

## Lesson Plan

Lesson Title	How Mosquitoes Grow
Grade Level	3 <sup>rd</sup> grade
Topic	Mosquitoes
Lesson time	45-50 minutes
Materials Required	<ul style="list-style-type: none"><li>• Digital microscope</li><li>• How Mosquitoes Grow (PowerPoint) (<a href="#">available here</a>)</li><li>• Mosquito Life Cycle Kit</li><li>• 3<sup>rd</sup> grade observation journal (<a href="#">available here</a>)</li></ul>
Standards addressed	<ul style="list-style-type: none"><li>• 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death</li><li>• 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all</li></ul>

### Step 1: Microscope study

For this lesson it is helpful to study mosquito larvae with microscope first. You probably will need to limit this portion of the activity to 10 minutes or you won't get to the rest of it! Get the students settled and focused before you turn on your microscope (if you have never used your digital microscope to examine mosquito larvae, please see the additional instructions at the end of this document). The main points that the students need to take away are from this exercise are:

- We are looking at the larva stage of the life cycle. The other stages are so different, that a larva is a different animal than the adult. Make sure they understand what "stage" means in this sense, and see if anyone knows the four stages of complete metamorphosis. You can also ask if anyone can give an example of another creature with a "larva" stage in its life cycle.

### Step 2: How Mosquitoes Grow (PowerPoint)

Slide 1: Introduce the lesson and the idea that we are going to study what mosquitoes need in the different stages of their life cycle so that we can figure out what habitats they are more likely to thrive in. All of these pictures have something to do with how mosquitoes grow.

Slide 2: What does a larva need? As you click/tap through this slide, the four basic things that a larva needs will be revealed. See if students can use the clues in the picture to figure each out.

1. Water: mosquitoes are completely aquatic in the larva stage. If the water in this puddle evaporates, the mosquito will not survive.
2. Food: mosquito larvae are not picky eaters! Perhaps the students already observed the mosquitoes eating during the microscope exercise. In nature, mosquito larvae eat just about anything that is small or soft (bacteria, algae, etc.).

3. Oxygen: unlike fish, mosquitoes do not breathe with gills. They must come to the surface to breathe. This may sound like a disadvantage, but it allows mosquitoes to survive in oxygen-poor water where their predators (especially fish) cannot survive.
4. Warmth: warmer temperatures typically mean mosquitoes can grow more quickly.

#### Slide 3: Life Cycle Review

Review the life cycle (consider having a student explain it). Help students understand the following (asking them works):

- There are 4 stages in the mosquito life cycle (egg, larva, pupa, adult). As a side note, most insects have these same 4 stages.
- Three of the stages occur in or on the water.
- Only the adult mosquito leaves the water.
- Only adult females bite because they need the protein from the blood to lay eggs.
- Adult males and females sip nectar as a source of sugar (energy food).
- Adult males and females can be distinguished from one another by their antennae.
- Warm weather causes the life cycle to go quickly.

#### Slide 4: Your Classroom Experiment

Let students know that we will be providing the mosquitoes in the Life Cycle Kit everything they need to grow, but since we won't let them bite us, we won't see them lay eggs.

#### Slide 5: Mosquito Growth Graph

Explain that we will be tracking mosquitoes. For this experiment, your mosquito observation cage should only have approximately 15 larvae (otherwise it becomes too difficult to accurately count). Each day, students simply graph the number of live mosquitoes in each life stage. They make different colored dots for each life stage so they can connect the dots of the same color each day to reveal trends. Click/tap through to see a partial example.

Slide 5: Allow the students to ask questions and continue discussing the Life Cycle Kit.

Step 4: Demonstrate how to use the life cycle kit and talk about the various tasks they will be responsible for (observing, activity sheets, feeding fish, making nectar, etc.)

Visit the [Mosquito School website](#) for more information or email [erice@msmosquito.com](mailto:erice@msmosquito.com)

## Notes about Using a Digital Microscope in the Classroom

Digital microscopes are a profoundly powerful tool for enhancing classroom presentations. There are a wide variety of relatively inexpensive digital microscopes available, and we currently use a ProScope Micro Mobile made by Bodelin technologies. This particular microscope attaches directly to an iPad (no cords) and uses the camera application that comes preinstalled on iPads. The iPad is either wirelessly connected to an Apple TV (if the classroom is equipped with one) or connected to a projector. Either way enables the entire classroom to study live mosquito larvae at the same time. This can be used to a quick introduction to the main lesson, as a means of generating interest and discussion during a question/answer portion of a lesson, or even as the focus of the lesson (as in our 4<sup>th</sup> grade “Adaptations of Mosquitoes” lesson). Here are a few suggestions if you plan to utilize this technology:

- Do not attempt to place the microscope directly over a dish of water. Even if there are large numbers of larvae present, they will tend to swim away from the light produced by the microscope. Instead, use a pipette to capture a small number of early-instar larvae in a drop of water, and place the drop on a flat, white surface (we use a plastic lid). If the bubble of water remains intact, you can place the microscope over the drop without displacing it, focus on the larvae, and they will not be able to wiggle away (see photo).
- It is imperative that you prepare students for this exercise prior to showing them a live magnified mosquito larvae. If you suddenly turn on the microscope and students see large, strange-looking creatures wiggling about, you will have an instant classroom management nightmare. Students will giggle, blurt out comments, and you will have to spend valuable and uncomfortable time regaining their focus. Preparing the students for this activity simply involves gaining their attention, informing them what is going to happen, and how they are expected to behave. Hold up the jar with the tiny wiggling larvae, and explain that a microscope will be used to magnify a few of them. Be very clear that when the microscope is turned on, everyone needs to observe silently. If students forget the expectations and are disruptive as soon as you turn it on, simply turn it back off and re-explain the expectations. After a short time of silent observation (30 seconds is more than enough), invite the students to raise their hand if they have a question or observation about what they see on the screen. This exercise can be an extremely valuable tool for generating interest and stimulating conversation about the topic.
- Prior to leading this activity in a classroom, spend a little time observing the mosquitoes on your own, so that you are prepared to help students understand what they are observing. The following list includes some of the behaviors that you are likely to observe:
  - **Feeding:** usually, after the larvae have been under the microscope for a few minutes, they will begin feeding. If small particles of food are present, they will be sucked in.



Some larger particles will get sucked in and then “spit out” the side of the head. You can ask if anyone knows of another animal that feeds in a similar manner (many students are familiar with other filter-feeding animals, especially baleen whales).

- **Thrashing movements:** typically, when the microscope is first turned on, the mosquitoes respond with a flurry of movement. They bump into one another, and students often describe this as “fighting” or “dancing”. You can mention that mosquito larvae have very thin, flexible exoskeletons, and they move by flexing their entire bodies. You can also point out that they have sensory hairs that help them sense what is around them.
- **Breathing:** When the mosquitoes move, their breathing tubes are often visible from the side. Once they calm down, they tend to begin breathing, and the tip of the tube breaks the surface of the water. You can explain how mosquitoes do not have gills, and instead breathe at the surface. For older students you can ask/explore this adaptation and see if they can figure out why it is so important (they can survive in oxygen poor conditions where predators that depend on gills, especially fish, cannot survive).
- **Grooming:** sometimes students will observe mosquitoes bending around, so that their head is touching their “tail”. You can inform the students that this is how mosquitoes clean their mouthparts.
- **Molting:** Occasionally, students will observe a mosquito larva that is in the process of splitting open and escaping from its older exoskeleton. This is a great time to talk about metamorphosis.
- **Defecating:** Fortunately, the mosquito larvae *usually do not* defecate “on camera”, but it does occasionally happen, and there is probably nothing much you can do to prevent a heightened and intense student response. Good luck swiftly regaining the collective focus of the classroom if this happens.