

Cycles and starting Mealworms

4th Grade

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Note: this lesson will take 2-3 days to operate and need to be revisited over a ~4 wk period to observe all the features of the mealworm life cycle.

References: (Checked 1/2005)

- 2003-04 Columbus Public Schools Science SLC Guide
- Mealworms under glass (from “**Meal Worms Under Glass**”. AIMS Book: Magnificent Microworld Adventures? See Michigan science standards, unable to locate this particular source)
- Cycles by Natalie Anderson, <http://www.wow.osu.edu>

Benchmarks:

SLC 5:

A.) Students will identify and explain events and cycles (i.e., phases of the moon, daily and seasonal orientation of the sun, life cycles of plants and animals, motion of gears etc.) and the next likely occurrences.

B.) Students will create charts and graphs to show patterns over time and predict the next likely occurrences.

Objectives:

Students will explore several different cycles including life cycles, the moon cycle and other sequences of events in daily life.

Materials:

- Mealworms
- Hand lenses
- Oatmeal
- Triple-beam balances
- Mealworm terrariums [plastic vessels]
- Science journals
- Order-of-Events Cards
- Order-of-Events Paper [w/arrows]
- Chart/butcher paper
- Pieces of Apple/Potato

Initial Demonstration:

Pass out cards to each group as well as the sheet with boxes and arrows on it. Tell the students to “put the packets of cards in order.”

Target Observations:

- Students will place the cards in sequence according to how they think that they should be placed.
- They will notice that many things seem to have a natural order, where-as other things do not seem to have a natural order.

Target Model:

- Some things occur in a predictable and reasonable sequence of events.
- Other things do not. To view the life cycle of an organism we will need to create a suitable habitat for the critter to thrive.

Procedure:

1. Explain that just like the cards that we just looked at, different animals and plants grow/develop in a certain cycle. For example, vertebrates [like humans], start out as babies, they grow up as children, become adults, and then have new children. All the while the kids look a lot like miniature versions of the adults.
2. The question is do all animals have the same cycle? What about insects? Insects are the most common type of animal on Earth, what is there living cycle?
3. Pass out the tubs of mealworms and the materials for their habitats so that the students can start becoming familiar with them and begin the set-up for the 4-wk long experiment. Teach the students how to handle the mealworms. They should not grasp them directly between their fingers, as they are likely to squish them. It is better to scoop them up with a folded piece of paper.
4. Build the mealworm habitat-
 - a. The habitat needs to be a clear plastic tub filled with oatmeal. A slice of apple or potato will provide adequate moisture for the mealworms. The oatmeal provides both a substrate and a carbohydrate/energy source.
 - b. They should have holey or cloth lids [actually not very necessary, O₂ needs are low, and they will not crawl out anyway].

This is a good place to review basic needs. Conduct a brief discussion of what the mealworms will need to survive [shelter, food, water, gas to breathe.

Target Observations:

- The mealworms need food, air, water, and shelter in order to grow.

Target Revised Model:

- The terrarium provides the mealworms with all their basic needs.

Procedure:

1. It is now time to start getting to know the mealworms better. Have the students make lists of questions about the mealworms [how much to they weigh, how long are they, how do they grow, what do they eat, how do they breathe, etc]. Make a class list of these questions and sort them into 3 categories:
 - a. Observation – things that the class can observe
 - b. Experimental – things that we can do an experiment to discover
 - c. Research – things that you would have to look up in a book or ask an “expert” to learn in the elementary school setting

2. Now have the students figure out how to answer these questions. Have them determine how to answer the observation questions and how to answer some of the experimental questions. For the observation questions, have them make the appropriate observations, and then draw pictures of what they see and record the appropriate masses and lengths.
 - a. Have them observe with both their unaided eyes. with hand-lenses, mass them on triple beam balances, etc
 - b. Set up how we might be able to learn other things about them, including the life cycle, and agree on an experimental procedure. *This is a good time review the scientific method.*
 - c. Have the students also record how many worms are in which life stage every time that they work with the critter and put that data into a chart. They will make a graph of this data later

Date [week 1]	Larva [worm]	Pupa [cocoon]	Adult [beetle]

- d. Repeat these observations every week until all life stages are seen.

Go over the observed life history pattern of the mealworms. Determine the average amount of time that the insect spent in each life stage. Introduce the term *metamorphosis*. Make graphs showing how many critters were in each life stage each week using the composite data from all the students’ data. Have the students draw and label the mealworms life cycle. The mealworm life cycle can then be reinforced by having the students predict the life cycle of butterflies using the butterfly life cycle cards. It is also good at this time to tell the students that not all insects have this type of life cycle. For example, grasshoppers have an “incomplete” metamorphosis.

Target Observations:

- Mealworms undergo several changes in their physical shapes during their development (egg, larva, pupa, adult, egg, etc.).
- Mealworms are insects

Target Revised Model:

- Mealworms have a lifecycle that is very similar to that of butterflies, which are also insects.
- The process by which insects change form from larva to adult is called metamorphosis.

Summary:

The students have made observations of mealworms as they progress through the various stages of their metamorphosis from egg to adult. They should be able to make the connection between this life cycle and that of the butterfly due to the similarities in the order of growth, as well as the fact that both are insects. They should be able to contrast this with the life cycles of other organisms, such as frogs or human beings.