



Wildlife Science @ Home: Ectotherms

STUDENT ACTIVITY

Why do we often see lizards resting on rocks in the early morning?

You are probably aware already that reptiles such as lizards are cold-blooded. But, what does that mean? Is their blood really cold? The answer is, "No."

Cold-blooded is a term used to describe what scientists call ectothermic. This simply means the animal must use its environment to control its body temperature. This is very different from mammals and other warm-blooded animals--take us, for example. Human beings are endothermic. We are capable of controlling our body temperature, usually by getting energy and heat from the food we eat. Our body temperature does not change with the outside temperature. It remains relatively constant.

Reptiles and other ectothermic animals cannot use food to control their body temperatures. If a lizard is cold, it needs to move to a warmer location. This is often on a rock in the sun. But how much can the sun affect a lizard's body temperature? Does it matter if the lizard lies on a rock on the grass if they are both in the sun?

These are good questions to answer with a science experiment. Since we don't want to harm animals (or ourselves) in the experiment, you are going to do a simulation. You will pretend that containers of water are lizards (this actually isn't as ridiculous as it sounds). A lizard's body weight is nearly 70% water! You will place three water containers at different locations around the outside of your house and compare the temperature change from morning to afternoon.

Do the Science

1. Take a walk around your home and select three locations for your containers. Two should be in the sun but on different surfaces, such as grass and rocks. The other one should be in the shade. Describe these locations in your research journal.
2. Make predictions. Which location would a lizard choose as a good place to warm up? Which location would a lizard choose for cooling down? Why? Write these predictions in your research journal.

Time

Total time 45-60 minutes over the entire day; Measurements in morning, midday, early evening

Materials

- Notebook to use as a research journal
- Pen or pencil
- 3 plastic containers with lids, same size
- Water
- Measuring cup
- Thermometer

3. Label your three containers with the names of each of the locations.
4. Use the measuring cup to pour the same amount of water into each container. Write this value in your research journal.
5. Use the thermometer to measure the temperature of the water in each of the containers. This will be your beginning temperature. Record in your research journal.
6. Secure the lids on the containers and place them in their locations. It is best to place them outside in the morning so they will be exposed to the sun for the entire day.
7. Return to the containers in a couple hours. Remove the lids and measure the temperatures. Record the time and temperatures in your research journal.
8. Repeat step 7 at least two more times, in midday and early afternoon.
9. When finished with your final measurements, bring the containers inside and clean up.

Think about It

Look at the data in your research journal. Which location had the highest water temperature? What time was that at? Which location had the lowest water temperature? Was it ever lower than when you started? Were these the results you expected? Why or why not?

Now, let's attempt to analyze these results in terms of what it means for lizards. If you were a lizard that was trying to heat your body temperature up early in the morning, where do you think you would go? How long do you think you could stay there before it got too hot for you? Would you move to any other places throughout the day? If you wanted to take pictures of lizards, where and when would you look? Are there times of the day that you might want to avoid? Why or why not?

Science never stops. Our observations and data answer some questions, but in the process they create new questions. We take the knowledge we gained from an experiment and apply it to new research. This is how we continue to improve our understanding of the natural world. Based on the results of this experiment, what new questions do you have? Can you design an experiment to answer those questions?

Don't forget to record all of your thoughts and response to these questions in your research journal. A written record of your science is important!



As an ectotherm, an eastern collared lizard needs to use its environment to change its body temperature. So, it will often sit in the sun to warm up.



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TEACHING GUIDE

In this activity, the student will better understand how ectotherms (cold-blooded animals) use their environment to help control their body temperature. The student will compare the temperature changes in sealed containers of water in various locations throughout the day and relate that to the needs of lizards and other ectotherms.

Time

The actual time spent on this activity is minimal, 45-60 minutes including setup and clean up. However, data should be collected at least three times throughout the day. Therefore, you should plan to begin this activity first thing in the morning and plan multiple 5-10 minute blocks of time throughout the day for data collection.

Teaching Tips, Modifications and Extensions

- It would be best to select locations that will be in the sun (for two containers) and in the shade (for one container) throughout the entire day of testing. You may consider observing potential locations a day or two in advance of doing the experiment to make sure you have selected appropriate locations.
- For best results, the containers should sit undisturbed throughout the day. When temperatures need to be taken, limit the disturbance. Try not to take the containers inside to take measurements.
- In the student guide, there is a brief mention of the fact that the average lizard is composed of approximately 70% water. This is an excellent opportunity to tie this activity in with the Water Conservation in the Desert Wildlife Science @ Home lesson. This activity also involves outdoor data collection using water and can be run in conjunction with this ectotherms activity.
- You may consider having students observe lizards around their house for a few days. They can record the time they saw the lizards, where they were located (e.g., block wall, rock, lawn, etc.), and what they were doing (e.g., resting, eating, running, etc.). The observations could be carried out, either before or after this experiment is run. Observing before can help the students generate hypotheses for this experiment. Observing after can help them tie their understanding into the real world.
- If time permits, students should be given the opportunity to carry out similar experiments to address some of the questions that arose at the end. They can also be given the opportunity to suggest (and even perform) modifications to this experiment to improve their results. This might include testing additional locations, extending the testing over more days, or changing the colors or opacity of the containers.