

Name _____ Date _____

Carrying Out the Solution 4-4**The problem:**

Our solution:

Materials needed to carry out the solution:

Data we will collect:

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Exit Slip 4-4

Your class figured out that an increase in human activity caused the tiger salamanders to disappear from Bayshore Pool. Now, Dr. Cortez is asking for your help to design a solution to this problem.



When designing a solution, it's important to consider the criteria for success and constraints.



1. Identify whether each statement indicates a criterion for success or a constraint. Circle the correct answer.

- a. The solution should be tested within one year.

Criterion for success

Constraint

- b. The solution should increase the number of tiger salamanders in the vernal pool.

Criterion for success

Constraint

- c. The solution should require only materials found in Dr. Cortez's laboratory.

Criterion for success

Constraint

- d. The solution should maintain a healthy environment for other organisms in the vernal pool.

Criterion for success

Constraint

2. Identify one possible solution that meets the criteria for success and constraints.

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Engineering Design 4-4: Monitoring the Design

1. What human activities cause the problem of plastic pollution in the ocean ecosystems?

2. What pattern do you find in our data for the design solution?

3. How does the design solution meet the criterion for success? Include data that shows the design solution is meeting the criterion for success.

4. How does the design solution meet the constraints?

5. What is our prediction for our design solution's impact on the problem we identified?

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Article 4-4: Cleaning Up the Great Pacific Garbage Patch¹

The campaign to rid the world's oceans of plastic trash marked a turning point last September as a giant, floating trash-collector steamed out of San Francisco on a mission to clean up the Great Pacific Garbage Patch.

The trash-collector was designed by Boyan Slat, a 24-year-old man from the Netherlands. He was inspired to solve the problem of trash in the ocean when he was on a beach vacation in Greece. He saw so much plastic floating in the ocean. Slat decided to make cleaning up the ocean his mission.



Slat's trash-collector has gone through several design changes. At first it was going to be attached to the ocean floor. That design was dropped, and the current design has the trash-collector floating on the surface of the ocean. If everything goes as planned, the device should collect 100,000 to 150,000 pounds of garbage in the first year.

Some say the project doesn't solve the true problem: plastic pollution entering the ocean. Critics of the trash collector argue that the cost of the trash-collector is a serious constraint. Preventing plastic from flowing into the ocean is a less expensive solution. "What's floating on the surface of the ocean is only 3% of the plastic that enters the ocean every single year," says Eben Schwartz, marine debris program manager for the California Coastal Commission.



Over the course of the next year, engineers will test the floating trash-collector as a solution to cleaning up plastic in the ocean. Will this device be the first design to clean up large amounts of plastic? Will the trash-collector be able to survive the windy, salty weather of the Pacific Ocean? How will the trash-collector affect ocean animals? There are still a lot of questions about this design solution.

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¹ Article adapted from L. Parker (2019). Floating trash collector has setback in Pacific Garbage Patch. Retrieved from

<https://www.nationalgeographic.com/environment/2018/09/ocean-cleanup-plastic-pacific-garbage-patch-news/>

Article 4-4: Questions

1. What are the constraints of Slat's trash-collector design?

2. What are the criteria for success?

3. Does Slat's design solve the problem of plastic pollution harming ocean animals?

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Communicating Findings 4-4:

Why does it matter if I drink tap water or bottled water?

Write a letter to your target group to communicate your answer to this question.

In your letter, include information about:

- Sources of tap and bottled water
- Quality of tap and bottled water
- Whether we will run out of tap and bottled water
- Impact of plastic bottles on ocean animals
- Your engineering design solution (You could even invite the target group to be a part of the solution!)

[illegible]