SCIENTIST IN RESIDENCE PROGRAM

Science Unit **Cycles: water and life**

Lesson 1 ***Design an evaporation experiment***

Summary In this lesson, students design an experiment to test how heat, wind, surface area and humidity impact the rate of evaporation.

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Grade level	2-6
Class time needed	1 hour
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LEARNING OBJECTIVES

1	Test the factors that affect the rate of evaporation
2	Experience setting up a simple control experiment
3	Learn why we only change one variable in an experiment

SUPPLIES

- 2 identical containers per student, such as a plastic cup
- Some wider containers, such as plates with sides
- Fan
- Heat source, such as a heat lamp or heating pad
- Terrarium (a clear plastic container with a lid and a few potted plants inside is sufficient)

BACKGROUND INFORMATION

Evaporation is the process of a liquid changing to a gas. Evaporation is an important part of the water cycle. The rate of evaporation is affected by four factors:

- Heat
- Wind
- Surface area of the water
- Humidity of the air

By changing only one of the above we can test if these factors affect the rate of evaporation.

In this lesson, students conduct a simple experiment to test the hypothesis that the above factors affect the rate of evaporation. In a scientific experiment we must test only one factor or variable at a time. If we try to test more than one variable at a time (i.e. heat and wind) then we won't know which variable affected the rate of evaporation.

In this experiment, students are provided with four treatment options (heat, wind, surface area or humidity). Students choose **one** treatment to compare with the control. For older students, they could come up with a hypothesis and design the experiment to test their hypothesis.

THE LESSON

Pre-lesson	Review the concept of evaporation and the water cycle.
The Hook	**Brainstorm** 1. What do you think affects the rate of evaporation? **2.** How do we test your prediction? **Play the Evaporation Game** • Everyone stands up. • Students pretend to be water molecules. • The scientist or teacher shouts out different treatments such as "Whew the sun comes out and you start to move around. Then the sun goes behind a cloud what happens to you the water molecule?"

Hands-on Activity	**Conduct an evaporation experiment that compares a control and a treatment.**
	• Students choose which type of treatment they are going to test:
	  ○ Heat (same type of container, different locations), or
	  ○ Wind (same type of container, different locations), or
	  ○ Surface Area (different types of containers, same location), or
	  ○ Terrarium (same type of container, different locations).
	• Set up a heat source, a fan, and a terrarium in different places in the classroom. Provide a space for controls that will not be affected by the heat or wind.
	• Students put equal amounts of water in each of their two containers. They mark the level of water with a whiteboard crayon at the beginning of the experiment.
	• Students use the observation sheet to record their experiment.

Wrap Up	**Gather as a class** Which treatment did you choose? What do you think will happen during your experiment?

VOCABULARY

Control experiment	An experiment where only one variable is changed.
Evaporation	The process of a liquid turning into a gas.
Hypothesis	A prediction of what you think will happen during your experiment.
Observations	What you notice when you pay careful attention. A key skill scientist use everyday.
Rate of evaporation	How quickly water changes from a liquid into a gas.
Result	The outcome of your experiment.
Treatment variable	The thing you changed in your experiment.

REFERENCES

The Water Cycle: Evaporation. USGS Water Science School. https://water.usgs.gov/edu/watercycleevaporation.html Accessed February 2018.

https://earthobservatory.nasa.gov/Features/Water/ Accessed February 2018.

ADD EVAPORATION EXPERIMENT WORKSHEET

EXTENSION

Older students could design their own experiment and come up with the variables to test.

Typically in an experiment scientist would have replicates (i.e. not just have one control container and one treatment container). Replicates allow us to see if our experiment is repeatable and statistically significant. If students are ready, if you have the time and you have the space it would be great to include replicates in your experiments. In this experiment, each student is only testing one treatment variable and one control variable therefore they don't have replicates although as a class if a number of student use the same treatment then we do have replicates.