Lesson Topic: Plant Growth: Effect of Genes and Environment

Objective:
Students will be able to:

1. Identify examples of environmental factors that affect plant growth.
2. Identify examples of genetic factors that affect plant growth.
3. Distinguish between environmental and genetic factors that affect plant growth.

Time Required: 75 minutes

Materials Needed:

- Two signs (one labeled “INCREASES”, one labeled “DECREASES”)
- Marker
- Teacher computer with internet access
- Projector/interactive whiteboard
- 1 computer/laptop/iPad per student with internet access
- Plant Growth: Effect of Genes and Environment Worksheet (attached)

Teacher Preparation:

- Assign a Legends of Learning Instructional Quick Play playlist for the day(s) you will be teaching the lesson.
  - Instructional - Middle School - Plant Growth: Effect of Genes and Environment
- Assign a Legends of Learning Content Review Quick Play playlist for the day(s) you will be teaching the lesson.
  - Content Review - Middle School - Plant Growth: Effect of Genes and Environment
- Make copies of Plant Growth: Effect of Genes & Environment Worksheet (1 per student)
- Hang the two signs labeled “INCREASES” and “DECREASES” in opposite corners of the room.

Engage (10 minutes):

1. Point to the corners of the room and show students the two signs.
2. Explain to students that they will be read a series of statements about plants and asked to decide if the situation described will increase or decrease plant growth. They should move the area with the sign that represents their opinion.
3. Read the following statements, and the students move to their chosen corner, reveal and briefly discuss the correct answer.
   a. Cacti plants thrive in desert climates with long, hot, sunny days. (increases)
   b. Orange trees are experiencing frost conditions. (decreases)
   c. Roses receive chemical treatments to prevent diseases. (increases)
   d. Overcrowding is occurring in a pasture. (decreases)
   e. Tall trees in the rainforest block sunlight from other plants. (decreases)
   f. Fertilizers are added to soils missing nutrients. (increases)
   g. Conifer trees are genetically resistant to cold temperatures. (increases)

4. Have students list some other factors that might contribute to plant growth.

Explore (30 minutes):

1. Have your students sign in to Legends of Learning. Instruct students to complete the Instructional playlist.
2. As students complete the assigned games, students will complete the Plant Growth: Effect of Genes & Environment Worksheet.
3. Circulate as students work through the playlist and complete the handout. Listen for evidence of understanding and use this opportunity to correct any misconceptions.

Explain (20 minutes):

1. Review answers to Plant Growth: Effect of Genes & Environment Worksheet by creating a labeled two-column chart on the board. Review part 2 of the worksheet, by asking students to stand to acknowledge agreement as each statement is read to the class.
2. Relate student knowledge to the activity at the beginning of class.
    a. What are some examples of environmental factors, and how do they affect plant growth? (allow several students to answer until there is a list of 3 to 4 factors on the board – nutrient availability, water, sunlight, insects, diseases, overcrowding)
    b. How are environmental factors different from genetic factors? (some environmental factors can be altered, adding fertilizer, irrigating soil, but genetic factors are determined during mitosis and put limits on factors such as plant height)
    c. What are some examples of genetic factors that affect plant growth? (allow several students to answer until there is a list of 3 to 4 factors on the board -genes that limit the height of a plant, the shape of leaves, cold tolerance, heat tolerance, drought tolerance)
    d. What are some ways humans change the environment that affects plant growth? (deforestation, pollution, overpopulation)

Elaborate (5 minutes):

1. Although many factors affect plant growth, genetic factors give some plants a natural advantage in any environment.
2. Show the time lapse video of the pea plant germination.
3. Ask students to describe the environment in the video and what allows the pea plant to grow in such an environment. (rocky, no soil, low light, no nutrients; pea plant is genetically able to germinate with few outside inputs)

Evaluate (10 minutes):

1. Have your students sign in to Legends of Learning. Instruct students to complete the Content Review playlist.
2. Analyze student results to determine what concepts need to be a focus for reteaching.

Additional Lesson Strategies:

- To use Legends for additional instruction, create a custom playlist with an instructional game and pre and post assessment.
- To use Legends for a quick formative assessment, create a 5-question assessment in a playlist.
- To use Legends for a student-directed experience, create a targeted freeplay playlist.
- Encourage students to play on their own at home in Legends of Learning: Awakening for a student-driven experience including avatars, battling, and quests all centered around topics they are covering in class.

Plant Growth: Effect of Genes & Environment

Name:_____

Directions: While playing the games in Legends of Learning, use what you learn to complete the assignment below.

Part 1: Sort the phrase below into the correct box based on if they affect plant growth is due to environmental reasons or genetics.

human impacts resistance to drought floods overcrowding deforestation freezing temperatures adaptation to wide temperature range fertile soil abundant sunshine water pollution disease resistance

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Part 2: Agree or Disagree. Next to each of the statements below, write A if you agree with the state or D if you disagree with the statement. Be prepared to defend your answer in a discussion later in the lesson.

_____ Small changes in the environment can activate or inactivate genes during mitosis.

_____ There is no limit on the height of a tree if it receives adequate water, sun, and nutrients.

_____ Bacteria and fungi in soils help plants grow.

_____ Compact soil is beneficial for plants because it keeps the root system intact.

Plant Growth: Effect of Genes & Environment

Name:_____KEY_____

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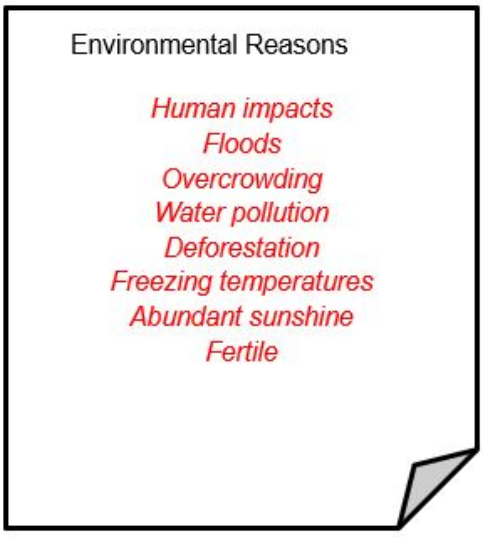

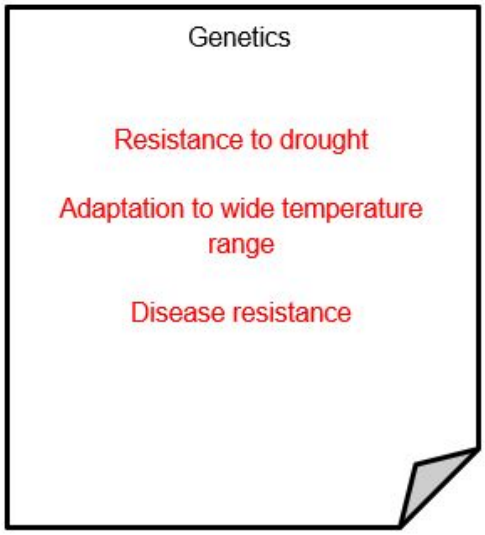

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__A___ Small changes in the environment can activate or inactivate genes during mitosis.

__D__ There is no limit on the height of a tree if it receives adequate water, sun, and nutrients.

__A___ Bacteria and fungi in soils help plants grow.

__D___ Compact soil is beneficial for plants because it keeps the root system intact.