TRB 5:5 - Activity 4: Observing Mealworms & Earthworms

Summary

Through hands-on investigation and observations students will learn that the behaviors of off-spring are inherited from the parent organism.

Materials

- 25--50 live mealworms. Mealworms are very inexpensive and can be purchased at any pet store. Please read "Caring for Mealworms," below.
- 25--50 live earthworms or night crawlers. Earthworms are very inexpensive and can be purchased at any fishing supply store.
- 1 tray for each group
- 1 metric ruler for each group
- black and white construction paper to cover half of each tray
- 1 flashlight for each group
- 2 chenille stems for each group
- several items to serve as barriers, such as pencils, clothespins, blocks of wood, crumbled pieces of paper, or soil for each group
- paper towels
- waxed paper
- 1 pipette or eyedroppers for each group
- 1 small container of water for each group
- bran flakes or oatmeal, carrot tops or celery leaves
- an assortment of mealworm adults, larvae and pupae (if you do not grow mealworm larvae to adulthood) See "Additional Resources " for ordering information.

Caring for Mealworms

During the investigation, keep the mealworms in the container in which you purchased them. Feed the mealworms bran cereal and/or oatmeal. For moisture, place a small piece of apple or potato in the container (frequently check the apple or potato to make sure it is not too dry or getting moldy). Since some investigations need "hungry " mealworms, have a separate container that has no food source available.

Mealworms need to be kept in a warm, but not hot, area. Do not place their container in direct sunlight. Mealworms move slowly when the temperature is below 58º F. They will mature at a faster rate if they are kept in a warm area at 75-85 ºF.

See "Building a Mealworm Habitat," for more details.

To be effective, this set of activities needs to be conducted over a time period of several days. The following is a suggested time schedule:

Day 1

Conduct the "Invitation to Learn " activity.

Day 2

Read the "Background Information " on each organism. Students should gain an understanding of each organism 's normal environment and how their physical characteristics provide a survival advantage. Have students also list behaviors that would be instinctual for each organism. Place damp paper towels in the freezer (see "Temperature Stimulus " below)) for Day 3 investigations.

Day 3

Conduct the investigations of how each organism responds to black and white surfaces, light, touch, barriers, moisture and temperature.

Day 4

Place the mealworms and earthworms in containers without food for 24 hours so they are hungry.

Day 5
Conduct the investigations of how each organism responds to food. Discuss inherited versus learned behaviors. If you are not going to watch the mealworms complete their metamorphoses, compare and contrast mealworm larvae, pupae and adults.
A Two-Week Period
Build a mealworm habitat and watch the mealworms complete their metamorphoses into darkling beetles.
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 and easier for students to observe. The large mealworms are often treated with hormones so they will NOT become adult beetles. The small mealworms will change into adult beetles within a month or two. Mealworms are also available from Carolina Science and Math at 1-800-334-5551 or http://www.carolina.com.Larvae =$5.95 for a pack of 50,paper catalog #BA-14-4272, online catalog #WW-14-4272; Larvae =$8.50 for a pack of 100,paper catalog #BA-14-4274, online catalog #WW-14-4274.They can also be purchased from Nasco (http://www.enasco.com/prod/Home) and Berkshire Biological Supply Company (http://stores.mgfx.com/bb/).
An assortment of adults, larvae and pupae can be purchased from Carolina Science and Math for $9.00.Paper catalog #BA-14-4264, online catalog #WW-14-4264.
Earthworms, or night crawlers, can be purchased cheaply and easily at your local fishing tackle shop. They are sold by the dozen. They can also be purchased from Carolina Science and Math.
The Honey Files, A Bee 's Life, A Teaching Guide and video. Available from the National Honey Board, 390 Lashley Street, Longmont, CO, 80501-6045,or http://www.honey.com/kids/video/index.html.This shows the life stages of bees and their survival behaviors.
Honey Bee Study Prints, twelve over-sized pictures of the life cycle of honeybees. Available from Dadant &Sons, 2765 S. Golden State Blvd., P.O. Box 2837,Fresno, CA, 93745,or toll free:(877) 432-3268. $24.50 plus shipping/handling and tax.
Utah Agriculture in the Classroom. Visit their website for great lessons on insects and creating insect habitats in the classroom (http://www.agclassroom.org/ut).

Background for Teachers

Sometimes offspring do not look like the parent organism at first; but as the offspring go through their life cycles they begin to look more like their parent(s). A life cycle is the stages a living organism goes through during its lifetime. Many insects go through dramatic changes from eggs to adults. The process is called metamorphosis.
Every organism responds to its environment, which is the surroundings in which the organism lives. Some behaviors (the way in which an organism acts) are "built-in " because they are inherited from the parent organism. These behaviors are called inherited or instinctual. Other behaviors are not inherited, but can be learned.

Intended Learning Outcomes

1-Use science process and thinking skills.
2-Manifest scientific attitudes and interests.
3-Understand science concepts and principles.
4-Communicate effectively using science language and reasoning.
6-Understand the Nature of Science.

Instructional Procedures

Invitation to Learn:

Divide students into cooperative groups.

Place a live mealworm and a live earthworm on a tray for each group.

Allow students to observe these organisms moving around on the tray.

Have students sketch each organism, measure how long each is, record how each one moves about, and chart any kind of noise made as it moves.

Have students discuss which end is the head and which is the tail of each organism. Have them give observable evidence to justify their reasoning.

Encourage students to gently pick up each organism and describe what it feels like on their hands.

After allowing students to make their initial observations, gather the trays, and return the worms to their containers.

Instructional Procedures:

Investigations

Engage students in the following investigations with mealworms and earthworms. Have them record their observations, questions and conclusions in their science journals.

Black and white surface stimulus

Give each group a tray with half of the surface covered with black paper and the other half with white paper.

Have students predict whether mealworms will prefer the black or white surfaces and justify their predictions.

Place several mealworms directly on the dividing line between black and white.

Allow 5-10 minutes for students to observe the mealworms ' behaviors. Have students record their observations with an explanation for the mealworms ' behaviors.

Repeat this process with earthworms.

Light and touch stimulus

Have students predict the mealworms ' response to light from a flashlight, and to being gently touched with a chenille stem. Have them justify their predictions.

Put mealworms on trays and give one to each group.

Shine a flashlight directly on the mealworms and observe their behaviors.

Gently touch the mealworms with a chenille stem that has a small loop at that end and observe their behaviors.

Allow 5-10 minutes for students to observe the mealworms ' behaviors. Have students record their observations with an explanation for the mealworms ' behaviors.

Repeat this process with earthworms.

Barrier stimulus

Give each group several items to act as barriers (a pencil, a clothespin, a block of wood, a crumbled piece of paper or a pile of soil, etc.).

Have students predict the mealworms ' responses to these barriers. Will they initially go around a barrier? Crawl over it? Burrow underneath it? Try to keep going forward? Go backwards? Will their responses differ for different barriers? Have students justify their predictions.

Give each group a tray and have the students arrange 3 or 4 barriers on it.

Place several mealworms on the tray.

Allow 5-10 minutes for students to observe the mealworms ' behaviors. Have the students record their observations with an explanation for the mealworms' behaviors.

Repeat this process with earthworms.

Moisture stimulus

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

Give each group a tray with half of the surface covered with a moist paper towel and the other half covered with a dry paper towel.

Place several mealworms directly on the dividing line between moist and dry.

Give each group a pipette or eyedropper and a small container of water. Have students gently place one drop of water on each mealworm and make observations of its response. Have students record their observations in their journals with an explanation for the mealworms' behaviors.

Repeat this process with earthworms.

Temperature stimulus

Prior Preparation

The day before this activity, place several slightly damp paper towels in a freezer. Place layers of waxed paper in between the damp paper towels for easy separation.

Prior to this activity, slightly moisten several paper towels and leave them at room temperature.

Just before this activity, place several slightly damp paper towels in a microwave to heat them.

Investigation

Have students predict how mealworms will react to a cold surface, a room-temperature surface and a hot surface, then justify their predictions.

Give each group a tray and a cold, a hot, and a room-temperature paper towel.

Place several mealworms on each paper towel.

Allow 5-10 minutes for students to observe the mealworms ' behaviors. Have students record their observations with an explanation for the mealworms' behaviors.

Repeat this process with earthworms.

Food Stimulus

Prior Preparation

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

Investigation

Have students predict how hungry mealworms will react when a food source is placed at the other end of a tray. Will they follow a direct route to the food? Will they meander around until they find it? Will they ignore it?

Give each group a tray with a small pile of bran flakes at one end.

Place several mealworms on the opposite end of the tray from the bran flakes.

Allow 5-10 minutes for students to observe the mealworms ' behaviors. Have students record their observations with an explanation for the mealworms ' behaviors.

Repeat this process with earthworms, using carrot tops or celery leaves instead of bran.

Discussion

As a class, list examples of instinctual and learned behaviors in other organisms and humans.

Examples of instinctual behaviors include: wolves living in a pack, moths flying toward the light, and bird and salmon migrations.

Examples of learned behaviors include: riding a bike, dogs scratching at the door to be let outdoors, 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.

Comparing Mealworm Life Cycle Stages

Do one of the following:

Construct a mealworm habitat and observe mealworm larvae undergo metamorphoses to become adults (see “Building a Mealworm Habitat”).

Purchase an assortment of larvae, pupae and adults (see “Additional Resources”). Have students observe each of the life stages, comparing and contrasting their similarities and differences.

Extensions

Training a mealworm

Pose the following question to the students: Can mealworms be trained to follow a certain pathway to a food source?
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 at the far side of the left-hand turn.
Release the mealworms again and count how many turn left toward the food source.
Allow the mealworms to go without food for 24 hours. Release the mealworms again and count how many turn left toward the food source.
Repeat this 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.”

Bibliography

Acknowledgements

These investigations were adapted from the Animal Behavior Teacher Guide, which provides information about additional explorations. Delta Education, catalog #38-438-4203, $32.95. 1-800-442-5444,http://www.delta-education.com.

This lesson is part of the Fifth Grade Science Teacher Resource Book (TRB3) http://www.usoe.org/curr/science/core/5th/TRB5/. The TRB3 is designed to be your textbook in teaching science curriculum to your students. This book covers all the objectives of each standard and benchmark. If taught efficiently, a student should do well on the End-of-Level (CRT) tests. The TRB3 is designed for teachers who know very little about science, as well as for teachers who have a broad understanding of science.

Authors

Utah LessonPlans