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 http://www.chem.ucsb.edu/scitrek/module as well as the student 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 that 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:

Student Notebook:
One given to every student and is filled out by the student. In these instructions, the examples are rectangular and filled out in black. The lead will use a student notebook to write in as an example for students. The notebook that 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 squarer and filled out in blue.

Picture Packet:
One per class that, if needed, the lead fills out. In these instructions, the examples are rectangular, labeled, and, if applicable, filled out in blue.

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. Make sure volunteers put dry woodchips in Su and Th and wet woodchips in Tu and Sa in the pillbox outside of the classroom.
2. Make sure volunteers are passing out nametags.
3. Make sure volunteers are setting up for the initial observation.
4. Set up the document camera to use for the class data (page 1, picture packet).

Notepad Pages and Picture Packet Page:
**Introduction: (2 minutes – Full Class – SciTrek Lead)**

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

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

- Pass out assessments.
- Read each question and have students circle if 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 pillbox set-up and explain the experiment they are about to run.
- Introduce the class question, “What variables affect the direction the mealworms travel?,” 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 with the least number of students in it and write the student’s name on one of the extra nametags that are in the lead box using that color of marker.
Observations: (23 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that 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 times on the class data sheet (page 1, picture packet).

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

- Have groups share what they did/learned.
  - 20 mealworms were able to crawl to dry or wet woodchips. More mealworms crawled to the dry than wet woodchips.
- Show students the class data sheet (page 1, picture packet) 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, the most likely live in a dry environment).

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 why/how this variable might affect the direction mealworms travel.

Variables: (13 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure volunteers are having their group come up with possible variables as well as how/why these variables might affect the direction mealworms travel.

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

- Have each group share one variable with the class and how/why they think it will affect the direction the mealworms travel.
- Tell students what they 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 the volunteers are writing their name and group color on the whiteboard.
2. Make sure volunteers set out nametags.
3. Set up the document camera to use for the Question Activity (page 2, student notebook).

**Notebook Pages, Notepad Pages, and Materials Page:**

```
SCIENTIFIC PRACTICES
Testable Questions
Circle **TESTABLE** if the question can be tested by science. Circle **NOT**
**TESTABLE** if the question cannot be tested by science.

1. What is the length of a brown bear's front paw? Testable Not Testable
2. Do bears like to swim? Testable Not Testable
3. Are black bears smarter than brown bears? Testable Not Testable
4. How many brown bears are at the Santa Barbara Zoo? Testable Not Testable
5. What type of bear is the most fearless? Testable Not Testable
6. How much honey does Wimpy the Pooch eat in 24 hours? Testable Not Testable
7. In one day, what is the total amount of berries that all brown bears eat? Testable Not Testable
8. Are polar bears fast? Testable Not Testable
9. Is putting panda bears on the endangered species list important? Testable Not Testable
10. Can a mother bear find her cub among 6 other cubs? Testable Not Testable
```
SCIENTIFIC QUESTIONS

If we change the light amount, what will happen to the number of mealworms in each compartment?

• What will happen if I change the number of mealworms in the container?
• If I change the bedding, where will more mealworms go?
• After 5 minutes, will more mealworms be in the grass or rocks?
• If I change the food type, what will happen to the number of mealworms in each compartment?

Experiment Considerations:
1. You will only have access to the materials on the materials page.
2. You will run an odd number of trials.
3. Each trial may take no longer than 5 minutes.
4. You will only get one trial in which you may do two trials at the same time.
5. No more than two versions of the changing variable can be used.
6. 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.
7. If you are changing the light amount and not using a bedding or a food, the bedding/food must be half filled in all three compartments.

NON-SCIENTIFIC QUESTIONS

• Do mealworms like apples?
• Do mealworms think flowers are pretty?
• Do mealworms have friends?
• Are mealworms fast?

Changing Variable: light amount

Why do you think your changing variable will affect the direction mealworms travel?

Mealworms will go to the dark instead of the light because other bugs and insects can be found in the dark.

Question our group will investigate:
• If we change the light amount, what will happen to the number of mealworms in each compartment?

Experimental Considerations:
1. You will only have access to the materials on the materials page.
2. You will run an odd number of trials.
3. Each trial may take no longer than 5 minutes.
4. You will only get one trial in which you may do two trials at the same time.
5. No more than two versions of the changing variable can be used.
6. 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.
7. If you are changing the light amount and not using a bedding or a food, the bedding/food must be half filled in all three compartments.

Changing Variable (independent variable) light amount

Discuss with your group how you think your changing variable will affect the direction mealworms travel.

Question our group will investigate:
• If we change the light amount, what will happen to the number of mealworms in each compartment?
**Introduction:** (2 minutes – Full Class – SciTrek Lead)

- Review the class question, what they learned/did last session, and what they will do today.

**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 measureable, 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.
  o Questions in which you cannot acquire the data.
  o 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?
  o On the board, write:
    ▪ Not Testable Questions
      • Can’t Acquire Data
      • Not Well Defined/Opinion
    ▪ Read the directions (page 2, student notebook).
  • As a class, go over each question and circle the correct answer. In addition:
    o 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.
    o 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.
      ▪ Number 1: What is the length of a brown bear’s front paw?
        Testable (Easy to Test-Measurement)
        Data: Use tape measure to measure the paw length
      ▪ Number 2: Do bears like to swim?
        Not Testable (Not Well Defined/Opinion-Contains the Word Like)
        Revised: In a 24-hour period, does a bear spend more time in the water or on land?
      ▪ Number 3: Are black bears smarter than brown bears?
        Not Testable (Not Well Defined/Opinion-Opinion Comparison)
        Revised: Does a black bear eat more berries than a brown bear?
      ▪ Number 4: How many brown bears are at the Santa Barbara Zoo?
        Testable (Easy to Test-Counting)
        Data: Count the number of brown bears at the zoo.
      ▪ Number 5: What type of bear is the most fearsome?
        Not Testable (Not Well Defined/Opinion-Contains an Not Well Defined/Opinion Word)
        Revised: Which is bigger a bear or a dog? Or, do other animals run when they see a bear?
      ▪ Number 6: How much honey does Winnie the Pooh eat in 24 hours?
        Not Testable (Can’t Acquire Data-Fictional Character)
        Revised: How much honey does a black bear eat in 24 hours?
      ▪ Number 7: In one day, what is the total amount of berries that all brown bears eat?
        Testable (Hard to Test)
        Data: Observe all brown bears for a day and determine, by weighing, the total mass of berries that they all ate.
      ▪ Number 8: Are polar bears fast?
        Not Testable (Not Well Defined/Opinion-Semi Measurable)
        Revised: What is the top speed of a polar bear? Or, is a polar bear faster than a cow?
      ▪ Number 9: Is putting panda bears on the endangered species list important?
        Not Testable (Not Well Defined/Opinion-Students Think the Answer is Yes)
        Revised: Did the number of panda cubs born in China increase after they were put on the endangered species list?
- **Number 10**: Can a mother bear find her cub among 6 other cubs?
  
  *Testable (Easy to Test-Observation)*
  
  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 that 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 that 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:
  - You will only have access to the materials on the materials page.
  - You must run an odd number of trials.
  - Each trial may take no longer than 5 minutes.
  - You will get one pillbox in which you may do two trials at the same time.
  - No more than two versions of the changing variable can be used.
  - 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.
  - 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 that are struggling.
- Encourage groups to pick different changing variables.
- After students pick their changing variable, 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) that students are specific (Ex: the direction the mealworms travel instead of the mealworms).

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

• Walk around and help groups that are struggling.
• Make sure groups fill out the materials page correctly and completely.
  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 that are struggling.
• 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>Su</th>
<th>M</th>
<th>Tu</th>
<th>W</th>
<th>Th</th>
<th>F</th>
<th>Sa</th>
</tr>
</thead>
<tbody>
<tr>
<td>dark + wc</td>
<td>30 min + wc</td>
<td>light + wc</td>
<td>light + wc</td>
<td>dark + wc</td>
<td>30 min + wc</td>
<td></td>
</tr>
</tbody>
</table>

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

• Have one student from each group share the question that they will investigate.
• Tell students what they 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 setting out notebooks.
2. Set up the document camera to use for the Technique Activity (page 5, student notebook).
Notebook Pages and Notepad Pages:

**TECHNIQUE**

*Median*

When running multiple trials in an experiment it is necessary to find one number to represent all of the data. The middle number, also known as the median number, is sometimes used to represent all the data. To find the median, first place all of the numbers from each trial in increasing order, second circle the middle number.

<table>
<thead>
<tr>
<th>Bedding</th>
<th>Number of Mealworms (In Increasing Order)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>2, 3, 4</td>
<td>3</td>
</tr>
<tr>
<td>Rocks</td>
<td>1, 2, 3, 4</td>
<td>4</td>
</tr>
<tr>
<td>Grass</td>
<td>16, 17</td>
<td>17</td>
</tr>
<tr>
<td>Dirt</td>
<td>13, 14, 17, 18</td>
<td>13</td>
</tr>
<tr>
<td>Wood Chips</td>
<td>10, 10, 10, 11</td>
<td>10</td>
</tr>
</tbody>
</table>

**PROCEDURE**

1. Get pillbox that is dark on Su and Sa and light on Tu and Th.
2. Put no bedding and no food in all compartments.
3. Put 30 mealworms in M and F.
4. Wait 6 minutes.
5. Count the number of mealworms in each compartment.
6. Repeat and find the median of trials.
**Introduction:** (3 minutes – Full Class – SciTrek Lead)

- Review the class question and what they learned/did 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.
- Have students find the median of each data set (page 5, student notebook). Find the median of the first two data sets as a class and then let students find the other three on their own.

**Procedure:** (18 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure procedures are concise, but still include all values of the controls, changing variable, and what data 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 that are struggling.
- If groups are changing light amount, make sure their notebooks and notepads are modified appropriately.
- Make sure control values are written in the trial A box with an arrow through the rest of the trials’ boxes and that changing variable values are written in each trial’s box.
Experiment: (25 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure for the first trial groups are using both sides of the pillbox, for the second trial they are using only one side of the pillbox, and for the third trial (time permitting) they are using box sides of the pillbox.

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

- Tell students what they will do next session.

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.
A larger version of this poster is in your lead box.
Introduction: (2 minutes – Full Class – SciTrek Lead)

- Review the class question and what they learned/did last session.
- Tell students that today they are going to graph their data and make a poster.

Graph: (10 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure students have their changing variable values (Ex: dark), not the compartment letter (Ex: compartment A) on the x-axis.
- Make sure students are labeling their 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 that 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 reference trial letters in the results summary.
- Volunteers struggle with results summaries, therefore, check each group’s results summary.
- Make sure students fill out the sentence frame on 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 that 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 the volunteer has gone over how to present the three sentences with the student several times.
- Each student should have the part(s) that 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 above).
Remind the volunteers that if a student is presenting multiple parts, they should have multiple sections highlighted and numbered in their notebook.

- Volunteers often forget to highlight student notebooks, so make sure this is done before Day 5.

**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 practice posters with.
3. Set up the document camera to use for the Notes on Presentations (page 2, picture packet).
4. Organize posters so experiments featuring the same changing variable will be presented back to back and posters are presented from easiest to understand to hardest to understand (suggested order: light amount, food type, bedding type).
**Introduction:** (2 minutes – Full Class – SciTrek Lead)

- Review the class question, what they learned/did last session, and what they will do today.
- Tell students that today they will work with a new volunteer.

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

- **DO NOT GIVE STUDENTS MORE THAN 15 MINUTES TO PRACTICE OR YOU WILL RUN OUT OF TIME FOR PRESENTATIONS.**
- Have volunteers rotate groups so that 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 make them generate predictions based on their data.
- Make sure students are reading from their notebook and practicing the poster 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 poster.
**Poster Presentations: (41 minutes – Full Class – SciTrek Volunteers/SciTrek Lead)**

- Tell students that if they ask a scientific question (a question that helps summarize what the group did/learned or makes predictions based on the group’s 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 on page 2 of the picture packet.
  - After groups read their question, stop the presentation and have the class identify the changing variable. Then record it in the picture packet.
  - When groups read their experimental set-up, record the values of the changing variable.
  - When a groups read their results graph, record the number of mealworms in each compartment.
- After each presentation, ask students:
  - 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) ask students:
  - What was the group’s changing variable?
  - What value of the changing variable did more mealworms travel to?
  - Why did they go to (insert what they went to)?
  - What does this mean able a mealworm habitat?
  - Can someone put what we learned into a sentence?
- Record what they learned under the summary on page 2 of the picture packet.
- After all presentations are over, have students tell you what type of environment that mealworms live in.

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

- Tell the students that the volunteers that have been working with them are undergraduate and graduate students that volunteer their time so that they can do experiments. Have the students say thank you to the volunteers. This is the last day with their SciTrek volunteers, therefore, they should say goodbye to them.
- Have volunteers give students SciTrek pencils.
- Tell students to remove the paper part of their nametag from the plastic holder and that they can keep the paper nametag but need to give the plastic holder back to their volunteer.

**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 student notebook and have them fill it out with their students 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 to use for the Tie to Standards Activity (pages 9-12, student notebook and pages 3-9, picture packet).
4. Put your lab coat in the lead box at the end of the day.

Notebook Pages:

I acted like a scientist when I counted the number of mealworms and recorded the amount in my notebook.

TIE TO STANDARDS

1. From the class experiments write 2 factors you would expect to find in a mealworm’s ideal habitat.
   - dry
   - dark

2. What would happen if the climate changed where the mealworms lived?
   a. They would have to move.

3. Overall, what are the three things that species can do when the environment changes?
   - move
   - die
   - adapt

4. PANDA
   a. What were the environmental changes that caused the panda’s habitat to decrease?
      - hunting
      - deforestation
   b. What type of changes were these?
      - POSITIVE
      - NEGATIVE
   c. What was the response of the panda to this environmental change?
      - move
   d. Can this response occur within the panda’s lifetime?
      - YES
      - NO

5. LOCUST
   a. What was the environmental change that caused the locust’s habitat to increase?
      - more resources, close by
   b. What type of changes were these?
      - POSITIVE
      - NEGATIVE
   c. What was the response of the locust to this environmental change?
      - move
   d. Can this response occur within the locust’s lifetime?
      - YES
      - NO

6. a. What is it called when animals move for only part of a year?
    - migration
   b. What is an example of an animal that does this?
    - whales, birds
   c. What are possible reasons animals move?
      - reproduce
      - weather
      - food
   d. What is the response of migrating animals to environmental changes?
      - move
   e. Can this response occur within the animal’s lifetime?
      - YES
      - NO
**Question Assessment:** (5 minutes – Full Class – SciTrek Lead)

- Pass out assessments.
- Read each question and have students circle if 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 that their experiments have taught you a lot about the direction mealworms travel and today we will review some of the variables that affect the direction mealworms travel.
- Ask the students what they think a wild mealworm’s habitat is like and why, then have them fill in question 1.
  - Dry
  - Dark
  - Eat dry bread-like foods
  - Loosely bound beddings
- Ask the 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 example 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 the students turn to page 10 in their notebooks. Show the students the picture of the Giant Panda (page 3, picture packet) and have them fill in questions 4a-4d.

   ![Panda Image]

   **Page 3, Picture Packet**

   **Move 1**

   - Why do you think the panda’s living area got smaller?
     - Deforestation
     - Deforestation caused bamboo plants to decrease significantly.
     - Significant part of Panda Diet
     - Pandas then had to move to where bamboo grows (couldn’t wait for new bamboo to grow because this can take up to 100 years)
     - Hunted by Humans
     - Hunting pandas is now illegal in China

   - Tell students that pandas use 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 and discuss 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 the students the picture of the locust (page 4, picture packet) and have them fill in questions 5a – 5d.

   ![Locust Image]

   **Page 4, Picture Packet**

   **Move 2**

   - Why do you think the locust were able to expand into new areas?
     - Locust moved because there were abundant resources close by.

- Tell students that locusts use 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 because food (resources) could be found in the yellow area as well the locusts were able to expand their range.
• Ask and discuss the following questions:
  o What was the environmental change that caused the locust’s habitat to increase? 5a
    ▪ There were more resources close by.
  o What type of changes were these? (positive or negative) 5b
    ▪ Positive response.
  o What was the response of the locust to this environmental change? 5c
    ▪ Move.
  o Can this response occur within the locust’s lifetime? 5d
    ▪ Yes.
• Have students fill in questions 6a- 6e.
• Ask and discuss the following questions:
  o What is called when animals move temporarily to another location? 6a
    ▪ Migration
  o What types of animals do this? 6b
    ▪ Birds, butterflies, whales, caribou, penguins, and salmon
• Show students the picture of whales and birds (page 5, picture packet).

- Whales, Birds, and Butterflies
  - Some animals only move for part of the year because the environment that they live in becomes temporarily undesirable.
  - What do you call it when animals move during specific times of the year?
    ▪ Migration
  - What are some animals that migrate?
    - Birds
    - Whales
    - Butterflies
  - Why do some animals migrate?
    - To reproduce
    - For a food source

- Move 3

- Page 5, Picture Packet

• Ask students the following questions:
  o What are possible reasons animals may do this (migrate)? 6c
    ▪ Reproduce, to search for food, or to search for better weather/warmer water.
  o What is the response of migrating animals to environmental changes? 6d
    ▪ Move.
  o 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 (page 6, picture packet) and have them fill in questions 7a – 7f.
Ask and discuss the following questions:

- Describe the environment that camels live in.
  - Hot, barren, little food and water.
- Tell students that animals store fat so that 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? 7a
  - Energy.
- Fat can be used by the animal as a substitution for food and water.
- 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) all over their bodies to stay warm.
- Would it be a problem if camels had fat all over their bodies and why? 7c
  - Yes, because they would get too warm.
- What adaption do camels have?
  - Hump.
- What is stored in a camel’s hump? 7d
  - Fat.
- What would happen if a camel was born without the ability to form a hump?
  - Might get too hot if fat is stored around its body, or 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? 7e
  - No, it takes many generations to develop/lose adaptations.
- Can this response occur within the camel’s lifetime? 7f
  - No.

Show students the picture of the giraffe (page 7, picture packet) and have them fill in questions 8a – 8f.

Ask and discuss 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?
  - Zebras, lions, gazelles, etc. (record two grass eating animals on the example notebook)
- What do the animals (recorded in the notebook) eat? 8b
  - Grass.
o Is there competition for this food source? 8c
  ▪ Yes.
o Besides grass, what other type of food might giraffes eat? 8d
  ▪ Leaves off trees.
o Why are giraffes better equipped to eat tree leaves?
    ▪ They have a long neck and are tall. This is the giraffe’s adaptation.
o 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
o 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.
o What would happen if a giraffe was born with a short neck?
  ▪ Might not have enough food to survive.
o What was the response of the giraffe to its environmental conditions? 8e
  ▪ Adapt.
o 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
  (page 8, picture packet) and have them fill in questions 9a – 9e

Die 1

Saber-Toothed Cat (extinct 7.2 million years ago)

- What adaptation did saber-toothed cats have to live in their environment?
  - Two large front teeth to catch prey
- What did saber-toothed cats eat?
  - Large prey
- Do you think that saber-toothed cats were able to catch smaller prey such as a mouse?
  - No, it would be hard because their two large teeth would get in the way.
- After all the large prey died off, saber-toothed cats were not able to catch smaller prey (such as mice) and did not have enough to eat. This led to their extinction.

• Ask and discuss the following questions:
  o What adaptation did the saber-toothed cat have to live in its environment? 9a
    ▪ Two large front teeth to catch prey.
  o What did they eat? 9b
    ▪ Large prey, such as deer
  o 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
  o During the time the saber-toothed cat lived the weather conditions on the planet changed, and
    the planet became much colder. This caused most of the large prey (deer-like animals) to die off
    because most of the vegetation froze and there was no food for the large herbivores (prey) to eat. Because
    there was less large prey, this resulted in less food for the saber-toothed cats.
  o What was the response of the saber-toothed cat to environmental changes? 9d
    ▪ Die.
  o Could this response occur within the saber-toothed cat’s lifetime? 9e
    ▪ Yes.
• Show the students the picture of the little swan island hutia (pronounced hoo-TEE-uh) (page 9, picture packet) and have them fill in questions 10a – 10f.

• Ask and discuss the following questions.
  o Tell students that 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.
    ▪ 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? 10 f
      ▪ Yes.

• What is it called when an entire species dies off? 11a
  o Extinction

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

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**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? **Testable**
   
   **Revision**: ?

2. How fast can Wonder Woman run? **Testable**
   
   **Revision**: How fast can Darcy run? ?

3. Is learning how to write in cursive valuable? **Testable**
   
   **Revision**: How many people can write in cursive? ?

4. What is the total number of cups of coffee that people in the United States drink in one week? **Testable**
   
   **Revision**: ?

5. Is soap easy to pour? **Testable**
   
   **Revision**: Is soap easier to pour than water? ?

6. What species of animal has the thinnest fur? **Testable**
   
   **Revision**: ?

7. Do ants like sugar? **Testable**
   
   **Revision**: Do ants eat sugar? ?

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