Grade 5 Innovative Science and Technology/Engineering Sample Task

Spring 2022

The Department of Elementary and Secondary Education (DESE) is developing an innovative science assessment for grades 5 and 8 that uses a new type of performance task for students. Students engage with meaningful problems through interactive computer simulations to conduct investigations, create and explore models, and solve science or engineering challenges. DESE is publishing one pilot performance task per grade as a sample task.

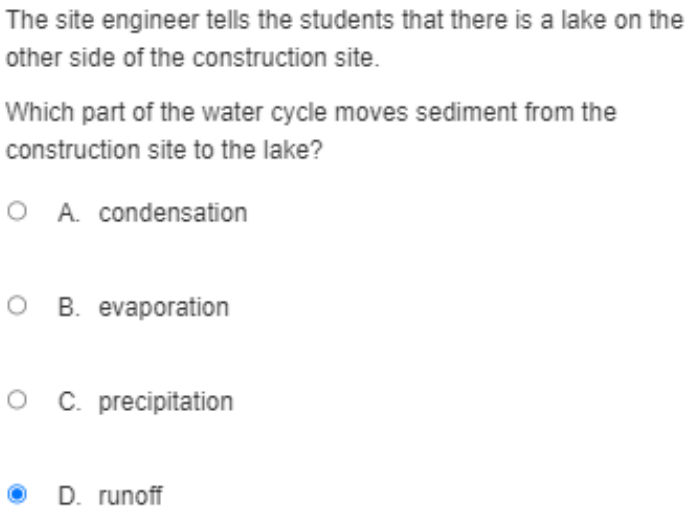
Sample items from the pilot test are available online at https://ma-innov-sci.mypearsonsupport.com/practice-tests/. The sample items are collected from a mini test called an ePAT (electronic practice assessment tool). Items in the ePAT are displayed in TestNav 8, the testing platform used for the computer-based tests.

This document provides information about each item from the sample task, including the following:

- science content area (reporting category)
- standard covered
- practice category
- item type
- item description
- correct answer (for selected-response and technology-enhanced items)
- percentage of students in the pilot who answered the item correctly (Percent Correct)

Scoring rubrics are provided for constructed-response and simulation items.

Task Set Item Number	Reporting Category	Standard	Practice Category	Item Type*	Item Description	Answer	Percent Correct
(1)	Earth and Space Science	5.ESS.2.1	Evidence, Reasoning, and Modeling	SR	Students will describe the water cycle process that moves sediment from a construction site, down a hill, and into a lake.	D	66%



(2)	Life Science	3.LS.4.4 5.LS.2.1	Evidence, Reasoning, and Modeling	SR TE	Students will describe how heavy rain would affect a food chain in a lake if no barriers were used at the construction site.	C *See Image*	Part A 61% Part B 49%

This question has two parts.

The diagram shows a food chain in the lake.

Part A

Which statement describes how heavy rain would **most likely** affect the plants in the lake if there were no barriers at the construction site?

- A. The plants would get energy from the mud that enters the water.
- B. The plants would use the mud that enters the water to grow taller.
- C. The mud that enters the water would block sunlight from reaching the plants.
- D. The mud that enters the water would help hold the plants in place at the bottom of the lake.

Part B

Based on the answer to Part A and the food chain diagram, select from the drop-down menus to correctly complete the sentence.

The amount of matter available to the snapping turtles would [decrease] because the plants would [make less plant matter].

(3)	Technology/ Engineering	4.ETS.1.3	Investigations and Questioning	TE	Students will evaluate how well different types and arrangements of barriers reduce the amount of sediment that flows into a lake.	*See Image*	69%

This question has two parts.

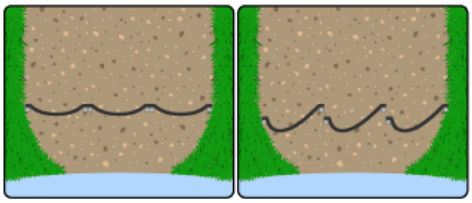
Part A: Simulation Activity

Click here to learn how to use the simulation.

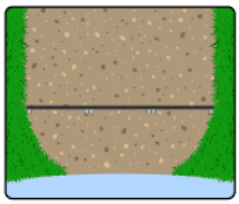
The simulation will let you test how well different types and arrangements of barriers reduce the amount of sediment that flows into the lake.

The students first want to determine which type of barrier prevents the most sediment from flowing into the lake when placed in a row, as shown in the diagram.

Sediment Barrier Designs



U Barriers J Barriers



I Barriers

YOUR GOAL: **Use the simulation to model how well a row of three of each barrier type works to prevent sediment from entering the lake during a light rainfall.**

1. Create and test the three barrier designs shown in the diagram.
2. Set Rainfall to Light and use a new model for each design you test.

Part B

Based on your results, select from the drop-down menus to evaluate the designs.

The type of barrier that works **best** is the [J barrier ▾]

because the number on the muddiness scale is

[less than ▾] the other saved models.

(4)	Technology/ Engineering	4.ETS.1.3	Investigations and Questioning	SIM	Students will evaluate how well different types and arrangements of barriers reduce the amount of sediment that flows into a lake during the worst weather conditions.	*See Image* *Second Drop Down: Saved model with lowest Muddiness Score*	74%

This question has two parts.

Part A: Simulation Activity

Click here to learn how to use the simulation.

In the previous question, you observed the water muddiness when using designs of only one barrier type in a light rain.

YOUR GOAL: **Create and test FIVE different barrier designs to determine which design best reduces the amount of sediment that reaches the lake during the worst weather conditions. You may use any combination of barrier types in your designs.**

- Use the controls for **Rainfall** and **Barriers** to make five barrier designs with any combination of barrier types.

Part B

Based on your results, select from the drop-down menus to describe the best design.

When evaluating different barrier designs to determine which is the best at reducing the amount of sediment reaching the lake during the worst weather conditions, it is important that each test has the same [amount of rainfall] and to compare their [muddiness levels].

This makes my saved model, [Choose...], the best design.

Performance (Points)
The student saves 5 models, the 5 saved models use the Heavy rainfall setting, and in the model selected by the student, the number on the Muddiness scale has the lowest muddiness score of the saved models, and the Muddiness scale is a 2 or 3. (1)
The student saves fewer than 5 models AND/OR the models do not use the Heavy rainfall settings AND/OR in the model selected by the student, the number on the Muddiness scale is greater than the other models. (0)

(5)	Earth and Space Science	4.ESS.2.1	Evidence, Reasoning, and Modeling	TE	Students will compare the amount of erosion that occurs after a heavy rainfall to erosion after a light rainfall.	*See Image*	68%

Using information from your saved models, select from the drop-down menus to correctly complete the sentences.

When the rainfall is heavy, the amount of erosion that occurs is [greater than] when the rainfall is light. The evidence that supports this statement is that during a heavy rainfall, the water reaching the lake is [more muddy than] it is during a light rainfall.

(6)	Earth and Space Science	5.ESS.3.1	Evidence, Reasoning, and Modeling	TE	Students will identify if observations provide evidence that barriers work to keep sediment in the construction site.	*See Image*	29%

The site engineer says it rained at the site and shows the students some pictures of the site after the rain. Students make observations to determine whether the sediment barriers kept the sediment in the construction area when it rained.

For each row, identify whether the observation in the table provides evidence that the barriers are working at keeping sediment in the construction site by dragging "Yes" or "No" into the table. Each answer may be used once, more than once, or not at all.

Yes No

Observation	Evidence of Barriers Working
Sediment is piled up behind the barriers in the construction site.	Yes
Sediment appears on the grass near the construction site.	No
Sediment does not appear on the sidewalk where the students are walking.	Yes

(7)	Earth and Space Science	4.ETS.1.3	Evidence, Reasoning, and Modeling	SR	Students will identify how a barrier design can be improved at a construction site.	B	75%.

The teacher shows the students a picture of how sediment barriers failed at a construction site where heavy rain occurred over several days. Based on what you have learned from the simulation, which is the **best** improvement that can be made to the sediment barrier design at this site?

- A. Remove one of the I barriers from the site.
- B. Add a row of J barriers near the top of the hill.
- C. Replace the metal posts on the I barriers with wooden posts.
- D. Create openings along the bottom of the I barriers to allow water to flow through.

(8)	Earth and Space Science	3.ESS.3.1	Evidence, Reasoning, and Modeling	CR	Students will evaluate three designs to see how well they use the fewest number of barriers to prevent sediment from entering the lake.	*See Scoring Guide*	29%

This question has four parts.

Part A: Simulation Activity

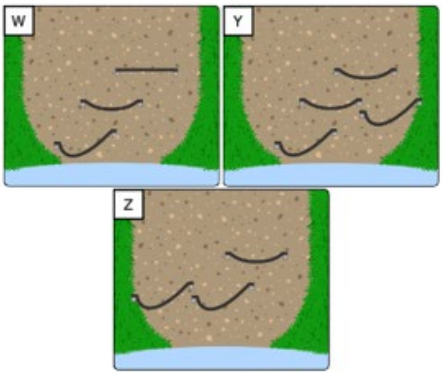
Click here to learn how to use the simulation.

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.

B I U 1500

Part C

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

B I U 1500

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.

B I U 1500

Number of Points Received	Percentage of Test-takers
0 pt.	30.0%
1 pt.	35.0%
2 pt.	16.0%
3 pt.	11.0%
4 pt.	7.0%
Omitting	0.0%

Scoring Guide for Parts B, C, and D (3.ESS.3.1, EAE)	
Score	**Description**
4	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.
3	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.
2	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.
1	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.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

* Innovative Assessment item types are selected-response (SR), technology-enhanced (TE), simulation (SIM), and constructed- response (CR).
** Sample responses and scoring guidelines for constructed-response items will be posted to the Department's website later this year.