Lesson 3: Adaptations of a Bold Blood Sucker

Overview

Students investigate mosquito adaptations at different stages of their life cycle, reinforcing how mosquitoes require water to develop and how to stay safe from them. A short interactive multimedia presentation provides an overview of the important concepts and terms, then students create models of a new type of blood-sucking organism using natural or human-made materials. Adaptations / extensions are listed at the end of the lesson, including ways to include a variety of classroom centers to help meet the needs of all learners.

Subjects: Science, Writing, Speaking & Listening, Reading, and Art

Grades: Adaptable for K–12

Duration: 40–75 minutes

Vocabulary

- Adaptations
- Behavioral adaptations
- Engineering design
- Larva / larvae
- Metamorphosis
- Model
- Proboscis
- Pupa / pupae
- Structural adaptations

Lesson Goals

- Increase students' understanding of mosquito adaptations that help them to survive and reproduce, as well as how to stay safe from them
- Provide students with the opportunity to apply the concept of adaptations to the process of engineering design

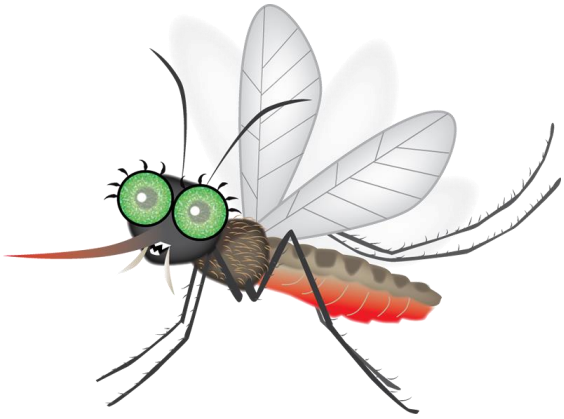
Objectives

- Students will demonstrate understanding of mosquito adaptations at all four stages of their life cycle, including ways they are able to suck blood, reproduce, and survive as larvae, and transform through the process of metamorphosis.
- Students will create models of a new blood-sucking organism and share it with their peers, gaining feedback which could be incorporated into a new iteration of the design.
- Students will write about how their organisms are adapted to survive and share their ideas and models in class presentations and/or discussion.
- Students will verbalize the importance of water in the mosquito life cycle and how they are adapted to best utilize it.

A student explains the adaptations of his new organism.
Courtesy Lucinda Watson, River Grove Elementary School, Lake Oswego, OR

Standards		Middle School (Grades 6-8)
Next Generation Science Standards (NGSS)	**Crosscutting Concepts**	• Structure and Function • Stability and Change
	Science & Engineering Practices	• Asking Questions and Defining Problems • Constructing Explanations and Designing Solutions • Developing and Using Models • Obtaining, Evaluating, and Communicating Information
	Disciplinary Core Ideas	LS1.A: Structure and Function LS1.B: Growth and Development of Organisms LS4.C: Adaptation
Common Core State Standards	**Speaking & Listening**	1, 2, 4, 6
	Language Standards	1, 2, 3, 6
	Writing Standards Science & Technical Subjects	4, 7, 10

Materials & Preparation

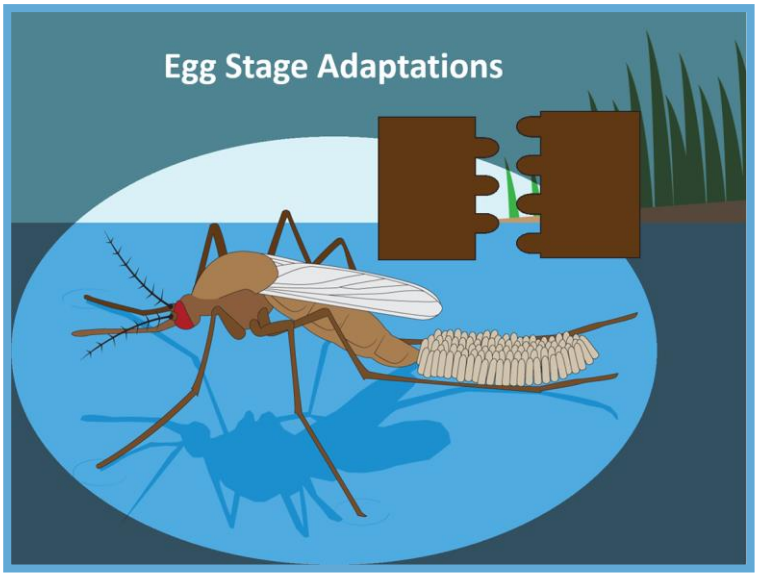


- Prepare to show the *Adaptations of a Bold Blood Sucker* PowerPoint presentation available at fightthebites.com/education/resources. Review the slide notes on the bottom of the slides.
- Write the word "Adaptations" on the board to refer to during the lesson.
- Copies of the "Beware of Mosquitula!" handout for each student (at end of lesson)
- *Optional:* Modeling clay or Play-Doh and natural materials like dried vegetation, twigs, pine needles, and pine cones for students to share
- *Optional:* Human-made materials for students to share, such as used paper towel tubes and/or toilet paper tubes, popsicle sticks, elastic bands, paper, cardboard, tape, and non-toxic glue
- *Optional:* Paper plates on which to construct creatures
- *Optional:* Colored pencils, markers and/or crayons for students to share
- *Optional:* Be ready to magnify dry mosquitoes and/or live mosquito larvae
- *Optional:* Microscope(s) and/or hand lens(es)
- *Optional:* Enlarged photographs of mosquitoes at all 4 life stages

Suggested Procedure

1. Ask students to turn to a neighbor and quickly brainstorm everything they know about how mosquitoes survive and why they can be dangerous. They should jot down their ideas on a piece of paper in words and pictures. Circulate through the room, answering any questions. After about a minute, tell students they have another 30 seconds to brainstorm and that they should be prepared to share one or more of their ideas with the class.
2. Ask the pairs to share their ideas with the class, and explain that the traits which help an organism (living thing) survive in their environment are called **adaptations**, pointing out the word on the board.

3. Share the *Adaptations of a Bold Blood Sucker* PowerPoint presentation with the class, including the brief video clips. Quickly present the visuals and information in the slide notes with the class in an interactive way.
4. When you get to the last slide of the presentation, ask students if they can remember the mosquito adaptations that were discussed for each stage. Discuss the difference between **structural adaptations** (physical structures of an organism which help it to survive) and **behavioral adaptations** (what an organism does which helps it survive). Ask students to spend a minute talking to a neighbor about mosquito adaptations and which they think are the most interesting. *Optional:* Ask students to draw and label and/or act out the adaptations they remember.



An animated slide from the "Adaptations of a Bold Blood Sucker" PowerPoint presentation
Courtesy Eric Engh, Marin/Sonoma Mosquito & Vector Control District

5. Next, tell students that they will have the opportunity to create a NEW organism which is either adapted to suck blood from other organisms OR has effective defenses against such blood-sucking organisms. Explain that they will be able to use a variety of materials, their creativity, and what they have learned about adaptations to help with their **engineering designs**. Show them the available materials, such as clay, natural vegetation, and/or human-made materials such as toilet paper tubes, used paper, and popsicle sticks with which they can work.

Students begin modeling new organisms with clay, inspired by magnified specimens and images of mosquitoes at different life stages.
Rick Reynolds

6. Ask students to choose a partner and collect materials with which to work. Rotate though the groups of students, answering questions and helping students get started, if necessary. Tell students that they should be prepared to present their work to the class, and that if they have time, they can create another life stage for their organism (such as a mosquito's larval stage).

7. After about 15 minutes, or whenever groups start to complete their designs, tell them that they have 5 minutes left to work. Explain that you will be looking for volunteers to make a brief presentation to the class about their organisms, and ask them to start cleaning up when they are finished. When 5 minutes have passed, ask the remaining students to help clean up.
8. Ask students to explain their organisms' adaptations in writing using one of the following methods or another way which they devise:
    - Labels can be created with small pieces of card stock and attached to their organisms with toothpicks and tape or another method.
    - They can illustrate their engineering designs on paper, labeling the adaptations which help them to survive. Color can be added with pencils, markers, or crayons.

A student proudly presents her new organism.
Courtesy Lucinda Watson, River Grove Elementary School, Lake Oswego, OR

9. Ask students to raise their hands if they would like to share their organism with the class. Call on a few groups, one at a time, to stand up and share their work, giving other class members a chance to ask questions about the organisms' adaptations at the end of each short presentation.
10. Tell students that they will be able to finish their projects for homework or in class the next day (if necessary and as you deem appropriate). Collect the finished projects to review more carefully and display around the classroom and/or the school. You could also ask students to refine their creations based on constructive feedback you and/or the rest of the class has provided before the creations are displayed publicly.
11. Close with a quick review of concepts learned during the lesson and ways students can help in the fight against mosquitoes (dumping standing water, staying safe from bites, educating others, etc.). Pass out the "Beware of Mosquitula!" handout for students to share with their families.

Adaptations / Extensions

- **Ask students to first plan their organisms** on paper before they start engineering them with physical materials, labeling the adaptations which will help the organisms to survive.
- **Classroom centers can be setup** with other activities related to adaptations, the new organisms, and/or mosquitoes, such as those listed below. This would provide more opportunity for student choice and differentiated learning experiences.

- **Students can create fictional stories** featuring their organisms.
- **Ask students to compare mosquitoes with their new organisms.** For example, a Venn diagram could be used. Details about the organisms' life cycles could also be included.
- **Students can write poems** about their new organisms and/or mosquitoes which include details about how they survive and/or how to stay safe from them. Completed poems can be shared with the class and/or displayed on classroom walls or hallway bulletin boards.

  "Mosquito" by J. Patrick Lewis is a wonderful poem you can to share with your students for inspiration. You can read it aloud or share a video of the former U.S. Young People's Poet Laureate reading it here: nowaterriver.com/poetry-month-2012-childrens-poet-laureate-j-patrick-lewis. Scroll down the page a bit for the video and complete text of the poem. Before or after you share it, ask students to try to identify a detail which could not have been scientifically accurate. (Answer: The mosquito in the poem is called a "he," but only female mosquitoes bite.)

- **Students can create public service announcements** about staying safe from their organisms and/or mosquitoes; video can be used and/or other communication methods, such as live acting.
- **Students can observe mosquito larvae and/or dried adults under magnification** using a macro lens or microscope to better see their unique adaptations. You can also connect it to a computer and/or data projector to show them to the whole class. Students can create detailed scientific illustrations of the organisms, then label and annotate the illustrations. Contact Clackamas County Vector Control District if you need specimens, macro lenses, and/or other hands-on resources.

More Resources / References

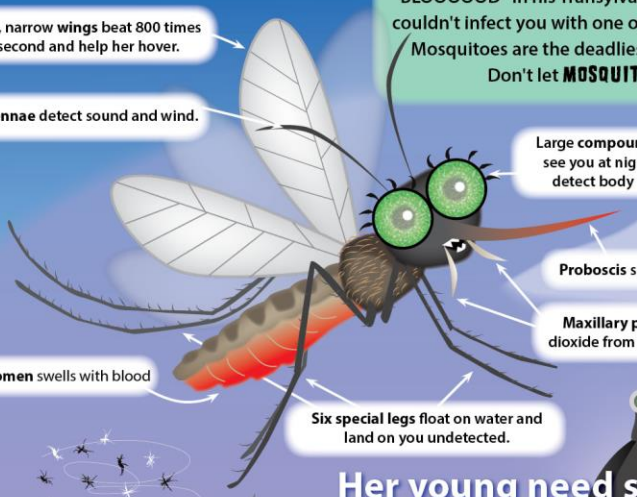
- More free resources are available on Clackamas County Vector Control District's website: fightthebites.com/education. For example, a large printed version of the "Beware of Mosquitula!" poster shown on the next page is available, as well as books, the "Fight the Bites!" video game, additional lessons, and short videos.
- "Animal Adaptations" lesson plan from the Museum of Natural and Cultural History – Univ. of Oregon: natural-history.uoregon.edu/sites/default/files/mnch/Animal%20Adaptations%20Lesson%20Plan.pdf
- PBS' short video "Deep Look: How Mosquitoes Use Six Needles to Suck Your Blood" can be a great springboard for a discussion about adaptations: pbs.org/video/deep-look-mosquitoes
- PowerPoint presentation adapted with permission from Eric Engh, Education Program / Insect Identification Specialist with Marin/Sonoma Mosquito & Vector Control District; more resources available from their Mosquito School website: msmosquito.com/mosquito%20school
- Pittawalla, Iqbal. How Mosquitoes Are Drawn to Human Skin and Breath: ucrtoday.ucr.edu/19377
- More information about the Next Generation Science Standards: nextgenscience.org

BEWARE OF MOSQUITULA!

Don't Let Her SUUUCK YOUR BLOOOOOD . . . or LAY EGGS!

ADAPTATIONS OF A BOLD BLOOD SUCKER

Mosquito bites don't just itch. They can carry diseases like **Zika virus** and **West Nile virus**. The fictional Count Dracula was scary when he said, "I vant to suuck your BLOOOOOD" in his Transylvanian accent, but even he couldn't infect you with one of those dreaded diseases. Mosquitoes are the deadliest creatures to humans. Don't let **MOSQUITULA** bite you!



Long, narrow wings beat 800 times a second and help her hover.

Antennae detect sound and wind.

Large **compound eyes** see you at night and detect body heat.

Proboscis sucks blood.

Maxillary palps detect carbon dioxide from breath & body odors.

Abdomen swells with blood

Six special legs float on water and land on you undetected.

DEFENSE FOR YOU

Head protection

Clothing covered in mosquito repellent

Long sleeve shirt and pants

Covered feet & ankles

Her young need standing water. Don't give it to 'em like these ZANY ZOMBIES!

Mosquito larva

Bird bath: Change water every 5 days

Kiddie pool: Change water or put it away

Water bowl: Change water–even if your pet is a zombie!

Can You Find These?

Ways to Fight the Bites!

- Repair damaged window and door screens.
- Provide bat boxes. Bats eat MILLIONS of mosquitoes!
- Use insect repellents (safely).
- Wear protective clothing.
- Go inside at dusk and dawn, when mosquitoes are most active.
- Use an electric fan outside at night. Wind can keep **MOSQUITULA** from landing on you!
- Be extra careful in wetlands and forests.

Things Collecting Water

- Bottle
- Can
- Clogged rain gutter
- Jar
- Grill cover
- Leaky faucet
- Low areas in ground
- Plant pot and saucer
- Puddle
- Tire
- Tools
- Toys

Visit FighttheBites.com to learn more.