Lead Information Packet

Module 1: Mealworms
3rd Grade

This document is not intended to give you all of the information you need to lead the module. It is only intended to be a reference during the module. You can find the complete instructions at scitrek.chem.ucsb.edu/module as well as the notebook and picture packet used during the module.

Important Things to Remember During the Module

1. You are responsible for keeping track of time in the classroom and making sure all activities run smoothly. There will be a time card in the lead box with suggested times to start/stop each activity.
2. You are responsible for keeping volunteers and students on track.
3. Walk around, during times volunteers are working with students and help struggling groups.

Types of Documents:

Notebook:
One given to every student and is filled out by the student. The lead will use a notebook to write in as an example for students. The notebook the lead uses is referred to as the class notebook in these instructions.

Notepad:
One given to every group and is filled out by the volunteer. In these instructions, the examples are narrower and taller than the notebook pages.

Picture Packet:
One per class that, if needed, the lead fills out. In these instructions, the examples are the same size as the notebook pages but they are labeled.

In these instructions, all other example documents are labeled.

Day 1: Question Assessment/Observations/Reproducibility Discussion/Variables

Schedule: You are responsible for BOLD sections

Introduction (SciTrek Lead) – 2 minutes
Question Assessment (SciTrek Lead) – 5 minutes
Observation Discussion (SciTrek Lead) – 2 minutes
Observations (SciTrek Volunteers) – 23 minutes
Reproducibility Discussion (SciTrek Lead) – 8 minutes
Variable Discussion (SciTrek Lead) – 2 minutes
Variables (SciTrek Volunteers) – 13 minutes
Wrap-Up (SciTrek Lead) – 5 minutes
**Preparation:**

1. Outside the classroom, have the volunteers pour water into one of their bags of woodchips that are in their group boxes. Then, have them fill compartment 1 of the choice chamber three-quarters full of dry woodchips and compartment 3 three-quarters full of wet woodchips.
2. Make sure volunteers are passing out nametags.
3. Make sure volunteers are setting up for the initial observation. Details of how to do this are on a picture in the volunteer boxes.
4. Set up the document camera for the class data (picture packet, page 1).
5. Pass out the question assessments.

**Introduction: (2 minutes – Full Class – SciTrek Lead)**

- Allow volunteers to introduce themselves.
- Introduce the module.

**Question Assessment: (5 minutes – Full Class – SciTrek Lead)**

- Read each question aloud and have students circle whether the question is testable or not testable by science.
- Collect assessments.

**Observation Discussion: (2 minutes – Full Class – SciTrek Lead)**

- Review the definition of an observation (a description using your five senses).
- Show the students the choice chamber and explain the experiment they are about to perform.
- Introduce the class question, “What variables affect the number of mealworms in each compartment?” and discuss why we are interested in the question (to learn about a mealworm’s habitat).
- Have students move to their groups.
  - If a student does not have a nametag, identify the group color with the least number of students in it and write the student’s name on one of the extra nametags in the lead box using that color of marker.
**Observations:** (23 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups who are struggling.
- Make sure groups are moving along and only spending ~7 minutes on recording observations of the experimental set-up and then releasing mealworms.
- Write down groups’ median numbers on the class data sheet (picture, packet, page 1).

**Reproducibility Discussion:** (8 minutes – Full Class – SciTrek Lead)

- Have groups share what they did and learned.
  - Groups released 20 mealworms and allowed them to crawl to dry or wet woodchips. More mealworms crawled to the dry woodchips than wet woodchips.
- Show students the class data sheet (picture packet, page 1) and have them brainstorm why groups got different values.
- Discuss the importance of repeating measurements.
- Introduce median (the middle number) and have students find the median of the collected data.
- Have students tell you how what they learned relates to the class question and what this means about the habitat a mealworm lives in (more mealworms were in...
the dry woodchips than in wet, therefore, they most likely live in a dry habitat).

**Variable Discussion:** (2 minutes – Full Class – SciTrek Lead)

- Review the definition of a variable (something in an experiment that can be changed).
- Explore one possible changing variable with the class and have students share how and why they believe this variable might affect the number of mealworms in each compartment.

**Variables:** (13 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups who are struggling.
- Make sure volunteers are having their group come up with possible variables, as well as how and why these variables might affect the number of mealworms in each compartment.

**Wrap-Up:** (5 minutes – Full Class – SciTrek Lead)

- Have each group share one variable with the class, as well as how and why they think this variable will (or will not) affect the number of mealworms in each compartment.
- Go over what students will do next session.

**Day 2: Question Activity/Questions/Materials Page/Experimental Set-Up**

**Schedule:** You are responsible for **BOLD** sections

- **Introduction (SciTrek Lead) – 2 minutes**
- **Question Activity (SciTrek Lead) – 20 minutes**
- **Question Discussion (SciTrek Lead) – 3 minutes**
- **Testable Questions (SciTrek Volunteers) – 8 minutes**
- **Question Discussion (SciTrek Lead) – 3 minutes**
- **Non-Testable Questions (SciTrek Volunteers) – 4 minutes**
- **Question/Experimental Set-Up Discussion (SciTrek Lead) – 3 minutes**
- **Question (SciTrek Volunteers) – 4 minutes**
- **Materials Page (SciTrek Volunteers) – 5 minutes**
- **Experimental Set-Up (SciTrek Volunteers) – 5 minutes**
- **Wrap-Up (SciTrek Lead) – 3 minutes**

**Preparation:**

1. Make sure volunteers are writing their name and group color on the whiteboard.
2. Make sure volunteers passing out nametags/notebooks.
3. Set up the document camera for the question activity (notebook, page 2).
Introduction: (2 minutes – Full Class – SciTrek Lead)

- Review the class question, as well as what students did and learned last session.

Question Activity: (20 minutes – Full Class – SciTrek Lead)

- Ask students, “What types of questions can be tested by science?”
  - Questions that involve things that are measurable, observable, or countable.
  - On the board, write:
    - Testable Questions
      - Measurable
      - Observable
      - Countable

- Ask students, “What types of questions cannot be tested by science?” Then review categories.
  - Questions in which you cannot acquire the data.
  - Questions that contain words that are not well defined or are opinions.
    - Opinion questions contain opinion words such as prettier, nicest, better, etc.
    - Not well defined questions contain words such as affected, react, etc.
    - Not well defined questions can contain semi-measurable words such as big, wide, heavy, etc. Ex: Is the Golden Gate Bridge wide?
  - On the board, write:
    - Not Testable Questions
      - Can’t Acquire Data
      - Not Well Defined/Opinion

- Read the directions (notebook, page 2).
- As a class, go over each question and circle the correct answer. In addition:
  - For testable questions, have students identify what data they would need to collect to answer the question and write measure, count, or observe by the question to indicate how you would collect data to answer the question.
  - For questions not testable by science, have students identify why the question is not testable and, if applicable, underline the word that makes the question not testable and write not well defined or can’t acquire data by the question to indicate why it is not testable. Then, have students revise the question to be testable.
1: What is the length of a brown bear's front paw?
   Testable
   Data: Use tape measure to measure the paw length

2: Do bears like to swim?
   Not Testable
   Revised: In a 24-hour period, does a bear spend more time in the water or on land?

3: Are black bears smarter than brown bears?
   Not Testable
   Revised: Does a black bear eat more berries than a brown bear?

4: How many brown bears are at the Santa Barbara Zoo?
   Testable
   Data: Count the number of brown bears at the zoo.

5: What type of bear is the most fearsome?
   Not Testable
   Revised: Which is bigger a bear or a dog? Or, do other animals run when they see a bear?

6: How much honey does Winnie the Pooh eat in 24 hours?
   Not Testable
   Revised: How much honey does a black bear eat in 24 hours?

7: In one day, what is the total amount of berries that all brown bears eat?
   Testable
   Data: Observe all brown bears for a day and determine, by weighing, the total mass of berries that they all ate.

8: Are polar bears fast?
   Not Testable
   Revised: What is the top speed of a polar bear? Or, is a polar bear faster than a cow?

9: Is putting panda bears on the endangered species list important?
   Not Testable
   Revised: Did the number of panda cubs born in China increase after they were put on the endangered species list?

10: Can a mother bear find her cub among 6 other cubs?
    Testable
    Data: Observe if a mother bear could find her cub among 6 other cubs.

**Question Discussion:** (3 minutes – Full Class – SciTrek Lead)

- Show the students the question frame on one of the group notepads and explain how it is used.
  - If we change the ______variable____, what will happen to the ______what you are measuring/observing______?
**Testable Questions:** (8 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups who are struggling.

**Question Discussion:** (3 minutes – Full Class – SciTrek Lead)

- Have one student from each group share one of their testable questions with the class.
- Have the other students identify if the question is testable or not, as well as the data that would need to be collected to answer the question.
- Review the categories of questions science cannot answer:
  - Category 1: Questions in which data cannot be acquired.
  - Category 2: Questions that contain words that are not well defined or contain opinions.

**Non-Testable Questions:** (4 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups who are struggling.

**Question/Experimental Set-Up Discussion:** (3 minutes – Full Class – SciTrek Lead)

- Have one student from each group share a question that science cannot answer.
- Have the other students identify if the question is testable or not, as well as why the question is not testable.
- Go over the options for variables that students can change: food type, bedding type, and light amount.
• Go over experimental considerations with students:
  o You will only have access to the materials on the materials page.
  o Each student will get one choice chamber.
  o You must run an odd number of trials. If needed, your volunteer will complete a trial.
  o Each trial may take no longer than 5 minutes.
  o No more than two versions of the changing variable can be used.
  o You may only have a food or a bedding, but not both. For example: if your changing variable is food type, your bedding type must be no bedding.
  o If you are changing the light amount and are using a bedding or a food, the bedding/food must be half-filled in all three compartments.

**Question:** (4 minutes – Groups – SciTrek Volunteers)

• Walk around, and help groups who are struggling.
• Encourage groups to pick different changing variables.
• After groups pick their changing variables, students should explain to their volunteer what about that variable they are interested in testing. For example, if they picked food type are they interested in testing sweet/sour, hard/soft, nature made/man made, etc.
• Make sure, for the second part of the question (what you are measuring/observing), students are specific (they should write, “the number of mealworms in each compartment” and not just “the mealworms”).

**Materials Page:** (5 minutes – Groups – SciTrek Volunteers)

• Walk around and help groups who are struggling.
• Make sure groups fill out the materials page correctly and completely, and then tape it onto the notepad.
  o Make sure groups do not have both a bedding and a food type.
**Experimental Set-Up: (5 minutes – Groups – SciTrek Volunteers)**

- Walk around and help groups who are struggling.
- Gives groups who are changing light amount a light/dark choice chamber.
- Make sure all control blanks are filled out.
- If a group is changing light amount and they have a food type or a bedding make sure they are putting the food/bedding in each compartment as is done below.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark + WC</td>
<td>20 MW + WC</td>
<td>Light + WC</td>
<td></td>
</tr>
</tbody>
</table>

**EXPERIMENTAL SET-UP**

**Changing Variable:** Light Amount / Light and Dark

**Controls** (variables you will hold constant):

- Insect Type / Mealworms
- Time / 5 min
- Number of MW / 20
- Food Type / No Food
- Bedding Type / No Bedding
- Container / Choice Type Chamber

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dark</td>
<td>20 MW</td>
<td>Light</td>
</tr>
</tbody>
</table>

**Prediction:**
I predict the compartment with the most mealworms will be

value of changing variable

**Wrap-Up:** (3 minutes – Full Class – SciTrek Lead)

- Have one student from each group share the question that they will investigate.
- Go over what students will do next session.
Day 3: Technique/Procedure/Results Table/Experiment

**Schedule:** You are responsible for **BOLD** sections

- Introduction (SciTrek Lead) – 3 minutes
- Technique (SciTrek Lead) – 7 minutes
- Procedure (SciTrek Volunteers) – 18 minutes
- Results Table (SciTrek Volunteers) – 5 minutes
- Experiment (SciTrek Volunteers) – 25 minutes
- Wrap-Up (SciTrek Lead) – 2 minutes

**Preparation:**

1. Make sure volunteers are passing out notebooks.
2. Make sure volunteers are labeling baking cups.
3. Set up the document camera for the technique activity (notebook, page 5).

**Introduction: (3 minutes – Full Class – SciTrek Lead)**

- Review the class question, as well as what students did and learned last session.

**Technique: (7 minutes – Full Class – SciTrek Lead)**

- Review why scientists perform multiple trials and what number they will use to represent all the trials (median).
- Review how to find the median.
- Find the median of the first two data sets as a class (page 5, notebook) and then let students find the other three on their own.

### Results Table

<table>
<thead>
<tr>
<th>Bedding</th>
<th>Final Number of Mealworms (in Increasing Order)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>3, 4, 5</td>
<td>3</td>
</tr>
<tr>
<td>Rocks</td>
<td>5, 5, 6</td>
<td>5</td>
</tr>
<tr>
<td>Grass</td>
<td>16, 17</td>
<td>17</td>
</tr>
<tr>
<td>Dirt</td>
<td>15, 19, 19, 17</td>
<td>17</td>
</tr>
<tr>
<td>Wood Chips</td>
<td>9, 10, 11, 13, 14</td>
<td>10</td>
</tr>
</tbody>
</table>
Procedure: (18 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups who are struggling.
- Make sure procedures are concise, but still include all values of the controls and changing variable, as well as the data that will be collected.
- Volunteers should be writing one step of the procedure and having students copy that step before moving on to the next step.

Results Table: (5 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups who are struggling.
- Make sure control values are written in the Compartment 1 box with an arrow through the rest of the components’ boxes while changing variable values are written in each component’s box.
**Experiment:** (25 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups who are struggling.

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### RESULTS Table

<table>
<thead>
<tr>
<th>Variables</th>
<th>Compartment 1</th>
<th>Compartment 2</th>
<th>Compartment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insect Type</td>
<td>Mealworms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>5 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Type</td>
<td>No Food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedding Type</td>
<td>No Bedding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light Amount</td>
<td>Dark</td>
<td>Dark/Light</td>
<td>Light</td>
</tr>
<tr>
<td>Container Type</td>
<td>Choice Chamber</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data**

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Compartment 1</th>
<th>Compartment 2</th>
<th>Compartment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Number of Mealworms</td>
<td>0 20 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Number of Mealworms</td>
<td>10 8 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Put Final Numbers of Mealworms in Increasing Order</td>
<td>10 8 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>10</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

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### Results Table

<table>
<thead>
<tr>
<th>Variables</th>
<th>Compartment 1</th>
<th>Compartment 2</th>
<th>Compartment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insect Type</td>
<td>Mealworm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>5 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Type</td>
<td>No food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedding Type</td>
<td>No bedding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light Amount</td>
<td>Dark</td>
<td>Dark/Light</td>
<td>Light</td>
</tr>
<tr>
<td>Container Type</td>
<td>Choice Chamber</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data**

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Compartment 1</th>
<th>Compartment 2</th>
<th>Compartment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Number of Mealworms</td>
<td>10 8 2</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>10 8 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Put Final Numbers of Mealworms in Increasing Order</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>10</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

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**Wrap-Up:** (2 minutes – Full Class – SciTrek Lead)

- Go over what students will do next session.

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**Day 4: Graph/Results Summary/Poster Making**

**Schedule:** You are responsible for BOLD sections

- Introduction (SciTrek Lead) – 2 minutes
- Graph (SciTrek Volunteers) – 10 minutes
- Results Summary (SciTrek Volunteers) – 10 minutes
- Poster Making (SciTrek Volunteers) – 33 minutes
- Wrap-Up (SciTrek Lead) – 5 minutes
**Preparation:**

1. Make sure volunteers are setting out notebooks.
2. Find a place to leave student posters.

**Introduction: (2 minutes – Full Class – SciTrek Lead)**

- Review the class question, as well as what students did and learned last session.

**Graph: (10 minutes – Groups – SciTrek Volunteers)**

- Walk around and help groups who are struggling.
- Make sure students have their changing variable values (Ex: dark), not the compartment number (Ex: compartment 1) on the x-axis.
- Make sure students are labeling their x-axis and writing the numerical value of mealworms on top of each column.

**Results Summary: (10 minutes – Groups – SciTrek Volunteers)**

- Walk around and help groups who are struggling.
- Make sure groups are generating a claim about the habitat a mealworm lives in (ideally the claim will allow them to make a prediction about future experiments) and using specific data points to support it.
  - Groups will be using measurements as their data, so make sure they are including numerical values in their data statement.
  - Do not let groups reference compartment numbers in their results summary.
• Volunteers struggle with results summaries, so you should check each group’s results summary.
• Make sure students fill out the sentence frame (notebook, page 9) *I acted like a scientist when.*

**Poster Making: (33 minutes – Groups – SciTrek Volunteers)**

• Help volunteers glue poster pieces onto the posters. When gluing, make sure **you** or the **volunteers** (not the students) are gluing the poster in the *exact* order that is shown on the diagram and the poster has a landscape orientation.
• Make sure the student in each group who is presenting the results graph, has a sentence frame sticker in their notebook and a volunteer has gone over how to present the three sentences with the student several times.
• Each student should have the part(s) they are presenting highlighted and numbered in their notebook: 1) scientists’ names, 2) question, 3) experimental set-up, 4) procedure, 5) results graph, and 6) results summary (see pictures below).
  o Remind volunteers if a student is presenting multiple parts, they should have multiple sections highlighted and numbered in their notebook.
• Volunteers often forget to highlight notebooks, so make sure this gets done before Day 5.

A larger version of this poster is in your lead box.
Wrap-Up: (5 minutes – Full Class – SciTrek Lead)

- Ask students the following questions:
  - How did you act like a scientist during this project?
  - What did you do, that scientists do?

Day 5: Poster Presentations

Schedule: You are responsible for **BOLD** sections

- **Introduction (SciTrek Lead) – 2 minutes**
- Practice Posters (SciTrek Volunteers) – 15 minutes
- **Poster Presentations (SciTrek Volunteers/SciTrek Lead) – 41 minutes**
- Wrap-Up (SciTrek Lead) – 2 minutes

Preparation:

1. Make sure volunteers are setting out notebooks.
2. Assign volunteers a new group to work with.
3. Set up the document camera for the *Notes on Presentations* (picture packet, page 2).
4. Organize posters so experiments featuring the same changing variable will be presented back-to-back and posters are presented from simplest to understand, to most difficult to understand (suggested order: light amount, food type, bedding type).

Introduction: (2 minutes – Full Class – SciTrek Lead)

- Review the class question, as well as what students did and learned last session.
- Explain to students they will work with a new volunteer today.

Practice Posters: (15 minutes – Groups – SciTrek Volunteers)

- Do not give students more than 15 minutes to review their experiment and practice their poster, or you will run out of time for presentations.
- Have volunteers rotate groups so each group can explain their experiment and practice their poster with a new volunteer.
- Make sure volunteers are having students explain their experiment and asking them questions that have them generate predictions based on their data.
- Make sure students are reading from their notebooks and practicing the posters in the following order: 1) scientists’ names, 2) question, 3) experimental set-up, 4) procedure, 5) results graph, and 6) results summary. They will not read the *I acted like a scientist when* or results table, from their posters.

Poster Presentations: (41 minutes – Full Class – SciTrek Volunteers/SciTrek Lead)

- Inform students if they ask a scientific question (a question that helps summarize what the group did/learned or requires them to makes a prediction based on their data) they will receive a SciTrek pencil after the presentations are done.
- Have students present their posters.
• While posters are being presented, record each group’s changing variable values and their data (picture packet, page 2).
  o After a group reads their question stop the presentation and have the class identify the changing variable. Then, record it in the picture packet.
  o When a group reads their experimental set-up, record the values of the changing variable.
  o When a group reads their results graph, record the number of mealworms in each compartment.
• After each presentation, ask students:
  o What questions do you have for this group?
• Once students have asked their questions (make sure each student answers a question; you should ask at least one question per presentation), as the whole class:
  o What was the group’s changing variable?
  o What value of the changing variable did more mealworms travel to?
  o Why did they go to (insert what they went to)?
  o What does this mean able a mealworm habitat?
  o Can someone put what we learned into a sentence.
• Record what students learned under the Summary (picture packet, page 2).
• After all presentations are over, have students describe a mealworm’s ideal habitat.

Wrap-Up: (2 minutes – Full Class – SciTrek Lead)

• Tell students, “The mentors who have been working with you are undergraduate and graduate students who volunteer their time so you can do experiments. This is the last day you will see your volunteers, so we should say thank you and goodbye.”
• Have volunteers give students SciTrek pencils.
• Have students remove the paper parts of their nametags (which they can keep) from the plastic holders and return the plastic holders to their volunteers.

Day 6: Question Assessment/Tie to Standards

Schedule: You are responsible for BOLD sections

Question Assessment (SciTrek Lead) – 5 minutes
Tie to Standards (SciTrek Lead) – 55 minutes
Preparation:

1. If the teacher is not leading the tie to standards activity, do the following:
   a. Give the teacher an extra notebook, and have them fill it out with their students, to follow along during the tie to standards activity.
   b. Collect the teacher’s lab coat and put it in the lead box.
2. Pass out the question assessments and notebooks.
3. Set up the document camera for the tie to standards activity (notebook, pages 9-12; picture packet, pages 3-9).
4. Put your lab coat in the lead box at the end of the day.

Question Assessment: (5 minutes – Full Class – SciTrek Lead)
- Read each question and have students circle whether the question is testable or not testable by science.
- Collect assessments.

Tie to Standards: (55 minutes – Full Class – SciTrek Lead)

A Mealworm’s Ideal Habitat (15 minutes)
- Tell the class, “Your experiments have taught me a lot about mealworms. Today we will review some of the variables that affect the number of mealworms in each compartment.”
- Ask students, “What is a wild mealworm’s habitat like, and why?” Then have them fill in question 1.
  - Dry
  - Dark
  - Eat dry bread-like foods
  - Loosely bound beddings
- Ask students, “What would happen if the climate changed where mealworms lived?” and have them fill in question 2.
- After, have one or two students share their responses. Record one of these responses into the class notebook under the document camera for students to copy.
- Review the three things (move, die, and adapt) a species can do when its habitat changes and have them fill in question 3.

Move/Migration (10 minutes)
- Have students turn to page 10 in their notebooks. Show students the picture of the Giant Panda (picture packet, page 3).
- Tell students, “Pandas used to live in the area that is green on the map but now only live in the area that is red on the map.”
- Have students brainstorm why this might be.
  - Confirm that it is because of hunting and deforestation.
- Ask, discuss, and when applicable record the answer in the class notebook, while student copy it into their notebook, for the following questions:
  - What were the environmental changes that caused the panda’s habitat to decrease? 4a
    - Deforestation and hunting
What type of changes were these? (positive or negative) 4b
- Negative

What was the response of the panda to this environmental change? 4c
- Move

Can this response (moving) occur within the panda’s lifetime? 4d
- Yes

Show students the picture of the locust (picture packet, page 4).

Tell students, “Locusts used to live in the area that is green on the map but now live in both the areas that are green and yellow.”

Have students brainstorm why this might be.
- Confirm that it is because food (resources) could be found in the yellow area as well, therefore the locusts were able to expand the area they lived in.

Ask, discuss, and when applicable record the answer in the class notebook, while student copy it into their notebook, for the following questions:

- What was the environmental change that caused the locust’s habitat to increase? 5a
  - There were more resources close by.

- What type of changes were these? (positive or negative) 5b
  - Positive.

- What was the response of the locust to this environmental change? 5c
  - Move.

- Can this response occur within the locust’s lifetime? 5d
  - Yes.

Ask and discuss the following questions:

- What is it called when animals move temporarily to another location? 6a
  - Migration

- What types of animals do this? 6b
  - Birds, butterflies, whales, caribou, penguins, and salmon

Show students the pictures of whales and birds (picture packet, page 5).

Ask, discuss, and when applicable record the answer in the class notebook, while student copy it into their notebook, for the following questions:

- What are possible reasons animals may do this (migrate)? 6c
  - Reproduce, to search for food, or to search for better weather/warmer water.

- What is the response of migrating animals to environmental changes? 6d
  - Move.

- Can this response occur within the animal’s lifetime? 6e
  - Yes.
Adapt (15 minutes)

- Have the students turn to page 11 in their notebooks. Show the students the picture of the camel (picture packet, page 6).
- Ask, discuss, and when applicable record the answer in the class notebook, while student copy it into their notebook, for the following questions:
  - Describe the environment that camels live in.
    - Hot, barren, little food and water.
  - Tell students, “Animals store fat so when needed, their bodies can burn the fat to produce energy and energy can be a substitution for food and water.”
  - What does burning fat provide for an animal? Energy.
  - Do you think fat is important for camels and why? Yes, it allows them to go for days without eating.
  - Why do whales have fat (blubber) all over their bodies? Whales have fat (blubber) to stay warm.
  - Would it be a problem if camels had fat all over their bodies and why? Yes, because they would get too warm.
  - What adaption do camels have? Hump.
  - What is stored in a camel’s hump? Fat.
  - What would happen if a camel was born without the ability to form a hump? They might get too hot or they might not be able to go for long periods of time without food and water.
  - If a camel was born in an area with lots of food and water, would the camel’s hump go away? No, it takes many generations to develop/lose adaptions.
  - What was the response of the camel to its environmental conditions? Adapt.
  - Can this response occur within the camel’s lifetime? No.

Show students the picture of the giraffe (picture packet, page 7).

Ask, discuss, and when applicable record the answer in the class notebook, while student copy it into their notebook, for the following questions:

- Describe the environment in which giraffes live.
  - Grass, some small trees, savannas.
- What do giraffes eat?
  - Grass.
What other animals live in the same area as giraffes? 8a
- Zebras, lions, gazelles, etc. (record two grass eating animals on the class notebook)

What do these animals eat? 8b
- Grass.

Is there competition for this food source? 8c
- Yes.

Besides grass, what other type of food might giraffes eat? 8d
- Leaves off trees.

Why are giraffes better equipped to eat tree leaves?
- They have a long neck and are tall. This is the giraffe’s adaptation.

If a giraffe was put in an area with lots of low vegetation, would the giraffe’s neck shrink?
- No, it takes many generations to develop/lose adaptations.
- Giraffes’ necks do not continue to get bigger because giraffes with longer necks need more nutrients to survive, and during droughts it is harder for them to get these nutrients. Therefore, there is a checks and balances system. In addition, leaves during a drought grow lower to the ground, which creates competition for the long-necked giraffes with other giraffes.

What would happen if a giraffe was born with a short neck?
- Might not have enough food to survive.

What was the response of the giraffe to its environmental conditions? 8e
- Adapt.

Can this response occur within the giraffe’s lifetime? 8f
- No.

Die (15 minutes)
- Have the students turn to page 12 in their notebooks. Show students the picture of the saber-toothed cat (picture packet, page 8).
- Ask, discuss, and when applicable record the answer in the class notebook, while student copy it into their notebook, for the following questions:
  - What adaptation did the saber-toothed cat have to live in its environment? 9a
    - Two large front teeth to catch prey.
  - What did they eat? 9b
    - Large prey, such as deer
  - Do you think that saber-toothed cats were able to catch smaller prey such as mice? Why or Why not? 9c
    - No, because of their large teeth.
- At the end of the time era in which saber-toothed cat lived the weather conditions on the planet changed, and the planet became much colder. The cold killed the plants. This caused the large herbivores (deer-like animals) to die off. Which result in their being no food for the saber-toothed cats.
What was the response of the saber-toothed cat to environmental changes? 9d
- Die.

Could this response occur within the saber-toothed cat’s lifetime? 9e
- Yes.

Show students the picture of the little swan island hutia (pronounced hoo-TEE-uh) (picture packet, page 9).

Tell students, “This rodent type creature lived on a small island in Honduras. People brought cats to this island and the cats start hunting the hutia. In addition, a hurricane devastated the island in 1955. Therefore, in 1955 this species died off.”

Ask, discuss, and when applicable record the answer in the class notebook, while student copy it into their notebook, for the following questions:
- Where did the hutia live? 10a
  - On an island.

- The two environmental changes to the island were? 10b
  - Introduction of house cats and hurricane.

- Why was the rodent not able to adapt to these new conditions? 10c
  - Adaptations take a long time and must occur over many generations of a species.

- Are larger or smaller habitat ranges beneficial for survival of species and why? 10d
  - Larger, the larger the habitat range the greater the chance of survival.

- What was the response of the hutia to the environmental change? 10e
  - Die.

- Could this response occur within the hutia’s life? 10f
  - Yes.

What is it called when an entire species dies off? 11a
- Extinction.

Do you think extinctions usually take place during the lifetime of one animal or over many generations of a species? 11b
- Over many generations, which allows humans to come in and prevent the extinction.
Extra Practice Solutions:

EXTRA PRACTICE

Questions

Circle TESTABLE if the question can be tested by science. Circle NOT TESTABLE if the question cannot be tested by science. If the question is NOT TESTABLE change (revise) the question to be something that is testable.

1. How many hours does a giraffe sleep in a day?  
   Revision:  
   Testable  Not Testable

2. How fast can Wonder Woman run?  
   Revision: How fast can Darby run?  
   Testable  Not Testable

3. Is learning how to write in cursive valuable?  
   Revision: How many people can write in cursive?  
   Testable  Not Testable

4. What is the total number of cups of coffee that people in the United States drink in one week?  
   Revision:  
   Testable  Not Testable

5. Is soap easy to pour?  
   Revision: Is soap easier to pour than water?  
   Testable  Not Testable

6. What species of animal has the thickest fur?  
   Revision:  
   Testable  Not Testable

7. Do ants like sugar?  
   Revision: Do ants eat sugar?  
   Testable  Not Testable