

# Observing Mealworms and Earthworms

## Summary

Students will observe mealworms and earthworms and then make and record observations about their behavior.

## Materials

- Earthworms
- Mealworms
- Black paper
- White paper
- Chenille stem
- Flashlight
- Pipettes
- Frozen gel pack

## Additional Resources

Mealworms can be purchased at your local pet store. They are inexpensive and most are sold in amounts of 50, 100, or 200. The large mealworms cost more, but are more lively, making them easier for students to observe. The large mealworms are often treated with hormones to prevent them from becoming beetles. Inquiring whether the mealworms have been treated with hormones may be a good idea. The smaller and untreated mealworms will change into beetles in four to six weeks.

Mealworms are also available from Carolina Science and Math at 1-800-334-5551 or <http://www.carolina.com>. Larvae are \$6.70 for a pack of 50. Petco Store sells untreated mealworms \$2.57 for 50 and four to five dollars for 100. Petsmart sells three different sizes of mealworms: 50 regular-sized or 35 giant or 25 super mealworms for \$2.99 per type.

Earthworms can be purchased from stores that sell fishing tackle.

## Books

For an alternative to mealworms and earthworms you could observe pillbugs. Pillbug investigations can be found in:

- *A Pillbug Project: A Guide to Investigation*  
; Robin Burnett; ISBN 10: 0-87355-109-5

## Videos

- *Eyewitness Butterfly & Moth*  
; director: Derek Hall; producer: Richard Thomson; writer: Brian Meel; <http://www.dk.com>

## Background for Teachers

All organisms have life cycles. Sometimes offspring do not look like the parent organism at first, but as they go through their life cycle, they begin to look more like the parents. Some organisms show direct development. This means they are born looking like the parent organisms, only smaller. As they develop, they change only by increasing in size until they are to the adult stage and look just like their parents. Spiders and earthworms go through direct development. Other organisms go through incomplete metamorphosis, which means they progress through three stages of development: egg, nymph, and adult. At each stage, they look different than they looked in the previous stage.

Cockroaches and grasshoppers are two insects that develop through incomplete metamorphosis. A third type of life cycle is called complete metamorphosis. The insects' bodies change dramatically as they go through four stages: egg, larva, pupa, and adult. Mealworms and butterflies develop by going through complete metamorphosis.

Every organism responds to its environment or the surroundings in which the organism lives. Some

behaviors are inherited or instinctual, while others can be learned.

The life cycle of mealworms will be observed and a journal will be kept to record their metamorphosis to adulthood as they become darkling beetles. Caterpillars' life cycles may also be observed and recorded as they change into painted lady butterflies.

#### *Caring for Mealworms:*

Mealworms can be kept in a covered plastic shoebox with holes drilled in the lid. Similar containers will work just as well, just so the mealworms have air holes for breathing. Bran or oatmeal can be used to line the bottom of the box and will serve as the mealworms food source. They will need a slice of apple or potato for moisture. Apples seem to last longer than potatoes. The mealworm habitat must be checked every day because the apple and potato slices tend to mold after a few days.

Mealworms need to be kept in a warm, but not hot, area. Do not place the container in direct sunlight. Mealworms move more slowly when the temperature is below 58 F. If you want to slow their growth process, they can be kept in the refrigerator for a short while. They will mature at a faster rate if they are kept in a warm area of 75 - 85F.

Mealworms also like to hide under things. A small bowl, similar to the aluminum tins that individual potpies are cooked in, tipped upside down in the habitat works well as a mealworm hiding place.

An additional habitat option is to use empty Cool Whip containers with holes punched in the lid. Inside the habitat would be the same as with the shoe boxes. Groups of students can have their own group habitats that they can observe.

Before beginning the Invitation to Learn and the investigations, discuss the differences of instinctual and learned behaviors. At the end of the investigations you will go over this again. Your discussion might include the following points:

Every organism responds to its environment. Some behaviors (how the organism acts) are "built in" or *instinctual*. These are inherited from the parent organism.

Other behaviors are *learned* because the organism learns them during its life. They can learn them from the parent or through experience.

### Intended Learning Outcomes

#### 1. Use Science Process and Thinking Skills

### Instructional Procedures

#### Invitation to Learn

In this activity, the students will be introduced to the mealworms and earthworms. They will study, sketch, measure, observe, record findings, and read about the worms. The students will be divided into pairs. Each pair of students will be given two heavy paper plates. One to three live mealworms will be placed on the first plate and one live earthworm will be placed on the second plate. If lightweight plates are used, make sure to put multiple plates together for sturdiness. Students may pair up to work together.

Next, give each student a copy of the [Mealworm and Earthworm Behaviors](#) worksheet. Allow the students to observe the worms as they move around on the plates. Have the students follow the directions on the sheet by observing, sketching, coloring, measuring and recording how each worm moves about on the plate and the sounds it makes as it moves. Encourage the students to gently pick up the mealworms and earthworms, then describe and record how they feel in their hands.

The students will now read information about mealworms and earthworms located on the [Mealworms-Background Information](#) and [Earthworms-Background Information](#) sheets.

Upon completion of the Invitation to Learn activity, the students will participate in multiple investigations with the mealworms and earthworms by going from station to station using the *Mealworm and Earthworm Behaviors* sheet. If time is short, the investigations may be conducted on another day.

## Instructional Procedures

To complete the investigations, continue using the *Mealworm and Earthworm Behaviors* worksheet. Direct the students to conduct the investigations using the instructions included on the sheet as they move from station to station. Using the information the students read in the background information during the invitation to learn segment, students will determine whether the behavior they observe in the worms is learned or instinctual. At the end of the investigations, discuss with the class what they discovered and lead them to realize that because the worms are lower life forms, their behavior is largely instinctual. Their instinctual behavior was passed to them from their parent organisms (darkling beetles). Also, point out that the mealworms (larva) look entirely different from the adult beetles, while baby earthworms look like the adult worms.

The teacher must set up the time limits for each station. Five to seven minutes should be plenty of time for students to make and record observations. It is also advised to go through the stations with the students before letting them begin the investigations.

Station 1: Black/White using a mealworm &

Station 2: Black/White using an earthworm

Students will use a half sheet of white construction paper taped to a half sheet of black construction paper at this station.

Students will predict whether the worms will prefer the black surface or the white surface. They must justify their prediction based on the mealworm and earthworm background information they read during the Invitation to Learn activity.

Station 3: Light and Touch Response using a mealworm &

Station 4: Light and Touch Response using an earthworm

At this station, students will predict the worms' response to light from a flashlight and to being gently touched with a chenille stem. They must justify their answers, again based on what they have learned so far about the worms.

Students will put the worms in the shoebox. Make sure to do this one type of worm at a time.

Shine the flashlight into the box. Observe and record the worms' behavior.

When this has been repeated with both kinds of worms, have the students put the worms back on the plate and lightly touch them with a chenille stem.

Record how the worms reacted to the chenille stem touching them.

Station 5: Barrier Response using a mealworm &

Station 6: Barrier Response using an earthworm

Give each group of students two paper plates and several items to act as barriers such as clothespin, piece of wood, a pencil, crumpled up pieces of paper, etc.

Have the students predict the worms' responses to these barriers. They can answer questions such as: Will the worms go around the barriers? Crawl over them? Burrow beneath them? Try to go through them? Will the mealworms react differently than the earthworms? Students must justify their answers based on what they previously read in the *Mealworms-Background Information* and *Earthworms-Background Information* sheets in the Invitation to Learn activity.

Have the students arrange the two or three barriers on the plate.

Depending on whether the students are at Station Five or Station Six, have them place either mealworms or an earthworm on their plate with the barriers and observe and record the behavior of the worms.

Students must record the reasons for the worms' behaviors regarding the barriers.

Station 7: Moisture Response using a mealworm &

Station 8: Moisture Response using an earthworm

Have students predict whether the worms will prefer a moist surface or a dry surface and justify their predictions.

Have a moist rag or paper towels lying right next to a dry rag or paper towels, so they are

touching.

Students will straddle the worm across the line separating the moist and dry towels and will then observe and record the worms' actions.

Supply both stations with one water dropper or pipette each and a small container of water.

Instead of using a small container of water, another option is to set these stations up by a sink.

Now have the students place the worm on the moist side and gently place one drop of water on the worm, recording its reaction. Students will explain what they think the reasons are for the worm's reactions.

Station 9: Temperature Stimulus using a mealworm &

Station 10: Temperature Stimulus using an earthworm

The day before doing this activity, place gel packs or several slightly damp paper towels in the freezer. Place layers of waxed paper in between the paper towels for easy separation. Retrieve them from the freezer just before commencing with this activity.

Just before this activity, place the rice or corn sacks or the damp paper towels in the microwave to heat. If using heating pads, turn them to warm.

To set up this station, place the hot and cold items next to each other with a hand towel or paper towels over the frozen gel pack and heated corn/rice packs or heating pad. This is to protect the worms. If using paper towels, you may want to do the same thing only with additional paper towels.

Have the students predict whether the worms will prefer the hot or cold areas.

Now have them place the worms on the areas and record their observations.

Discussion after the Investigations

As a class, list examples of instinctual behavior in the mealworms and earthworms. Bring up the fact that most, if not all, of the behaviors are instinctual because they are lower life forms.

List examples of instinctual and learned behaviors in other organisms and humans. Some examples of instinctual behaviors may include wolves living in a pack, moths and other insects flying toward lights, birds and salmon migration. Some examples of learned behaviors may include riding a bike, dogs whining or scratching to go out of doors, and cats meowing to be fed. Discuss the role that instinctual and learned behaviors might play in providing an organism with a survival advantage or disadvantage in a particular environment.

Observing and Journaling Mealworms' Life Cycle Stages

Construct a mealworm habitat and observe mealworm larva undergo metamorphoses to become adults. See Caring for Mealworms in the Background section.

Have students record their observations in a science journal or spiral bound notebook. They will be comparing and contrasting the four stages the mealworm's experience as they become darkling beetles. They will be writing about and drawing what they observe.

## Extensions

Curriculum Extensions/Adaptations/Integration

Additional mealworm and earthworm investigations:

Food Stimulus Station

The day before this activity put mealworms and earthworms in a container with no food for 24 hours.

Have students predict how hungry mealworms and earthworms will react when they are placed at one end of a paper plate (or tray) and a food source is placed at the other end. Consider these questions in the predictions: Will they follow a direct route to the food? Will they meander around until they find it? Will they simply ignore it?

Give each pair of students a paper plate with a small pile of bran flakes or oatmeal at one end. Place several mealworms on the opposite end of the food source on the paper plate.

Allow five minutes for students to observe the mealworms' behavior. Have the students record their observations with an explanation for the mealworms' behavior.

Repeat the process using carrot tops or celery leaves as the food source for the earthworms.

#### Training a Mealworm

Pose the following question to the students: Can mealworms be trained to follow a certain pathway to food?

Construct a "T" maze in a shallow box (the lid from a case of copy paper would be ideal).

Release several mealworms at the bottom of the "T" and record how many turn left at the "T" and how many turn right at the "T".

Repeat this experiment again and place bran flakes or oatmeal at the far side of the left-hand turn. Release the mealworms again and count how many turn left toward the food source.

Repeat the process for two more cycles.

On the fourth cycle, DO NOT place any food in the maze. Release the hungry mealworms and count how many turn left at the top of the "T".

#### Painted Lady Butterflies

Observing the metamorphosis of the Painted Lady Butterflies is also a fun extension. Two useful websites are listed in the web sites section for buying and caring for the caterpillars.

Mealworm and earthworm cinquain poems can be written as language arts connection. A cinquain is a simple, five-line verse that follows a specific pattern. The pattern is:

Line 1 - one word of two syllables (usually a noun that names the subject of the poem)

Line 2 - four syllables (two-syllable adjectives describing the noun in line one)

Line 3 - six syllable (showing action)

Line 4 - eight syllables (expressing a feeling or observation about the subject)

Line 5 - two syllables (describing or renaming the subject)

Examples:

Mealworm  
Yellow larva  
Eating, growing, changing  
Will become a darkling beetle  
Insect  
Earthworm  
Humus-maker  
Wiggling, squirming, struggling  
Trying to escape from the hook  
Fish bait

#### Family Connections

Look for insects in the yard and garden that go through complete metamorphosis.

#### Assessment Plan

The completeness and accuracy of the *Mealworm and Earthworm Behaviors* worksheet can be used as an assessment.

Observe the students as they work at the stations, noting the ease or difficulty they have at following the procedures and understanding the content at each station can also be an assessment method.

#### Bibliography

Haury, D. L. & Rillero, P. (1994). Perspectives of hands-on science teaching. *The ERIC clearinghouse for science, mathematics, and environmental education*. Retrieved January 14, 2006, from <http://www.ncrel.org/>

Lopez, R. E. & Tuomi, J. (1995). Student-centered inquiry. *Educational Leadership*, 52(8), 78. Research has shown that hands-on learning in science will help students remember the material better because they are part of the learning process and not just spectators. While this is true for all learners, it can have a profound impact on students with difficulties such as second language barriers and learning and behavior disabilities.

#### Authors

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