# Life Cycles Digital Sampler

## Sample Lesson

- Big Ideas
- Unit Summary

*Lesson 6: Trees: Fall Measurements*

- Teacher Background Information
- My Science Notebook
- Mi Libreta de Apuntes de Ciencias
- Assessments
- Teacher Masters
- Visual Pack
- ExploraGear
- I Wonder Circle

## More about Science Companion

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Science Companion
The Teacher Lesson Manual engages and guides teachers to implement hands-on science lessons with their students. Lesson by lesson, students develop strong process skills and in-depth understanding of specific concepts.

The book brings teachers up to speed for the science content through “Teacher Background Information” and in-context lesson notes. Teachers can feel comfortable with leading the class—whether they have a long history of teaching science or not.

Each Teacher Lesson Manual focuses on a set of Big Ideas for a science topic. Each lesson focuses on a Big Idea. Groups of lessons (called clusters) develop a Big Idea through a series of different experiences and discussions.

Lessons Follow a Consistent Sequence

**Engage** – In this section of a lesson, the teacher introduces the topic. The goal is to briefly generate interest, activate prior knowledge, or link the day’s activities to what has come before.

**Explore** – This is often (but not always) a hands-on exploration conducted in small groups. Students record their work in their Science Notebooks. Collaboration with peers is encouraged. Key materials are provided in the ExploraGear kit.

**Reflect and Discuss** – In this important section, the teacher and students discuss what they observed, share ideas and data, and reflect on the day’s activities. This portion of the lesson brings the class back to the Big Idea.

You’ll find that while the lesson format is very consistent, students explore science content and the process of “doing science” in a large variety of ways.

You’ll also find that students LOVE the mix of active, hands-on, minds-on science.
Lessons at a Glance

Science Content: Big Ideas

The Life Cycles Unit concentrates on the following Big Ideas. Along with the scientific Habits of Mind discussed on pages 6-7, these concepts should be reinforced throughout the unit. The lessons in which each big idea is introduced or is a major focus are indicated in parentheses.

Introductory and Culminating Lessons

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. (Lessons 1, 2, and 26)

Humans

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. The stages of the human life cycle repeat from one generation to the next. (Lessons 3 and 4)
- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Rapid physical growth is a natural part of the human life cycle until adulthood. (Lessons 7 and 24)
- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Intellectual growth is a natural part of the human life cycle. (Lessons 8 and 25)
- Humans, like all animals, need food, water, air, shelter, security, and healthy sanitary conditions in order to survive. Humans also have emotional, social, and intellectual needs. (Lesson 9)

Trees

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Physical growth and change are natural parts of the tree life cycle. (Lessons 5, 6, 11, 16, 19)
- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Trees are more likely to survive and thrive in each stage of their life cycle when their survival needs are met. (Lesson 10)
- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. A tree has multiple annual cycles within its life cycle. (Lesson 20)
Seed to Seed

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Seeds are an important stage in the life cycle of a plant. (Lesson 12)

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Plants are more likely to survive and thrive in each stage of the life cycle when their survival needs are met. (Lesson 13)

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Flowers are an important stage in the pea plant life cycle. (Lesson 18)

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Fruits are the final stage in the pea plant life cycle. (Lesson 23)

Butterflies

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Caterpillars are an important stage in the butterfly life cycle. (Lesson 14)

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Physical growth and change are natural parts of the butterfly life cycle. (Lesson 15)

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. Chrysalises are an important stage in the butterfly life cycle. (Lesson 17)

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. The adult is the final stage in the butterfly life cycle. (Lesson 21)

- All living organisms have life cycles that include being born, growing up, reproducing, and, eventually, dying. The adult butterfly may reproduce and lay eggs that hatch to create the next generation. (Lesson 22)
# Unit Summary

<table>
<thead>
<tr>
<th>Overview</th>
<th>Cluster 1: Humans (Lessons 3-4, 7-9, 24-25)</th>
<th>Cluster 2: Trees (Lessons 5-6, 10-11, 16, 19-20)</th>
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</thead>
<tbody>
<tr>
<td><strong>Introduction (Lessons 1-2)</strong></td>
<td>Children study human life-cycle stages and see how these stages repeat themselves from one generation to the next. They discuss the basis for physical and intellectual growth and track this growth over the course of the school year.</td>
<td>Children study a class tree. Through careful observation and measurement, they see how the class tree grows and changes during the school year.</td>
</tr>
<tr>
<td><strong>Science Content</strong></td>
<td>Public organisations have life cycles that include being born, growing up, reproducing, and eventually, dying.</td>
<td>Offspring tend to resemble their parents.</td>
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<tr>
<td>* All living organisms have life cycles that include being born, growing up, reproducing, and eventually, dying.</td>
<td>Humans have a basic life cycle that includes birth, growth, reproduction, and death.</td>
<td>Humans have a basic life cycle that includes birth, growth, reproduction, and death.</td>
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<tr>
<td>* Rapid physical growth is a characteristic of the human life cycle prior to adulthood.</td>
<td>Making and strengthening connections in the brain is the basis for intellectual growth.</td>
<td>Scientific investigation requires careful observation, measurement, and record keeping.</td>
</tr>
<tr>
<td>* Humans have basic survival needs, as well as intellectual and social needs.</td>
<td></td>
<td>Deciduous trees shed their leaves in the fall, are dormant in the winter, and unfurl new leaves and flowers in the spring.</td>
</tr>
<tr>
<td><strong>Science Center</strong></td>
<td>Create a museum with artifacts from previous generations.</td>
<td>Post photographs of the class with the tree.</td>
</tr>
<tr>
<td>* Create a museum with evidence of growth.</td>
<td>Create a museum with evidence of growth.</td>
<td>Examine tree cross sections.</td>
</tr>
<tr>
<td>* Exercise brains with brain games and brainteasers.</td>
<td>* Exercise brains with brain games and brainteasers.</td>
<td>Observe daily changes in a cutting from the class tree.</td>
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<tr>
<td>* Look for pictures of tree houses designed to meet human needs.</td>
<td>* Look for pictures of tree houses designed to meet human needs.</td>
<td>Examine cones from different trees.</td>
</tr>
<tr>
<td>* Post chart with children’s measurements.</td>
<td><strong>Family Links</strong></td>
<td>Inventory the trees in their neighborhood.</td>
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<td></td>
<td>Prepare questions for an intergenerational interview.</td>
<td>Identify household items derived from wood products.</td>
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<td></td>
<td>Share family photo albums and baby books.</td>
<td>Bring tree cross sections from home.</td>
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<td></td>
<td>Compare a family member’s arm span to their height.</td>
<td>Identify whether inventoried trees are deciduous or evergreen.</td>
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<td></td>
<td>Monitor the effect of practicing a skill at home.</td>
<td><strong>Further Science Explorations</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Cross-Curricular Extensions</strong></td>
<td>Track changes in physical strength over the school year.</td>
</tr>
<tr>
<td>Language Arts: Read Charlotte’s Web.</td>
<td><strong>Mathematics:</strong> Perform rate of growth calculations. Estimate how much time they spend practicing a skill.</td>
<td>Monitor improvement that results from practicing a skill.</td>
</tr>
<tr>
<td>Music: Sing songs (such as rounds) that have repeating patterns.</td>
<td>Language Arts: Write an account of a large family gathering. Write a poem describing a favorite food. Write or read stories about someone who experiences intellectual growth.</td>
<td>Follow a “brain recipe” to approximate the brain’s weight and consistency.</td>
</tr>
<tr>
<td>Social Studies: Discuss early human settlements.</td>
<td>Physical Education: Monitor a physical education skill over the year.</td>
<td>Perform brain exercises and discuss brain fitness.</td>
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<tr>
<td>Mathematics: Create a graph of trees found in their neighborhood. Group and classify a variety of leaves.</td>
<td><strong>Language Arts:</strong> Write poems or stories about the class tree. Read tree quotations and proverbs.</td>
<td><strong>Art:</strong> Make a collage of tree leaves. Create class tree still life. Draw a picture of what the class tree will look like in 50 years. Identify and draw natural patterns similar to tree rings. Decorate Arbor Day posters.</td>
</tr>
</tbody>
</table>
Cluster 3: Seed to Seed (Lessons 12-13, 18-23)

Children examine the life cycle of a pea plant. They look at soaked and dry seeds, plant sprouts, and study the growth of plants under different conditions. They examine a wide variety of flowers and learn how flowers grow into fruits and seeds.

- Seeds have an embryo, stored food, and a protective coating.
- Seeds and plants grow best when their basic needs of light, air, and water are met.
- Flowers have characteristics such as smell, taste, shape, and appearance that determine the pollinators they attract.
- A flower’s ovary becomes the fruit; the egg becomes the seed.

Cluster 4: Butterflies (Lessons 14-15, 17, 21-22)

Children study the life cycle of Painted Lady butterflies. They create a life-stage calendar for the butterfly. They observe, measure, and draw caterpillars, examine their chrysalises, and compare the eating behavior of caterpillars with that of the emergent butterflies. They observe butterfly mating behavior, and if conditions are right, see tiny caterpillars hatch from freshly laid eggs.

- Butterflies have life stages that include egg, larva, chrysalis, and adult.
- Metamorphosis occurs during the chrysalis stage of development.
- Butterflies are different in structure and behavior than caterpillars.
- Before butterflies die, they lay eggs and propagate another generation.

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<th>Science Center</th>
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<th>Family Links</th>
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<th>Further Science Explorations</th>
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<td>Overview</td>
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<th>Cross-Curricular Extensions</th>
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<tr>
<td>Overview</td>
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</table>

**Language Arts:** Write about an experience with plants. Write about a grain of pollen. Read a biography of Johnny Appleseed.

**Mathematics:** Measure seeds. Graph pea plant growth. Sort fruits and seeds. Create cross sections of different solids.

**Art:** Press flowers. Draw with flower petals.

**Mathematics:** Calculate how long butterfly life cycle stages last.

**Language Arts:** Read The Very Hungry Caterpillar.

**Mathematics:** Measure seeds. Graph pea plant growth. Sort fruits and seeds. Create cross sections of different solids. **Art:** Press flowers. Draw with flower petals.

**Mathematics:** Calculate how long butterfly life cycle stages last.

**Language Arts:** Read The Very Hungry Caterpillar.

**Mathematics:** Create a drama about metamorphosis. Create a story in which they are able to metamorphose on command. Describe a time when they underwent a “metamorphosis.”

**Art:** Create imaginary animals with metamorphic life cycles. Draw pictures of emerging or adult butterflies.
A QUICK LOOK

Overview
Children take baseline measurements of the class tree in order to track its physical growth from the fall to the spring.

Key Notes
- This lesson is suitable for flexible implementation with mathematics.
- Since children spend part of the day outdoors, remind them to dress appropriately.
- Invite three or four volunteers (parents or older children) to assist the children with their tree measurements.
- Visit the tree a day or two before teaching the lesson to note changes since the last visit.
- If the children in your class need experience measuring length or circumference, consider teaching the Skill Building Activity “Measuring Length and Circumference,” on page 312.
- For more information about the science content of this lesson, see the “Trees” section of the Teacher Background Information.
Lesson 6

Lesson Goals

1. Discover how physical growth can be tracked by taking periodic measurements of the tree over time.
2. Accurately take and record a baseline measurement.
3. Make and discuss predictions about tree growth.

Assessment

Assess children on their measurement skills using the Measuring Length and Circumference checklist. Additionally, you can review the predictions and justifications in the children's science notebooks and use the Predicting checklist to evaluate their prediction skills.
### Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td><strong>ExploraGear</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tape measures</td>
<td>1 per group</td>
<td>To measure trunk and branches.</td>
</tr>
<tr>
<td><strong>Classroom Supplies</strong></td>
<td></td>
<td></td>
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<tr>
<td>Clipboards (optional)</td>
<td>1 per group</td>
<td>To use when recording tree measurements.</td>
</tr>
<tr>
<td>Marker, permanent</td>
<td>1</td>
<td>To mark the tree.</td>
</tr>
<tr>
<td>Pencils</td>
<td>1 per child</td>
<td>To record tree measurements.</td>
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<tr>
<td><strong>Previous Lesson</strong></td>
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<tr>
<td>Family Link “Trees: Tree Inventory”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>List of class tree growth and change predictions</td>
<td>1</td>
<td>To use during discussion.</td>
</tr>
<tr>
<td><strong>Curriculum Items</strong></td>
<td></td>
<td></td>
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<tr>
<td><em>Life Cycles Science Notebook</em>, pages 39-40</td>
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<tr>
<td>Teacher Directions “Making Paper,” page 98</td>
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<tr>
<td>Teacher Master “Tree Diagram”</td>
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<tr>
<td>Family Link “Household Items”</td>
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<tr>
<td>Family Link “Tree Cross Section Request”</td>
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<tr>
<td>Checklist: Measuring Length and Circumference (optional)</td>
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<tr>
<td>Checklist: Predicting (optional)</td>
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<tr>
<td>Skill Building Activity “Measuring Length and Circumference,” page 312</td>
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</table>

*For the most current list of all ExploraGear materials, please visit our web site: www.sciencecompanion.com/exploragear*

### Preparation

- Locate the list of tree growth and change predictions the class developed during Lesson 5.
- Make an overhead transparency of the Teacher Master “Tree Diagram.”
- Assign volunteers (parents or older children) to the groups to assist the children when they measure the tree.
- Make one copy of the Family Link “Household Items” and the Family Link “Tree Cross Section Request” for each child.
To prepare for the measurements, do the following:

- **Trunk circumference** (see letter A in the illustration): With the permanent marker provided in the ExploraGear, mark a place at least 50 cm (20 in) from the ground. Children will measure the circumference at this spot now and in the spring.

- **Main branch length** (see letter B in the illustration): Mark a place where the branch meets the trunk by drawing a ring around the branch. Children will measure this branch now and in the spring.

- **Secondary branch length** (see letter C in the illustration): Mark a place where this branch meets the main branch by drawing a ring around it. Children will measure this secondary branch now and in the spring.

**MANAGEMENT NOTE:** Try to provide each group of children with their own marked branch.
**Vocabulary**

- **baseline**................. The first measurement, or starting point, scientists make to prepare for tracking something.
- **blade**.................. The flat surface of a leaf.
- **circumference**........... The measurement around the outside of a cylinder or round object.
- **deciduous**............. Trees that drop their leaves every year.
- **evergreen**........... Trees that do not drop their leaves every year.

**Teaching the Lesson**

**Engage**

**Introductory Discussion**

1. Have the children recall what they did the last time they visited the tree. *(They observed and described the tree. They predicted which parts of the tree and its surroundings might grow or change during the year.)*

**Teacher Note:** To stimulate discussion, refer to the growth and change predictions you and the children developed during the sharing discussion in Lesson 5.

2. Explain that today the children will measure three parts of the tree that might grow during the year. Inform the children that:
   - They will take physical measurements to establish a baseline, or starting point, followed by a second set of measurements in the spring.
   - By comparing measurements in the spring to their baseline measurements they will be able to determine whether the tree has grown.

3. To prepare the children for making and recording their measurements:
   - Display the overhead transparency of the Teacher Master “Tree Diagram.”
   - Familiarize them with the measurement questions on page 40 of their science notebooks.

4. Divide the class into small groups.

**Management Note:** Make sure to record the names of the children in each group in order to group them the same way in the spring tree measurement lesson.
Explore

Demonstration
1. Take the class to the tree. Remind the children to bring pencils and their science notebooks.
2. Have the children stand in a semi-circle while you demonstrate how to take the measurements. Remind them to measure accurately in order to detect changes.
3. Demonstrate how to take the following measurements:
   - Trunk circumference (See the graphic below)
   - Main branch
   - Secondary branch

Measuring Our Tree
Have the groups make their measurements and record them in their science notebooks, page 40.

Management Note: Assigning roles to the group members helps all members participate. Tasks include measurers, instruction readers, and recorders. You may find it helpful for one child from each group to carry a clipboard on which the group records their measurements. The children can transfer this information to their science notebooks when they return to the classroom.
Reflect and Discuss

Sharing and Synthesizing

1. Have the groups share their measurements with the class.

**Teacher Note**: If the children get different results for their trunk measurements, you might discuss errors that occur while measuring (transposing numbers, having slack in the tape measure, measuring at the wrong spot on the trunk). Reinforce the idea that careful measurement of the tree is very important to accurately determine growth.

2. Ask the children to share what they found most interesting or difficult about their tasks.

3. Have the children open their science notebooks to page 40. Instruct them to predict the change they expect to see in the three tree measurements by spring, and to record their predictions.

4. Encourage some of the children to share their predictions. Do they think the tree will grow a lot? Why or why not?

5. Have the children discuss how their own growth during the year might compare with the growth of the class tree. Will they grow more or less than the tree? Why do they think so?

**Teacher Note**: You might want to make copies of the groups’ findings and display them in the Science Center so the children can look at them and compare their measurements.

Ongoing Learning

**Family Link**

1. Send home Family Link “Household Items” and have the children identify several household items that are made from trees.

2. Send home Family Link “Tree Cross Section Request.” The children examine tree cross sections in Lesson 10, “Trees: Growth Rings.” Although the ExploraGear contains tree cross sections, having more available gives the children additional opportunities to observe the growth rings in detail.
**Maintenance**

Review the results of the Family Link “Trees: Tree Inventory” from the previous lesson. Discuss the different types of trees children noticed and the criteria they used to decide what “type” of tree they observed.

**Extending the Lesson**

**Further Science Explorations**

*Paper Making*

See the Teacher Directions “Making Paper” on page 98 for details. You will need one or two additional class sessions for this project.

*Other Tree Investigations*

1. Have the children measure the circumference of the class tree at the ground, 20 cm (8 in) above the ground, 50 cm (20 in) above the ground, and 100 cm (40 in) above the ground. Why are the measurements different? Which measurement is the best to use? Why?
2. Have the children bring leaves from their neighborhood to compare with those of the class tree. Record comparisons and in the blank pages at the back of their science notebooks.

**Language Arts Extensions**

Have the children write stories describing:
- What life was like at the time when a 50-year-old tree sprouted
- What will happen to their tree over the next 10, 20, or 50 years

**Art Extension**

Have the children draw a picture of what their class tree will look like in 50 years.

**Planning Ahead**

*For Lesson 7*

Invite parents or older children to assist the children as they measure their heads, heights, hands, and feet at four measurement centers.
Teacher Background Information

Introduction

Children find their own growth to be an unending source of interest. They are also fascinated by the development, or life cycle, of other organisms, both animals and plants. This unit contains the following lesson clusters that focus on some “big ideas” about animal and plant life cycles:

- Humans
- Trees
- Seed to Seed
- Butterflies

The big idea for each cluster is an understanding that accumulates as children progress through the lessons. You don’t need to tell the children what it is or explain it. In addition to the information in the lessons themselves, the Science Center and Science Library and Web Links sections of this manual (pages 32-34) contains activities, games, and recommended book and web sites that can enhance children’s comprehension of the big ideas. The assessment tools included in the teacher masters for this unit can help you evaluate children’s increasing understanding of each big idea, as well as their developing process skills.

Overview

A life cycle is the series of developmental stages that living organisms pass through during their lifetime. The life cycle begins with the organism’s earliest embryonic form, continues to a mature (or adult) state where it produces more of its own kind, and finally ends in death. Each species of living organism has a unique life cycle. Some organisms, including many insect species, grow, mature, reproduce, and die in a very short span of time. Other organisms, such as humans, spend long periods in the immature, reproductive, and post-reproductive stages.

All organisms develop survival needs as soon as they begin their life cycle. To survive, grow, and achieve their potential life span, most animals require food, water, protection, and oxygen (either from air or water). Plants, on the other hand, make their own food using energy from sunlight, but require water, carbon dioxide, and basic minerals and nutrients. A few organisms (most of these are bacteria) are able to live without oxygen.
Living things continually face threats to their survival or ability to reproduce. The most common threats are predation (being eaten), disease, inadequate food or water, and loss of habitat. Natural events, such as extreme weather conditions, can threaten the survival of an individual or population. For example, an unexpected drop in temperature may kill or harm a farmer’s crop or a species’ food source. Various human activities, such as using pesticides, contaminating water, or clear-cutting forests, sometime threaten an organism’s survival.

Plants and animals reproduce in a variety of ways at the adult stage of their life cycles. Flowers, for example, typically have both male and female reproductive organs. (Some plants have separate male and female flowers; in some species these are on separate plants.) Animals are usually either male or female. (Some animals, like worms, are both male and female.)

All living things have a life span unique to their species. A life span is an organism’s average length of life under optimal conditions. For some organisms, reproduction marks the end of the life cycle. For example, annual plants (plants that live only one year) end their life cycle shortly after reproduction. Some insects have life spans of less than a month; in this short time, they develop, reproduce, age, and die. Other organisms live and reproduce year after year. The bristlecone pine, for example, has a potential life span of thousands of years. Many mammals, including humans, have an extended period of reproduction, as well as a long period of aging following reproduction. In the Life Cycles Unit, children compare the life spans of humans, trees, plants, and butterflies.

Humans

Life Cycle

The human life cycle is marked by clearly recognizable changes. From conception through death, humans experience the following stages:

Fertilized egg ➔ Embryo ➔ Fetus ➔ Baby/Infant ➔ Toddler ➔ Child ➔ Teenager/Adolescent ➔ Mature (reproducing) adult ➔ Senior ➔ Death

At the mature adult stage of the human life cycle, humans are developmentally prepared to reproduce. The resulting offspring will in turn begin their cycle of life stages. Eventually, they too may have children of their own, and the cycle will repeat. The life cycle of the parent and that of the child represent two successive generations. Within a nuclear family, all of the children of one set of parents make up the new generation. Within an extended
family, all the children of the parents, plus the children of the parents’ brothers, sisters, and cousins are the next generation. Within a population, each new generation consists of all the offspring of the current breeding adults (for humans, a generation is sometimes loosely defined).

**Growth and Change**

From conception until adulthood, humans experience rapid physical growth. Fundamentally, physical growth involves an increase in the number of cells that make up the body. Increasing body mass is made possible by a human skeleton that is able to grow, with proper nutrition, until adulthood.

In addition to the obvious physical changes, humans also experience intellectual growth. The brain of a newborn consists of billions of nerve cells, called neurons, waiting to be used or “connected.” It’s impossible for us to truly know a newborn’s experience of their world. However, we do know that all newborns encounter the world with their senses. The information they collect with their senses is processed and connections are made in distinct regions of the brain. This is how infants learn about their world.

For example, when a child encounters a dog for the first time, the child’s senses respond. The dog’s appearance is processed by the brain’s occipital lobe, its bark by the temporal lobe, its feel by the parietal lobe, its smell by the olfactory cortex, and the emotions that it evokes by the brain’s limbic system. Connections are formed between neurons in the different parts of the brain to create a pathway by which the brain can recognize a dog. Subsequently, when a child conjures up the image of a dog, neurons in these different regions of the brain all “fire” together, creating a complex image of a dog that includes its smell, touch, sound, appearance, and the child’s emotions about it. Existing neural connections are strengthened or new neural connections are formed during each encounter with a dog. The web of connections that results is the physical manifestation of learning.

With billions and billions of working parts (neurons), the brain is a remarkably complex organ. Scientists have made great strides in their understanding of the workings of the brain, but much remains to be discovered. Early insights into the operation of the brain were the result of studies conducted on individuals who had suffered brain injuries or lesions. By noting which region of the brain was injured and relating it to the function, or functions, lost as a result of the affliction, scientists were able to attribute certain functions to specific parts of the brain. Thus, a rudimentary map of the brain developed.
Technological advances have made it possible to monitor brain activity in a non-invasive way that does not rely on the presence of brain lesions. The PET scan (PET is an acronym for Positron Emission Tomography) has led to great advances in the field of brain science. The PET scanner creates images of the working brain in which active regions are shown in brilliant color. These images are based on the brain’s utilization of a radioactively labeled sugar, since active regions of the brain require energy and that energy comes from sugar. In this way, scientists detect which areas of the brain are active (consuming sugar) by scanning the brain for emissions (positrons) from the radioactively labeled sugars. Scientists relate the activity being performed when the PET scan is taken to the parts of the brain seen as active on the scan. By doing this, they piece together a map of the regions of the brain and the functions each controls.

(Note: PET scanners are also important diagnostic tools for detecting brain tumors. This is possible because tumor cells grow at an uncontrolled and thus faster rate than normal cells. PET scanners can detect the increased sugar consumption of the rapidly growing tumor.)

Physical and intellectual growth only occur if the body has adequate nutrients and energy stores available. Like all animals, humans require food (for energy production), water, air, and protection from environmental extremes to function effectively and, ultimately, to survive. In addition to our basic needs, humans require a stimulating environment in which to thrive intellectually. As social animals, humans also have a fundamental need for companionship.

Trees

Trees are ubiquitous in the lives of most children. Children see them every day, climb in them, play in their leaves, eat their fruit, and sit in their shade. They also constantly use objects made from trees—furniture, toys, even paper. The study of trees connects with the familiar world of children and reinforces their understanding that science is part of their everyday experience. In the Life Cycles Unit, trees are used to illustrate two types of cycles: the life cycle and the annual cycle.

A tree is a tall, woody plant with a main trunk. In contrast, shrubs are short, woody plants with multiple trunks. Trees are the tallest plants, and they rely on the amazing strength of wood to achieve their height. Some trees grow to heights of more than 100 meters (300 feet). Trees are perennial plants, meaning that they live for more than two years. In fact, the oldest living organisms are trees. Bristlecone pines, for example, can live for more than 4,000 years.
There are two general types of trees: flowering trees and non-flowering trees. The seeds that develop from flowers are enclosed in a fruit or nut that protects and nourishes the seed. Flowering plants are called angiosperms, from the Latin angi, meaning ‘enclosed,’ and the Greek sperma, meaning ‘seed.’ The trees that do not produce flowers are called gymnosperms, from the Latin gymn, meaning ‘naked,’ and the Greek sperma, meaning ‘seed.’ In the gymnosperms, the seeds are naked—they have no protective fruit or nut surrounding them. The most common examples of gymnosperms are the conifers, or cone-bearing trees. The seeds are borne on special seed-scales that are arranged in a spiral pattern that makes a cone.

Oaks, maples, and palm trees are examples of flowering trees. Pines, cedars, ginkgoes, and cycads are examples of trees that are gymnosperms.

**Parts of a Tree**

The major parts of a tree are its roots, trunk and branches, leaves, and reproductive structures (flowers, cones, fruit, and seeds).

The **roots** are the part of the tree below ground. The roots serve several functions. They anchor the tree and help hold it upright. Roots store sugars made during photosynthesis. They also absorb water and nutrients through tiny strands called root hairs. Root systems are extensive; many trees have more of their mass underground than above ground.

The **trunk** is the upright, supporting portion of the tree. The trunk consists of wood surrounded by bark. The wood provides the stiffness and strength needed to support the crown—the branches, leaves, and reproductive structures. The youngest wood, or sapwood, contains the xylem tissue, which transports water and nutrients from the roots to the leaves and reproductive structures. Wood is a nonliving part of the tree; it is made of dead cells from past growing seasons.

The bark protects the trunk. The bark of some trees, such as the redwood trees of California, contains fire resistant chemicals. Other trees have bark that contains poisons to fend off insect pests. While the wood transports water and nutrients from the roots to the leaves, the inner bark transports sugars from the leaves down to the roots. If you remove the bark from a strip that goes all the way around a tree, you prevent the sugars from reaching the roots and the tree will die.
As in other green plants, leaves manufacture sugars through the process of **photosynthesis**. In this process, water (taken up by the roots) and carbon dioxide (taken up through pores in the leaves) are combined using energy from sunlight to produce sugars. Cells throughout the tree use the sugars for metabolism and growth. Oxygen and water are produced as by-products of photosynthesis and released into the air. Photosynthesis is made possible by chlorophyll, a green pigment that actively captures light energy.

Trees reproduce by creating **seeds**, the product of male pollen uniting with female eggs. Seeds are dispersed by various means. Some, such as maple seeds and some conifer seeds, have wing-like appendages that aid in wind dispersal. Willow and cottonwood seeds have tufts of downy fibers that allow them to catch the wind and travel considerable distances. Animals disperse the seeds of many species of trees. For example, squirrels gather acorns (the seeds of oaks), and birds eat the fruit of cherry or ash trees. Even ocean currents disperse seeds. Coconuts are wrapped in a large mass of fibers that provide buoyancy and protect the coconuts while they float in the sea.

**Growth and Development**

Trees grow in both height and diameter. As a tree’s trunk and its branches elongate, and new branches are produced, its height increases. All growth occurs at the upper or outer tips of the trunk and branches. A tree’s diameter increases through the activity of the **cambium**, the growing part of the trunk, branches, and roots. This very thin cell layer between the wood and the bark produces the transport tissue of the tree (xylem and phloem) and more cambium. On the inside, xylem (from the Greek *xulon*, meaning ‘wood’) tissues are produced. This is the **sapwood**, and the growth that produces the characteristic rings that mark the annual growth of trees. It becomes the **heartwood** as the xylem becomes non-functional. The outside of the cambium produces the phloem (from the Greek *phloios*, meaning ‘bark’), the tissues that transport sugars made in the leaves to all parts of the tree. (It is also called the inner bark.) As the phloem becomes non-functional it is shed outward and becomes bark. As the new bark cells grow outward, they replace old bark cells that have sloughed off.

Cross-sections of tree trunks and branches often reveal annual rings of growth. Each annual ring consists of two parts: light-colored wood formed during the spring when growing conditions are best (**earlywood**), and dark-colored wood formed during the less favorable months (**latewood**). The number of rings can indicate a tree’s age. In temperate
climates, with a growing season and a dormant season, one ring is produced each year. In warmer climates where periods of plentiful moisture and drought define the growth periods, trees can produce more than one ring each year. In some tropical climates, where the growing conditions are relatively constant, there may be no discernable rings at all. A tree’s rings can also provide information about the growing conditions during its lifetime. Wide rings correspond to periods of favorable conditions for rapid growth, whereas narrower rings indicate periods of poor conditions for growth.

Trees grow throughout the world, from the extreme cold regions near the Arctic to the hot tropical regions of the equator. They grow in both rich and poor soil, in deserts and swamps, and at elevations ranging from sea level to mountaintops. Trees often grow in thick forests. However, where water is scarce or other conditions prevent the growth of forests, trees grow sparsely, either singly or in small groups.

Importance of Trees

Perhaps the most important function of trees is to produce oxygen, an essential gas for much of life on earth. Trees also reduce erosion and flooding. Their extensive root networks pervade the soil and keep it from eroding during times of heavy rain. Their branches and leaves provide protection from wind. In addition, trees absorb carbon dioxide which helps combat global warming.

Trees provide food and habitat to many animals. Deforestation is one of the leading causes of extinction and loss of biodiversity.

Trees give economic benefits to humans. They provide lumber for construction. They are also a source of food in the form of edible fruits and nuts, as well as oils from tree-borne fruit, such as olive oil and coconut oil. Tree saps provide maple syrup and rubber. Useful spices, medicines, and fibers also originate from trees.

The Life Cycle of a Tree

Like all plants, a tree’s life cycle begins at the seed stage. Under optimal conditions (enough warmth and water) the seed germinates and produces an emerging sprout called a seedling. The seedling continues to grow and develop, reaching the small tree stage known as a sapling. Saplings characteristically have trunks between 2 and 4 inches in diameter and demonstrate vigorous growth. The sapling continues to grow and develop, eventually reaching maturity at the adult tree stage. An adult tree has the ability to reproduce and begins bearing fruit,
cones, or nuts. Growth slows as some of the tree’s resources are devoted to reproduction. With age the tree enters a period of decline. As with other organisms reaching old age, the tree’s ability to fight disease diminishes and it may succumb to fungal and other infections. This is called the senescent tree stage. Senescent trees may have dead tops or limbs. They may have pockets of rot and though they continue to grow they lose more wood than they are able to produce. Eventually trees succumb to disease, rot, and environmental stresses, and die. The carcass decomposes and becomes the rich soil matter that nurtures future generations of trees.

The Annual Cycle of Deciduous Trees

The annual cycle of a deciduous tree is familiar to many people. The seasons themselves are commonly described in terms of the changes occurring to the leaves and flowers of deciduous trees. In the summer the deciduous tree is covered with actively photosynthesizing leaves. The long days and warm temperatures make this an ideal time to produce and store the sugars it needs for growth, reproduction, and basic functions. The tree also forms the buds that will emerge as next year’s leaves and flowers.

In the autumn, deciduous trees prepare for winter by losing all their leaves. The leaves will not be needed in winter because the shorter and colder days are not conducive to photosynthesis. By dropping their leaves, deciduous trees conserve water that would otherwise be lost through evaporation. Before they are shed, the leaves often turn bright colors as the loss of green chlorophyll makes yellow and orange pigments in the leaf visible. Some dying leaves simply turn brown. Other colors, the vivid reds and purples, are caused by chemical reactions in the leaf triggered by shorter days and cooler temperatures. The buds formed in the summer remain small and inconspicuous.

Trees in temperate climates settle into a period of dormancy in winter. Dormancy conserves the tree’s resources while conditions are unfavorable for photosynthesis.

Trees emerge from dormancy in the spring. The flow of sap resumes and buds become swollen before emerging as leaves, flowers, or both. Carefully dissecting these buds reveals a cottony material surrounding and insulating the tiny embryonic leaves or flowers inside. A series of hard overlapping scales, a type of modified leaf, cover most buds. These bud scales protect the delicate bud from cold and dry conditions during the winter months. They are shed in response to the longer days and warmer temperatures of spring, allowing the leaves and
flowers to emerge. **Bud scale scars**, a series of mostly parallel lines around the circumference of the branch, are obvious and signify the location of shed scales.

Buds found at the tip of a twig are called **terminal buds**; those emerging along the side of a twig are called **lateral** or **axillary buds**. In addition, **accessory**, or collateral, **buds** containing flowers often occur on either side of a lateral leaf bud. These accessory flower buds will be rounder and larger than those containing leaves. Below each lateral bud a leaf scar shows where last year’s leaf was attached. If you look closely at a leaf scar you can see dot-like vascular bundle scars marking the place where the transport vessels (phloem and xylem) once carried water, sugar, and nutrients to and from the leaf. Each tree species has a distinct bud type and arrangement. Consequently, buds can be used to identify a tree even when its flowers or leaves are not visible. The buds of different tree species vary in size, shape, color, number of scales, and smell. The arrangement of buds on these trees is likewise distinct, with the buds of some trees appearing singly, while those of others occur in pairs or clusters.

**Evergreen Trees**

All trees slough off old leaves. **Evergreen trees** remain green all year by shedding aged individual leaves continuously rather than all at once. New leaves often appear in spring on evergreen trees. We usually think of conifers as evergreens and flowering trees as deciduous. While this is a good rule of thumb, some conifers are actually deciduous (larches, for example), and some flowering trees are evergreens (holly trees are one example).

**Seed to Seed**

**Life Cycle**

In the Life Cycles Unit, the children study pea plants and seeds. A pea plant is an annual plant, one that completes its life cycle—growing, flowering, setting seed, and dying—in one growing season. A pea plant’s life cycle begins at the seed stage. A seed consists of an **embryo** (or tiny plant), which usually comes with its own food supply for initial growth; it is enclosed in a protective **seed coat**. If a seed lands on a suitable site with the favorable conditions of moisture and temperature, then water and oxygen penetrate the seed coat, and **germination**, or the initial sprouting of the seed, takes place. When provided with adequate light, air, and water, the sprout grows and develops, until it reaches the flowering plant stage. At this stage, the plant produces flowers and has the ability to reproduce. If reproduction is successful
The Science Notebook is a student’s ongoing record of his or her work as a scientist. Each Science Companion module for grades 1-6 has a Student Science Notebook tailored for that module.

Student Science Notebooks are age-appropriate. Notebooks for younger grades contain minimal text and opportunities to draw instead of write, so all students can participate and shine as scientists. For older grades, Student Science Notebooks utilize students’ developing skills: they contain procedures for students to follow, and provide support for controlling variables as students develop their own experiments—all leading to increased independence.

All the Student Science Notebooks develop literacy and support mathematics skills. Students apply these disciplines in the highly motivating process of doing science.
Hello, Scientist,

All scientists like to study things carefully. They like to think and ask questions. They try things out and then see what happens. They use their senses to observe things. They describe their observations with pictures and words.

Scientists use science notebooks to write and draw their ideas and their observations about the things they study.

This is your science notebook. You will write and draw some of your ideas and your observations here.

Enjoy it!
Tree Measurements

Tree Measurements (Lessons 6 and 19)
Fall Tree Measurements

1. Trunk circumference (measurement A).

   Fall: _________      Spring Prediction: _________

2. Main branch length (measurement B).

   Fall: _________      Spring Prediction: _________

3. Secondary branch length (measurement C).

   Fall: _________      Spring Prediction: _________

4. Did you predict that any tree measurements would be different in the spring? Why or why not?
Hola Científico,

A todos los científicos les gusta estudiar las cosas cuidadosamente. Les gusta pensar y hacer preguntas. Experimentan y luego ven que sucede. Usan sus sentidos para observar las cosas. Describen sus observaciones con dibujos y palabras.

Los científicos usan una libreta de apuntes para escribir y dibujar sus ideas y sus observaciones de las cosas que estudian.

Ésta es tu libreta de apuntes de ciencias. Aquí escribirás y dibujarás algunas de tus ideas y observaciones.

¡Disfrútala!
Medidas del Árbol
Medidas del Árbol

1. La medida de la circunferencia del tronco (medida A).
   En Otoño: _________
   Predicción Para la Primavera: _________

2. La longitud de la rama principal (medida B).
   En Otoño: _________
   Predicción Para la Primavera: _________

3. La longitud de la rama secundaria (medida C).
   En Otoño: _________
   Predicción Para la Primavera: _________

4. ¿Tus medidas de otoño son diferentes a tus predicciones de primavera? ¿Porqué o porqué no?
Assessments

Science Companion supplies a variety of tools to assess children “in-the-act” of doing science, as well as evaluate their understanding and proficiency as they finish clusters of lessons.

In the Teacher Lesson Manual:

- **Big Ideas and lesson goals** are clearly outlined on each lesson’s Quick Look pages.
- **Assessment Options** in each lesson suggest where pre-assessment and formative assessment can occur in the context of a lesson.

In the Assessment Book:

- **Rubrics** are supplied to score understanding of science content. The criteria in each rubric are derived from a module’s Big Ideas and lesson goals.
- **Opportunities Overviews** show where each criteria can be evaluated during pre-assessment, formative assessment and summative assessment.
- **Checklists and Self-Assessments** list criteria that are related to science process skills.
- **Performance Tasks** are used for summative assessment to evaluate students’ understanding of Big Ideas and lesson goals. The Assessment Book supplies evaluation guidelines and blank masters for each Performance Task.
- **Quick Checks**—another summative assessment tool—employ a multiple-choice format.

The Science Notebook Teacher Guide:

A final assessment tool is the Science Notebook Teacher Guide. This teacher edition of the Student Science Notebook is annotated to help teachers know what to expect in from children in their Student Science Notebooks.
Checklist: Measuring Length and Circumference
Teacher Assessment
(Lessons 6-7, 19, and 24)

Determine whether the following skills are evident as the child measures different objects. You might assign one point for each criterion that the child demonstrates. You can add specific observations or comments in the space below each criterion.

Name  Date

Criteria:

A. Uses the appropriate measurement tool for the task.

B. Lines up the ruler or tape measure at “zero”.

C. Identifies the correct unit of measurement.

D. Selects an appropriate dimension to measure.

E. Rounds to the nearest unit of measurement.
Checklist: Predicting
Teacher Assessment

(Lessons 5-7, 13, and 22)

Determine whether the following skills are evident as the child makes predictions. You might assign one point for each criterion that the child demonstrates. You can add specific observations or comments in the space below each criterion.

Name

Date

Criteria:

A. Makes relevant predictions.

B. Provides rationale for predictions using related understandings, observations, and/or data.

C. Revises predictions as pertinent information is discovered.
The Changing Tree
Trees Cluster (Lessons 5-6, 10-11, 16, 19-20)

Use pictures and words to describe how a tree changes during one year.
Include as many details as possible.

**TEACHER NOTES:**
Use this assessment after teaching Lesson 20.
You might administer this task orally, individually, or in small groups.

**EVALUATION GUIDELINES:**
When evaluating children’s responses, consider whether they include the following:

- Trees go through many physical changes throughout a year. Possible changes children might mention include the color of leaves; the loss of leaves, the growth of new leaves, the lengthening of branches, and possibly an increase in the overall size.
- Some children might also relate the timing of the particular changes to the seasons.
- Some children may connect physical changes in trees to the absence or presence of certain survival needs.

**Explain how a tree changes over the course of its life span.**

- Children may note that a tree may grow quite large over the course of its life span, increasing its overall size (height, trunk circumference, number and size of branches). Some may even include that the number of growth rings will increase.
- Some children may express that trees, like other plants, will reproduce or produce smaller trees.
- Children might note that at some point, trees can start to reduce in size, as branches become old and heavy and break off. The trunk may begin to rot or decompose. Trees will eventually die.

**What does a tree need to survive?**

- The survival needs of a tree are air, water, food, light, space, and protection. Children’s responses will vary. Most children should list at least these three: air, water, and food.
1. (Lesson 5) Which sense did you not use to observe your tree?
   a. hearing
   b. touch
   c. sight
   d. smell
   e. taste

2. (Lessons 6, 19) Place an “X” next to all of the ways you can measure the change on a tree.
   \[ X \text{ leaf size} \quad X \text{ branch length} \]
   \[ X \text{ trunk circumference} \quad X \text{ growth rings} \]

3. (Lesson 19) Which of the following does not affect tree growth?
   a. temperature
   b. color
   c. water
   d. space

4. (Lesson 20) True or false?
   Change and growth are a natural part of a tree’s life cycle. \[ \text{true} \]
Teacher Masters may be reproduced and used during lessons. Their uses vary—they may be used by individuals, in groups, or as reference sheets for teachers or adult helpers in the classroom.

Family Letters (introductions to the module) and Family Links (homework or optional activities) are also in the Teacher Masters.

Visuals include posters and pictures that may be displayed or projected in the classroom during lessons. In some cases, Visuals may also include cardstock games that are used during lessons.
Tree Diagram
Family Link with Science

Household Items

Our class is studying trees in science.

Ask your child to identify and list at least 10 household items that are made from trees.
The ExploraGear® provides all of the hard-to-find, hands-on materials needed to effectively implement a Science Companion module. This kit of non-consumable and consumable items is your go-to place for the tools needed to teach inquiry science. The authors of Science Companion carefully developed the curriculum so that the ExploraGear® items are not overwhelming and unfamiliar, but filled with the most essential, high quality items needed to engage students in a rich, interactive, inquiry science experience.
Science Companion uses the “I Wonder” Circle to help students reflect on how they (and other scientists!) do science.

- **I Wonder**: notice, ask questions, state problems
- **I Think**: consider, gather information, predict
- **I Try**: experiment, model, test ideas, repeat
- **I Observe**: watch, examine, measure
- **I Record**: record data, organize, describe, classify, graph, draw
- **I Discover**: look for patterns, interpret, reflect, conclude, communicate discoveries
What’s in Science Companion?

For the Teacher

Teaching and Assessment

- Teacher Lesson Manual
- Assessment Book
- Student Notebook Teacher Guide

Great Classroom Support

- Reference Materials
  - Teacher Reference Materials
  - Lesson 0
- Teacher Masters

Visual Aids

- Transparencies and Posters
- I Wonder Circle® Poster in English & Spanish

www.sciencecompanion.com
I Discover...
What’s in Science Companion?

For the Student:

Classroom Supplies

Student Science Notebook
English & Spanish

ExploraGear® Kit

Great Curriculum Support

Student Reference Book
(Levels 4-6)

What Is a Scientist?

Trade Books
(Levels K-3)

Curriculum now available in print and digital!

ScienceCompanion
www.sciencecompanion.com
Collecting and Examining Life
From collecting animal tracks to dissecting flowers, children deepen their understanding of what makes something alive as well as exploring the similarities and differences among living things.

Rainbows, Color, and Light
Through experiments with prisms, mirrors, bubbles, water, sunlight, and flashlights, children bring rainbow effects into their classroom and onto the playground. They also mix colors to observe that colored light produces different results than mixing pigmented paints, dough, or water.

Solids, Liquids, and Gases
While deciding what makes a solid a solid, watching water disappear from an open cup, or comparing various liquids, children find the value in asking questions and probing the world around them for meaningful answers.

Early Science Explorations
From making a collage of the leaves and seeds they find to constructing a lever from rocks and wood, children are introduced to the wonders of science and scientific exploration. Contains 7 studies in one book: Growing and Changing; Class Pet; Collections from Nature; Constructions; Dirt, Sand and Water; Sky and Weather; and My Body.

Weather
One day students learn to use a thermometer to record temperature, another day they measure rainfall or investigate the nature of ice. Throughout the year, students use their senses as well as scientific tools to discover that weather is a dynamic part of nature.

Magnets
From testing what sort of everyday objects are attracted to magnets to comparing the strength of different magnets, children deepen their observation skills while learning about the nature of magnets.

Soils
From closely observing soil components and their properties to discovering the importance of earthworms, children use their senses of sight, smell, and touch to explore the wonders of soil.

Rocks
One day children examine fossils, another day they might test minerals. As children collect, examine, describe, and experiment with rocks, minerals and fossils, they hone their observation skills and begin to unravel the puzzle of what rocks are and how they are formed.
Habitats
From going on a nature walk to dissecting owl pellets, children are asked to think about how organisms (plants, animals, fungi, and microscopic living things) survive in the places they live, and how they interact with other living things.

Light
Whether watching light “bend” a pencil in water or building a periscope, the combination of hands-on, multi-sensory learning enables children to understand what light is, how it behaves, and why it makes sight possible.

Electrical Circuits
Whether exploring static charges, figuring out how to get a light bulb to light, or testing the conductivity of everyday objects, students experience firsthand the excitement of electricity and scientific discovery.

Our Solar System
One day children chart the moon’s cycles, another day they might make a scale model of our solar system. By observing the world around them, they address questions such as “Why are there seasons?” and “Why does the moon appear to change shape?”

Nature’s Recyclers
By watching composting worms create soil, to modeling the nutrient cycle, students have the opportunity to investigate the organisms that carry out the process of decomposition and recycle nutrients in an ecosystem.

Watery Earth
Whether following a drop of water through the water cycle, measuring their own water usage, or exploring how filters clean dirty water, students are encouraged to use what they learn to have a positive impact on water resources.

Earth’s Changing Surface
From building river models that explore erosion and deposition to touring the school grounds looking for evidence of the earth’s changing surface, students use hands-on investigations to discover the dynamic nature of the earth’s surface.

Matter
With challenges like exploring what they can learn about an unknown substance called “Whatzit,” students experience the excitement of scientific discovery and gain an appreciation of the scientific method used by professional scientists.

Human Body in Motion
By modeling how muscles move bones, testing reflexes, and measuring the effects of exercise on breathing and heart rate, students begin to appreciate the interactions between body parts and recognize the importance of protecting them by making healthy choices.

Energy
Whether testing the efficiency of light bulbs, exploring heat conduction, or designing an imaginary invention demonstrating the transfer of energy, students discover that energy is at the root of all change occurring in the world around them.

Force and Motion
By demonstrating and explaining ways that forces cause actions and reactions, as well as gaining a deeper understanding of basic forces such as friction and gravity, students discover the many ways that forces affect the motion of objects around them.

Science Skill Builders
With 21 lessons spanning the breadth and depth of science skills, students develop a core understanding of using tools in science, scientific testing, observation skills, and the importance of analysis and conclusions.

Design Projects
Animal Homes, Human Tools, Simple Machines, Moving Systems, Electrical Circuits, Human Systems. The design project series was developed to support compatible modules by allowing students to design and/or build animal homes, tools, machines, and designs of their own creation. Taking between 4-6 sessions, the projects strengthen skills and ideas about choosing materials, using tools, working with the limitations of materials, solving problems, and overall project design.
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<td>Prepares students to do inquiry-based science</td>
<td>✓</td>
<td>Lesson O introduces students to the scientific method through the “I Wonder” Circle</td>
<td></td>
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<tr>
<td>Hardback, colorful, content-rich student reference materials for upper elementary students</td>
<td>✓</td>
<td>Student Reference Books</td>
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<td>Bound student science notebooks to foster student literacy and reading skills</td>
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<td>The original Student Science Notebooks</td>
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<tr>
<td>Parallels in instructional design to <em>Everyday Mathematics</em>®</td>
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<td>Developed by the creators of <em>Everyday Mathematics</em>®</td>
<td>✓</td>
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<tr>
<td>Variety of assessment strategies</td>
<td>✓</td>
<td>Teacher-friendly formative and summative assessment strategies</td>
<td>✓</td>
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<tr>
<td>A variety of pilot options to fit the interests and needs of districts</td>
<td>✓</td>
<td>Several no-cost pilot options, including an innovative online pilot program</td>
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<tr>
<td>Correlations to local and state science standards</td>
<td>✓</td>
<td>Correlated to state standards with customized local standard correlations available upon request</td>
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<tr>
<td>Teacher must gather minimal teacher supplied items</td>
<td>✓</td>
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<td>Early Childhood activity-based modules available</td>
<td>✓ (K Only)</td>
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<tr>
<td>Unique content offered to meet standards</td>
<td>✓</td>
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<td>Children develop science habits of mind in addition to content knowledge</td>
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<td>“I Wonder” Circle integrates modules as tool for student reflection</td>
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<td>Engaging activities nourish children’s curiosity</td>
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<td>Engaging, hands-on activities focused on Big Ideas</td>
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<td>Supports teachers in reaching Big Ideas</td>
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<td>Reflective Discussions help children integrate their experience and build science knowledge</td>
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<tr>
<td>Full curriculum available digitally</td>
<td>✓</td>
<td>Hyperlinked teacher materials (iTLM’s) &amp; digital student materials build affordable access</td>
<td>✓</td>
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A New Way to Pilot...

An Innovative Free Online Pilot Program!

We know that both time and financial resources are limited for school districts these days.

So, we are delighted to introduce an exciting new digital opportunity for you to try Science Companion materials at no cost, at a scale that is easily manageable. And it’s high tech, too!

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