Object Lessons about Gardening
Teachers Information

The Object Lessons in this section include:

1. Parts of a Seed / Diversity of Seed
2. Germinating the Seed
3. Preparing the Soil
4. Anchoring the Roots

Object Lesson #1 – Parts of a Seed / Diversity of Seed

“...The land produced vegetation: plants bearing seed according to their kinds and trees bearing fruit with seeds in it according to their kinds. And God saw that it was good ... the third day.” Genesis 1:11-13

“The body is a unit, though it is made up of many parts; and though all of its parts are many, they form one body. So it is with Christ...” 1 Corinthians 12:12-31

Materials Needed:

1. A variety of seeds including tomato, cabbage and carrot seeds. These are three types of seeds often shared with Haiti and other countries around the world in the Giving Gardens project. It may be interesting for students to observe and learn about some of the specific seeds that their money will purchase. This may also be the time to help students understand that the tomato, cabbage and carrot seeds (although they are not the only seeds sent to countries in need around the world through this project) may be somewhat different than those same types of seeds grown in the United States. This is because scientists are continually working to provide seeds that will grow best in the climates in which they will be planted.
2. Crayons, colored pencils, or markers
3. Magnifying glass
4. Diagram of seed parts and answer sheet
5. A place to display a “seed museum.” One way for students to discover the diversity in the seeds that God created is to have students collect seeds and bring them in to put in a display – a seed museum. You might arrange a time for students to go on a hike to collect seeds. You could also encourage students to bring seeds they find at home. This
could be an ongoing project/display. By observing the seeds in the collection, questions about seeds will be raised (e.g., Why do seeds have different shapes? How are seeds transported from one location to another?) and students should be encouraged to find the answers to their questions.

6. A variety of different fruits and vegetables
7. Containers with soil to plant some of the seeds removed from the fruits and vegetables

**Note:** For ease of discernment between instructions and spoken text, the spoken text is larger, offset and displayed in *italics*

**MESSAGE #1:**

*In learning about the parts of the seed, we see that each seed has exactly what it needs for growth and life. A seed has three main parts: the embryo, stored food and a seed coat. The plant embryo is the tiny plant inside of the seed. The food stored in the seed helps the tiny plant grow until it can make food of its own. The seed coat is the protective outer covering for the young plant.*

*The size of the seed has no relationship to the size of the plant that develops from it.*

*“It is like a mustard seed, which is the smallest seed you plant in the ground. Yet when planted, it grows and becomes the largest of all garden plants, with such big branches that the birds of the air can perch in its shade.”* Mark 4:31-32

*The number of seeds produced by an individual plant varies according to the size of the seed.*
Activity 1: Parts of the seed

1. Show the students the drawing of the parts of the seed. Have them locate the seed coat, the stored food and the embryo on the drawing.

2. Have each student pick a seed

   **What color is the seed?**

   and draw a picture of it.

3. Have each student carefully remove the seed coat

   **Do you see the embryo inside?**
   **What color is the embryo?**

   and draw a picture of what they see.

4. Have each student carefully open the embryo.

   **Can you see the roots or the shoot that will form the stem and leaves beginning to grow?**

   (use magnifying glass if necessary)

5. Have each student choose another seed to study.

   **In what ways is it alike and in what ways is it different than the first seed you observed?**

MESSAGE #2:

Just as the seed contains a variety of parts – each with its own important job – the church, too, is made of many people with different gifts and talents. God designed the seed to have exactly what it needs to live and grow.

This is also the way God places us together in the church. God designed each of us to have
different gifts and abilities. Some of us are gifted as musicians or teachers while others are good listeners, problem-solvers or readers.

When we come together as God’s family, the church, the gifts are complete. The body of Christ is complete and whole and the work of the church can continue.

Seeds are very diverse. That means “different.” Each variety of seed is different from every other variety.

A watermelon seed looks very different from the seed of a strawberry or tomato. A coconut (one of the largest seeds on earth) is quite different from a poppy seed.

Students are like the seeds – each is unique and precious to God. Each child of God produces the fruit that God has planned for them.

Certain seeds grow best in certain conditions. Some plants really like sunlight. Some don’t need much water. Some plants prefer sandy soil.

For plants to nourish and feed people, scientists need to make sure that the seeds they send to far away places will be able to grow in the climate in which these people live.

The scientists at Hope Seeds continue to work to make sure that the seed that is sent will be the right seed to best feed the hungry.
Activity 2: Diversity of seeds

1. Collect a variety of seeds and begin a class “seed museum.” Cabbage, carrot and tomato are three of the types of seeds that the Giving Gardens project will be sending to other countries around the world.

   Notice the many ways that God created seeds. They are all different! Think of reasons that not all seeds look the same even though they have the same three basic parts: the seed coat, the embryo and the food source.

2. Cut open several different fruits or vegetables (watermelon, apple, peach, cucumber, tomato, etc.). Enjoy eating the food that this plant produced.

   Can you believe that a watermelon started out as one seed? What would happen if you planted some of the seeds from these fruits and vegetables? Would they grow?

   Try planting some of these seeds and watch to see what happens!

3. Talk about what it means to be “good stewards.”

   PRAYER: Dear Lord, We ask You to guide us in this Giving Gardens project. Thank you for this opportunity to feed the hungry using the diversity of gifts we are given. We also ask You to open our hearts and show us ways to be good stewards of the gifts You have given to us. Amen.
Object Lesson #2 – Germinating the Seed

“I give you every seed-bearing plant on the face of the whole earth and every tree that has fruit with seed in it. They will be yours for food.” Genesis 1:29

Materials Needed:

1. Seeds (beans, watermelon, sunflower, etc.)
2. Sandwich-sized zipper storage bags, one per student
3. Paper towels, one per student (solid white suggested)
4. Mist/Spray bottle with water
5. Permanent marker
6. Tape

MESSAGE:

The stages from the swelling of the seed to when the first leaves come through is known as germination. All seeds need water, sunlight and oxygen to germinate. A seed contains the food it needs to keep the tiny plant inside (the embryo) alive and start the germination process.

Seeds are usually scattered after the growing season. They lie dormant during the winter. Dormancy (a time of inactivity and no growth) delays germination until the conditions are right for growing.

While a seed is germinating, all processes are slowed down so that few food resources are wasted. This dormancy is similar to an animal hibernating in winter.

When environmental conditions are right, the seed rapidly takes in water and begins to grow. The root pushes its way through the seed coat into the soil. The shoot pushes its way to the surface, becoming the stem and leaves.
Now that germination is complete, the young plant can make its own food in its leaves and gather water through its roots.

While seeds appear to be very small and inconsequential, they are capable of wonderful growth when accompanied by the right environment.

Faith is like that, too. It is planted at baptism and the Holy Spirit provides the rest of the work. Seeds grow as does faith. The seed grows and becomes part of a plant that can bear fruit (food).

Faith also grows and produces fruit – love, joy, peace, patience, kindness, goodness, faithfulness, gentleness, self-control. It is through the fruit of love that we are able to share with others some of the gifts we have received.

More information is available at
LEARN MORE ABOUT SEEDS: GERMINATION

Activity: Germinating Seeds

1. For each student, use a permanent marker to write student’s name on the outside of a zipper sandwich bag.
2. Fold a paper towel so it fits into the bag. Fold up about a half-inch on the bottom so the seeds can be seen when they sprout.
3. Spray water onto the paper towel until it is very moist.
4. Put 4-5 seeds in the bag. Be sure the seeds are on the paper towel.
5. Seal the bag. Tape the bag in a warm location that allows the germination of the seeds to be viewed. It generally takes 3-4 days before they begin to sprout. A window works well if it isn’t cold.
6. As the seeds germinate have students record their observations of the seeds:
   a. Date
   b. Written description
   c. Draw a picture of what is observed
As seeds begin to germinate in 3-4 days, talk about the process the students are observing.

Did you notice how the seed took in water and swelled? Were you able to see the root push its way through the seed coat? Did you see the shoot push its way to the surface to become a stem and leaves?

**PRAYER:**  
*Dear Giving God, We pray in this Giving Gardens project that You would cause “heart germination” to occur. Please make our hearts swell with Your love so that the fruits of our faith may come out. Amen.*

**“GREEN” CONNECTION**

Did you know that the plastic bag we used in this activity is made of petroleum? The bag may be reused for another activity if it is washed and allowed to dry.

If plastic bags are thrown into the garbage, they are taken to a landfill.

Garbage in a landfill doesn’t decay (break down) quickly because the water, sunlight, oxygen and worms needed to cause decomposition are not available there.

The garbage in a landfill is packed so tightly that there is no room for the water, sunlight, oxygen and worms to get in.

To show how long decomposition takes, here are a few items we throw away all the time.
Can you guess how long it takes for these items to decompose in a landfill?

A piece of paper (2-4 weeks)

An aluminum pop can (500 years)

A plastic bag (500 – 1,000 years)

A glass bottle (Undetermined – it could be as long as a million years!)

The United States is the #1 trash-producing country in the world. Did you know Americans throw away 9 times more garbage than people in Central America and Africa?

The average American throws 1,609 pounds of garbage into a landfill each year. This means that 5% of the world’s people generate 40% of the world’s wastes!

God wants us to care for our planet. In Genesis 2:15, God placed humans in the Garden of Eden as its gardener, to tend and care for it.

Reuse containers made of plastic, glass and aluminum instead of throwing them into a landfill. If materials cannot be reused, be sure to recycle them.
Object Lesson #3 – Preparing the Soil

“Again Jesus began to teach by the lake. The crowd that gathered around Him became so large that He got into a boat and sat in it out on the lake, while all the people were on the shore at the water’s edge. He taught them many things by parables, and in His teaching said, “Listen! A farmer went out to sow his seed...” Mark 4:1-20

Materials Needed:

Activity #1:
(NOTE: This will make approximately 20 Edible Dirt Cups)
1. Milk – 4 cups
2. Instant vanilla pudding – small box
3. Instant chocolate pudding – small box
4. Whipped topping – 12 ounce
5. Chocolate sandwich cookies
6. Mixer
7. Bowls
8. Clear plastic cups, one per student
9. Gummy worms, at least one per student
10. Sprinkles
11. Spoons, one per student

Activity #2:
1. A large rock (a piece of concrete, flagstone or brick would also work)
2. Soil
3. Seeds
4. Section of soil containing lots of weeds (if possible)
5. Mist/Spray bottle with water

MESSAGE #1:

Dirt – it is fun to dig in and kids love to get it wet and play with it. While playing in soil may be fun, it is also interesting to learn that soil is important to grow seeds.

Soil is a combination of materials – both living and non-living. One part of soil is broken down rock.

Another part of soil is organic matter which is made of decaying plants and animals.
Water and air are also part of soil.

These materials help to support plant life by providing nutrients, water and air. Soil also holds roots in the ground.

Soil is filled with many living creatures – like worms. Worms create tunnels in the soil that allow air and water to reach the roots of the plants. Worms also eat decaying plant materials. Their waste fertilizes the soil.

Healthy soil is one of the most important factors to grow healthy plants.

Activity 1: Making Edible Dirt Cups

(NOTE: You may want to make these ahead of time for the students; leave enough of the puddings and cookies to put one together during the session to illustrate)

1. Pour 2 cups of milk into a bowl. Add a small box of instant vanilla pudding and mix according to the directions on the box.
2. Into a second bowl, add 2 cups of milk. Add a small box of instant chocolate pudding. Mix according to the package directions.
3. Add a half of a container of whipped topping to each bowl. Mix well.
4. Crush half of a bag of chocolate sandwich cookies.
5. Into the bottom of each clear plastic cup, add a whole sandwich cookie. These cookies represent the bedrock.

This is the rock layer on which the soil rests.

6. Next, add some of the crushed cookies to each cup.

This represents the parent material.

7. Next, add some vanilla pudding.

This represents the subsoil which is lighter in color than the upper layer of soil which is called the topsoil.
8. Next, add some chocolate pudding.

*This layer represents the topsoil which is the nutrient-rich layer of soil at the very top. This is the layer of soil that is most important in gardening.*

9. Top off with a gummy worm and sprinkles.

*These represent organic matter (like decaying leaves) and living organisms found in soil.*

10. Refrigerate one hour or more before eating. Enjoy!

**MESSAGE #2:**

*Jesus often spoke in parables. Parables are stories from ordinary life used to illustrate spiritual truth. In Mark 4, Jesus tells the Parable of the Sower. In this parable, a farmer sows some seed. At the time of Jesus, seed was spread by hand. Some of the seed was scattered on the path, so the seed wouldn’t grow because the path’s soil was so hard. Instead it was eaten by the birds.*

*Some of the seed fell on rocky places that had a little soil on top of solid rock. Although these seeds quickly sprouted, the soil wasn’t deep enough for roots to form, so the plants soon died.*

*Other seeds were scattered among the thorns or weeds. The thorns and weeds choked out the plants so they could not bear grain.*
Finally, some seed fell into the good soil. This soil was deep enough for roots to grow, filled with nutrients and free of weeds. The plants grew and produced a plentiful harvest.

The Bible tells us the meaning of this parable. The “seed” represents The Word of God.

“Some people are like seed along the path where The Word is sown. As soon as they hear it, Satan comes and takes away The Word that was sown in them.

“Others, like seed sown on rocky places, hear The Word and at once receive it with joy. But since they have no root, they last only a short time. When trouble or persecution comes because of The Word, they quickly fall away.

“Still others, like seed sown among thorns, hear The Word; but the worries of this life, the deceitfulness of wealth, and the desires for other things come in and choke The Word, making it unfruitful.

“Others, like seed sown on good soil, hear The Word, accept it, and produce a crop – thirty, sixty, or even a hundred times what was sown.”
Mark 4:15-20

Why would a farmer from Jesus day allow precious seed to land on a path, among rocks or in soil filled with thorns?
This parable is not describing a careless farmer who is scattering seeds at random. The farmer in this parable is using the acceptable method of hand-seeding a large field—throwing it by handfuls as he walks through the field. His goal is to get as much seed as possible to take root in good soil.

The fact that some of the seed produced no crop was not the fault of the faithful farmer or of the seed. The amount of crop produced depended on the condition of the soil on which the seed fell. It is our responsibility as Christians to spread the “seed.”

Activity 2: The Parable of the Sower

A parable is sometimes called an earthly story with a heavenly meaning. In the Parable of the Sower, we are reminded that it is our job as Christians to “plant the seed.” This means that it is our responsibility to share the Good News of the Gospel. As Christians, we share Jesus and God takes care of the rest!

Earthly Story  
“...fell along the path and the birds came and ate it up...” Mark 4:4

Heavenly meaning  
“Satan comes and takes away The Word” Mark 4:15

To illustrate this part of the parable, place some seed on a surface to represent a path. Quickly remove the seed from the surface to represent it being eaten by a bird.

If no seed is on the surface, no crop (food) can be produced.
**Earthly Story**  “Some fell on rocky places, where it did not have much soil.”  Mark 4:5

**Heavenly meaning**  “Hear The Word and at once receive it with joy. But since they have no root, they last only a short time.”  Mark 4:16

Place a thin layer of soil on a large rock (or piece of flagstone). Scatter some seeds onto the soil. Mist the soil with water to represent rain. Allow the seeds to grow and observe their growth over the next few weeks.

**Will these plants be able to send down deep roots so that the plant can be healthy and produce a crop (food)?**

**Earthly Story**  “Other seeds fell among thorns which grew up and choked the plants.”  Mark 4:7

**Heavenly meaning**  “Hear The Word but the worries of this life, the deceitfulness of wealth, and the desires for other things come in and choke The Word, making it unfruitful.”  Mark 4:18

**NOTE:** Your climate, time of year, etc., may not be conducive for this illustration. If that is the case, you will need to talk the students through without it.

To illustrate this part of the parable, dig up a small section of a garden that is full of weeds. Place this section of soil (containing the weeds) in a planting container. Scatter some seeds onto this soil. Mist the seeds with water to represent rain. Allow the seeds to grow and observe them during their growth.

**Will the weeds growing in the soil affect the ability of these plants to grow?**

**Earthly Story**  “Still other seed fell on good soil. It came up, grew, and produced a crop...”  Mark 4:8

**Heavenly meaning**  “Hear The Word, accept it, and produce a crop.”  Mark 4:20
Fill a container with potting mix soil. Scatter some seed into this soil. Mist the seeds with water to represent rain. Allow the seeds to grow and observe their growth.

*Will the healthy soil help the seeds be able to produce a crop (food)?*

**PRAYER:**

*Dear Lord, It is our prayer in the Giving Gardens project that not only will the seeds given to people in Haiti and other countries around the world grow and produce food, but also that You would prepare the heart’s (soil) of these people to receive Your Word of salvation (the seed).*

*Amen.*

**“GREEN” CONNECTION**

*Can you think of any ways in which you can improve the soil? One way to make soil healthier is by composting. Leaves, grass clippings, garden wastes, and kitchen scraps can all be composted.*

*When you compost materials, you are allowing them to decay. When these materials decay, you are putting the nutrients back into the soil to make it healthier.*

*Composting is a way to naturally fertilize the soil. Composting also keeps wastes like kitchen scraps and leaves out of a landfill where they will not decay.*

*One type of composting is called vermicomposting. It’s the process of composting food wastes with worms. When worms eat food scraps, leaves, etc., they leave their droppings behind that fertilize the garden.*
This “fertilizer” helps seeds and plants grow naturally (organically) without the addition of chemical fertilizers.
Object Lesson #4 – Anchoring the Roots

“... and I pray that you, being rooted and established in love may have power together with all the saints, to grasp how wide and long and high and deep is the love of Christ, and to know this love that surpasses knowledge – that you may be filled to the measure of all the fullness of God.” Ephesians 3:16-19

“The rain came down, the streams rose, and the wind blew and beat against the house; yet it did not fall, because it had its foundation on the rock.” Matthew 7:24-27

Materials Needed:

1. One container with an entire plant (root, stem, flower) growing in the soil.
2. A second container that has a cutting from a plant (stem, flower) placed in the soil. To make the best comparison, try to use the same type and size of a plant in each container.
3. A fan (could use a sturdy piece of cardboard)
4. Mist/Spray bottle with water

MESSAGE:

Once a seed is placed in the right conditions, the root pushes its way out of the seed coat. Its job is to enter the soil and anchor the plant. That way, when the winds and rain come, the plant will be safe and secure, held fast by the soil.

This anchor (the root) also allows the plant to carry water and nutrients from the soil into the plant.

Two common types of roots are branched roots (they spread out across large areas – trees have this type of root) and tap roots (they contain one large central root – a carrot has this type of root).

Just as it is important for a plant to be anchored to the soil by a root, it is also important in our lives as Christians for us to be anchored to a firm
foundation – a rock – something to hold us safe and secure when storms come into our lives.

In Matthew 7, Jesus tells a story about a wise builder and a foolish builder. The foolish builder built his house on the sand. When the rain and winds came, the house fell with a great crash.

The wise man built his house on a rock. The rock provided a solid foundation for his home. This foundation could withstand the winds and the storms.

When we are firmly anchored to Jesus, He provides a foundation that is strong and sure. This foundation keeps us firmly grounded when the storms of life attack us. Rooted in God’s Word, we continue to receive the nutrients that keep us strong.

Activity: Anchoring Roots

1. Using the container with the plant with the root, stem and flower and the container with the cutting of only the stem and flower in the soil, push on both plants with equal amounts of force.

   What happens?

2. Allow a fan (the wind) to blow on each plant.

   What happens?

3. Spray each plant with water (the rain).

   What happens?

   Why do you think that God designed plants to have roots?
Dear God, We pray that the seeds planted in the Giving Gardens project will send out roots that will hold the plants in the soil. Once anchored in the soil, we pray that the roots will absorb food and water for the plant to help it grow and produce food. It is also our prayer that as seeds of faith are planted in the hearts of people in Haiti and around the world, these seeds of faith will send out roots, anchoring them to Christ. Amen.

As you know, trees have roots. You may have seen the large roots of a tree if you have dug around one. You now know that the job of the roots of the tree is to anchor the tree to the soil so that nutrients (food) and water can be transported through the roots from the soil into the tree.

Do you know why trees are important in our world? We know that God created trees (and other plants) on day three of creation. Why did God put them in our world and how can we care for them?

You may know that some trees – like apple trees – produce food. Trees also make oxygen for us to breathe. We have all been under a tree on a hot day to stay cool in its shade. While sitting under a tree, you may have been able to see a nest of some animal that makes a tree its home. You have things in your home that are made from trees – a wooden toy, paper, cardboard, cereal boxes and many other things.
The average American uses seven trees a year in paper, wood and other products made from trees. This amounts to about 2 billion trees that need to be cut down each year.

One way we can care for the trees that God has created is to recycle products made of paper. Paper can be recycled which means that it can be used to make more paper. That’s good news! Did you know that if Americans recycled all of their newspapers, we could save 250 million trees from having to be cut down? Wow! That’s a lot of trees that could do all of the other jobs that God made them to do!
Spouting Seed – Fill in the Parts

Wheat Ridge Ministries
“Giving Gardens” Hearts for Jesus Project
www.wheatridge.org/givinggardens
Spouting Seed with Identification

- Leaf
- Stem
- Seed coat
- Food source
- Root
Stewardship in its simplest form means to care for something or someone else. The “Giving Gardens” project is caring for children in Haiti who do not have enough food to feed themselves or their families. That is stewardship – the act of caring for someone else.

It also goes deeper than that. The stewardship of “Giving Gardens” begins with seeds that can be planted, watered, nourished, harvested and consumed – and replanted so that the physical needs of families are met over and over again. Food is harvested and families are fed.

Teaching has occurred so that the garden can be sustained. All this takes hard work, but the benefits are obvious: Hunger is diminished. Nutrition has improved.

On this side of the ocean the seeds have also been stewarded or cared for. The participants of the “Giving Gardens” project have been caring for the seeds. Groups of Christians are using their time, talents and treasures to steward all the components of the project. The Lord has surely blessed all the workers in the garden, making good use of them and you!

There is an intangible aspect to this project as well. It goes beyond physical hunger, gardens, or the development and monetary support of seeds. It is the most important stewarding of all. In this project, the opportunity exists for souls to be fed with the lifesaving word of the Gospel! When children and their families in Haiti receive the seeds, they will go to a school to learn how to plant them. At this school, they will learn about Jesus!

Think about the story of Jesus in John 6, when He said, “I am the bread of life. He who comes to Me will never go hungry, and he who believes in Me will never be thirsty ... everyone who looks to the Son and believes in Him shall have eternal life...” This is not only the food for life – it is the food of life! It is the most important food of all. Souls are fed and nourished, lives are changed, and Christ is proclaimed! That is stewardship!
GIVING GARDENS

SEED 🌾 + TEACHING

+ PLANTING

= FOOD

X JESUS

= SOULS FED
Learn More About Seeds

General Information

A seed is a tiny, partially developed young plant surrounded by a stored food supply and protected by a seed coat.

Approximately 350,000 kinds of plants produce seeds. The seeds of different kinds of plants vary greatly in size. The coconut seed can weigh up to 50 pounds (23 kilograms), while some weeds produce seeds that are so tiny that thousand of them together weigh only an ounce (28 grams).

The size of the seed has no relationship to the size of the plant that develops from it. One example that demonstrates this idea is the mustard seed. The mustard seed is considered to be among the smallest of all plants, but it can develop into a large plant.

The number of seeds produced by an individual plant varies according to the size of the seed. Coconut palms produce only a few seeds, but a small weed can produce thousands of tiny seeds.

Seeds come in many sizes, shapes, colors and textures. This enables them to survive a wide range of adverse conditions. Each seed is specifically adapted to its environmental needs. Moisture, temperature, light and oxygen are necessary for a seed to sprout.

Seed Structure

Seeds develop in the ovary of a plant. Each seed contains a plant embryo. Included in the seed is stored food that helps the tiny plant grow until it can make food of its own.

Flowering plants are classified into two large groups. Plants that have seeds that sprout only one leaf are called monocotyledons (monocots). Plants that have two seed leaves are called dicotyledons (dicots).

Every seed consists of three main parts: the embryo, stored food and the seed coat. The seed coat is a protective covering for the developing embryo. It develops from the wall of the ovary.

In monocot seeds, a material called endosperm is present. Endosperm is a tissue that contains stored food. Both the endosperm and the embryo are enclosed with the seed coat.
In dicots, the cotyledons are the seed leaves that are attached to the plant embryo. The cotyledons also store food. When the seed begins to grow, one part of the embryo becomes the root of the new plant, another part becomes the lower stem, and the rest becomes the upper stem and leaves.

An example of a dicotyledon seed is a bean seed. The tiny embryo in this seed is tucked between two halves of the seed. The two halves of the seed are cotyledons or seed leaves. The cotyledons are filled with stored food. The seed leaves are usually different in form than the leaves that develop later. These dicot cotyledons serve as seed leaves and turn green. They last for a short time and actually make food in photosynthesis.

A corn seed, a monocotyledon, has a tiny embryo inside. The seed will not separate into two parts when the seed coat is removed as a dicot seed will do. The food is stored around the embryo and is called the endosperm. There is only one leaf (the cotyledon). This is quite thin and is not packed with food, nor does it function as a seed leaf.

The number of seed leaves present in the seed is only one way to classify monocot and dicot plants. Another way they can be classified is by counting flower petals and sepals, the part of the flower that covers the petals when at bud stage. Dicots have petals and sepals in groups of fours or fives or in multiples of fours or fives. Monocots have petals and sepals in groups of threes or sixes or multiples of three. The leaf structure of monocots and dicots is also different. Monocots have net-veined leaves and monocots have parallel-veined leaves.

**Dispersal**

Seeds are usually scattered after the growing season. They lie dormant during the winter months. When the conditions are right, the seeds absorb water and begin to grow.

There are many different ways that seeds are spread. Seeds can be spread by the wind, water and hitch-hiking on animals. If all seeds just dropped from the parent plant, there would be too many baby plants in the same area competing for water, space and sunlight.

Many seeds, such as winged seeds of the maple tree (we sometimes call these “helicopters” or “spinners”), are built especially for scattering by the wind. The wind currents catch them and the little wings keep the seeds twirling so they are deposited a distance from the tree. The fluffy parachute, such as the covering of a milkweed, lets the wind carry the lightweight seeds. They can be caught by little currents of wind ensuring that they do not land near the parent plant.

The weight of the seed can be an adaptation for obtaining the necessities of life. As explained above, seeds that are light in weight can use the wind as transportation to new growing areas. Heavy, round seeds will tend to roll downhill as a method of dispersal. Those seeds that depend on water for transportation, such as the coconut or cranberry, have air sacs to make them buoyant so they can float.
Plants such as raspberries depend on animals for dispersal. They have brightly colored fruits to attract the birds and other animals. The fruits and seeds are eaten by the birds or animals and the seeds dropped are eliminated as undigested material often many miles away from the parent plant. The animal-carried seeds, such as burrs, have little hooks that catch on anything that comes near. Vehicles like fabric, fur and hair give them a free ride to new territory. This type of seed inspired the inventors of Velcro.

Some plants forcibly expel their seed. An example of a plant that does this is a lupine. When the pods dry and split open, the seed contents land some distance away from the parent plant.

The main purpose of specialized dispersal adaptations for seeds is to spread the species and to find suitable environmental conditions for growth. There must be an adequate food supply, moisture, soil, air and sunlight to develop successfully. Some may not land in areas where germination is even possible. This is the reason most plants produce so many seeds in a lifetime.

**Germination**

The stage from the swelling of the seed to the emergence of the first leaves is known as germination. All seeds need water, sunlight and oxygen. A seed contains food needed to keep the tiny plant alive and start the process of germination. The food is either around the embryo, as in an endosperm, or stored in special leaves known as cotyledons.

Only a small percentage of the many seeds produced by a plant will survive. Some will fall in the wrong place as on rocks or cement or in dense shade. Other seeds will be eaten by birds or other animals. Some seeds will rot. The seeds that are eaten by birds or animals are important in nature’s food chain because they provide nourishment for these animals. Those seeds that survive will germinate to form new plants.

Seeds are usually scattered after the growing season. They lie dormant during the winter. Dormancy delays germination until conditions become favorable for growth. While the seed is dormant, all the processes are slowed down so that few food resources are wasted. During this time, the embryo is still alive. When dormancy is broken and conditions are right, the seed rapidly takes in water and begins to grow. The roots push out through the seed coat. This anchors the developing seedling and provides a way to obtain water and minerals. The shoot pushes its way to the surface, becoming the stem and leaves. Germination is now complete and the young plant can make its own food in its leaves and gather water through its roots.