

# Science Lessons for Grades 6-8

## “CSI Hawaii: The Case of the Sick Insect in Hawaii”

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Using the Native Biota for Science Education

**Discipline:** General Science – Hypotheses, controls, and evidence

**Grade:** 6 to 8

### Standards

Project 2061 Benchmarks:

1. Scientific investigations usually involve the collection of relevant data, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations to make sense of the collected data. 1B/M1b\*
2. If more than one variable changes at the same time in an experiment, the outcome of the experiment may not be clearly attributable to any one variable. It may not always be possible to prevent outside variables from influencing an investigation (or even to identify all of the variables). 1B/M2ab

### Purpose/Goal

By the end of the lesson, students should be able to write a testable hypothesis based on observations or known information, understand the role of a control in an experiment, and use evidence from an experiment to make a conclusion about an unknown.

### Context

Students are asked to write a hypothesis based on observations, in the context of a hypothetical situation. Information about the situation is given in text. Students may misunderstand the meaning of “observation,” thinking that observations are only possible when they can see something physically. Teachers may need to encourage students to observe what they see as well as to think about what they already know. Students may also hold the misconception that a hypothesis is simply an “educated guess.” Hypotheses in this lesson follow the “if, then, because” format and thus are an activity, a prediction, and a cause. Teachers may want to stress that hypotheses are more than just guesses but are testable predictions that express what students expect to occur. Although this lesson focuses on formulating and testing hypotheses, it does so within the context of pollution and water quality. Students who understand types, sources, causes, and consequences of water pollution will be better able to focus on the main tasks of hypothesis formation and testing. This lesson can stand alone, but is better within a series that includes an introduction to water quality and a follow-up lesson that has students formulating hypotheses about and testing water from their school (for a real-world application).

### Preparation

Teachers should gather water quality test kits, dishwasher detergent, vinegar, hand soap, cups, and plastic spoons. A water source is necessary. Teachers should divide materials for the appropriate number of groups and must make copies of the activity booklet before class. Teachers should test the detergent, vinegar, and hand soap with the local water source before class and adjust the lesson if necessary.

### Website

This lesson uses GREEN Low Cost Water Monitoring Kits, manufactured by LaMotte:  
<http://www.lamotte.com/pages/edu/5886.html>.

### Motivation

Teachers may:

1. Introduce students to water quality tests in order to reduce distractions associated with the novelty of using the tests.
2. Give students a series of interesting phrases, some of which are a) predictions, b) statements of fact, and c) hypotheses, and ask students to correctly identify the hypothesis [e.g. a) bugs will not be able to fly without wings, b) bugs have wings and fly, c) if I pull the wings off the bug then the bug will not be able to fly because bugs need wings for lift]

3. Point to something in the classroom and ask the students to make observations about the object. Expand their frame of thinking by asking them additional questions that rely on their existing knowledge (e.g. they can observe that a chair is made out of wood, but they can also use their existing knowledge to know that the wood was originally a tree).

4. Give students some hypothetical, fun situations to determine their understanding of controls (e.g. "Bobby always drinks a coca-cola at 9:00 and always burps at 9:05. Can we conclude Bobby burbs because he drank the coke?" Lead students through a discussion wherein they determine that Bobby could simply burb on time even if he did not have a coke.)

### **Description**

Students are given a hypothetical situation in which they are asked to be detectives and determine what poison (a detergent, vinegar, or hand soap) has made an insect ill. Following a storybook format, students are introduced to the problem, learn about methods to solve the problem (including water quality tests of the insect's "water bowl"), develop and test hypotheses, share their data with other groups in the class, and make a conclusion based on evidence. Students test various household "poisons," compare their results to tests of a control (plain water), and conclude what the poison was based on this evidence. An activity booklet (consisting of two legal sheets of paper folded in half) guides students through the activity and serves as a worksheet. To create interest and ownership, characters in the story are named after the school mascot and town name. This lesson is designed for group work, and students must share their results with each other in order to make a correct conclusion. This lesson will take at least two 45-minute class periods.

### **Assessment**

1. In a test, teachers can give students another hypothetical situation and ask students to formulate a hypothesis. Students should be able to phrase a hypothesis using the "if, then, because" format.

2. Students should also correctly identify the "poison," or be able to discuss errors that could have happened. Any discussion of errors indicates a higher level of knowledge.

3. Students who can correctly identify the role of the control have also likely gained a higher level of knowledge.

### **Follow-Up Activities**

Students will have learned new skills in this lesson, including formulating hypotheses and using water quality tests. Teachers can capitalize on this knowledge by applying it to a real world situation. For instance, students can make hypotheses and then test their tap water or the water of a nearby water body. This shows that both water quality testing and the scientific process have application to the real world.