

I. Lesson Overview

Title: “Holy Ethogram, Batman!”:
How to describe honeybee foraging behaviors

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Description of Lesson (Abstract):

Hands-on experience and the observation of natural processes *in situ* can be invaluable tools when it comes to teaching behavior and ecology. The complexities and relationships within systems are often best understood when students have the ability to make discoveries themselves and then make inferences relating to those observations.

In this activity, students are given a basic introduction to the foraging behaviors of bees (see complimentary PowerPoint, entitled *Bee Foraging and Adaptations*). Ideally this activity should follow the ‘*A Beeee C’s of Anatomy*’ dissection, so that students have an understanding of the physical attributes of the bees. Using this background, students then can observe the behaviors of live bees in their natural environment, and contextualize those behaviors with what they already know about foraging strategies and physiology. Since there will also be other insects (or even birds) present at the same flowers, this activity also facilitates discussions on competition and aggression.

Grade Level: 9-12, Honors Biology, can be adapted for College Prep

Duration/Time (Hours, Days): Designed for a 120min class. The PowerPoint and initial question and answer session can be compressed to save time.

Standards: National Science Education Content Standards
California Science Content Standards

Learning Objectives:

After completing this activity, students will be able to...

- a) Explain why certain behaviors benefit bees while foraging, and how their behaviors affect the flowers and other insects around them.
- b) Describe how foraging honeybees behave on flowers, and how their physiology is related to those behaviors
- c) Demonstrate how to create an ethogram, collect observational data, and interpret results

Materials:

- 1) Flowering plants that have been in an area long enough to attract honeybees
- 2) 50% Sucrose solution in a spray bottle (if there are not enough bees visiting the bushes, they can be sprayed several times a day for two days prior to the activity to stimulate visitation)

II. Student Protocol (include visuals)

Background: Please see complimentary PowerPoint presentation with notes

Pre-Assessment: Question-and-Answer dialogue during the PowerPoint

Post-Assessment: Whole-class discussion of observations, dealing primarily with their answers to the questions at the end of the worksheet.

III. Instructor Information (include visuals)

A. Please see attached Powerpoint with notes and background.

B. Preparation: Identify areas on your campus where flowers are blooming and are visited by insects. Honeysuckle is probably the best for this activity, as it tends to be a common landscaping plant, blooms most of the year in temperate climates, and attracts many kinds of nectivores. If you feel an insufficient number of bees are visiting the flowers (meaning there won't be enough action to keep students interested), you can spray the flowers and surrounding leaves with a 50% sucrose solution 3-4 times daily for 2 days prior to the activity. This will stimulate visitation to the site and noticeably increase the numbers of bees seen over the course of the day.

C. Safety Concerns: One word: bees. There is a slide in the Powerpoint that deals with proper care and handling of honeybees, and normally a discussion of why bees sting prior to the activity is enough to keep students from aggravating the bees and being stung. We have done this activity with a total of six classes (half in the Fall, half in the Spring) and had no problems. As a precaution, students who were allergic to stings or didn't know and were concerned were allowed to observe from a distance or not at all.

D. Class Setup: the Powerpoint presentation should be given either at the start of the class period or the day before. At the very least, a review of bee behaviors and the proper way to act around bees should occur at the start of the period. This normally works best if leading questions are used to prompt student discussion (examples are provided in the Notes of the Powerpoint slides). Students should form groups of 3-4, if possible, and be spaced evenly around the focal plants. After 10 minutes, groups should rotate to a new location. Time should be left at the end of the period for a review discussion of their observations.

E. Assessment

1. **Informal/Formative:** At the end of the activity, a whole-class discussion of their observations to ensure students understood what they saw. Whenever possible, other students should answer any questions that come up based on their own observations. During this discussion, the instructor acts more as a mediator than a lecturer, prompting the conversation along.

2. **Formal/Summative:** The questions at the end of the worksheet serve as the formal assessment. Based on instructor preference, students can attempt to answer these questions prior to the whole-class discussion and revise them afterwards, or simply have students wait until the discussion is complete.

IV. Appendices

- 1) *Sample PowerPoint*
- 2) *Sample Worksheet*
- 3) *Answer Key*

For more information, please contact Meg Eckles (meg.eckles@gmail.com).
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