Saguaro Life Cycle
An IDEAL Reference Library Database Science Lesson

Author	ADE Content Specialists
Grade Level	3rd Grade
Duration	2-3 class periods

Aligns to:

Science
Strand 4: Life Science
Concept 2
PO 1. Compare life cycles of various plants
PO 2. Explain how growth, death, and decay are part of the plant life cycle.

Strand 1: Inquiry Process
Concept 2
PO 1. Demonstrate safe behavior and appropriate procedures in all science inquiry.
PO 2. Use metric and U.S. customary units to measure objects
PO 5. Record data in an organized and appropriate format.

Concept 3
PO 1. Construct reasonable interpretations of the collected data based on formulated questions.

Connects to:

Science
Strand 4: Life Science
Concept 1
PO 1. Describe the function of the following plant structures:
- roots – absorb nutrients
- stems – provide support
- leaves – synthesize food
- flowers – attract pollinators and produce seeds for reproduction

Concept 3
PO 2. Examine an ecosystem to identify microscopic and macroscopic organisms.

PO 3. Explain the interrelationships among plants and animals in different environments:
- producers – plants
- consumers – animals
- decomposers – fungi, insects, bacteria

Reading
Strand 1: Reading Process
Concept 6
PO 5. Extract information from graphic organizers (e.g., webs, Venn diagrams, flow charts) to comprehend text.
PO 6. Connect information and events in text to experience and to related text and sources.

Strand 3: Comprehending Informational Text
Concept 1
PO 4. Use a variety of sources (e.g., trade books…) to answer specific questions, and/or gather information.

Mathematics
Strand 1: Number Sense & Operations
Concept 3
PO 1. Solve grade-level appropriate problems using estimation.
PO 2. Estimate length and weight using U.S. customary units.

	Strand 2: Data Analysis, Probability, & Discrete Mathematics **Concept 1** **PO 6.** Solve problems using graphs, charts and tables.

Overview

The life cycle of plants varies by the type of plant. Some plants grow slowly and live hundreds of years. Other plants grow very quickly and live only a few months or years. All plants eventually die and decay, which are important steps in a plant's life cycle. The book *Cactus Hotel* calls attention to the different stages of a saguaro life cycle and provides information about each stage.

Purpose

In these lessons, students will build on their understanding of plant life cycles by reading about and observing the saguaro cactus life cycle. Students will connect their learning of the saguaro life cycle to those of other plants. Students will also learn how to organize data in a table and use that data to solve problems related to the age of the saguaro.

Materials

- *G*uiberson, B. (1991). *Cactus Hotel*. New York City: Henry Holt and Company. ISBN 0-8050-1333-4.
- Saguaros in their natural habitat for observations
  If outdoor observations are not possible or practical, use pictures of saguaros (see saguaro.ppt)
- Student lab books to record observations
- Student lab books showing data from previous plant life cycle activities
- Saguaro Life Cycle Handout
- Scissors, tape measure, string (81 feet per group) that can be cut into various lengths (for extension activity)

Objectives

Students will:

- Identify stages of the saguaro life cycle
- Explain how growth, death, and decay are part of a plant's life cycle
- Use life cycle data to predict the age of a saguaro cactus
- Compare the saguaro life cycle to that of another flowering plant

Lesson Components

Prerequisite skills:

- Students should have been introduced to the key idea of plant life cycles and should have had the opportunity to grow a plant from seed or see different stages of a plant's life cycle.
- Students should have experience making measurements in U.S. Customary units and metric units.
- Students should have experience organizing data into tables.

Engagement

1. Show the cover of the book *Cactus Hotel* and ask students
   - What do you think this book is about?
   - Why do you think that?

2. Read the book aloud to the students. After finishing the book, ask
   - What plants or animals need the saguaro to help them survive?
   - What plants or animals does the saguaro need to survive?

3. Explain to the students that books can be used in many ways. The main point of the book is about how the saguaro depends on plants and animals for its survival and other plants and animals depend on the saguaro to survive. Explain that this book also tells us about the life cycle of the saguaro. We are going to use the information in this book to learn more about the life cycle of the saguaro.

Exploration

If possible, take students to observe living saguaros. Students should look for saguaros in different stages of the life cycle. Students should record descriptive observations in their notebooks and draw pictures of the observed saguaros. Observations could include:

- the size of the saguaro (measure the cactus height, if possible).
  Caution: Saguaros have sharp thorns. Students should only measure under close adult supervision and should not touch the cactus. The teacher may want to measure the cactus and let the students read the height off of the measuring tape.
- the number of branches on the cactus
- whether the cactus has flowers or fruit
- the number and locations of holes in the cactus, and whether any animals are in/near the holes
- whether the cactus is still standing, has fallen down, or has died

If actual observations are not possible, have students record their observations using pictures (see saguaro.ppt). Pictures can be printed one per page or multiple pictures per page and cut into cards that can be sorted.

1. Look around for young saguaros.
    - Where do you usually find young saguaros?
      (Answer: under other plants like Palo verde, bushes, or other trees)
    - Why do you think this is so?
      (Answer: Tiny saguaros dry up in the hot sun. The seeds that land in a shady place have a better chance of growing in the cooler shade. It also hides them from other animals that might try to eat the young saguaro.)
2. Look around for older saguaros.
    - How are you going to know that the saguaro is older?
      (Answer might include: flowers and fruit, is tall, has branches, has holes in the stem)
3. Look around for saguaro flowers and fruit
   Flowers and fruit are most common during late spring or early summer. Students may not be able to observe these depending on time of year of the lesson.
    - What color are the flowers? (Answer: white)
    - What color is the fruit? (Answer: red)
    - Where on the saguaro can you find the flowers and fruit? (Answer: the top and the tips of each branch)
4. Look around for dead or dying saguaros.
    - What does a dead saguaro look like?
      (Answers will vary: It could be standing up with drooping branches, it could be completely on the ground, or anywhere between these two. There might be lots of decaying plant flesh, it could be just the ribs, or it could be anywhere between these two.

Explanation

Help students build understanding of the saguaro life cycle. Have students think about and discuss the following questions about the different stages of the life cycle.

1. **Young saguaros**
    - Why do you usually find young saguaros growing under other plants such as bushes, palo verde, or other trees?
      (Answers may include: The seeds that land under other plants have a better chance of growing in the cooler shade. Tiny saguaros dry up in the hot sun. Other plants hide them from animals that might try to eat the young saguaro.)
2. **Older saguaros**
    - What do the branches on the saguaro tell you about the age of the saguaro?
      (Answer: As saguaros get older, they grow more branches and the branches get bigger. A saguaro without branches is usually younger than one with branches. A saguaro with 1 branch is usually younger than one with 3 branches.)
    - Why do some saguaros have holes in the stem?
      (Answer: Gila woodpeckers make the holes for their nests. Other birds, like owls use the nests when the woodpecker moves out.)
    - Where on the saguaro do you see holes and why do you think they are there?
      (Answer: Holes are high on the stem so it is harder for other animals to reach the nests.)
3. **Flowers and fruit**
    - How is the flower an important part of the saguaro life cycle?
      (Answer: Pollinated flowers develop into fruit that contain the seeds. Some of the seeds germinate and grow into a new saguaro.)

4. **Dead or dying saguaros**
    - Why is death and decay an important part of the saguaro life cycle? (Answers will vary: returns/recycles nutrients back to the soil, makes room for new plants to grow.)

Evaluation

1. Instruct students to draw the life cycle of a saguaro. (Use "The Life of the Saguaro" Handout.) It may be helpful to review the components of a plant life cycle with students prior to distributing the handout. Include pictures of the flower, fruit, and at least three pictures of the saguaro during different stages/ages of growing.
2. After students have drawn their pictures of the saguaro life cycle, ask
    - How we can estimate the age of the saguaros you observed? (Answers may include: can use the height, the number of branches, the number of holes, or whether it has flowers.)
3. Explain to students that we will be looking for information in the book to help us estimate the ages. As a class, make a data table to organize the life cycle information in the book, *Cactus Hotel*.

Data compiled from *Cactus Hotel*

Age (years)	Height	Description of Saguaro
10	4 inches	Tiny with spiny sides. Hidden under other plants.
25	2 feet	Taller and thin, with spiny sides. Hidden under other plants
50	10 feet	Straight and tall. No branches. Starts to get holes. Might have flowers or fruit on top.
60	18 feet	Starts to grow branches. May have holes in stem. Might have flowers or fruit on top.
150	50 feet	Has multiple (7) long branches. Many holes in stem. Might have flowers or fruit on top.
200	50 feet	Branches droop or break off. Might tip over and die.
dead		Green skin turns brown and falls off. You can see the wood ribs inside. Might be standing up, or on the ground.

4. Instruct students to use the data from the book to estimate the age of the saguaros drawn in their life cycle diagrams. Students should record the estimated age next to the pictures in their drawings. If students are using the provided pictures (saguaro.ppt), the estimate is included below. (Students responses may not match exactly. Their explanation is more important than the exact age they select.)

Estimated Age (years)	Height	Explanation for Estimate
10	4 inches	Height and picture match description in book for 10 years old
14-18	10 inches	10 inches is between 4 inches and 2 feet. The age should be within the range of 10-25 years. Since 10 inches is closer to 4 inches, the age should be closer to 10 years.
26-28	25 inches	25 inches is slightly taller than 2 feet. The age should be close to but slightly older than 25 years.
28-34	4 ft	4 feet is between 2-10 feet, so the age should be between 25-50 years. Since 4 feet is closer to 2 feet, the age should be closer to 25 years.
55-58	17 ft	17 feet is between 10-18 feet, so the age is between 50-60 years. Since 17 feet is closer to 18 feet, the age will be closer to 60 years. It is starting to get branches, so it should be close to 60 years.
100-110	34 ft	34 feet is between 18-50 feet, so the age is between 60-150 years. Since 34 feet is half way between the two heights, the age will be about half way between 60-150 years. It also has several holes and a few branches.
125-135	41	41 feet is between 18-50 feet, so the age is between 60-150 years. Since 41 feet is closer to 50 feet, the age should be closer to 150 years. It also has many holes and several branches.
140-150	48	48 feet is between 18-50 feet, so the age is between 60-150 years. Since 48 feet is closer to 50 feet, the age should be closer to 150 years. It also has many branches.
150-200	50	Has multiple (7) long branches. It has flowers or fruit on top. Other picture shows arms drooping, so the saguaro is dying.

5. On the handout, students should describe how the saguaro life cycle is similar to the plants they previously grew in class.
   (Answers may include: the plants had similar steps in their life cycle (germination, growth, flower, fruit, release seeds, and germination again); both are flowering plants; both grew from seeds; both need similar factors to grow (air, water, light, etc.); both grew branches as they got older)
6. On the handout, students should describe how the saguaro life cycle is different from the plants they previously grew in class
   (Answers may include: the saguaro grows slower, the saguaro gets taller, the saguaro lives longer, the saguaro needs different growing conditions (light, temperature, water, etc.), the flowers have different pollinators)

7. On the handout, students should explain why death and decay are an important part of a plant's life cycle.
   (Answers may include: Returns/recycles nutrients back to the soil, makes room for new plants to grow)
8. On the handout, students should explain why they didn't include dead saguaros in their life cycle drawing.
   (Answers may include: Saguaros can flower and produce seeds more than once in their lifetime. A new life cycle starts when new seeds are made, but the plant making the seeds doesn't necessarily die right away. All plants will eventually die.)

Elaboration

Saguaro Size
If students were unable to observe saguaros in the field, they may not understand how tall the saguaros really are. To help students understand the scale of the saguaro, allow students to measure lengths of string that correspond to the saguaro heights.

1. Provide each pair of students with a scissors, a tape measure, and at least 81 feet of string for this activity.
   Caution: Scissors can be sharp. Provide students with blunt tip scissors or provide safety guidelines for using scissors.
2. Instruct students to measure lengths of string that correspond to the heights of the saguaro mentioned in *Cactus Hotel* (4 inches, 2 feet, 10 feet, 18 feet, 50 feet).
   - If space permits, ask students to lay out their lengths of string side by side to compare heights. (With adult assistance, it might be possible to attach the strings vertically to a wall or outdoor structure so students get a better sense of the height of a mature saguaro.)
   - Students may also want to mark on the string the estimated heights of their observed saguaros.

Saguaro Interrelationships
Depending on where this lesson fits in your curriculum map, you may want to go back and ask students to further elaborate on the relationships that the saguaro has with other plants and animals at each stage of its life cycle.

Sources

*G*uiberson, B. (1991). *Cactus Hotel*. New York City: Henry Holt and Company.
ISBN 0-8050-1333-4.

The Life of a Saguaro

1. In the space below, draw a diagram showing the life cycle of a saguaro. Draw and label the flowers, the fruit, and 3 pictures of different sizes as it grows.

2. How is the saguaro life cycle like the life cycle of the plant you grew in class?

3. How is the saguaro life cycle different than the life cycle of the plant you grew in class?

4. Explain why death and decay are an important part of a plant's life cycle.

5. Why didn't you draw the dead saguaro on your life cycle diagram?