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# Ant Lions and the Scientific Method

Middle School Lesson Plan; may be adjusted for most age levels.
Adapted by Laura Robinette Sanders, Environmental Science Institute: 8/20/10
Adapted from the NSTA lesson plan "Ant Lions and Biology" by Brad Williamson
http://www.accessexcellence.org/AE/AEPC/NSTA-share/Williamson.php

## Background Information:

Science is driven by questions. For students to really experience the process of science, they should work on answering questions that arise from their own natural curiosity. In this lesson, students design and construct their own questions and experiments, observe and analyze answers. Ant lions and their intriguing behaviors naturally generate student questions.

## Materials:

4-oz. low form cups, one per student or pair of students,
Sand, used in cups as an ant lion habitat for observations
Live ant lion specimens, two per habitat**
Ants or flour beetles, used as prey
Access to hand lenses or other observation tools
Science journals, one per student

**Note to Teachers:** All questions and investigations can be documented and recorded by students in science journals. TEKS are from §112 Implementation of Texas Essential Knowledge and Skills for Science, Elementary, and Implementation of Texas Essential Knowledge and Skills for Science, Middle School, Beginning with School Year 2010-2011.
§112.15 (Grade 4), §112.16 (Grade 5), §112.18 (Grade 6), §112.19 (Grade 7): 1A, 2, 3A, 4A, 10A, 11B, 11C, 13B,

****Acquiring ant lions** is the limiting factor for this activity. If ant lions are not available commercially, they can be easily collected. Once a suitable habitat is located, several dozen can be collected in just minutes. Ant lions range throughout the United States. Ant lion larvae prefer dry, sandy, or loose soils that are sheltered from the weather. Under the eaves of homes and buildings, along the bare loose dirt next to the foundation, hundreds of ant lion pits are often found. Other sites include the dry duff beneath juniper trees and along the sand bars of rivers. Keep an eye out for these intriguing insects and mark down locations for future use. Collecting involves using a spoon or similar instrument to scoop 1/2 inch of soil from the bottom of the pit (the ant lion should be in the sample). Many ant lions can be held, temporarily, in a large 44-oz, plastic drink cup, with minimal loss.

Ant lions survive without food or water for more than a week at a time. They can be fed small ants, fruit flies, house flies, flour beetles and more. Even if ant lions were collected from dry soil, they are easy to work with in a sand substrate. If sand has variable grain size, this is a productive area of investigation. Containers should be filled with about 1.5 to 2.5 inches of sand. There is no need to cover the container. Don't water the sand (unless the effects of rain are investigated), as the ant lions will get enough water from their prey.

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## Activity 1: Observations

Students walk into class to find a 4-oz low form cup of sand at each of their desks, one per student. In the middle of the sand is a small, conical depression. From the very beginning of class students begin to ask questions. The first student questions typically range from: "What are we supposed to do with this?" to "How did you make that hole?" Teachers respond by instructing students to record some measurements of the pit and draw a simple sketch in science journals. Do not reveal anything about the activity.

If pits collapse from movement of the cups by the students, the ant lions will begin to repair the damage to the pit after a short period of time. Then students will begin to observe that a living organism is at the bottom of the pit. Teachers should encourage students to ask and write down their newest investigations in their journals, which might include, "What is that?" "Did it make this hole?" "Why?" "What does it look like?" Support students by helping them develop their question and observation skills. If students ask for hand lenses or stereoscopes, these can be tools that support their explorations. The curiosity-based questions developed during the first activity can be used to develop hypotheses suitable for scientific investigation.

## Activity 2: Turning Questions Into Hypotheses

Teachers may choose to select some questions and observations that might work best for the classroom experience before this activity begins. Ask questions of the students to direct them toward a working hypothesis that is suitable for experimental design. For example, students may have wondered why the pits are of different sizes. Students might speculate that the size of ant lions might be related to pit size. Suggest that students come up with a way to examine this relationship. What predictions could be made? How can the predictions be tested? What factors need to be controlled in order to answer the question? If the class explores one question such as this together, they may use this as a springboard and example for their own test they design from their own questions they wrote in their journals during the previous activity.

## Activity 3: Student Research

Each student is assigned at least one ant lion to care for and serve as a focus for student research. Students can be given the option of taking the ant lions home to share the activity with their parents. Methods and results can be shared with the class in presentation format. Example student investigations include: habitat preference, substrate effects on pits, effect of rainfall on pit construction, effect of temperature on pit construction, etc.

## Additional Resources:

**Bottle Biology**. **www.bottlebiology.org**
Did you know you can use bottles to create an ecosystem, explore the concept of niche, and model a lakeshore? You may have made a tornado in a bottle but have you used bottles to pickle your own cabbage? Have you made a bottle microscope, a bottle timer or bottle tweezers? Learn how to explore science and the environment with soda bottles and other recyclable materials.

**Bernd Heinrich,** "In a Patch of Fireweed", pp 141-151

**Sally Stenhouse Kneidel,** "Creepy Crawlies and the Scientific Method", chapter 10. Though this is targeted to an elementary teacher audience, high school biology teachers that are looking for creative ways to incorporate insects as vehicles for scientific inquiry might find it beneficial.