LESSON 11: THE PLANT LIFE CYCLE

TEACHER GUIDE

BACKGROUND INFORMATION

- Plants change throughout their lives, both in appearance and to what they devote their energy.
- Most but not all plants start as seeds. For example, algae can reproduce by cell division or by sending out spores. However, seed reproduction is the most well-known method of plant reproduction and the one on which this lesson is focused.
- Once a seed is planted, it goes through the cotyledon phase. In this phase, the plant is just beginning to grow out of its shell. You may be able to see some roots and plant sticking out at this point but it is unlikely that the plant will have yet reached sunlight. Since the plant has not reached sunlight and the plant needs sunlight to make food, the plant will still be feeding from its food store within the seed. A seed only needs water and its own food store at this stage of its development.
- After the cotyledon phase, a plant reaches the seedling phase. In this phase, the plant has reached the surface of the ground and unfurls its first leaves. It is now able to take-in light through its leaves to perform photosynthesis.
- Photosynthesis is the process of converting carbon dioxide (a gas prevalent in our air) and water into sugar. Sugar is a plant's food source.
- After the seedling phase, a plant goes through its vegetative phase. This is when a plant utilizes its energy to go through the rest of its growing and becomes a full-sized plant. This phase comes before the plant produces any flowers or fruits.

- The flowering phase follows the vegetative phase. In this phase, the plant uses much of its energy to produce flowers. Plants use flowers to attract pollinators such as bees, butterflies and moths (moths only pollinate to a minimal extent but do serve in this role). Pollinators move pollen (which mainly consists of sperm cells) from the male part of a plant to a female part. This process achieves fertilization of the receiving plant. The receiving plant may be the same plant the pollen was collected from, or a different plant.
- Once a plant has produced flowers, it may go through a fruiting phase. Not all plants go through this stage; some stop after the flowering phase. If a plant does reach this phase, it uses its energy to create fruits. A fruit is the part of a plant which contains the plant's seeds. Peppers, avocadoes and peas are all examples of fruits.
- Eventually, all plants die, just as all other living things ultimately die.
- Note: before you teach this lesson, you may wish to look through the plants in your aquaponics system and attempt to identify which of the stages each plant is in. This exercise is part 1 in the "activity" section of this lesson.

LESSON OBJECTIVES

- To understand that plants grow and develop throughout their lives.
- To gain a deeper understanding of how plants work and develop through an introduction to the life cycle of a typical plant.
- To know that plants use light as an essential element of photosynthesis to make their food.
- To understand the main function of flowers.
- To understand that when plants produce fruits, it is to harbor seeds.
- To understand that all plants eventually die.
- To practice using information to label, using plants in this case.

Lesson Materials

- A blank sheet of paper for each student.
- Drawing and writing utensils for each student.
- Copies of the assessment

Assessment Answer Key

1) The cotyledon phase is when there are some roots and plant material sticking out of the seed. (B)
2) Plants grow flowers as a reproduction method. Flowers attract pollinators which are important in the reproduction process.
3) All plants do not go through all of the stages. (B)
4) All plants do eventually die. (A)

STUDENT GUIDE – HOW DOES A PLANT CHANGE THROUGHOUT ITS LIFETIME?

VOCABULARY

Develop – to grow and change

Fruit – the flesh that holds the seeds in a plant. Peppers are actually fruits!

Reproduce – to make a new version of yourself. Plants reproduce when they make new plants.

Pollinate – a process that helps plants reproduce. This is often done by bees; bees take the pollen from the male part of a flower to the female part of a flower.

Decompose – to rot.

LECTURE AND DISCUSSION

- Begin the lesson by asking the class: do you look the same as you did when you were born? Do you look the same as when you were five? Do you think you will look the same when you are thirty as you do now? Do you think you will look the same when you are eighty as you will when you are thirty?
- People change throughout their lives, and so do plants! (power point)
- Ask the class: what do you think plants start as?
    - Plants often start as seeds. This is stage #1. (power point)
    - Seeds are like houses for the new plants. They contain the new plant which is like us in our houses. They have a protective layer for their plant which is like our walls and roof. They often have food for the plant which is like our pantries and refrigerators!

- Stage #2 is called the cotyledon phase. (power point)
    - In this stage the seed is beginning to turn into a plant.
    - It will look like there are some roots and a tiny plant coming out of the seed.
    - The plant is still all the way underground in this phase. This is as if a baby person were still inside its mother.
- Stage #3 is the seedling phase. (power point)
    - During this phase there will be a baby plant poking out of the ground.
    - This is when you first start to see your plant.
    - Now the plant has reached the light with new leaves, so it can really start to grow!
        - Plants use light taken in by their leaves to help make their food.
- Stage #4 is the vegetative phase. (power point)
    - During this phase, the plant grows up to be an adult plant.
    - The plant has leaves at this stage, but no flowers or fruits.
- Stage #5 is the flowering phase. (power point)
    - This is when the plant creates flowers.
    - Plants make flowers so they can be pollinated in order to make new plants.
    - Flowers attract bugs such as bees to pollinate them.
        - Ask the class: who has seen a bee on a flower?
    - Some plants stop at this phase and go on to reproduce without fruit.
        - Ask the class: can you think of any plants that stop after the flowering phase?
            - Flowers, lettuce and basil are examples of plants that stop after the flowering phase.
- Stage #6 is the fruiting phase. (power point)

- This is when the plant produces a fruit.
- A fruit contains the seeds of the plant. But remember, not all plants use fruits to produce seeds.
- Ask the class: can you think of some examples of plants that produce fruits?
    - Bananas, tomatoes and zucchinis are all fruits.

- The last stage (#7) a plant goes through is when it dies. (power point)
    - After a while, all plants die.
    - Some plants live longer than others, but they will all eventually die.
    - Plants that grow outside decompose when they die, and become part of the soil for from which new plants can grow.

ACTIVITY

Part 1:

- Take either the entire class or groups of students at a time to the aquaponics system.
- Have the students attempt to identify which phase the plants are in.
- You may consider calling on one student to identity the phase of a particular plant and another to explain why they think that plant is in that phase. This way, each student can get a chance to participate.

Part 2:

- Put the final slide of the Power Point presentation up for students to read.
- Give each student a blank sheet of paper, drawing utensils and a writing utensil.
- Have each student pick a plant that produces fruit as well as obvious flowers. Zucchinis, tomatoes, eggplants and peppers are all good options.

- Have the students draw that plant in each phase of its life.
    - The students may choose to create a landscape with a horizontal plant progression. Or, they may wish to create a circular cycle. Either method will work.

It might be fun to let the students decorate their projects.

CONCLUSION

- Plants change throughout their lives just like people do.
- Ask the class: what is the first phase in the plant cycle?
    - Plants often start as a seed.
- Ask the class: what is the second phase?
    - The cotyledon phase comes next. This is when the plant is poking out of the seed.
- Ask the class: what is the third phase?
    - The seedling phase is third. This is when the plant come out of the ground but is still an immature plant.
- Ask the class: what is the fourth phase?
    - The fourth phase is the vegetative phase. This is when the plant does the rest of its growing-up, but before the plant grows flowers or fruits.
- Ask the class: what is the fifth phase?
    - The flowering phase is next. Plants grow their flowers in this phase to attract pollinators like bees.
- Ask the class: what is the sixth phase?
    - After the flowering phase comes the fruit phase. This is when the plants produce fruits which contain seeds for new plants.

- Ask the class: what is the seventh phase?
    - At the end of its lifecycle, a plant will die. This is the final phase of the plant cycle.

EXTENSION

- *Science* – This lesson is an introduction to topics like plant reproduction and photosynthesis. This lesson provides a great opportunity to explore these topics further.

- *Social Studies* – Mentioning bees in reference to pollination opens the opportunity to explore the topic of dwindling bee populations and the effect their absence would have on our lives as well as the environment.

Name_____ Date_____

ASSESSMENT 11 – THE PLANT LIFE CYCLE

1) What is the cotyledon phase? (Circle one)

a) Before anything is coming out of the seed.

b) When there are some roots and plant sticking out of the seed.

c) In between the flowering and the fruiting phases.

d) The final phase.

2) Why do plants grow flowers? (In your own words)

3) Do all plants go through all of the stages? (Circle one)

Yes

No

4) Do all plants eventually die? (Circle one)

Yes

No