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. You can find the complete instructions at [http://www.chem.ucsb.edu/scitrek/module](http://www.chem.ucsb.edu/scitrek/module). This document is intended to be used as a reference 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.

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 Volunteer) – 13 minutes
- **Wrap-Up** (SciTrek Lead) – 5 minutes

Preparation:

1. If the classroom has a document camera, ask the teacher to use it for the class data (page 1, picture packet).
2. Make sure that volunteers are setting up for the initial observation. Details of how to do this are on a picture in the volunteer boxes.
Introduction: (2 minutes – Full Class – SciTrek Lead)

- Introduce the module/SciTrek volunteers.
Question Assessment: (5 minutes – Full Class – SciTrek Lead)

- Pass out assessments.
- Read each question and have students circle if the question is testable/not testable.
- Collect assessments.

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

- Review the definition of an observation (a description using your five senses).
- 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 that groups are moving along and only spending ~7 minutes on 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 (page1, 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.
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
- **Testable Questions (SciTrek Lead)** – 8 minutes
- **Testable Questions (SciTrek Volunteers)** – 8 minutes
- **Question Discussion (SciTrek Lead)** – 3 minutes
- **Testable Questions (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. If the classroom has a document camera, ask the teacher to use it for the question activity (page 2, student notebook).
2. Have volunteers set out notebooks.
   a. If students are not in the classroom before SciTrek starts, have volunteers set out the notebooks where students should sit when they come into the classroom.
   b. If students are in the classroom before SciTrek starts, have volunteers set out the notebooks where they want students to sit, and students will move to these spots after the introduction.

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

![Testable Questions](image)
SCIENTIFIC QUESTIONS

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

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?

NON-SCIENTIFIC QUESTIONS

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

Experimental Considerations:

1. You will run an odd number of trials.
2. Each trial may take no longer than 5 minutes.
3. You will only get one pillon in which you may do two trials at the same time.
4. No more than two versions of the changing variable can be used.
5. You may only have one food aggression, not both. For example if your changing variable is food, your bedding must be same.
6. If you are changing the conditions and you have a constant bedding or food, it must be filled half full in both compartments.
7. You will only have access to the materials on the materials page.

Changing Variable (Independent Variable): light amount

Discuss with your group why you think your changing variable will affect the direction mealworm travel.

QUESTION

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)

- If needed have SciTrek volunteers set out notebooks.
- Review the class question and what they learned last SciTrek visit.
- If needed have students move to their notebook.

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

- Ask students what type 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 **opinions or are not well defined**.
    ▪ 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. Example: Is the Golden Gate Bridge wide?
  o On the board, write:
    ▪ Not Testable Questions
      • Opinion/Not Well Defined
      • Can’t Acquire Data
• Read the directions on page 3.
• 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 (Opinion/Not Well Defined-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 (Opinion/Not Well Defined-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 (Opinion/Not Well Defined-Contains an Opinion/Not Well Defined 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 (Opinion/Not Well Defined-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 (Opinion/Not Well Defined-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 I change ______variable_______ what will happen to ______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 opinions or are not well defined.

**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.
- Tell students they will get to pick a question to design an experiment to answer.
- Go over experimental considerations with students
  - You will only have access to the materials on the materials page.
  - You will 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, not both. For example, if your changing variable is food, your bedding must be no bedding.
  - If you are changing the conditions and you have a constant bedding or food, it must be filled half full in all three compartments.

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

- Walk around and help groups that are struggling.
- Try to 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. For example, if they picked food type are they interested in testing sweet/sour, hard/soft, nature made/man made, etc.
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.

Experimental Set-Up: (5 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure that all control blanks are filled out.

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 time.

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. If the classroom has a document camera, ask the teacher to use it for the technique discussion (page 5, student notebook).
2. Have volunteers set out the materials that their group will use.
3. Have volunteers set out notebooks.
   a. If students are not in the classroom before SciTrek starts, have volunteers set out the notebooks where students should sit when they come into the classroom.
   b. If students are in the classroom before SciTrek starts, have volunteers set out the notebooks where they want students to sit, and students will move to these spots after the introduction.
**Technique**

When running multiple trials in an experiment it is necessary to find the number to represent all of the data. This could be represented by finding the median. 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>Final Number of Mealworms (in increasing order)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>1, 2, 5</td>
<td>3</td>
</tr>
<tr>
<td>Rocks</td>
<td>1, 3, 5, 9, 10</td>
<td>4</td>
</tr>
<tr>
<td>Grass</td>
<td>13, 15, 16, 17</td>
<td>17</td>
</tr>
<tr>
<td>Dirt</td>
<td>10, 12, 14, 18, 20</td>
<td>13</td>
</tr>
<tr>
<td>Wood Chips</td>
<td>9, 10, 11, 12, 14</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 woodchips and no food in all compartments.  
3. Put 20 mealworms in A and E.  
4. Wait 5 minutes  
5. Count the number of mealworms in each compartment.  
6. Repeat and find median of trials.
Introduction: (3 minutes – Full Class – SciTrek Lead)

- If needed have SciTrek volunteers set out notebooks.
- Review the class question and what they did last time.
- If needed have students move to their notebooks.

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

- Review why scientists do 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 on the top data set of page 5.

Procedure: (18 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure procedures are not too long but include all values of the changing variable, controls, and what data will be collected.
- Volunteers should be writing one step 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 that control values are written in trial A with an arrow through the rest of the trials and that changing variable values are written in each trial box.
Experiment: (25 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure that for the first trial groups are using both sides of the pill box, 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 pill box.

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

- Tell students what they will do next time.

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. Ask the classroom teacher for a place to leave the student posters.
2. Have volunteers set out notebooks.
   a. If students are not in the classroom before SciTrek starts, have volunteers set out the notebooks where students should sit when they come into the classroom.
   b. If students are in the classroom before SciTrek starts, have volunteers set out the notebooks where they want students to sit and students will move to these spots after the introduction.
A larger version of poster is in your group box.

My experiment shows that mealworms live in dark environments because 10 mealworms went to the dark and 2 mealworms went to the light.
Introduction: (2 minutes – Full Class – SciTrek Lead)

- If needed have SciTrek volunteers set out notebooks.
- Review the class question.
- Tell students that today they are going to graph their data and make a poster.
- If needed have students move to their notebooks.

Graph: (10 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure that students have their changing variable values, not compartment letter on the x-axis.
- Make sure that students are writing the number of mealworms on top of each column.

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

- Walk around and help groups that are struggling.
- Make sure that 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 data to back it up.
- Volunteers struggle with results summaries, therefore, try to check each group’s results summary.
- Have 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 poster. When gluing, make sure that the volunteers are gluing the poster in the exact order that is shown on the diagram and that the poster has a landscape orientation.
- Make sure that 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)
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. If the classroom has a document camera, ask the teacher to use it for the notes on presentations (page 2, picture packet). If there is no document camera write the class question on the board.
2. Organize posters so that experiments featuring the same changing variable will be presented back to back.
3. Have volunteers pass out notebooks.

Picture Packet Page:

![Picture Packet Page](image-url)
Introduction: (2 minutes – Full Class – SciTrek Lead)

- If needed have SciTrek volunteers pass out notebooks.
- Tell students that they will have 15 minutes to discuss their experiment and practice their posters.
- DO NOT GIVE STUDENTS MORE THAN 15 MINUTES OR YOU WILL RUN OUT OF TIME FOR POSTERS.

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

- Organize posters so that experiments featuring the same changing variable are presented back to back.
- Make sure that 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) 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 data on page 2 of the picture packet.
  - When a group reads their question, record the changing variable.
    - Stop the presentation after the question and have the class identify the changing variable.
  - When a group reads their experimental set-up, record the values of the changing variable.
  - When a group reads their results graph, record the number of mealworms.
- After each presentation ask students:
  - What questions do you have for this group?
  - Can someone summarize what we learned from this group?
- 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 the 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 SciTrek 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 classroom has a document camera, ask the teacher to use it for the tie to standards activity (pages 9-12, student notebook) and tie to standards picture (pages 3-9, picture packet).
2. Pass out the question assessments and notebooks.
3. Remind the teacher to give you their lab coat 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 experiment write 2 factors you would expect to find in a mealworm’s ideal habitat.
   a. dry
   b. 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?
   a. move
   b. die
   c. 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. What is it called when animals move for only part of a year? migration
   a. What is an example of an animal that does this?
      whales    birds
   b. What are possible reasons animals may do this?
      reproduce
      weather    food
   c. What is the response of migrating animals to environmental changes? move
   d. 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/not testable.
- 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.
  - Dark
  - 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, 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.

<table>
<thead>
<tr>
<th>Panda</th>
<th>Move 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Giant Panda image]</td>
<td>![Map of China with panda's habitat]</td>
</tr>
</tbody>
</table>
| - 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 (could 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 panda’s 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 student’s brainstorm why this might be.
  - Confirm that it is because of hunting and deforestation.
- Ask and discuss the following questions
  - What are the environmental changes that caused the panda’s habitat to decrease?
    - Deforestation and hunting
  - What type of changes were these? (positive or negative)
    - Negative
  - What was the response of the pandas to this environmental change?
    - Move
  - Can this response (moving) occur within the panda’s lifetime?
    - Yes

- Show the students the picture of the locust (page 4, picture packet) and have them fill in questions 5a – 5d.

<table>
<thead>
<tr>
<th>Locust</th>
<th>Move 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Locust image]</td>
<td>![Map of Africa with locust's habitat]</td>
</tr>
</tbody>
</table>
| - 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 locust 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 student’s brainstorm why this might be.
  - Confirm that because food (resources) could be found in the yellow area as well the locust were able to expand their range.
- Ask and discuss the following questions.
  - What was the environmental change that caused the locust’s habitat to increase?
    - There were more resources close by.
What type of changes were these? (positive or negative)
- Positive response.
- What was the response of the locust to this environmental change?
  - Move.
- Can this response occur within the locust’s lifetime? 5d
  - Yes.

- Have students fill in questions 6a-6e.
- Ask and discuss the following questions.
  - What is called when animals move for only part of the year?
    - Migration
  - What types of animals migrate?
    - Birds, butterflies, whales, caribou, penguins, and salmon)
- Show students the picture of whales and birds (page 5, picture packet).

- Ask students the following questions.
  - What are possible reasons animals may do this (migrate)?
    - Reproduce, to search for food, or to search for better weather/warmer water.
  - What was the response of migrating animals to environmental changes?
    - Move.
  - Can this response occur within the animal’s lifetime?
    - 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.
  o Describe the environment that camels live in.
    ▪ Hot, barren, little food and water.
  o 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.
  o What does burning fat provide for an animal?
    ▪ Energy.
  o This can be used by the animal as a substitution for?
    ▪ Food and Water.
  o Do you think fat is important for camels and why?
    ▪ Yes, it allows them to go for days without eating.
  o Why do whales have fat (blubber) all over their bodies?
    ▪ Whales have fat (blubber) all over their bodies to stay warm.
  o Would it be a problem if camels had fat all over their bodies and why?
    ▪ Yes, because they would get too warm.
  o What adaption do camels have?
    ▪ Hump.
  o What is stored in a camel’s hump?
    ▪ Fat.
  o 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.
  o If a camel was born in an area with lots of food and water, would the camels hump go away?
    ▪ No, it takes many generations to develop/lose adaptations.
  o What was the response of the camel to its environmental conditions?
    ▪ Adapt
  o Can this response occur within the camel’s lifetime?
    ▪ No.
• Show students the picture of the giraffe (page 7, picture packet) and have them fill in questions 8a – 8f.

![Giraffe Image]

Giraffe

- Describe the environment that giraffes live in.
  - 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?
  - Grass.
- What would happen if a giraffe had a short neck?
  - Might not have enough food to survive.
- What is stored in the giraffe's neck?
  - Bone growth, what else could giraffes eat?
  - Bone grows, what else could giraffes eat?
  - Bones off of spine.
  - Why is a giraffe's bones important if it never has trouble?
  - A neck is a long neck and a tall. This is the giraffe's adaptation.
  - If giraffes and part of a bone with lots of bone growth, would the giraffes end up with?
    - No. It takes many generations to develop/lose adaptations.
  - Giraffes do not continue to get larger because Giraffes do not have enough space to fit a larger body. Their necks are a long neck and a tall combination. In addition, their necks are a long neck growth which makes it possible for the long neck giraffe with other giraffes.
  - What would happen if a giraffe had a short neck?
    - Might not have enough food to survive.

• Ask and discuss the following questions.
  o Describe the environment in which giraffes live.
    ▪ Grass, some small trees, savannas.
  o What do giraffes eat?
    ▪ Grass.
  o What other animals live in the same area as giraffes?
    ▪ Zebras, lions, gazelles, etc. (record two grass eating animal on the example notebook)
  o What do the animals (recorded in the notebook) eat?
    ▪ Grass.
o Is there competition for this food source?
  ▪ Yes.

- Besides grass, what other type of food might giraffes eat?
  ▪ 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 check and balance 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?
  ▪ Adapt.

- Can this response occur within the giraffe’s lifetime?
  ▪ 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

- Ask and discuss the following questions.
  - What adaptation did the saber-toothed cat have to live in its environment?
    ▪ Two large front teeth to catch prey.
  - What did they eat?
    ▪ 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?
    ▪ No, because of their large teeth
  - 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.
  - What was the response of the saber-toothed cat to environmental changes?
    ▪ Die.
  - Could this response occur within the saber-toothed cat’s lifetime?
    ▪ Yes.
• Show the students the picture of the little swan island hutia (page 9, picture packet) and have them fill in questions 10a – 10f.

![Little Swan Island Hutia (extinct in 1955)](image)

• Ask and discuss the following questions.
  o Tell students that this rodent type creature lived on a small island in Honduras and 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 dies off.
  o Where did the hutia live?
    ▪ On an island.
  o The two environmental changes to the island were?
    ▪ Introduction of house cats and hurricane.
  o Why was the rodent not able to adapt to these new conditions?
    ▪ Adaptations take a long time and must occur over many generations of a species.
  o Are larger or smaller habitat ranges beneficial for survival of species and why?
    ▪ Larger, the larger the habitat range the greater the chance of survival.
  o What was the response of the hutia to the environmental change?
    ▪ Die.
  o Could this response occur within the hutia’s life?
    ▪ Yes.
  
• What is it called when an entire species dies off?
  o Extinction
• Do you think extinctions usually take place during the lifetime of one animal or over many generations of a species?
  o Over many generations, which allows humans to come in and prevent the extinction.
• Tell students that they can keep their SciTrek notebooks and that you have enjoyed working and learning with them and that SciTrek will be back later in the year to run another module.
**Extra Practice Solutions:**

<table>
<thead>
<tr>
<th>Question</th>
<th>Testable</th>
<th>Not Testable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How many hours does a giraffe sleep in a day?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. How fast can Wonder Woman run?</td>
<td></td>
<td></td>
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<tr>
<td>3. Is learning how to write in cursive valuable?</td>
<td></td>
<td></td>
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<tr>
<td>4. What is the total number of cups of coffee that people in the United States drink in one week?</td>
<td></td>
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<tr>
<td>5. Is soap easy to pour?</td>
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<tr>
<td>6. What species of animal has the thickest fur?</td>
<td></td>
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<tr>
<td>7. Do ants like sugar?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EXTRA PRACTICE:**

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.