

Engineering a Sponge Creature Habitat - Teacher's Guide

Abstract

After students learn about some adaptations shown by desert plants and animals, they plan, design, and test their own solution for reducing evaporative loss from their sponge "creature." Sponges are weighed at the beginning and end of the experiment (1-3 days), and the creature with the smallest water loss wins.

Grade level: 5th grade

Duration and Teacher Preparation

Preparation - 10 minutes

Activity

- a) 60 minutes for slide show and designing plan
- b) 30 minutes to construct habitat and weigh sponge creature
- c) 30 minutes to collect and analyze final data

Next Generation Science Standards

- 3-5-ETS.1. Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, cost.
- 3-5-ETS.2. Compare multiple possible solutions to a problem.
- 3-5-ETS.3. Plan and carry out fair tests in which variables are controlled and failure points considered.

Common Core State Standards

- W.5.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
- MP.5. Use appropriate tools strategically.
- M.5.NBT.4. Use place value to round decimals to any place.

Reference pages from Glimpse of the Chihuahuan Desert: pages 5-6 & 43-51

Materials (consumables underlined):

- 1 desert adaptations slide show
- 1 sponge per team (15 in kit)
- 1 foam plate per team of 2 students
- 1 plastic cup per team (15 in kit)
- 1 sponge to use as a control
- 3 scales
- Recycled materials that students bring from home or find at school
- Students need worksheets and pencils

Background

Water is limited in the desert. The Chihuahuan Desert region near Las Cruces, for instance, receives an average annual **precipitation** of only 8.9 inches (225 mm). The most important wet season, from July through September, brings more than 50% of this average rainfall.

While not much precipitation falls in the desert, the amount of water that could evaporate is high. This is due to high solar radiation and high temperatures. In our area, the **potential evaporation** (the amount of water that could evaporate if it was available) is more than 90 inches.

To live in a dry environment, desert plants and animals have numerous **adaptations**. Some adaptations are physical structures such as creosote bush's small, waxy leaves or a jackrabbit's long ears. Other adaptations are behavioral, which includes animals finding habitats within the desert that help cool the organism and reduce water loss.

In this activity, students will engineer a habitat for their sponge "creature" with the goal of minimizing water loss over the 1-3 day experiment.

Conocimiento de fondo

El agua está limitada en el desierto. La región del Desierto Chihuahuense cerca de Las Cruces, por ejemplo, recibe como promedio una **precipitación** anual de solamente 8.9 pulgadas (225 mm). La estación húmeda más importante, de julio a septiembre, aporta más del 50% de lluvia anual.

Aunque no mucha precipitación cae en el desierto, la cantidad de agua que podría evaporarse es alta. Esto es debido a la alta radiación solar y altas temperaturas. En nuestra área, la **evaporación potencial** (la cantidad de agua que podría evaporarse si estuviera disponible) es más de 90 pulgadas.

Para vivir en un medio ambiente seco, las plantas y los animales del desierto tienen numerosas **adaptaciones**. Algunas adaptaciones son estructuras físicas como las pequeñas hojas enceradas de la gobernadora o las orejas largas de una liebre. Otras adaptaciones tienen que ver con el comportamiento, que incluye que los animales

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encuentran hábitats dentro del desierto que ayudan a refrescar los organismos y reducir la pérdida de agua.

En esta actividad, los estudiantes "ingenieros" van a diseñar un hábitat para sus "criaturas" de esponja con la meta de reducir la pérdida mínima de agua durante el experimento de 1-3 días.

Procedures

1. Have students read the note from the sponge creature on their worksheet. This gives the general goal of the project. Tell them that you will show them a slide show with some real desert plant and animal adaptations. They can use this to start thinking of ideas on how to create the sponge creature habitat.
2. Show students the desert plant and animal adaptations slide show.
3. Have students work with a partner to create a plan for a habitat that will keep their sponge creature from drying out. Make sure they follow the sponge creature requests:
 - Nothing can be placed or spread directly on the sponge creature's body. For example, they cannot put Vaseline all over the sponge.
 - The sponge creature must be exposed to the air for at least 10 minutes each day. If there are habitats that are completely sealed, you will need to make sure students open them for 10 or more minutes each day.
 - After the sponge creature is in its habitat, students can not add more water to the sponge or the habitat.
4. Review the students' habitat plans and initial their worksheets once you have approved the plan.
5. Give students time to gather their supplies and construct the habitat.
6. After the habitat is prepared, have students place their sponge creature in a bowl of water for one minute. The goal is to completely saturate the sponge with water.
7. At the end of one minute, students will remove the sponge and turn the sponge above the cup of water to get rid of any water not completely held by the sponge. Next, they place the sponge on the foam plate. This allows any extra water on the sponge to fall off without making a mess in the classroom.
8. Next, students will place the sponge creature on the scale and record the initial weight on the Sponge Creature Data Table. If the scale does not read zero, they will need to press "Tare" to reset the scale prior to weighing. After weighing, students should turn off the scale and dry the top to prepare for the next group.
9. Have students carefully place their sponge creature in the habitat they created and leave it there for the duration of the experiment.
10. **IMPORTANT:** At the same time your students place their sponge creatures in the habitats, you must also set up a **control** sponge creature. Follow procedures 6-8. After the control sponge creature is saturated and weighed, place it on the foam plate and leave it in an exposed area in the classroom for the duration of the experiment. We will compare the water loss of this control to the water loss of the sponge creatures in students' habitats.
11. The experiment can run for one to three days. If your classroom is very hot and dry, you may want to run the experiment for one day only to make sure there is at least some water left in the sponges.
12. At the end of the experiment, have students carefully remove their sponge creature and weigh it again. Record the final weight on the Sponge Creature Data Table.
13. Have students calculate the total weight (water) loss for their sponge creature.
14. Create the Class Results Table with students, showing each group's water loss. Discuss the results and have students fill out the Analysis and Discussion section on their worksheet.

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Glossary

adaptation (*adaptación*) - a behavior or structure that allows a plant or animal to better survive and reproduce in a particular environment

control (*control*) - a subject in an experiment where the treatment is not applied, thereby serving as a comparison with the experimental group

potential evaporation (*evaporación potencial*) - the amount of water that could evaporate from an area if enough water were available. For example, although Las Cruces only receives approximately 9 inches of precipitation each year, the potential evaporation is more than 90 inches, meaning 90 inches of precipitation could evaporate if it were available.

precipitation (*precipitation*) - rain, snow, sleet, and hail

Glosario

adaptación (*adaptation*) - un comportamiento o estructura que permite que la planta o el animal sobreviva mejor y se reproduzca en un ambiente particular

control (*control*) - un sujeto en un experimento en el que no se aplica el tratamiento, sirviendo así para comparación con el grupo experimental

evaporación potencial (*potential evaporation*) - la cantidad de agua que podría evaporarse de una área si suficiente agua estuviera disponible. Por ejemplo, aunque Las Cruces solamente recibe aproximadamente 9 pulgadas de precipitación cada año, la evaporación potencial es más de 90 pulgadas, es decir, que 90 pulgadas de precipitación podrían evaporarse si ésta estuviera disponible.

precipitación (*precipitation*) - lluvia, nieve, aguanieve (cellisca) y granizo

Engineering a Sponge Creature Habitat

Question: What is the best “habitat” for reducing evaporation for a sponge creature?

Materials

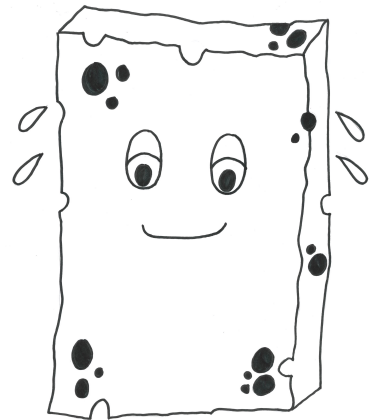
- Sponge
- Cup for water
- Recycled materials from home or school
- Foam plate
- Scale

Hi! I'm your desert sponge creature.

I'm on my way back home and need to rest here in your classroom for a few days. The problem is, it is dry here. Will you please make a nice habitat for me to stay in for a few days? I have a couple of requests:

- Please don't put anything directly on my body. Make a nice habitat that you can put me in and take me out of easily.
- I don't need much air, but please make sure I have access to some fresh air for at least 10 minutes every day.
- Follow the directions below and let me soak up water at the start of my stay, but please don't add more water after that.

Thank you for your help!



Procedures

1. With your partner, create a plan for a habitat that will keep your sponge creature from drying out. Make sure you follow the sponge creature requests above. Describe your habitat plan below.

We are going to wash out 4 milk cartons and then cut and tape them into a large box. We will cover the opening with a napkin that we tape onto the top. For 10 minutes every day, we will lift up the napkin so our sponge creature can breathe. We will decorate the outside of the milk cartons with pictures of flowers so our sponge creature will feel at home and happy.

2. Ask your teacher to approve your plan and then place her/his initials here: SVB

Engineering a Sponge Creature Habitat - Answer Key and Samples

Engineering a Sponge Creature Habitat, continued

- Gather your supplies and construct your habitat.
- After your habitat is prepared, place your sponge creature in a bowl of water for one minute. The goal is for the sponge to soak up as much water as it can.
- At the end of one minute, remove the sponge and turn it over the cup to get rid of water not completely held by the sponge. Place the sponge on the foam plate. This will let any water not actually in the sponge to fall off without making a mess in the classroom.
- Make sure the scale reads 0 g before you weigh your sponge. You may have to press “Tare” to reset the scale. Place your sponge creature on the scale and record the initial weight on the Sponge Creature Data Table. Turn off the scale and dry off the top to prepare it for the next group.
- Place your sponge creature in the habitat you created and leave it there for the duration of the experiment.
- Help your teacher set up the control sponge creature. This sponge creature will be left out in the classroom rather than placed into a habitat.
- At the end of the experiment, carefully remove your sponge creature and weigh it again. Record the final weight on the Sponge Creature Data Table.
- Calculate the total weight loss for your sponge creature.
- With your class, fill out the Class Results Table on the next page. Compare your sponge creature’s water loss with the water lost by other sponge creatures and with the control.
- Answer the Analysis and Discussion questions.

	Weight of the sponge	Weight rounded to nearest <u>whole number</u>
Starting weight	60.1 g	60 g
Final weight	49.9 g	50 g
Total water lost (starting weight minus final weight)	10.2 g	10 g

Engineering a Sponge Creature Habitat - Answer Key and Samples

Engineering a Sponge Creature Habitat, continued

Class Results Table

Group Number	Total Water Lost	Habitat
Control	21.0 g	Left out in the classroom.
1	10.2 g	Milk boxes with napkin over the top
2	22.4 g	Plastic tray with cage of pipe cleaners around sponge.
3	49.6 g	Paper cracker box.
4	13.6 g	Wrapped in a wet paper towel.
5	9.2 g	Two butter containers; sponge is between the two.
6	7.7 g	Plastic bag completely sealed except for 10 min/day
7	13.9 g	Plastic bag with holes poked in it.
8	36.4 g	Cardboard box decorated with tissue paper.
9	13.0 g	Empty tissue box lined with plastic wrap.
10		
11		
12		
13		
14		
15		

Analysis and Discussion

1. Which type of habitat was best for reducing water loss? **The sealed plastic bag.**
2. What was the difference in water loss between your habitat and the best habitat? **2.5 g**
3. Which had the lowest water loss - your habitat or the control? **Our habitat**
What was the difference in water loss between your habitat and the control? **10.8 g**
4. Based on the results of these trials, how would you change your habitat if you were doing this again?
Write your answer on the back of this worksheet.

Name: _____

Date: _____

Engineering a Sponge Creature Habitat

Question: What is the best “habitat” for reducing evaporation for a sponge creature?

Materials

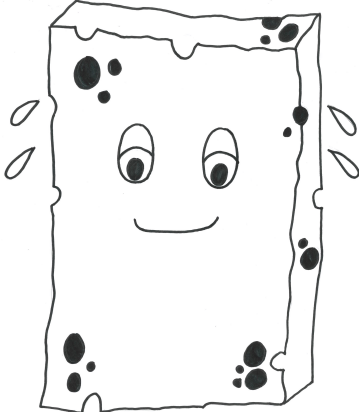
- Sponge
- Cup for water
- Recycled materials from home or school
- Foam plate
- Scale

Hi! I'm your desert sponge creature.

I'm on my way back home and need to rest here in your classroom for a few days. The problem is, it is dry here. Will you please make a nice habitat for me to stay in for a few days? I have a couple of requests:

- Please don't put anything directly on my body. Make a nice habitat that you can put me in and take me out of easily.
- I don't need much air, but please make sure I have access to some fresh air for at least 10 minutes every day.
- Follow the directions below and let me soak up water at the start of my stay, but please don't add more water after that.

Thank you for your help!



Procedures

1. With your partner, create a plan for a habitat that will keep your sponge creature from drying out. Make sure you follow the sponge creature requests above. Describe your habitat plan below.

2. Ask your teacher to approve your plan and then place her/his initials here: _____

Name: _____

Date: _____

Engineering a Sponge Creature Habitat, continued

3. Gather your supplies and construct your habitat.
4. After your habitat is prepared, place your sponge creature in a cup of water for one minute. The goal is for the sponge to soak up as much water as it can.
5. At the end of one minute, remove the sponge and turn it over the cup to get rid of water not completely held by the sponge. Place the sponge on the foam plate. This will let any water not actually in the sponge to fall off without making a mess in the classroom.
6. Make sure the scale reads 0 g before you weigh your sponge. You may have to press "Tare" to reset the scale. Place your sponge creature on the scale and record the initial weight on the Sponge Creature Data Table. Turn off the scale and dry off the top to prepare it for the next group.
7. Place your sponge creature in the habitat you created and leave it there for the duration of the experiment.
8. Help your teacher set up the control sponge creature. This sponge creature will be left out in the classroom rather than placed into a habitat.
9. At the end of the experiment, carefully remove your sponge creature and weigh it again. Record the final weight on the Sponge Creature Data Table.
10. Calculate the total weight loss for your sponge creature.
11. With your class, fill out the Class Results Table on the next page. Compare your sponge creature's water loss with the water lost by other sponge creatures and with the control.
12. Answer the Analysis and Discussion questions.

Sponge Creature Data Table

	Weight of the sponge	Weight rounded to nearest whole number
Starting weight		
Final weight		
Total water lost (starting weight minus final weight)		

Name: _____

Date: _____

Engineering a Sponge Creature Habitat, continued

Class Results Table

Group Number	Total Water Lost	Habitat
Control		Left out in the classroom.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Analysis and Discussion

1. Which type of habitat was best for reducing water loss? _____
2. What was the difference in water loss between your habitat and the best habitat? _____
3. Which had the lower water loss - the sponge in your habitat or the control sponge? _____
What was the difference in water loss between your habitat and the control? _____
4. Based on the results of these trials, how would you change your habitat if you were doing this again?
Write your answer on the back of this worksheet.

Nombre: _____

Fecha: _____

Hoy Soy Ingeniero: Diseñando un Hábitat para Mi Criatura de Esponja

Pregunta: ¿Cuál es el hábitat mejor para reducir la evaporación de una criatura de esponja?

Materiales

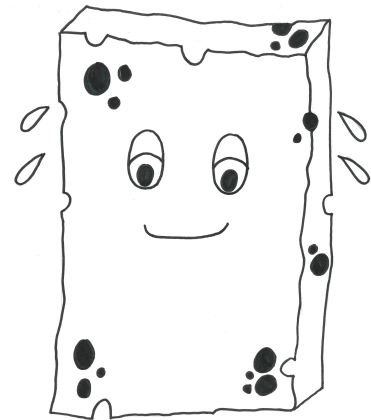
- Esponja
- Vaso de plástico
- Materiales reciclados de la casa o la escuela
- Plato de poliestireno
- Balanza

¡Hola! Soy tu criatura de esponja del desierto.

Voy rumbo a casa y necesito descansar en tu salón de clases por unos días. El problema es que aquí está seco. Por favor, ¿me harías un hábitat agradable para quedarme aquí por unos días? Tengo un par de peticiones:

- Por favor no pongas nada directamente sobre mi cuerpo. Haz un hábitat agradable en donde me puedas meter y sacar fácilmente.
- No necesito mucho aire, pero por favor asegúrate de que tenga acceso al aire fresco por lo menos 10 minutos cada día.
- Sigue las instrucciones abajo y déjame absorber el agua al comienzo de mi estancia, pero por favor, no añadas más agua después.

¡Gracias por tu ayuda!



Procedimientos

1. Con tu compañero/a, crea un plan para un hábitat que resguardará a tu criatura de esponja para que **no** se seque. Asegúrate de seguir las peticiones de arriba. Describe el plan de tu hábitat abajo.

2. Pídele a tu maestro/a que apruebe tu plan y pon sus iniciales aquí: _____

Nombre: _____

Fecha: _____

Hoy Soy Ingeniero: Diseñando un Hábitat para Mi Criatura de Esponja

- Reúne tus materiales y construye tu hábitat.
- Después de preparar tu hábitat, pon tu criatura de esponja en un vaso de plástico con agua por un minuto. La meta es que la esponja absorba la cantidad más posible de agua.
- Al fin de un minuto, saca la esponja y ponla sobre el vaso para quitar cualquier cantidad de agua que no está dentro de la esponja. Pon la esponja en el plato poliestireno. Esto permitirá que cualquier agua que no está en la esponja se caiga sin hacer un lío en el salón de clase.
- Asegúrate que la balanza se lee 0 g antes de pesar tu esponja. Puede ser que tienes que oprimir "Tare" para fijar la balanza otra vez. Pon tu criatura de esponja en la balanza y anota el peso inicial en la Hoja de Datos: Criatura de Esponja. Apaga la balanza y seca la parte encima para prepararla para el próximo grupo.
- Pon tu criatura de esponja en el hábitat que has creado y déjala ahí por la duración del experimento.
- Ayúdale a tu maestro/a a preparar la criatura de esponja de control. Esta criatura de esponja se quedará al aire libre en el salón de clases en lugar de colocarse en un hábitat.
- Al fin del experimento, cuidadosamente saca tu criatura de esponja y pésala otra vez. Anota el peso final en la Hoja de Datos: Criatura de Esponja.
- Calcula la pérdida total de peso de tu criatura de esponja.
- Con tu clase, llena la Hoja de Resultados de la Clase en la próxima página. Compara la pérdida de agua de tu criatura de esponja contra la pérdida de agua de otras criaturas de esponja y con el control.
- Contesta las preguntas de Análisis y Discusión.

	Peso de la esponja	Peso redondeado al número entero más cercano
Peso al empezar		
Peso final		
Pérdida total de agua (peso al empezar menos peso final)		

Nombre: _____

Fecha: _____

Hoy Soy Ingeniero: Diseñando un Hábitat para Mi Criatura de Esponja

Hoja de Resultados de la Clase

Número de Grupo	Pérdida Total de Agua	Hábitat
Control		Quedó en el salón de clases.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Análisis y Discusión

1. ¿Cuál tipo de hábitat era mejor para reducir la pérdida de agua? _____
2. ¿Cuál es la diferencia de pérdida de agua entre tu hábitat y el mejor hábitat? _____
3. ¿Cuál la pérdida de agua menos grande - la esponja en tu habitat o la esponja de control? _____
 ¿Cuál es la diferencia de pérdida de agua entre tu hábitat y el control? _____
4. Basado en los resultados de estos ensayos, ¿cómo cambiaría tu hábitat si lo hicieras otra vez?
 Escribe tu respuesta al otro lado de esta hoja de trabajo.