

2022 Innovative Science Sample Student Work and Scoring Guide

Grade 5

Question 8: Constructed-Response

Reporting Category: Earth Science

Practice Category: Evidence, Reasoning, and Modeling: Evaluate claims and evidence to argue the best scientific explanation or engineering design solution, including developing and analyzing models to represent scientific phenomena and engineering concepts.

Standard: 3.ESS.3.1 Evaluate the merit of a design solution that reduces the damage caused by weather.* Clarification Statement: Examples of design solutions to reduce weather-related damage could include a barrier to prevent flooding, a wind-resistant roof, and a lightning rod.

Item Description: Students will evaluate the merits of a sediment barrier design in preventing damage to a lake caused by sediment due to weather.

Scoring Guide

Select a score point in the table to view the sample student response.

Score	Description
<u>4</u>	The response demonstrates a thorough understanding of evaluating the merits of a sediment barrier design in preventing damage to a lake caused by sediment due to weather. The response clearly describes the reason for a criterion of using fewer barriers. The response correctly identifies the design that best meets the design criteria and uses evidence to explain the reasoning. The response also clearly describes an improvement to the design.
<u>3</u>	The response demonstrates a general understanding of evaluating the merits of a sediment barrier design in preventing damage to a lake caused by sediment due to weather. The response clearly describes the reason for a criterion of using fewer barriers. The response correctly identifies the design that best meets the design criteria and uses evidence to explain the reasoning. The response also clearly describes an improvement to the design.
<u>2</u>	The response demonstrates a limited understanding of evaluating the merits of a sediment barrier design in preventing damage to a lake caused by sediment due to weather.
<u>1</u>	The response demonstrates a minimal understanding of evaluating the merits of a sediment barrier design in preventing damage to a lake caused by sediment due to weather.
<u>0</u>	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Score Point 4

This question has four parts.

Part A: Simulation Activity

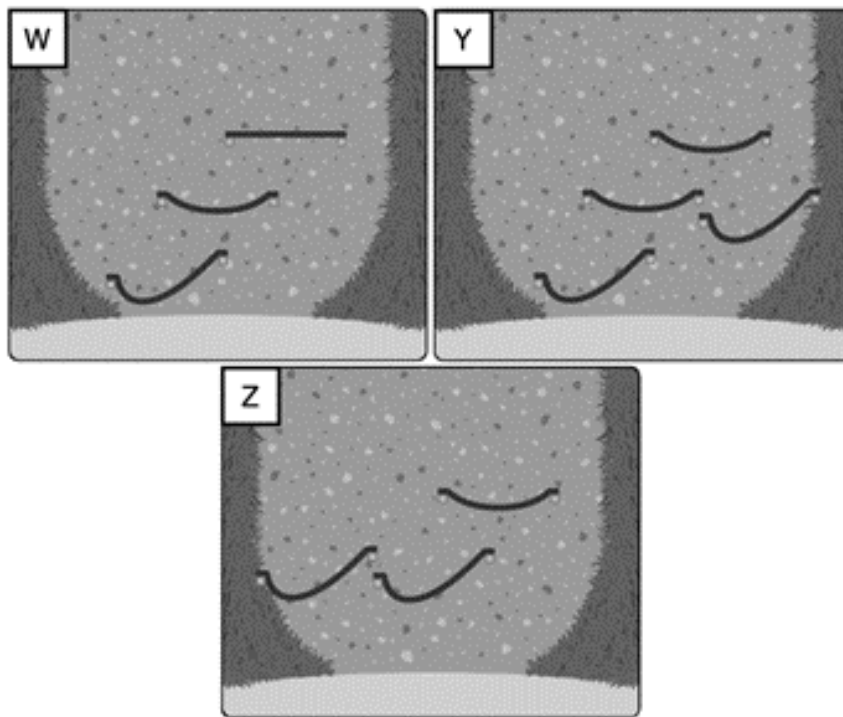
[Click here to learn how to use the simulation.](#)

The teacher presents three sediment barrier designs, W, Y, and Z, to the students and asks them to evaluate the designs based on two criteria.

Criteria for Evaluating Designs

Criterion 1: Prevents the greatest amount of sediment from entering the lake

Criterion 2: Uses the smallest number of barriers



YOUR GOAL: Use the simulation to model these three designs in a heavy rainfall and determine which design best meets the criteria.

Part B

Describe **one** reason a construction company would include "Prevents the greatest amount of sediment from entering the lake" as one of the criteria for evaluating sediment barriers.

One reason a construction companies would include a criteria of "Prevents the greatest amount of sediment from entering the lake" is for the animals, if there is too much sediment in the lake the plants will have less light and that could disrupt the entire food chain.

Part C

Which design (W, Y, or Z) **best** meets the two criteria for evaluating designs? Provide evidence to support your answer.

Design Z best fit the criteria because it used the least amount of barriers. Design Y also had the same level of sediment that entered the lake but they used four barriers and Design Z used only three so design Z was a better design.

Part D

Describe **one** change the students could make in the simulation to improve the barrier design from Part C so that less sediment enters the lake. Explain how the design change reduces the amount of sediment that enters the lake.

One change design Z could make is put a J barrier instead of a U barrier, this will reduce the amount of sediment in the pond because the J barrier can hold more sediment than the U barrier.

Score Point 3

This question has four parts.

Part A: Simulation Activity

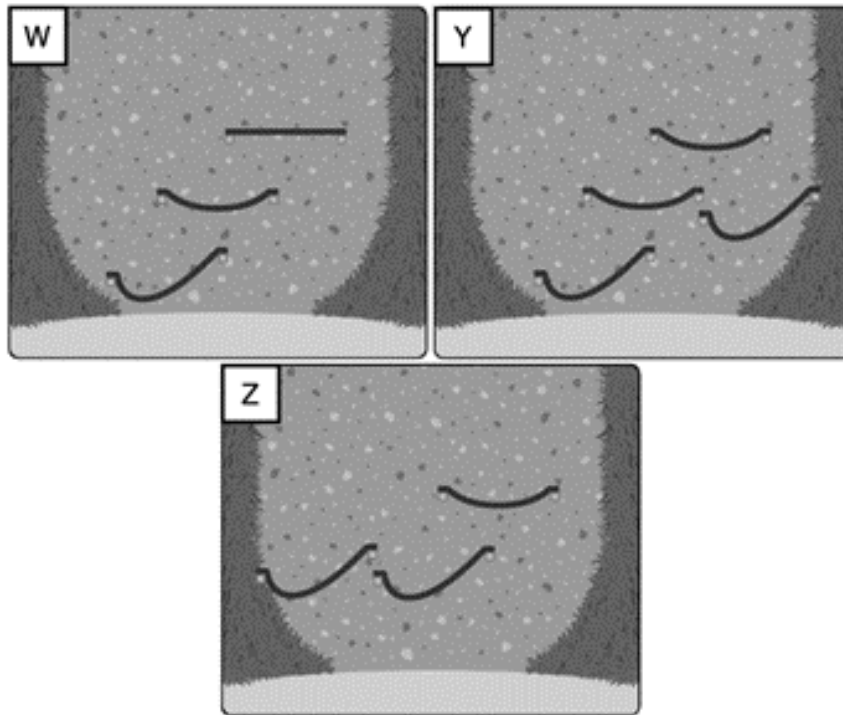
[Click here to learn how to use the simulation.](#)

The teacher presents three sediment barrier designs, W, Y, and Z, to the students and asks them to evaluate the designs based on two criteria.

Criteria for Evaluating Designs

Criterion 1: Prevents the greatest amount of sediment from entering the lake

Criterion 2: Uses the smallest number of barriers



YOUR GOAL: Use the simulation to model these three designs in a heavy rainfall and determine which design best meets the criteria.

Part B

Describe **one** reason a construction company would include "Prevents the greatest amount of sediment from entering the lake" as one of the criteria for evaluating sediment barriers.

One reason a construction company would include "Prevents greatest amount of sediment from entering the lake" as one of the criteria for evaluating sediment barriers is because preventing sediment from entering the lake is the reason the barriers are there.

Part C

Which design (W, Y, or Z) **best** meets the two criteria for evaluating designs? Provide evidence to support your answer.

Design Z best meets the criteria because, like design Y, it has a muddiness scale of 3, but unlike design Y, it only uses 3 barriers.

Part D

Describe **one** change the students could make in the simulation to improve the barrier design from Part C so that less sediment enters the lake. Explain how the design change reduces the amount of sediment that enters the lake.

One change the students could make is adding a J barrier to the right of the other J barriers, to make a row. This would make the muddiness on the scale 2, instead of 3.

Score Point 2

This question has four parts.

Part A: Simulation Activity

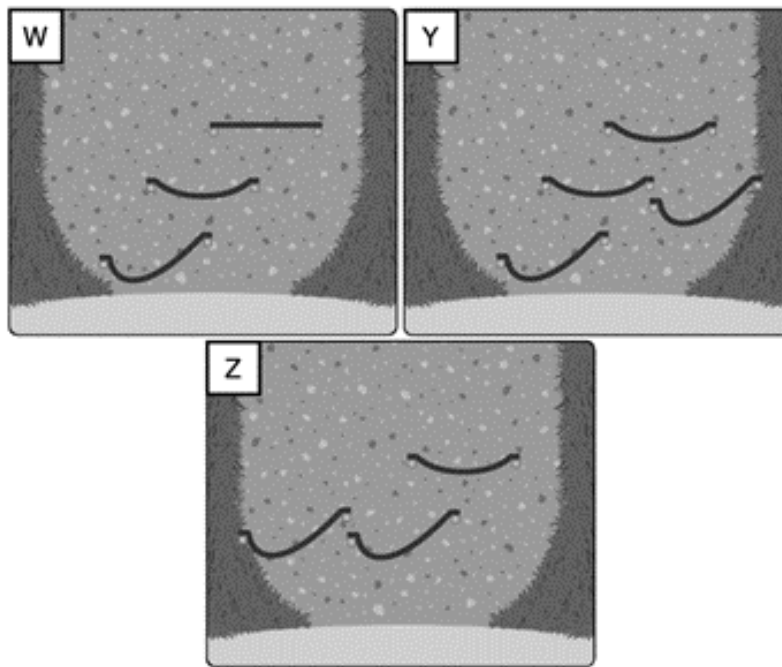
[Click here to learn how to use the simulation.](#)

The teacher presents three sediment barrier designs, W, Y, and Z, to the students and asks them to evaluate the designs based on two criteria.

Criteria for Evaluating Designs

Criterion 1: Prevents the greatest amount of sediment from entering the lake

Criterion 2: Uses the smallest number of barriers



YOUR GOAL: Use the simulation to model these three designs in a heavy rainfall and determine which design best meets the criteria.

Part B

Describe **one** reason a construction company would include "Prevents the greatest amount of sediment from entering the lake" as one of the criteria for evaluating sediment barriers.

The construction company wants to prevent the sediment from going in the lake because in the lake there are plants that need sunlight but when the mud takes over the lake it will block the sunlight

Part C

Which design (W, Y, or Z) **best** meets the two criteria for evaluating designs? Provide evidence to support your answer.

Y and z both had equal amounts of mud because they had j barriers so it collected more mud

Part D

Describe **one** change the students could make in the simulation to improve the barrier design from Part C so that less sediment enters the lake. Explain how the design change reduces the amount of sediment that enters the lake.

Add a j barrier

Score Point 1

This question has four parts.

Part A: Simulation Activity

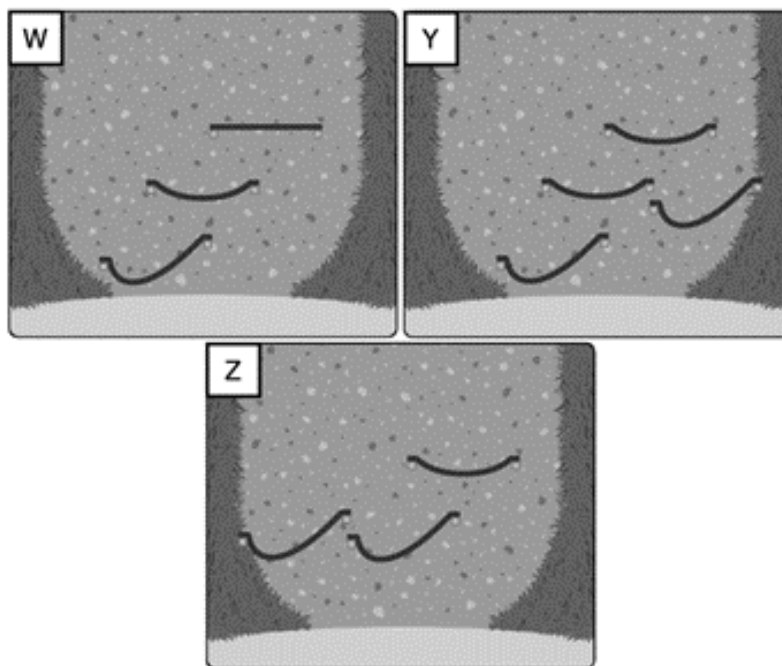
[Click here to learn how to use the simulation.](#)

The teacher presents three sediment barrier designs, W, Y, and Z, to the students and asks them to evaluate the designs based on two criteria.

Criteria for Evaluating Designs

Criterion 1: Prevents the greatest amount of sediment from entering the lake

Criterion 2: Uses the smallest number of barriers



YOUR GOAL: Use the simulation to model these three designs in a heavy rainfall and determine which design best meets the criteria.

Part B

Describe **one** reason a construction company would include "Prevents the greatest amount of sediment from entering the lake" as one of the criteria for evaluating sediment barriers.

because the J barrier is better.

Part C

Which design (W, Y, or Z) **best** meets the two criteria for evaluating designs? Provide evidence to support your answer.

W meets the best .

Part D

Describe **one** change the students could make in the simulation to improve the barrier design from Part C so that less sediment enters the lake. Explain how the design change reduces the amount of sediment that enters the lake.

one change that the students could have made was adding the J barrier.

Score Point 0

This question has four parts.

Part A: Simulation Activity

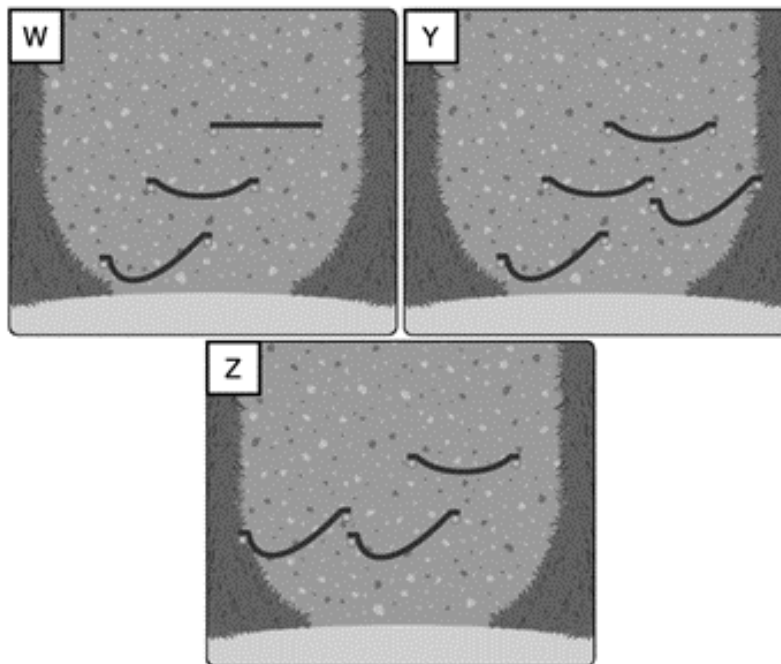
[Click here to learn how to use the simulation.](#)

The teacher presents three sediment barrier designs, W, Y, and Z, to the students and asks them to evaluate the designs based on two criteria.

Criteria for Evaluating Designs

Criterion 1: Prevents the greatest amount of sediment from entering the lake

Criterion 2: Uses the smallest number of barriers



YOUR GOAL: Use the simulation to model these three designs in a heavy rainfall and determine which design best meets the criteria.

Part B

Describe **one** reason a construction company would include "Prevents the greatest amount of sediment from entering the lake" as one of the criteria for evaluating sediment barriers.

a would be the one that had the most muddy.

Part C

Which design (W, Y, or Z) **best** meets the two criteria for evaluating designs? Provide evidence to support your answer.

c and b are the same muddy.

Part D

Describe **one** change the students could make in the simulation to improve the barrier design from Part C so that less sediment enters the lake. Explain how the design change reduces the amount of sediment that enters the lake.

c and b can be the same muddy.