

## Genetics vs. Environment Lesson 1: *The Solve* Educator's Resource Guide

### Objective

In *The Solve*, students will:

1. Solve a Comic Mystery that demonstrates that even identical twins are who they are because of both genetics and environment, working together.
2. Create a Mind Map to explore relationships among complex Genetics vs. Environment vocabulary.
3. Communicate understanding that human traits are influenced by both genetics and environment.

**Time Required:** 75 minutes

Materials Required	Safety Considerations	Science & Engineering Practices
<ul style="list-style-type: none"><li>• Student Guide (<i>includes student agenda and Mind Map</i>)</li><li>• Genetics vs. Environment Mosa Mack Comic Mystery (Printable or Motion Comic)</li><li>• Scissors</li><li>• Glue or tape</li></ul>	None	<ul style="list-style-type: none"><li>• Developing and Using Models</li><li>• Constructing Explanations or Arguments From Evidence</li></ul>

### Episode Description

Jasper and Mo, twins separated at birth, are finally going to meet in person, televised on *Oprah* for all the world to see! Unfortunately, their reunion doesn't go as smoothly as everyone thought it would. While they both know that, as identical twins, they share the same genes, they cannot seem to agree on the reason behind their similarities and differences.

After a brotherly brawl, Mosa Mack is called to the scene to help Jasper and Mo get to the bottom of this question: is it genetics or environment that make them who they are? After lots of research, Mosa figures out that the answer to this question may not be what either Jasper or Mo expected.



## **Inquiry Scale: Leveling Information**

*The Solve* can be completed in various settings, including presentation-style, small groups, or individually. In the case of a flipped or blended classroom, it can be completed entirely at home.

### **Level 1: Most teacher-driven** (*recommended for grades 4–5*)

View the animated mystery twice: once in full, and a second time along with the discussion questions, pausing the video as needed to answer the episode questions as a group. Project and complete the Mind Map as a class-wide activity. This can be done digitally or on paper. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

### **Level 2** (*recommended for grades 5–6*)

View the animated mystery in full. Afterwards, have students work through the episode questions to the best of their ability in small groups. Play the mystery a second time, pausing the video to discuss each question. Direct students to complete the Mind Map in small groups, either digitally or on paper. Come back as a class to review correct answers, as needed. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

### **Level 3** (*recommended for grades 6–7*)

Provide students with their student URL and have students view the animated mystery in small groups. Have students play the animated mystery once in full and then answer episode questions in their table groups to the best of their ability. Then, as a class, project the mystery, pausing, as needed, to discuss episode questions in a think-pair-share format. Have students complete the Mind Map in table groups, either digitally or on paper. Have students quiz each other on the vocabulary until you feel they're familiar with the terms. In table groups, have students go through the discussion questions on their own, and review answers as a class. Finally, have students complete the quiz digitally or on paper as an exit ticket.

### **Level 4** (*recommended for grades 7–8*)

Provide students with their student URL and have students view the animated mystery and complete episode questions in pairs. Have students review their answers with a neighboring table group. Have students complete the Mind Map in pairs, either digitally or on paper. Have students quiz each other on the vocabulary until they feel they're familiar with the terms. Have these same pairs go through the discussion questions. Finally, have students complete the quiz digitally or on paper as an exit ticket.

# MOSA MACK SCIENCE

## Agenda

### I. Solve the Genetics vs. Environment Mosa Mack Mystery (20 minutes)

**Differentiation Tip:** The comic book and motion comic video can be read/watched as a class, in small groups, individually, or completed for homework. For additional support, students can read or watch the comic/episode twice: once before completing the questions, and once with teacher guidance, pausing to discuss each answer.

1. Read/watch the Mosa Mack Mystery on Genetics vs. Environment.
2. Students answer the questions in their Student Guide as they read/watch. Encourage students to cite the specific page numbers/time codes in the Comic Mystery to promote writing with supporting evidence. Answers can be found in the key below.



### II. Vocabulary Mind Map Activity (15–45 minutes)

**Differentiation Tip:** The Mind Map can be done as a class, in small groups, individually, or completed for homework.

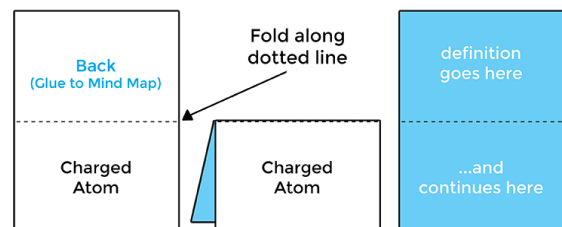
1. Students may complete the Mind Map **digitally**. Follow directions below. (15 minutes)
  - a. Go to <https://mosamack.com/home/genetics-vs-environment>
  - b. Select **Lesson 1: The Solve**.
  - c. Select **Vocabulary** and complete **Part 1**: matching terms with definitions.
  - d. Complete **Part 2**: matching terms and definitions with images on a diagram.
2. To complete the Mind Map **on paper**, follow the directions below (45 minutes).
  - a. Print and pass out the Student Guide: Genetics vs. Environment Lesson 1: *The Solve*.
  - b. Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Genetics vs. Environment unit.
  - c. Model the directions carefully, emphasizing the following. Students should:
    - **cut** out the vocabulary cards on the **solid** lines only
    - **fold** the cards at the **dotted** lines
    - write the definition of the term on the inside of the card using definitions provided
  - d. Students use the clues from the Mind Map images, definitions, and terms to place the cards in the correct location in the Mind Map.
  - e. Check that the students have matched their cards correctly before moving on.
  - f. Students use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.

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STUDENT GUIDE

III. Exit Ticket: Check for Understanding  
Complete the exit ticket below or you can take the quiz online!

Name: \_\_\_\_\_

1. Which of the following is an example of a non-renewable resource?
  - a. Wind
  - b. Solar (Sun)
  - c. Trees
  - d. Fossil Fuels
2. Resources are equally distributed throughout the world. True or false?
  - a. True
  - b. False
3. How long does it take to make?
  - a. Hundreds of millions of years
  - b. 40 years
  - c. A few years
  - d. 1 million years
4. Burning fossil fuels releases which gas into the air, making the Earth warmer?
  - a. Oxygen
  - b. Water
  - c. Nitrogen
  - d. Carbon Dioxide
5. Which of the following does not show a quick "cycle"?
  - a. Wind
  - b. Oil
  - c. Water
  - d. Carbon



- g. Students discuss the questions with their group or as a class when they have completed the Mind Map.

## Teacher Tips:

- Since this is the first time many of the students will have seen these vocabulary terms, have students work together to use the images, definitions, and collaborative thinking to figure out where the terms go.
- Check in on student groups through this process. When you see a student or group who has placed a card in the correct place, ask a facilitating question such as, “Why do you think that term goes there?” or “What evidence leads you to believe that term goes there?” When students explain their thinking, this is a great opportunity to provide positive reinforcement. Then, encourage students to share their reasoning to the class or to other groups who may have trouble identifying the location of that specific term.
- If you do not have access to a color printer, provide students with black and white copies and project the colored version of the Mind Map at the front of the room so that students can reference both images.

## III. Exit Ticket: Check for Understanding (10–15 minutes)

**Differentiation Tip:** This can be done in groups, pairs, individually, or more formally as a quiz online.

1. Students complete the exit ticket to check for understanding. This can be done online by selecting the **Quiz** button in Lesson 1 or on paper in the Student Guide. Answers are in the key below.

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## Answer Key

### Episode Questions

1. Why do Mo and Jasper have the same genes? (Page 1) (0:15)

*They are identical twins, so they were born with identical genes.*

2. Why are Jasper and Mo arguing? (Pages 2-3) (0:35-2:05)

*One twin believes that their genes are responsible for making them who they are; the other twin believes that the environment in which they grew up is responsible.*

3. What do Mosa, Billy, and the researchers review about genes? (Page 6) (3:50-4:15)

*Genes come from our parents. And a gene is a section of our DNA – that's sort of a code for a specific trait. For example, we have a specific gene that is coded for a dimpled chin.*

4. True or false: one gene always determines one trait. (Page 6) (4:15-4:40)

*False*

5. What are examples of environmental factors? (Pages 6-7)(4:40-5:00)

*Answers will vary: environmental factors include diet, nutrition, stress, and exposure to toxins.*

6. What example do the researchers give of genetics and environment working together? (Page 7) (5:08-5:20)

*For example, even if you have the genes for a certain type of cancer, healthy eating and exercise can help to prevent that trait from appearing.*

7. As the group looks at Twin Studies, the researchers tell them that the more a trait is shared by identical twins, the more it is because of \_\_\_\_\_; the less a trait is shared by identical twins, the more it's because of \_\_\_\_\_.

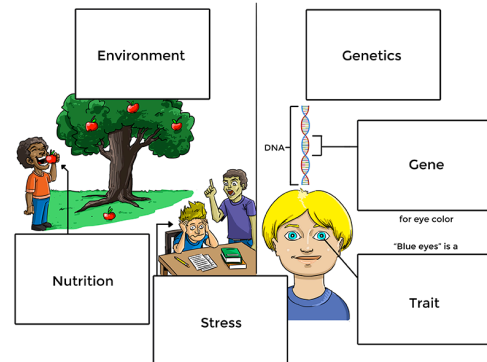
Fill in the blanks in the sentences above and give examples of each below. (Page 9) (6:10-6:35)

*The more a trait is shared by identical twins, the more it's because of genetics (for example, eye color is caused by genetics). The less a trait is shared by identical twins, the more it's because of environment (for example, weight is mostly caused by environment and diet).*

8. What did Mosa figure out? What makes us who we are? (Answer Comic)

*We are who we are because genetics and environment work together.*

### Mind Map



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## Quiz:

1. Diet and stress are mostly examples of which type of factors?
  - a. Genetic
  - b. Environmental**
  - c. Nutritional
  - d. Inherited
2. Eye color is mostly caused by:
  - a. Genetics**
  - b. Environment
  - c. Nutrition
  - d. Inherited
3. If a trait varies greatly within a pair of identical twins, it is most likely caused by what?
  - a. Genetics
  - b. Environment**
  - c. Nutrition
  - d. Inherited
4. A section of our DNA that codes for a specific trait is called a \_\_\_\_\_.
  - a. Environmental Factor
  - b. Genetic Factor
  - c. Gene**
  - d. Chromosome
5. True or false: one gene always codes for one trait.
  - a. True
  - b. False**
6. True or false: both genetics and environment are responsible for making you who you are.
  - a. True**
  - b. False