

# Bay Area Scientists in Schools Presentation Plan

**Lesson Name** Insect Physiology

**Presenter(s)** Candice Torres, Natalia Chousou-Polydouri, Lisa Fernandez

**Grade Level** 5<sup>th</sup> **Standards Connection(s)** life sciences: multicellular organisms have specialized structures

**Abstract:** This extremely hands-on presentation will explore insect physiology and the systems humans and insects have in common. An introductory activity involving the entire classroom will give students the opportunity to experience the insect sense of smell. Through crafts, games, and puzzles, three different stations will demonstrate the insect skeletal, circulatory, and digestive systems.

## **Vocabulary/Definitions:**

- physiology: the science of organisms and how their bodies work
- exoskeleton: a hard shell that supports and protects an insect
- molting: shedding the entire exoskeleton
- circulatory system: body parts that circulate fluid with nutrients and oxygen
- hemolymph: insect blood
- digestive system: body parts that digest and help food move

## **Materials:**

We will bring all materials necessary for the presentation.

The introductory activity requires scented strips of paper.

Station 1: straws and string.

Station 2: rectangular planter full of water, food coloring, tubes, pumps.

Station 3: puzzles & party blowers.

## **Classroom Set-up:**

Three different learning stations will be set up beforehand by the presenters. If possible, the circulatory system station should be conducted outside, because it involves water. The students will separate into three groups and rotate to each station.

## **Classroom Visit**

### **1. Personal Introduction:**

3 Minutes

We are students from UC Berkeley, in the Environmental, Science, Policy and Management Department. We belong to a group called Organisms and the Environment, and we all study different organisms. Candice studies ants, Natalia studies spiders, and Lisa studies mealybugs (each of us will introduce ourselves). We would like to introduce the idea of insect physiology, and share what we know about insects through a variety of activities.



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**Topic Introduction:****20 Minutes**

What is physiology? We'll briefly discuss what the term means, and how it relates to different systems within an organism. What are some examples of human systems? For instance, does any one know what the olfactory system in humans does? It allows us to smell. What do we use our sense of smell for? Ants use their olfactory system to recognize one another. (Here we tape a strip of paper with one of three scents to the students' hands. Like ants, the students smell one another to identify who is in their group. Once they have found their groups, we will begin the next activities).

**2. Learning Experience(s):****40 Minutes**

Each group will spend 10 minutes at each station, then rotate to the next.

**Station 1 (Candice- The Skeletal System):** In insects, the skeleton is on the outside and the muscles attach from the inside to make it move. Molting is a "problem" that insects have to solve, since their skeleton is on the outside. When they want to grow, they have to shed their exoskeleton whereas human bones grow inside and the skin grows too. The students will create small models an insect leg and compare them to those of a human. To do this, we will use string and bendy straws. The strings will be tied and threaded through the straws, as muscles, and the straws are the exoskeletons. When the string is pulled, the straw bends just like a muscle pulling to move a leg.

**Station 2 (Natalia- Circulatory System):** I will ask about the human circulatory system and explain that it is a closed system of tubes/veins. Conversely, insects have an open circulatory system where hemolymph (insect blood) flows freely around the organs carrying nutrients. This will be displayed by means of colored water diffusing through water with the help of a pump (i.e. to mimic a heart). Students will take turns pumping food coloring through the water, as nutrients are pumped through the hemolymph.

**Station 3 (Lisa- Digestive System):** I will present a large, black background shaped like the silhouette of an insect. This will have outlines of where the insect digestive organs are located (similar to a puzzle board). There will be pictures of each organ labeled with its name on one side, and its definition on the back. Each student will be given a specific organ at the beginning of the activity. As each part is defined and discussed, the students will place their organ on the insect. There will also be an outline of a human with the corresponding organs, and I will ask them to identify what organs in humans serve the same function as those of the insect. I will show pictures of different insect mouthparts (chewing vs. sucking), and then give them "party blowers" that resemble how a proboscis (sucking mouthpart) functions.

**3. Wrap-up: Sharing Experiences and Building Connections** \_\_\_\_\_ **5** \_\_\_\_\_ **Minutes**

*Putting the pieces together – how will students share learning, interpret experience, build vocabulary?*

Rather than asking specific questions, we will open the discussion and ask for volunteers to share what they learned (i.e. what was their favorite station, word, organ, etc). A handout will be left with the teacher; students can color and label pictures of what they learned.

**4. Close:** \_\_\_\_\_ **2** \_\_\_\_\_ **Minutes**

*How can kids learn more? Thanks and good-bye! Clean-up.*

We will refer the students to different websites and address any last minute questions.

**TOTAL** \_\_\_\_\_ **70** \_\_\_\_\_ **Minutes**

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## INSECT

### Foregut

*esophagus*: food travels through this tube after swallowing

*salivary glands*: these produce a liquid that digests food in the mouth

*crop*: this organ is like a bag that stores and digests food

### Midgut

*caecum*: this organ stores bacteria which help digest food

*ventriculus*: in this long organ, most nutrients are absorbed from food

*Malpighian tubules*: these filter waste from the circulatory system

### Hindgut

*colon*: a tube that passes waste and may remove water from it

*rectum*: this organ that stores solid waste before it leaves the body

## HUMAN

*esophagus*: food travels through this tube after swallowing

*salivary glands*: these produce a liquid that digests food in the mouth

*stomach*: this organ is like a bag that stores and digests food

*caecum*: this organ stores bacteria which help digest food

*small intestine*: in this long organ, most nutrients are absorbed from food

*kidneys*: these filter waste from the circulatory system

*bladder*: this organ stores liquid waste before excretion

*colon*: a tube that passes waste and removes water from it

*rectum*: this organ that stores solid waste before it leaves the body



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## Follow-up – After Presentation

Suggest students write a letter explaining “How we learned about insect physiology...”

**Invent an Insect** (*California Academy of Sciences*) In this creative activity, learners will find out what makes an insect an insect by studying examples of insect adaptations and by examining why there are so many different types of insects. Learners will also design their own insect based on the needs of a specific environment. This standard-based lesson plan includes great extension ideas, resources for educators, and discussion questions.

<http://www.calacademy.org/teachers/resources/lessons/invent-an-insect/>

### Reading Connections:

- Kingdom: Micro Monsters: Extreme Encounters With Invisible Armies. Nam Nguyen. Kingfisher. 48pp. Trade ISBN 978-0-7534-6455-7, \$14.99. (6–8) The incredible photographs in this book zoom in on tiny insects and nearly invisible creatures to illustrate the amazing adaptations that allow these animals to survive and thrive. Glossary. (KLO) IV.

<http://www.nsta.org/recommends/ViewProduct.aspx?ProductID=20115>

**Supplemental Material: Zoom in On True Bugs** (Scholastic)

<http://teacher.scholastic.com/activities/explorations/bug/libraryarticle.asp?ItemID=124&SubjectID=138&categoryID=4>

- Praying Mantises: Hungry Insect Heroes. Sandra Markle. Lerner Publishing Group. 48pp. Library ISBN 978-0-8225-7300-5, \$27.93; Paperback ISBN 978-0-8225-8985-3, \$8.95. (I) Fascinating text, close-up photographs, and accurate diagrams reveal remarkable information about one of nature’s insect heroes—the praying mantis. Through this captivating book, readers will gain an appreciation of these incredible hunters that help rid farms and gardens of insect pests. Glossary, Index, Websites, Further Reading. PJC (II, IV, VIII)

<http://www.nsta.org/recommends/ViewProduct.aspx?ProductID=18484>