sprout.

What plant needs did you meet in this activity?

Why didn’t these plants need soil?

Larry Says…
Bamboo can grow really fast. Sometimes it grows almost a metre in just one day! Bamboo grows in Asia. Bamboo is used in food, medicine, construction, and fabric.

Plant Growth Rate Race
Grow two plants and compare their growth rates. Change something about how you care for the plants and see how that affects its growth. Compare your plant growth results with other members.

I planted ____________________________
I experimented by ____________________________
I predict that ____________________________ will grow faster because ____________________________
_________________________ grew faster because ____________________________

Dig it!

- What happens if a plant’s needs are not met?
- Why do some plants grow better in some places than others?
- Why do some plants grow faster than others?

What’s next?
You will learn about leaves in Skill Builder 4. Leaves are a very important part of plant food production.
Skill Builder 4: Leaves

Skills Checklist

- Define & explain photosynthesis
- Grow new plants by propagation
- List ideas for eating plant leaves

Dream it!

Background for Leaders

Leaves are the energy producers for the plant. Leaves take water and carbon dioxide and convert them to oxygen and sugars (food) with the help of the Sun’s energy. This process is called photosynthesis.

Carbon Dioxide + Water ---- (with energy from sunlight)----> Oxygen + Sugar (Food)

Most leaves are large and flat so they can capture as much sunlight as possible. Leaves are green because they are filled with a green pigment called chlorophyll. Leaves have small pores on their underside where carbon dioxide can enter and oxygen is released. Leaves also have veins (ridges on the leaf surface) that connect to the leaf stalk which connects to the stem. Water is transported from the roots all the way up to the leaves for use in photosynthesis.

Leaves come in a variety of shapes. Some leaves are very pointed, while others are rounded. Some leaves are divided into smaller leaflets with varying arrangements. Needles on evergreens are also a type of leaf. Photosynthesis occurs in the needles. Cactus spines are the remnants of leaves that were reduced many, many years ago. Cacti have very small leaves and green stalks for photosynthesis.

While all plants produce food by photosynthesis, some plants, such as the Venus Flytrap, also consume insects for additional energy.

Leaves can be eaten as an excellent source of energy by humans and other animals. Lettuce, spinach, kale, and herbs are all examples of leaves. We also eat seeds, grains, fruit, and parts of roots or other underground parts of plants. Use caution when considering eating an unfamiliar plant as some plants or plant parts are poisonous.

Plant propagation is the process of creating new plants from an existing plant. Gardeners can take clippings or cuttings from plants and use these pieces to produce a new plant. For example, a leaf can be cut from the stem and placed in water. Small roots will develop at the base of the stem. Then, it can be planted in a small pot of soil. Some leaves are planted directly into soil and will continue to grow. Plants can also be propagated by taking a clipping of a stem or moving a section of a plant, including the roots, to a new location. This is effective with strawberries.
Important Words

Help members define the following words and listen for them using these words in their discussions. To increase the members’ understanding, try providing a synonym members know or provide examples. The more personalized the examples, the better.

<table>
<thead>
<tr>
<th>Photosynthesis</th>
<th>The process where plants and some other living things use sunlight (energy) to convert carbon dioxide and water to food (carbohydrates) and oxygen.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle</td>
<td>Needle shaped leaves found mainly on conifers, such as pine.</td>
</tr>
<tr>
<td>Propagation</td>
<td>Breeding of plants naturally from the parent stock by leaves, stems, or plantlets.</td>
</tr>
</tbody>
</table>

Age Considerations

- 8 +

Thinking Ahead

- What will you discuss with members? Gather observations and think of examples that will help support your decision.

Preparing for Success

- Linking back to the Skills Checklist, help members identify how they will know they have been successful in learning from this Skill Builder. Discuss what success in these activities might look like, sound like, or feel like.

Activating Strategies

To get members thinking about this topic, ask them the following questions:

- Why do we need plants?
- What do leaves do?
- Why do leaves come in different shapes?

Photosynthesis Equation

**Time Required:** 10 minutes

**Supplies:**
- Access to video online
- Pencil

**Directions:**
2. Complete the photosynthesis equation using the words provided below the diagram.

```
Carbon Dioxide + Water \[\rightarrow\] Oxygen + Food (Sugar)
```

Sunlight
**Do it!**

**Leaf Shapes**

**Time Required:** 15 minutes

**Supplies:**
- Plant samples
- Pencil

**Directions:**
Ask members to examine the leaves on their plants or on plants outdoors. Leaves can grow in many different shapes and patterns. Members should draw three different leaf shapes.

Remember, needles on conifers are leaves, too.

**Leaf Rubbings**

**Time Required:** 30 minutes

**Supplies:**
- Leaves (try to find leaves of varying shapes and sizes)
- Thin Paper
- Wax Crayons (with paper covering removed)

**Directions:**
1. Place a leaf on a hard surface with the bottom (vein side) up.
2. Put a thin sheet of paper over the leaf.
3. Rub the side of the crayon over the leaf. The leaf shape will start to appear. Veins will be more defined.
4. Continue until the entire leaf is visible. Remove the leaf from under the paper.
5. Repeat with other leaves and/or more colours.

Note: leaves can be overlapped to create a leaf collage.

**Propagation**

**Time Required:** 30 minutes

**Supplies:**
- Healthy Plant
- Scissors
- Cup
- Water
- Soil
- Container for planting
- Rooting Hormone (optional, can be purchased in the seasonal/gardening section of major retailers or at garden centres)
Directions:
This activity includes three methods of plant propagation. Encourage members to attempt at least one propagation method.

1. **Leaf**: Cut a leaf at the base of a stem where it joins the plant. Place the base of the leaf stem in a small cup of water. Small roots will begin to form in a few days. When the roots are developed, plant the clipping in soil. Water it regularly. This method works well with African violets or begonias.

2. **Stem**: Cut the stem of a plant or branch leaving about 6 leaves. Remove the bottom two leaves from the clipping. You can plant this clipping directly in soil. Water it regularly. This method works well with geraniums, ivies, or coleus.

3. **Plantlets**: Remove a section from the base of the stem of a large plant and plant it in a new pot. Don’t take too much from the first plant. You want both plants to survive. This method works well with strawberries or perennials.

**Planting the cuttings:**
1. Prepare the soil mixture by making it moist, but not wet. If available, add rooting hormone to the soil. This will encourage root development.
2. Make small holes (about 2 cm deep) with your finger. (Holes will be larger for plantlet propagation.) Depending on the size of the cuttings and containers you can plant more than one cutting in a container.
3. Cut a piece from the mother plant. The size of the clipping will depend on the method selected.
4. Gently place the cutting in the hole. Hold it by the leaf so the base of the stem is not damaged.
5. Press the soil mixture gently around the cutting to hold it upright.
6. Place in an area with good sunlight and warmth. Make sure the soil stays moist.
7. After about 10 days, check to see if the plants have rooted by gently pulling up on the cuttings.

Encourage members to include a photo of their plants showing the mother plant and the new plant.

**Plant Salad**

**Time Required:** 30 minutes

**Supplies:**
- Leafy greens (Lettuce, spinach, and/or kale)
- Additional plant products for salad as selected by members.
  (Suggested additional ingredients include broccoli, carrots, cauliflower, cucumbers, tomatoes, olives, sunflower seeds, strawberries, dried cranberries, blueberries, raspberries, and herbs)

**Directions:**
Members will create a salad of their choice. Members will record their recipe in the Member Manual. Discuss the importance of plants for healthy meals and snacks.

After enjoying their salad creation, members should think about all of the plants and plant products they eat. From fruits and vegetables to bread and trail mix, plants are essential in our diets. Ask members to name a food from a plant that matches each colour of the rainbow (and white and black). Some suggestions are included on the following page. Leaves, seeds, grains, fruits, veggies, and products that grow underground (ex. potatoes) are all products of plants. Plants are even used in drinks like coffee, tea, lemonade, etc.
Dig it!

Discuss the following questions:
- Do all of the leaves in your salad look the same?
- Why do we need plants on Earth?
- How can you grow new plants from the plants you already have at home?

What’s next?

Skill Builder 5 discusses what a plant is doing inside. Members will want to share these new discoveries with others.

<table>
<thead>
<tr>
<th>Red</th>
<th>Strawberries, Rhubarb, Beets, Tomatoes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>Oranges, Carrots, Cantaloupe, Pumpkins</td>
</tr>
<tr>
<td>Yellow</td>
<td>Corn, Lemons, Bananas</td>
</tr>
<tr>
<td>Green</td>
<td>Avocados, Broccoli, Asparagus, Peas, Celery, Lettuce</td>
</tr>
<tr>
<td>Blue</td>
<td>Blueberries, Saskatoons</td>
</tr>
<tr>
<td>Purple</td>
<td>Eggplant, Purple Cabbage, Purple Grapes, Raisins</td>
</tr>
<tr>
<td>White</td>
<td>Cauliflower, Potatoes, Onions, Parsnips</td>
</tr>
<tr>
<td>Black</td>
<td>Blackberries, Olives</td>
</tr>
</tbody>
</table>
Skill Builder 4: Leaves

Larry Says....
Leaves come in many different shapes and sizes. They can be pointed or rounded. Some leaves are made up of groups of smaller leaflets. All leaves have the same job. They all work to power the plant so it can grow bigger and stronger.

SKILLS CHECKLIST
- Define & explain photosynthesis
- Grow new plants by propagation
- List ideas for eating plant leaves

Important Words
Watch for these important words throughout this Skill Builder:
Photosynthesis, Needle, Propagation

Dream it!
Photosynthesis Equation
Watch the Photosynthesis video at this link: http://www.harcourtschool.com/activity/science_up_close/311/deploy/interface.swf Then, complete the photosynthesis equation.

\[ \text{Carbon Dioxide} + \text{Water} + \text{Sunlight} \rightarrow \text{Oxygen} + \text{Food (Sugar)} \]

Use these words: Carbon Dioxide, Oxygen, Water, Food (Sugar)

Do it!
Larry Says...
A blade of grass, a pine needle, a fern frond, and a maple leaf are all examples of leaves. They are very different shapes.

Leaf Shapes
Plants can be identified by the shape of their leaves. Poplar trees, maple trees, and flowers have different leaves. Look at the plants you have grown in this project. Are the leaves the same? Draw three different leaves.

Leaf Rubbings
Collect a few leaves of different shapes for an art activity. Remember, leaves are important to plants. Don't take too many leaves from one plant at once. Using wax crayons, create a work of art. Follow your leader's instructions.

Propagation
If you cut off part of a plant and put it in some soil will it grow? Some plant clippings (pieces) can grow into new plants. This is called propagation. You can propagate plants in a variety of ways. Try to grow a new plant using at least one of the following methods.

1. **Leaf**: Cut a leaf at the base of a stem where it joins the plant. Place the base of the leaf stem in a small cup of water. Small roots will begin to form in a few days. When the roots are developed, plant the clipping in soil. Water it regularly.

2. **Stem**: Cut the stem of a plant or branch leaving about 6 leaves. Remove the bottom two leaves from the clipping. You can plant this clipping directly in soil. Water it regularly.

3. **Plantlets**: Remove a section from the base of the stem and plant it in a new pot. Don't take too much from the first plant. You want both plants to survive.

Include a picture of your new and old plants. The original plant (the one you got the clippings from) is called the mother.

Larry Says...
Plants make excellent gifts. You can take clippings from your plants and start them in new containers to pass the gift of gardening on to a friend or sell your plants at a Farmers' Market!

http://www.visualoryplants.com/images/lh_subis_divisoria_rooted_cutting.jpg

CANADA
4-H Manitoba
In the Member Manual

**Plant Salad**

Salad is made from plants. Leaves are the key piece to making a salad. Other vegetables that are added to salads are plants, too.

Make a salad using plant products that you like. Include your recipe below. Make sure your salad includes some leaves!

**My Plant Salad**

Can you name a plant that we eat that matches each colour of the rainbow? Think about leaves, seeds, grains, fruit, veggies, and things that grow below the ground.

<table>
<thead>
<tr>
<th>Red</th>
<th>Orange</th>
<th>Yellow</th>
<th>Green</th>
<th>Blue</th>
<th>Purple</th>
<th>White</th>
<th>Black</th>
</tr>
</thead>
</table>

**Dig it!**

Do all of the leaves in your salad look the same?

Why do we need plants on Earth?

How can you grow new plants from the plants you already have at home?

**What’s next?**

Have you been wondering what’s happening inside the plants? Find out more in Skill Builder 5.
Skill Builder 5: What’s Going On Inside?

Skills Checklist

- Explain how water is transported in plants
- Extract DNA from a fruit
- Determine the age of a plant

Dream it!

Background for Leaders

Like all living organisms, plants complete a number of processes using their tiny cells. We can’t see these processes without a microscope, but we can prove that they are happening.

Plants transport water using stacks of very tiny cells (compartments) that stretch from the roots to the shoots and out to each leaf. These cells are called xylem. Xylem acts like a straw as it sucks water from the roots to the shoots. There are other transport cells that move food, including sugars and nutrients, to different parts of the plant. These cells are called phloem. Phloem can move materials in either direction. Not all plants need these transport cells. Some plants, such as moss and algae, are very short so they can reach water without using these cells.

Plants also contain DNA. DNA (deoxyribonucleic acid) is a long chain of chemicals that acts as a code for identifying the plant. Each type of plant has a slightly different combination of chemicals in its DNA. DNA is what makes a rose a rose and a cat a cat. Although the seeds look a lot alike, DNA helps make yellow beans different from green beans and petunias different from pansies. All living things have their own unique code. DNA can be collected from the fruit of plants in an interesting experiment that is included in this Skill Builder.

Plants that survive the winter need protection. Trees produce wood and bark and trees add a new layer of wood and bark each year. Wood is produced on the inside of the trunk and branches of trees. Layers of wood are visible as rings inside the tree. There is a layer for each year of growth. Bark is added to the outside. Because bark can be worn off and shed, only a few layers of bark from previous years will remain on a tree.

Important Words

Help members define the following words and listen for them using these words in their discussions. To increase the members’ understanding, try providing a synonym members know or provide examples. The more personalized the examples, the better.

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduction</td>
<td>The ability to transport materials to other parts of the plant. Not all plants have tissues that carry materials up to tall shoots. Plants without conducting tissues cannot grow very tall.</td>
</tr>
<tr>
<td>Xylem</td>
<td>Straw-like tissues in plants that carry water and nutrients up from the roots to the shoots.</td>
</tr>
<tr>
<td>Phloem</td>
<td>Tissues that carry sugars and foods between the leaves and the roots.</td>
</tr>
<tr>
<td>DNA</td>
<td>Deoxyribonucleic Acid: A long molecule containing the genetic information that makes each type of living thing unique. Includes sugar, phosphate, and nitrogen bases arranged in a ladder-like shape.</td>
</tr>
</tbody>
</table>
Age Considerations

- 8 +

Thinking Ahead

- What will you discuss with members? Gather observations and think of examples that will help support your decision.

Preparing for Success

- Linking back to the Skills Checklist, help members identify how they will know they have been successful in learning from this Skill Builder. Discuss what success in these activities might look like, sound like, or feel like.

Activating Strategies

To get members thinking about this topic, ask them the following questions:

- What happens inside a plant?
- How do plants get water from the roots?
- How old are the oldest plants?

Provide members with a magnifying glass. Ask members to look closely at a plant and find something interesting they hadn’t noticed previously.

Do It!

Conducting Tissues

The leader may wish to prepare this activity a few hours before members arrive. It takes a significant amount of time for the colour to become visible in the leaves. Allow members to start the conduction activity with a new piece of celery or another flower and watch it move. Members can prepare this activity and return for observation as they are completing additional activities in this Skill Builder.

Time Required: 15 minutes prep + approximately 1 hour for colour conduction

Safety Precautions: Use caution when cutting stalks or stems with a sharp knife.

Supplies:

- Stalk of Celery (with leaves attached), Cabbage Leaves, or a White Carnation
- Food colouring (red or blue works best)
- A Sturdy Jar
- Water
- Knife
- Pencil
- Pencil Crayons

Directions:

1. Keeping the leaves attached, cut the bottom end off of the celery to expose a fresh end.
2. Add water and a few drops of food colouring to the jar.
3. Place a celery stalk in the glass. (Encourage members to make a prediction of what will happen before adding the celery).
4. Results should be visible after approximately an hour. Members may return to the jar periodically to note any changes.

http://blog.everythingdinosaur.co.uk/blog/archives/2014/10/17/school-lesson-plan-how-do-fossils-form-key-stage-12.html
Members will record a description or drawing showing before and after representations of their learning in the Member Manual. Ask them to explain why this happened.

Note: The xylem transports the water (and food colouring) and is the active cell type in this activity. Phloem conducts sugars, which were not included in this activity.

**DNA Extraction**

*Time Required: 20 minutes*

**Supplies:**
- Sealable Plastic Bag
- Glass
- 5 mL Rubbing Alcohol (chilled)
- Strawberry, Banana, or Pumpkin
- 100 mL Water
- 10 mL Dish Soap
- 1 mL Salt
- Coffee Filter
- Toothpick

**Directions:**
1. Combine water, dish soap, and salt. This is the extraction solution.
2. Place a strawberry in the plastic bag. Add 20 mL of extraction solution. Remove excess air and seal tightly.
3. Squish the strawberry for 5 minutes.
4. Place a coffee filter over a glass. Pour the strawberry mixture through the filter.
5. Keep the fluids in the glass. Discard the larger pieces that were filtered out.
6. Add 5 mL of cold rubbing alcohol to the fluids. Keep the mixture still.
7. After a few minutes you will see a string of sticky material forming on the surface.
8. Collect the stringy/chunky material with a toothpick. Analyze it. This is the DNA from the fruit.

**Aging Plants**

*Time Required: 20 minutes*

**Supplies:**
- Tree Stump or Slice/Slab from a Tree
- Pencil

**Directions:**
Discuss the process of developing wood and bark in plants that overwinter. Additional notes on this topic are included in the Background for Leaders section of this Skill Builder.

The age of a tree can be determined by counting the rings in the wood of the trunk or stump. Ask members to determine the age of a tree by counting the rings on the stump or on a slice or slab cut from a tree. An image of a ten year old tree is included on the following page if a tree stump is not available.
Discuss the uses of wood products. Humans use wood for buildings, flooring, cupboards, furniture, decorations, fences, paper, musical instruments, bonfires, and much more. We must be aware of the amount of wood that we are using. Many forests have been logged to gather wood for human projects. Recently, replanting of trees has become a major focus so forests are healthier, the planet is greener, and there are trees for the future. Learn more about forestry in Manitoba by visiting the Manitoba Forestry Industry webpage at https://www.gov.mb.ca/conservation/forestry/industry/overview.html.

Dig it!

Discuss the following questions.
- Why do plants need xylem & phloem?
- How long do you think your plants will grow?
Then, ask members to complete the sentence: “Plants are cool because...” Members may have different opinions. Ask them to share their ideas.

What’s next?
The final Skill Builder gives a close up view of the importance of flowers in completing the plant life cycle.
In the Member Manual

Skill Builder 5: What’s Going On Inside?

Larry Says....
There are all kinds of cool things happening inside plants. Different parts of the plant have different jobs. Photosynthesis powers the plant’s work.

SKILLS CHECKLIST
- Explain how water is conducted in plants
- Extract the DNA from a fruit
- Determine the age of a plant

Dream it!
Take a magnifying glass and get a close up look at your plant from the outside. What’s something you just noticed about plants?

Do it!

Conducting Tissues
Conducting tissues, called xylem and phloem, are the parts of the plant that move things from one part of a plant to another part. Roots help gather moisture from the soil. Follow your leader’s instructions. How does water travel from the roots to the leaves? As you complete this activity, draw before and after pictures showing the change. Why did this happen?

Before

After

What’s next?
Skill Builder 6 gives you a close up view of sweet smelling flowers. You may find a future career working with plants.

DNA Extraction
Extract means to remove something. Scientists use machines to do this, but you can do it at home with a few simple ingredients. Follow your leader’s instructions.

DNA... Say it... De-oxy-ribo-nucleic-acid

Larry Says...
DNA is a code that tells a plant that it is a plant. It gives instructions to the plant telling it how to grow. Animals have DNA too. That’s why they are animals, not plants.

Aging Plants
Some plants only live for one growing season. In Manitoba, many seeds are planted in the spring, plants grow in the summer, and they die in the fall. Trees are able to live all year.

Trees add a new layer of bark and wood each year to protect themselves. You can see how old a tree is by counting its rings. Find a stump or a slice from a tree and figure out how old it is.

What do we use wood for?

Why should we limit the amount of wood products we are using?

Dig it!

Why do plants need xylem & phloem?

How long do you think your plants will grow?

Complete this sentence:
Plants are cool because...

http://swedishchiliaronzo.blogspot.ca/2008/04/10000-year-old-bristlecone-pine.html
Skill Builder 6: Flowers

Skills Checklist

- Identify the main parts of a flower
- Explain the process & importance of pollination
- Name jobs & hobbies relating to plants & nature

Dream it!

Background for Leaders

Remember the flowering plant that was planted in Skill Builder 1 (“Plant It” activity)? Try to complete this Skill Builder when that plant is in bloom.

Flowers are an essential part of the life cycle as they are necessary for the production of the next seed. Flowers consist of many parts. In this project, members will explore the basic, most visible parts of the flower. Flowers are attached to the stem of the plant. The petals are the most visible part of the flower. Petals form a ring around the outside of the flower and are usually brightly coloured to attract insects and hummingbirds. The stamen is the male part of the flower where pollen is produced. Flowers may have more than one stamen stretching up from the base of the flower. The pistil is the female part of the flower that collects the pollen and carries it deeper into the flower to the ovule which contains the future seed(s). The pistil is usually found in the center of the flower. Not all flowers are the same. Some flowers have only a pistil, while other flowers have only stamen. All of these parts are clearly visible on a lily, iris, and amaryllis.

Pollination, the process of transferring pollen from one flower’s stamen to another flower’s pistil, is crucial in the production of a seed. Pollen is very small and sticky. It sticks to the feet of insects. Pollen can be transferred by insects, hummingbirds, other animals, and wind. Bees are especially good pollinators. We need to protect bees so our flowers will continue to bloom and seeds will be produced. Bees need flowers as a source of nectar to make honey.

The beauty of flowers attracts people to gardening. People like flowers so much, they have named their children after some flowers and plants. Popular plant names include Dahlia, Daisy, Flora, Iris, Lily, Petunia, Rose, Violet, Alder, Aster, and Sage.

Gardening is also a popular hobby and some people have jobs that are closely linked to plants. Opportunities working with plants include: plant scientist, arborist, florist, fruit or vegetable producer, garden centre manager, garden designer, groundskeeper, farmer, crop specialist, soil specialist, conservation officer, etc.

Important Words

Help members define the following words and listen for them using these words in their discussions. To increase the members’ understanding, try providing a synonym members know or provide examples. The more personalized the examples, the better.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stamen</td>
<td>The male fertilizing part of a flower including a pollen containing anther and filament.</td>
</tr>
<tr>
<td>Pistil</td>
<td>The female parts of the flower including the stigma, style, and ovary.</td>
</tr>
<tr>
<td>Pollen</td>
<td>Fine, yellow, powdery substance on the stamen for flower fertilization. Often transferred by wind, insects, or other animals.</td>
</tr>
<tr>
<td>Pollination</td>
<td>The transfer of pollen from a stamen to a pistil for fertilization.</td>
</tr>
</tbody>
</table>
Age Considerations

- 8 +

Thinking Ahead

- What will you discuss with members? Gather observations and think of examples that will help support your decision.

Preparing for Success

- Linking back to the Skills Checklist, help members identify how they will know they have been successful in learning from this Skill Builder. Discuss what success in these activities might look like, sound like, or feel like.

Activating Strategies

To get members thinking about this topic, ask them the following questions:

- Where have you seen the prettiest flowers?
- Why do people like flowers?
- Why does the Earth need flowers?

Parts of a Flower

Time Required: 15 minutes

Supplies:

- A Flowering Plant (Try to complete this activity when the flowering plant that was planted in Skill Builder 1 “Plant It” is in bloom.)

For this activity, members will refer to their own flowering plant. Members should try to match the parts in the diagram to the parts of their own flower. Members may require assistance to correctly label the diagram included in their Member Manual. A labeled diagram is included below.

Leaders may also provide flowers for comparison of parts. Members may wish to dissect a flower to see the hidden internal parts. Ask members to think about the purpose of each part.

- Pistil (collects pollen)
- Petal (coloured to attract insects)
- Stamen (contains pollen)
- Ovary (contains future seeds)
- Stem (holds the flower)
Do it!

The Cheesy Bee

Time Required: 20 minutes

Supplies:
- Cheezies
- Small Bowls
- White Paper (use copies of the flower print page included in this guide on page 43)

Directions:
1. Place cheezies in multiple small bowls or ‘flowers’.
2. Members will act as bees eating their snack of cheezies. As they are eating, the cheese will stick to their fingers. Remind members that they cannot lick their fingers between bites.
3. When the ‘bees’ are finished eating, they can land on their final flower (a white printed flower page). Members will rub their fingers around on the flower so the flower is pollinated.
4. Explain that now that this flower has received pollen from another plant it can produce a seed or a fruit containing seeds.

Beautiful Bouquet

Time Required: 40 minutes

Safety Considerations: Use caution when cutting stems or fruit with a knife.

Supplies:
- Vase
- Fresh Flowers (or artificial)
- Fruit (to make a fruit bouquet)
- Wooden skewers

Directions:
Members may create a flower bouquet or a fruit bouquet.

Flower Bouquet:
1. Collect flowers and leafy plants. If your plants are not flowering, you can choose to use artificial plants from a craft store. Artificial bouquets last much longer.
2. Cut the end of the stem to get a fresh end. Members can cut the flowers to different lengths so they all are visible.
3. Arrange flowers in a vase with water.
4. Ensure sufficient water remains in the vase. Bouquets will need additional water each day.

Fruit Bouquet:
1. Collect brightly coloured fruit.
2. Carefully, using a sharp knife, cut fruit into different shapes. Some fruit can be cut to look like flowers with petals.
3. Attach fruit pieces to wooden skewers as the stems.
4. Arrange in a bouquet.
If stored at appropriate temperatures, the fruit bouquet is a tasty treat.
Jobs & Hobbies

Time Required: 10 minutes

Supplies:
- Pencil

Directions:
Ask members to think of at least five jobs or hobbies relating to plants. Then, ask members to add a checkmark beside the jobs or hobbies that have an agricultural connection. Some suggestions are included in the Background for Leaders section of this Skill Builder.

More Flowers

Time Required: 10 minutes

Supplies:
- Pencil

Directions:
This activity consists of two parts: Flowery Names and Smelly Plants.

Flowery Names: Discuss the tradition of naming children after flowers. This practice was especially popular in the 1800’s and has been gaining attention in recent years. Ask members to name some people they know that are named after flowers or plants. Discuss whether they would like to be named after a flower and why or why not.

Smelly Plants: Many plants are fragrant. Ask members to smell the plants around them and decide whether they smell good or bad. Some smell good, while others may smell bad. Plants release scents for many different reasons. Sometimes they smell to attract pollinators. Sometimes plants smell (and taste) terrible as a warning that they will make you sick if you eat them. Some plants give off a scent that repels mosquitoes. Gardeners plant these mosquito repelling plants to reduce the number of mosquitoes on their patios.

Dig it!

Ask members to respond to the following questions.
- Why are flowers important?
- Why are bees “good bugs”?
- What job relating to plants would you choose?

What’s next?

Congratulations! You have completed all of the Skill Builders in Exploring Gardening. Members will now begin working on the Showcase Challenge. Have a great Achievement. The members could not have done it without you!
Flower design from: http://flowercoloringpage.blogspot.ca/2013/05/big-flower-coloring-pages.html
Skill Builder 6: Flowers

Larry Says....
All plants are beautiful, but flowers can make them even prettier. You can even eat some flowers like dandelions, broccoli, and cauliflower.

Skills Checklist
- Identify the main parts of a flower
- Explain the process & importance of pollination
- Name jobs & hobbies relating to plants & nature

Important Words
Watch for these important words throughout this Skill Builder:
Stamen, Pistil, Pollen, Pollination

Dream it!
Parts of a Flower

Flowers are made up of many different parts. See if you can match these parts to the flowers on the plants you have grown. What does each part do?

Use these words:
Petal
Stem
Pistil
Stamen
Ovary

More Leaves...
View this video (https://www.youtube.com/watch?v=XZSwL1vXuYo) to see the pollination process up close.

Do it!
The Cheesy Bee
Bees are very important insects. They help plants by moving tiny flecks of pollen from one plant to another plant. When a bee lands on a flower it sucks sugary nectar from the flower. The pollen sticks to the feet of the bee and is moved to the next flower when the bee goes searching for more food.

In this activity, you will use your fingers to fly from flower to flower while you enjoy a snack. Don’t lick your fingers between bites!
Include a picture of you acting like a bee!

More Leaves...
Learn more about honey by visiting the BeeMaid website at http://www.bemaind.com/honey-facts.

Did You Know...
- Honey never goes bad. Bacteria can’t grow in it because it is acidic.
- Honey bees have been around for 30 million years.
- A single Canadian Prairie honey bee colony of 20,000 to 60,000 honey bees will produce an average of 170 pounds (77 kg) of honey in a single season.
In the Member Manual

Beautiful Bouquet
Collect some pretty flowers and other leafy plants. Arrange them in a beautiful bouquet and place them in water. You might want to cut some of your flowers at different heights as you are piecing them together. Bouquets are often given as gifts.

If you can’t find flowers outdoors or in your plant collection, you can also use artificial flowers that can be purchased at a craft store. This bouquet will last much longer.

You can also create a fruit bouquet by cutting different shapes from brightly coloured fruit and using wooden skewers as stems. This makes a tasty decoration.

More Leaves...
Look at more great ideas for arranging flowers and plants into beautiful bouquets and decorations.
http://www.styleathome.com/decorating/subsection/flower-arranging

More Flowers

Flowy Names
Parents often name their children after someone or something that is important to them. What names can you think of that are also the names of flowers or plants?

Would you like to be named after a flower or plant?

Smelly Plants
Some plants are very smelly. Many plants can be used to repel mosquitoes including rosemary, marigolds, citronella, basil, lemon thyme, and lavender. Do any of your plants smell?
Do they smell good or bad?

Larry Says...
Plants help people in many ways. Plants give us shade from the sun. Some plants are tasty to eat. All plants make oxygen for us to breathe. Plants provide homes for wildlife. Plants are used in making medicine like cancer drugs and pain killers. Plants make the Earth beautiful.

Dig it!
Why are flowers important?

Why are bees “good bugs”?

What job relating to plants would you choose?

What’s next?
Now that you have finished all the Skill Builders in this project, it is time to think about and plan for the Showcase Challenge. The Portfolio Page is for you to make sure your Exploring Gardening Project Skills Chart is complete. There is a space for you to write down some thoughts and reflections on the project (what you liked and didn’t like, etc.).
Showcase Challenge

Have members use their Member Manual to help them organize what they have learned in this project. The form of the Showcase Challenge can vary according to the wishes of the leaders and the members' abilities. Information could be presented in many forms, some of which are: posters, pamphlets, written reports, speeches, computer presentations, displays, etc. Suggestions are listed on the Showcase Challenge page at the back of the Member Manual. The best results are almost always obtained when members are allowed to present their information in the style of their choice.
In the Member Manual

Do It!
Insert or attach your finished product or a photo of you sharing your skills in your Showcase Challenge.

Dig It!
Now that you have showcased your project skills:
- How did your Showcase Challenge go?
- What would you do differently next time?
- How will you use your new skills in the future? (in different situations?)
**Portfolio Page**

Once members have completed all the Builders they will have a lot of information recorded in their manuals. These are products of their learning. As a final exercise in the project, members and leaders will pull together all this learning in completing the Portfolio Page in the Member Manual. There is a skills chart that lists the skills members are expected to complete by the end of the project. Members and leaders must indicate how they know the member was successful at a particular skill. Leaders will find evidence if they think about what they have observed members doing, what discussions they have had with members, and what members have produced. If leaders think that members need to go back and improve on any skill, this chart helps them clarify what needs to be done.
Above and Beyond!
In addition to project skills, 4-H also increases skills in meeting management, communications, leadership, community involvement through participation in club, area, or provincial 4-H events or activities. List below any activities you participated in this year in 4-H.
(Some examples include Executive Positions Held, Workshops, Communication, Community Service, Rally, Bonspiels, Conferences, Judging, Camp Trips, Awards, Representation to Area or Provincial Councils, etc)

**Feel Free to add additional pages that include awards, certificates, new clippings, photos or other items that describe your 4-H involvement.**

Member Point of Pride!

What I learned...

What I need to improve on...

What I want others to notice...

Member’s Signature: ______________________

Point of Praise! Another’s perspective on your achievements in 4-H.

(community professionals, 4-H club head leaders, friends of 4-H)

I am most impressed by...

I believe that you have learned...

In the future I encourage you to...

Signature: ______________________
4-H Achievement

4-H Achievement is... a 4-H club celebration when members have completed their projects. Achievements are planned by the club to give recognition to members and leaders for their accomplishments in their 4-H projects and club activities.

A 4-H Achievement can take many different formats: from choosing a theme, to member project displays, to members using their new skills for the event (entertainment, food, decorating, photographer, etc.), to members presenting their project to the whole group, the options are endless and open to the creativity of the members and leaders in each club!

Clubs may also plan their Achievement to promote 4-H to the community or to recognize sponsors and others who have helped the club.

Members and leaders - be sure to check your project books for the project completion requirements, so you will be ready for your club’s Achievement celebration!

If you have any questions, comments or suggestions for this or other 4-H projects contact:

Manitoba 4-H Projects
Manitoba Agriculture
1129 Queens Avenue
Brandon, MB R7A 1L9

Email: 4h@gov.mb.ca
Phone: 204-726-6613
Fax: 204-726-6260

This manual is for educational use only and is not intended as professional advice.

For more information about 4-H and the many 4-H opportunities available please visit

http://www.gov.mb.ca/agriculture/4-h/
What is 4-H?

4-H is an international youth organization involving more than 7 million members in 80 countries around the world.

In Canada, 4-H began in 1913 in Roland, Manitoba as a community-based organization dedicated to growth and development of rural youth. Today’s 4-H program reaches both farm and non-farm youth across Canada. The motto of “Learn To Do By Doing” is embodied in the program, as 4-H focuses on skill development as well as personal development of life skills such as communications, leadership and citizenship.

4-H Motto

“Learn To Do By Doing”

4-H Pledge

I pledge,
My HEAD to clearer thinking,
My HEART to greater loyalty,
My HANDS to larger service,
My HEALTH to better living,
For my club, my community, and my country.

All project materials are available in alternate format upon request.