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)*

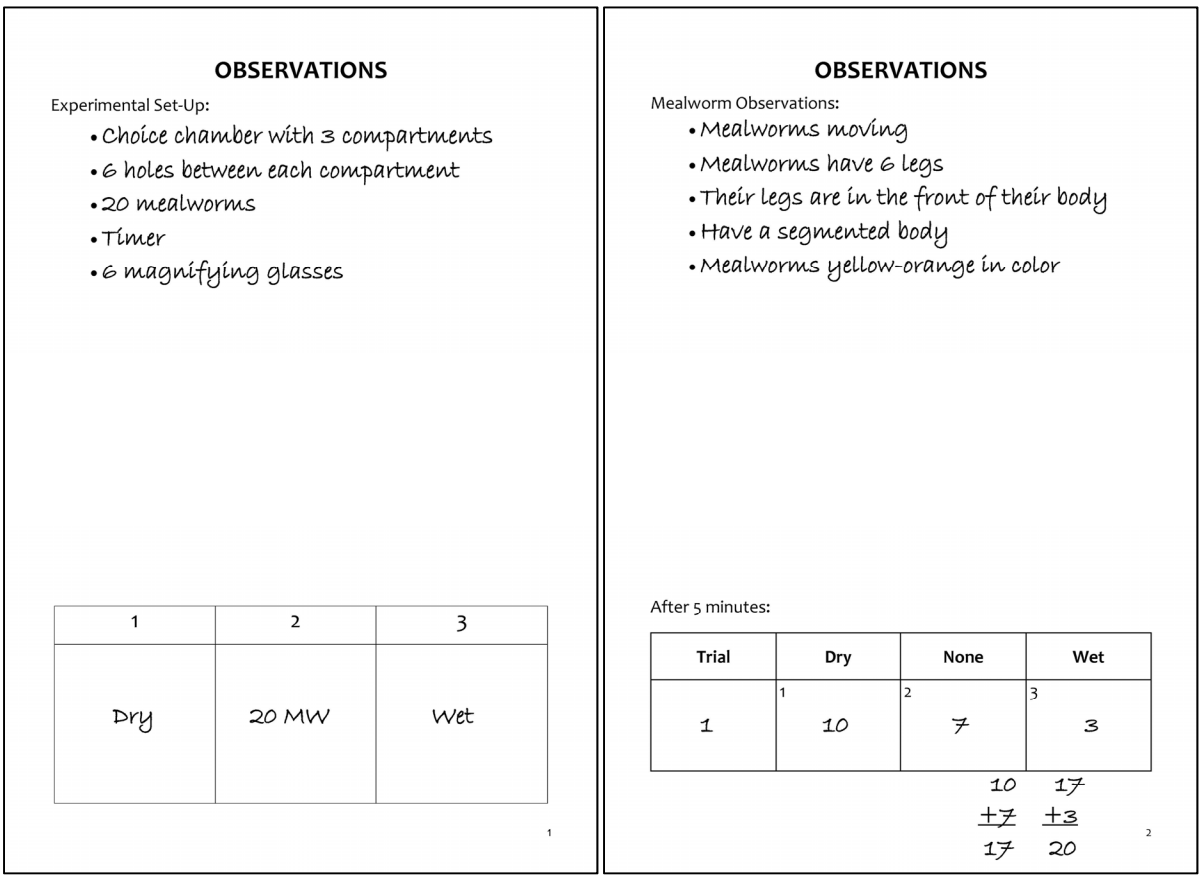
- Allow volunteers to introduce themselves.
- Introduce the module.

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

Experimental Set-Up:

- Choice chamber with 3 compartments
- 6 holes between each compartment
- 20 mealworms
- Timer
- 6 magnifying glasses

1	2	3
Dry	20 MW	Wet

1

OBSERVATIONS

Mealworm Observations:

- Mealworms moving
- Mealworms have 6 legs
- Their legs are in the front of their body
- Have a segmented body
- Mealworms yellow-orange in color

After 5 minutes:

Trial	Dry	None	Wet
1	1 10	2 7	3 3

10 17
+7 +3
17 20

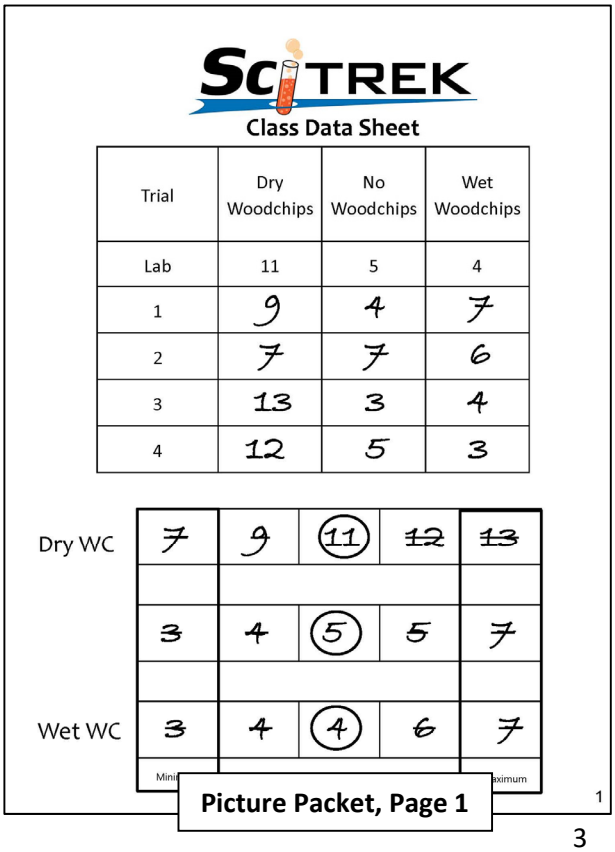
2

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



Class Data Sheet

Trial	Dry Woodchips	No Woodchips	Wet Woodchips
Lab	11	5	4
1	9	4	7
2	7	7	6
3	13	3	4
4	12	5	3

Dry WC	7	9	(11)	12	13
	3	4	(5)	5	7
Wet WC	3	4	(4)	6	7

Mini… …eximum

1

Picture Packet, Page 1

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.

VARIABLES

Variable	How will changing this variable affect the number of mealworms in each compartment?
Length of Container	The longer pillbox will have fewer mealworms in each compartment. 5 Agree, 0 Disagree
Bedding Type	Mealworms might travel to soft bedding so they can burrow in it. 3 Agree, 2 Disagree
Food Type	Mealworms will travel to sweet food because other insects do too. 4 Agree, 1 Disagree
Number of Mealworms	If there are too many mealworms in the pillbox, they won't be able to move. 4 Agree, 1 Disagree
Light Amount	Mealworms will go to the light instead of the dark so they will be able to see. 4 Agree, 1 Disagree

3

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:

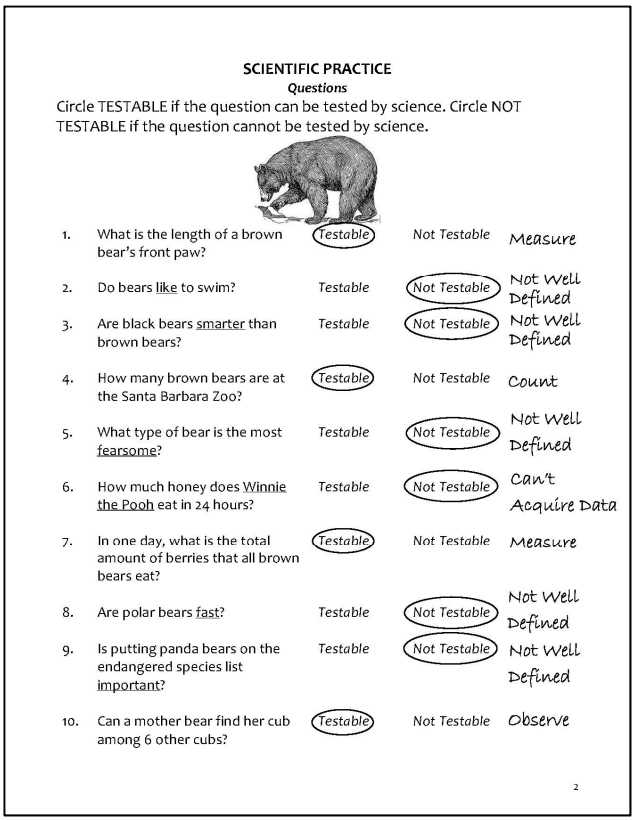
1. Make sure volunteers are writing their name and group color on the whiteboard.
2. Make sure volunteers passing out nametags/notebooks.
3. Set up the document camera for the question activity (notebook, page 2).

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.



SCIENTIFIC PRACTICE

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	Measure
2.	Do bears like to swim?	Testable	(Not Testable)	Not Well Defined
3.	Are black bears smarter than brown bears?	Testable	(Not Testable)	Not Well Defined
4.	How many brown bears are at the Santa Barbara Zoo?	(Testable)	Not Testable	Count
5.	What type of bear is the most fearsome?	Testable	(Not Testable)	Not Well Defined
6.	How much honey does Winnie the Pooh eat in 24 hours?	Testable	(Not Testable)	Can't Acquire Data
7.	In one day, what is the total amount of berries that all brown bears eat?	(Testable)	Not Testable	Measure
8.	Are polar bears fast?	Testable	(Not Testable)	Not Well Defined
9.	Is putting panda bears on the endangered species list important?	Testable	(Not Testable)	Not Well Defined
10.	Can a mother bear find her cub among 6 other cubs?	(Testable)	Not Testable	Observe

2

- *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 <u>like</u> 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 <u>smarter</u> 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 <u>fearsome</u>?
  - 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 <u>Winnie the Pooh</u> 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 <u>important</u>?
  - 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)*

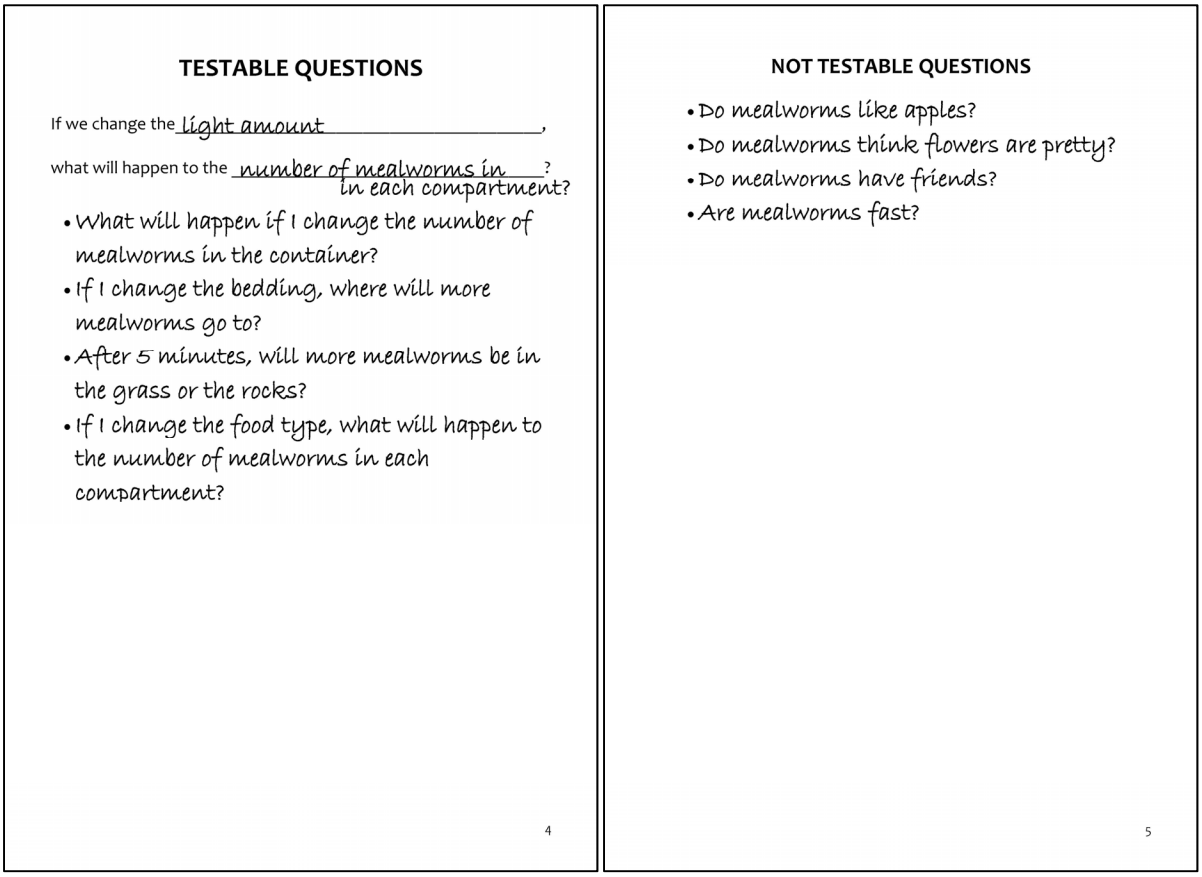
- Show the students the question frame on one of the group notepads and explain how it is used.
  - If we change the <u>___variable___</u>, what will happen to the <u>____what you are measuring/observing_____</u>?

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.



TESTABLE QUESTIONS

If we change the light amount,

what will happen to the number of mealworms in 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 to?
- After 5 minutes, will more mealworms be in the grass or the rocks?
- If I change the food type, what will happen to the number of mealworms in each compartment?

4

NOT TESTABLE QUESTIONS

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

5

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.

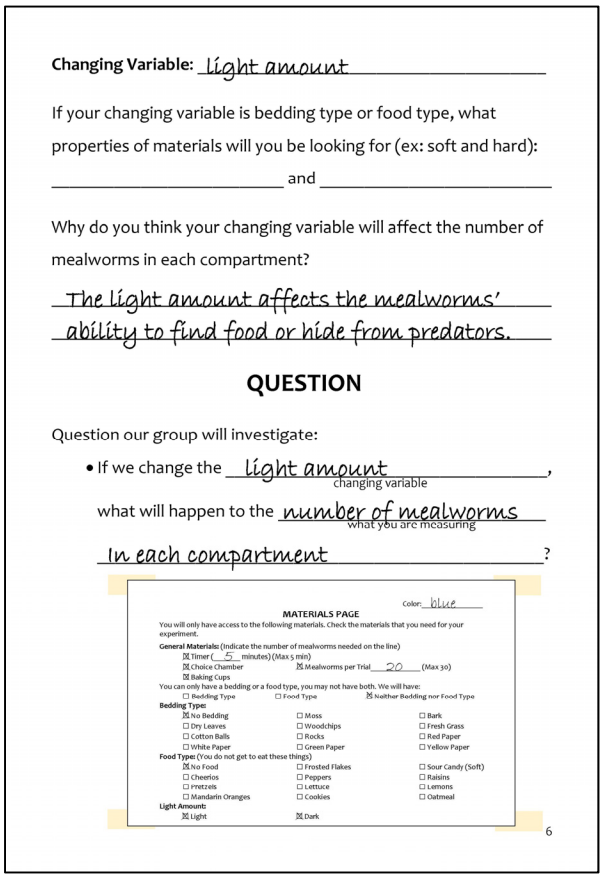
- Go over experimental considerations with students:
  - You will only have access to the materials on the materials page.
  - Each student will get one choice chamber.
  - You must run an odd number of trials. If needed, your volunteer will complete a trial.
  - Each trial may take no longer than 5 minutes.
  - 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 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.
  - Make sure groups do not have both a bedding and a food type.



Changing Variable: light amount

If your changing variable is bedding type or food type, what properties of materials will you be looking for (ex: soft and hard):

_____ and _____

Why do you think your changing variable will affect the number of mealworms in each compartment?

The light amount affects the mealworms' ability to find food or hide from predators.

QUESTION

Question our group will investigate:

- If we change the light amount (changing variable),

what will happen to the number of mealworms (what you are measuring)

in each compartment?

Color: blue

MATERIALS PAGE

You will only have access to the following materials. Check the materials that you need for your experiment.

General Materials: (Indicate the number of mealworms needed on the line)

☒ Timer (5 minutes) (Max 5 min)
☒ Choice Chamber
☒ Mealworms per Trial 20 (Max 30)
☒ Baking Cups

You can only have a bedding or a food type, you may not have both. We will have:

☐ Bedding Type ☐ Food Type ☒ Neither Bedding nor Food Type

Bedding Type:

☒ No Bedding	☐ Moss	☐ Bark
☐ Dry Leaves	☐ Woodchips	☐ Fresh Grass
☐ Cotton Balls	☐ Rocks	☐ Red Paper
☐ White Paper	☐ Green Paper	☐ Yellow Paper

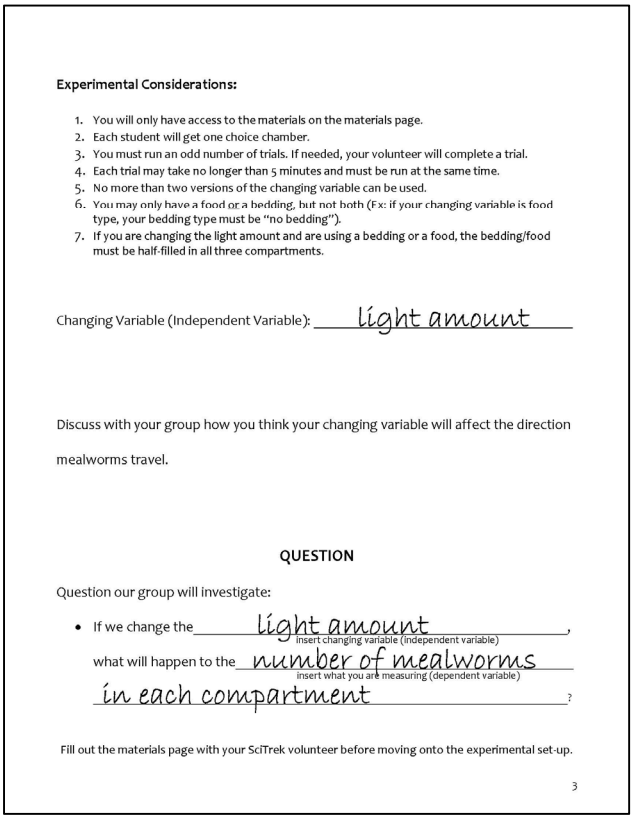
Food Type: (You do not get to eat these things)

☒ No Food	☐ Frosted Flakes	☐ Sour Candy (Soft)
☐ Cheerios	☐ Peppers	☐ Raisins
☐ Pretzels	☐ Lettuce	☐ Lemons
☐ Mandarin Oranges	☐ Cookies	☐ Oatmeal

Light Amount:

☒ Light ☒ Dark

6



Experimental Considerations:

1. You will only have access to the materials on the materials page.
2. Each student will get one choice chamber.
3. You must run an odd number of trials. If needed, your volunteer will complete a trial.
4. Each trial may take no longer than 5 minutes and must be run 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 (Ex: if your changing variable is food type, your bedding type must be "no bedding").
7. 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.

Changing Variable (Independent Variable): light amount

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

QUESTION

Question our group will investigate:

- If we change the light amount (insert changing variable (independent variable)),

what will happen to the number of mealworms (insert what you are measuring (dependent variable))

in each compartment?

Fill out the materials page with your SciTrek volunteer before moving onto the experimental set-up.

3

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.

1	2	3
Dark + WC	20 MW + WC	Light + WC

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 Type / Choice Chamber

1	2	3
Dark	20 MW	Light

Prediction:

I predict the compartment with the most mealworms will be

_____.
value of changing variable

7

EXPERIMENTAL SET-UP

Write your changing variable (Ex: food type) and the values (Ex: cookies) you will use in the compartments.

Changing Variable: light amount / light and dark

Controls (variables you will hold constant):
Write your controls and the values you will use in all your trials (control/value, Ex: insect type/mealworm).

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

Write what you will put in each compartment of the container at the start of the experiment.

1	2	3
Dark	20 MW	Light

Prediction:

I predict the compartment with the most mealworms will be the dark.
value of changing variable

4

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:

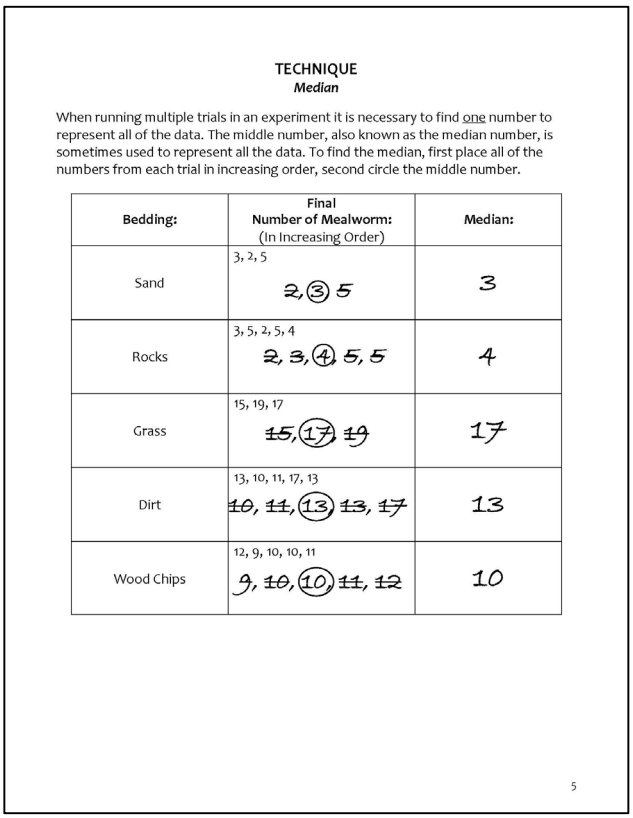
1. Make sure volunteers are passing out notebooks.
2. Make sure volunteers are labeling baking cups.
3. Set up the document camera for the technique activity (notebook, page 5).

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.



TECHNIQUE
Median

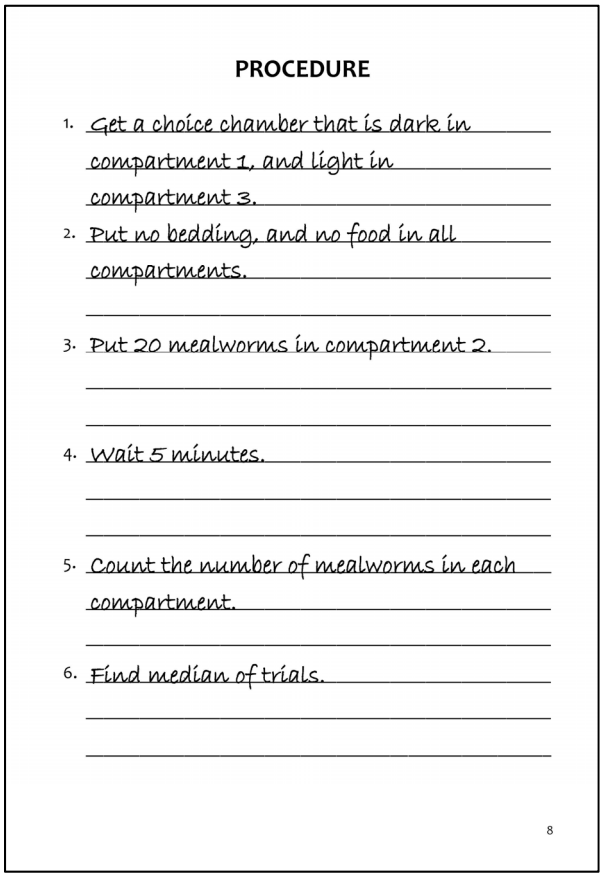
When running multiple trials in an experiment it is necessary to find one number to represent all of the data. The middle number, also known as the median number, is sometimes used to represent all the data. To find the median, first place all of the numbers from each trial in increasing order, second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

Bedding:	Final Number of Mealworm: (In Increasing Order)	Median:
Sand	3, 2, 5 2, (3) 5	3
Rocks	3, 5, 2, 5, 4 ~~2, 3,~~ (4) ~~5, 5~~	4
Grass	15, 19, 17 ~~15,~~ (17) ~~19~~	17
Dirt	13, 10, 11, 17, 13 ~~10, 11,~~ (13) ~~13, 17~~	13
Wood Chips	12, 9, 10, 10, 11 ~~9, 10,~~ (10) ~~11, 12~~	10

5

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

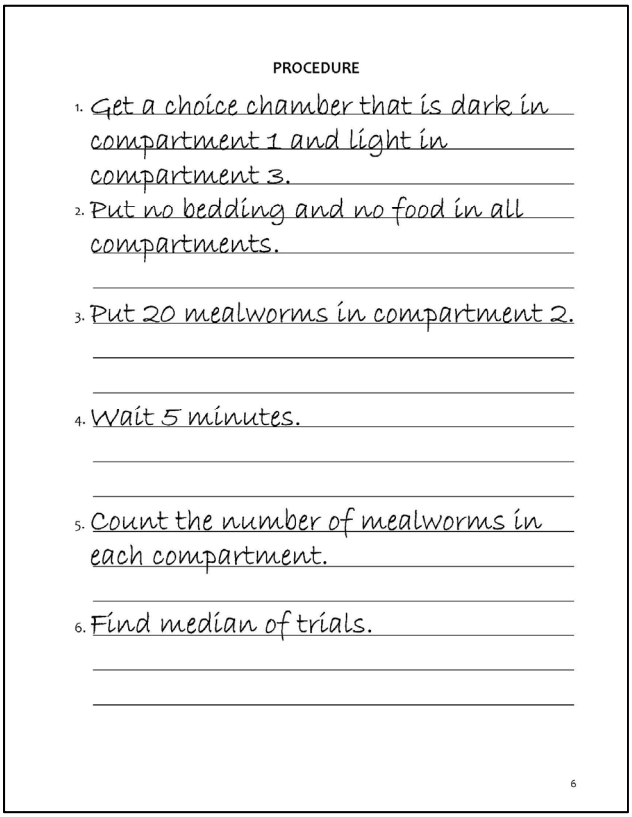
- Walk around and help groups who are struggling.
- Make sure procedures are concise, but still include all values of the controls and changing variable, as well as the data that will be collected.
- Volunteers should be writing one step of the procedure and having students copy that step before moving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



PROCEDURE

1. Get a choice chamber that is dark in compartment 1, and light in compartment 3.
2. Put no bedding, and no food in all compartments.
3. Put 20 mealworms in compartment 2.
4. Wait 5 minutes.
5. Count the number of mealworms in each compartment.
6. Find median of trials.

8



PROCEDURE

1. Get a choice chamber that is dark in compartment 1 and light in compartment 3.
2. Put no bedding and no food in all compartments.
3. Put 20 mealworms in compartment 2.
4. Wait 5 minutes.
5. Count the number of mealworms in each compartment.
6. Find median of trials.

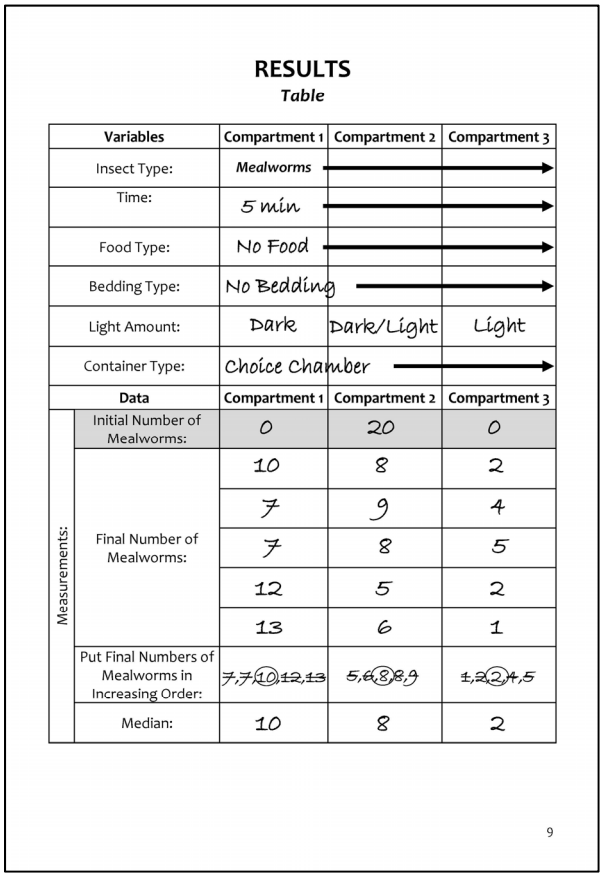
6

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.

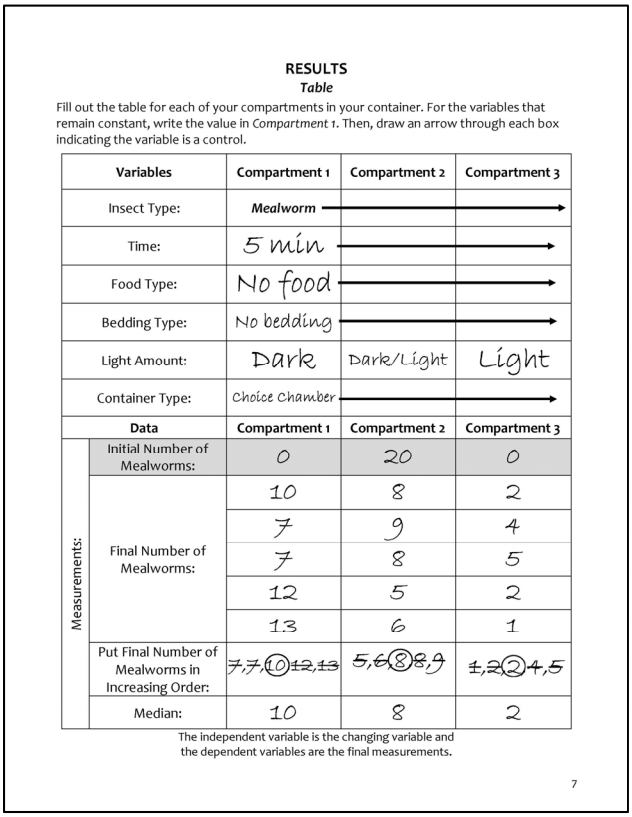


RESULTS

Table

Variables	Compartment 1	Compartment 2	Compartment 3
Insect Type:	*Mealworms* →		
Time:	5 min →		
Food Type:	No Food →		
Bedding Type:	No Bedding →		
Light Amount:	Dark	Dark/Light	Light
Container Type:	Choice Chamber →		
Data	**Compartment 1**	**Compartment 2**	**Compartment 3**
Measurements: Initial Number of Mealworms:	0	20	0
Measurements: Final Number of Mealworms:	10	8	2
	~~7~~	9	4
	~~7~~	8	5
	12	5	2
	13	6	1
Measurements: Put Final Numbers of Mealworms in Increasing Order:	~~7,7,~~(10)~~12,13~~	~~5,6,~~(8)~~8,9~~	~~1,~~(2)~~4,5~~
Measurements: Median:	10	8	2

9



RESULTS

Table

Fill out the table for each of your compartments in your container. For the variables that remain constant, write the value in *Compartment 1*. Then, draw an arrow through each box indicating the variable is a control.

Variables	Compartment 1	Compartment 2	Compartment 3
Insect Type:	*Mealworm* →		
Time:	5 min →		
Food Type:	No food →		
Bedding Type:	No bedding →		
Light Amount:	Dark	Dark/Light	Light
Container Type:	Choice Chamber →		
Data	**Compartment 1**	**Compartment 2**	**Compartment 3**
Measurements: Initial Number of Mealworms:	0	20	0
Measurements: Final Number of Mealworms:	10	8	2
	~~7~~	9	4
	~~7~~	8	5
	12	5	2
	13	6	1
Measurements: Put Final Number of Mealworms in Increasing Order:	~~7,7,~~(10)~~12,13~~	~~5,6,~~(8)~~8,9~~	~~1,~~(2)~~4,5~~
Measurements: Median:	10	8	2

The independent variable is the changing variable and the dependent variables are the final measurements.

7

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

- Go over what students 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:

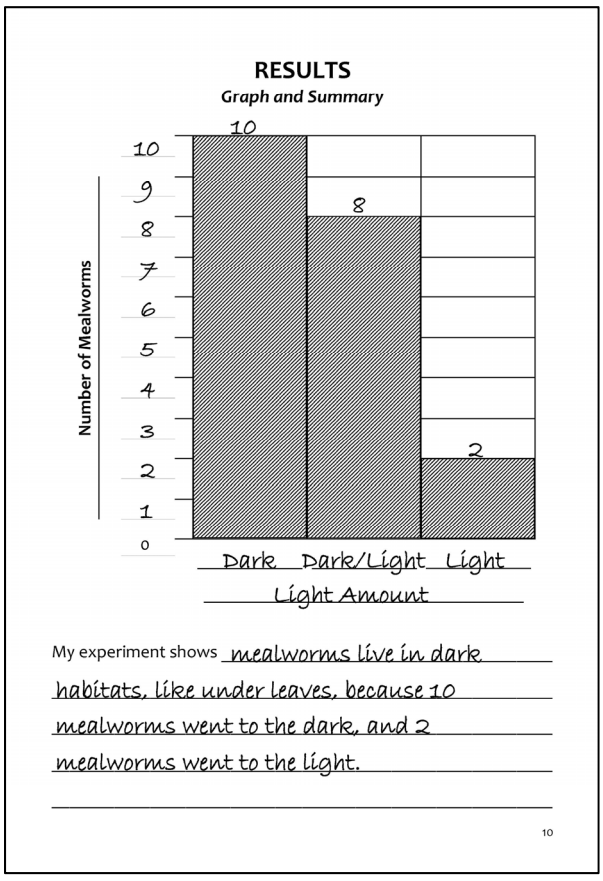
1. Make sure volunteers are setting out notebooks.
2. Find a place to leave student posters.

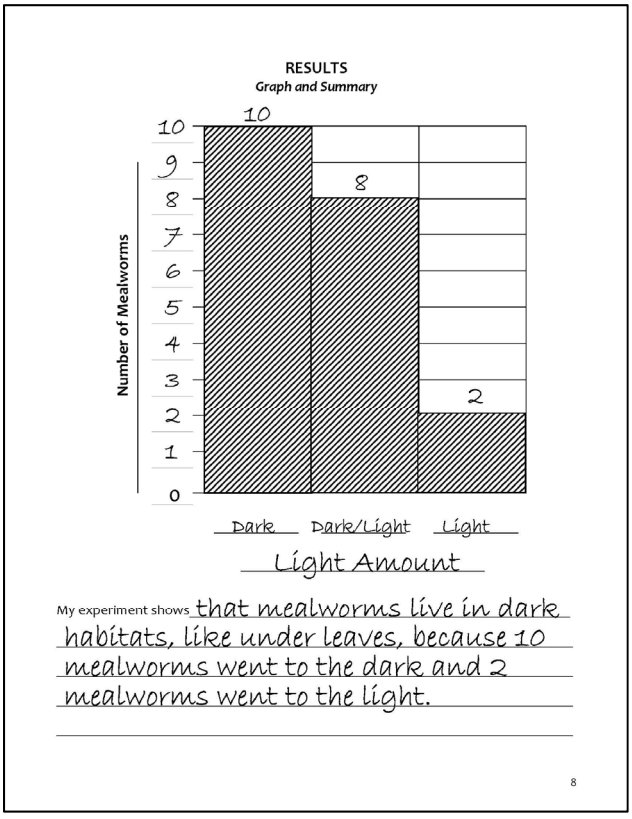
Introduction: *(2 minutes – Full Class – SciTrek Lead)*

- 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)*

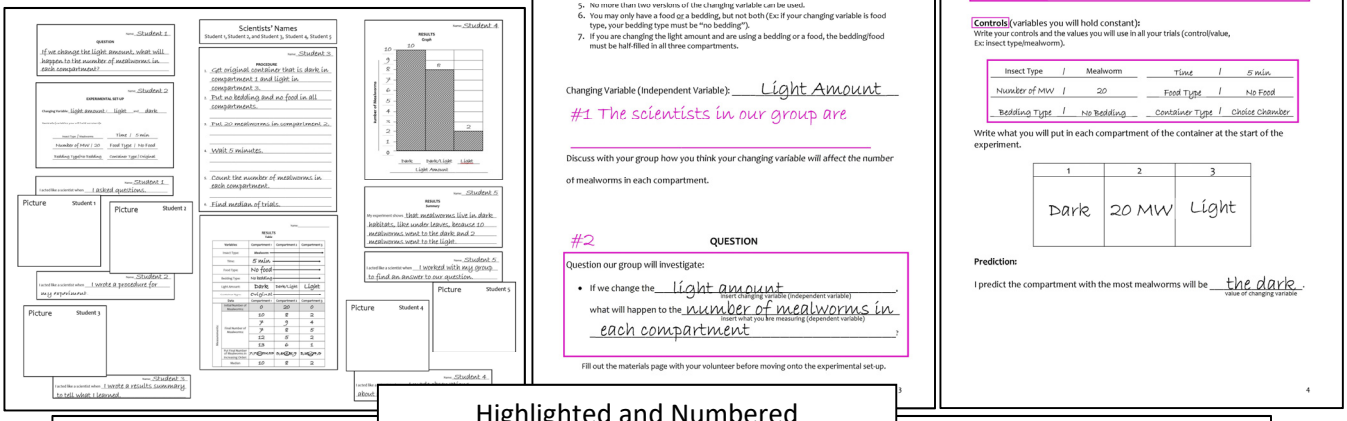
- Walk around and help groups who are struggling.
- Make sure groups are generating a claim about the habitat a mealworm lives in (ideally the claim will allow them to make a prediction about future experiments) and using specific data points to support it.
    - Groups will be using measurements as 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*.

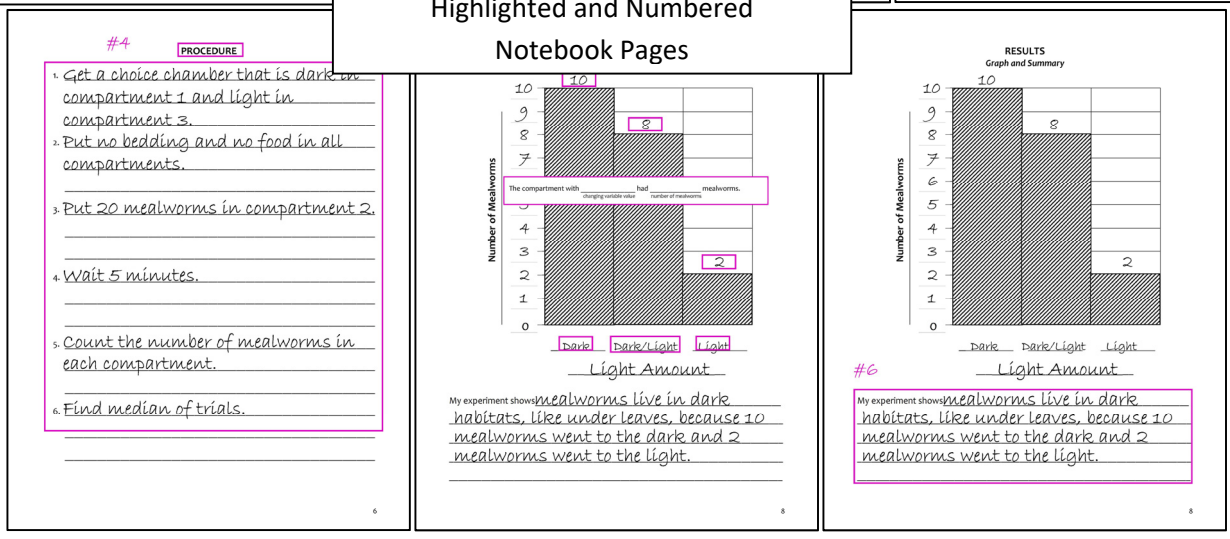
Poster Making: *(33 minutes – Groups – SciTrek Volunteers)*

- 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).
    - 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.



Highlighted and Numbered Notebook Pages



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.

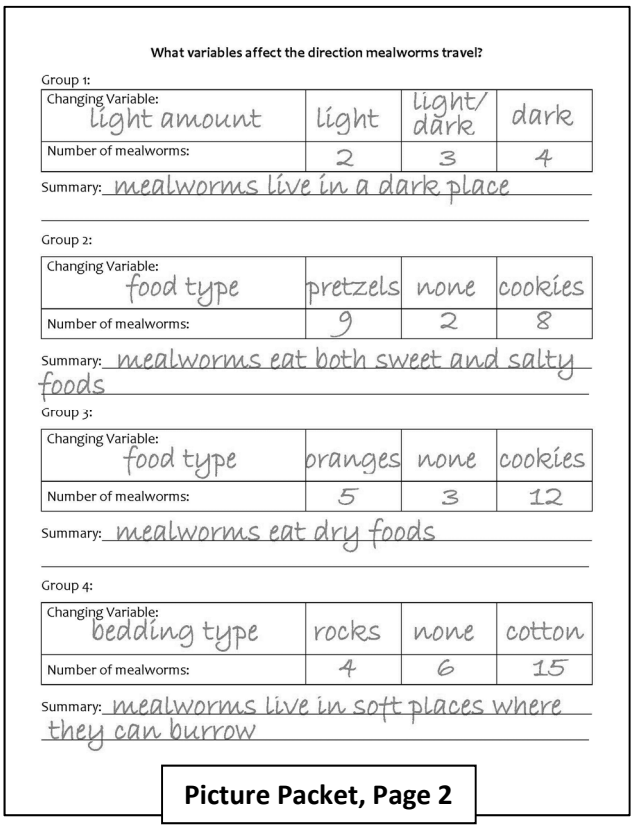
Practice Posters: *(15 minutes – Groups – SciTrek Volunteers)*

- **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).
    - After a group reads their question stop the presentation and have the class identify the changing variable. Then, record it in the picture packet.
    - 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 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), as the whole class:
    - 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 students learned under the *Summary* (picture packet, page 2).
- After all presentations are over, have students describe a mealworm's ideal habitat.



What variables affect the direction mealworms travel?

Group 1:

Changing Variable: light amount	light	light/ dark	dark
Number of mealworms:	2	3	4

Summary: mealworms live in a dark place

Group 2:

Changing Variable: food type	pretzels	none	cookies
Number of mealworms:	9	2	8

Summary: mealworms eat both sweet and salty foods

Group 3:

Changing Variable: food type	oranges	none	cookies
Number of mealworms:	5	3	12

Summary: mealworms eat dry foods

Group 4:

Changing Variable: bedding type	rocks	none	cotton
Number of mealworms:	4	6	15

Summary: mealworms live in soft places where they can burrow

Picture Packet, Page 2

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.

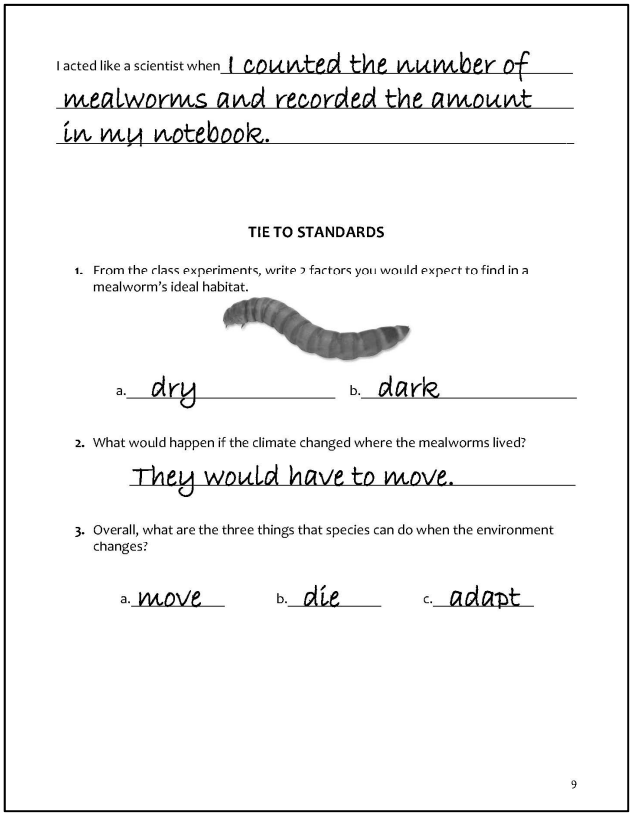
Question Assessment: *(5 minutes – Full Class – SciTrek Lead)*

- 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*.


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.

a. dry b. dark

2. What would happen if the climate changed where the mealworms lived?

They would have to move.

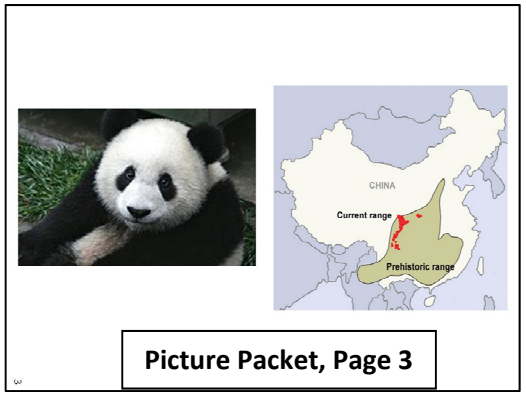
3. Overall, what are the three things that species can do when the environment changes?

a. move b. die c. adapt

9

Move/Migration (10 minutes)

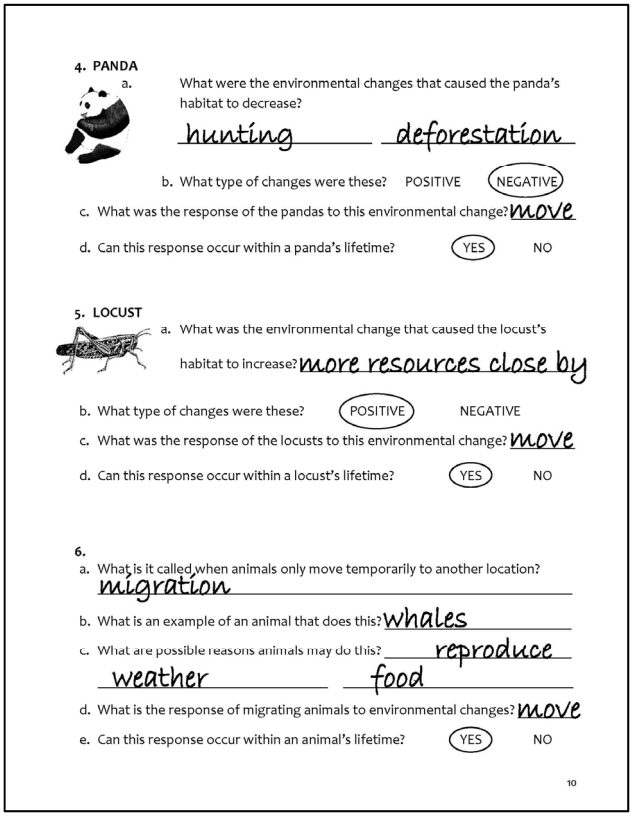
- Have students turn to page 10 in their notebooks. Show students the picture of the Giant Panda (picture packet, page 3).
- Tell students, "Pandas use to live in the area that is green on the map but now only live in the area that is red on the map."
- Have students brainstorm why this might be.
    - Confirm that it is because of hunting and deforestation.
- Ask, 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



Picture Packet, Page 3

- 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 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 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 it is 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.


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 pandas to this environmental change? move

d. Can this response occur within a 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 locusts to this environmental change? move

d. Can this response occur within a locust's lifetime? (YES) NO

6.

a. What is it called when animals only move temporarily to another location? migration

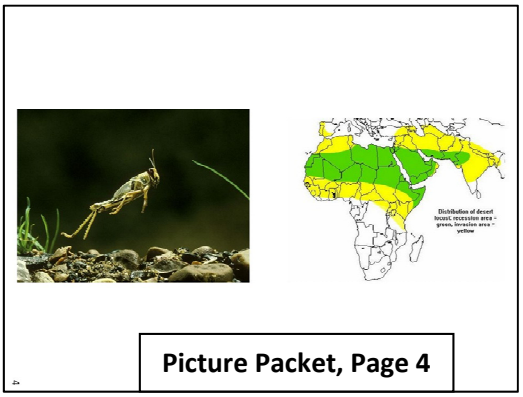
b. What is an example of an animal that does this? whales

c. What are possible reasons animals may do this? reproduce weather food

d. What is the response of migrating animals to environmental changes? move

e. Can this response occur within an animal's lifetime? (YES) NO

10



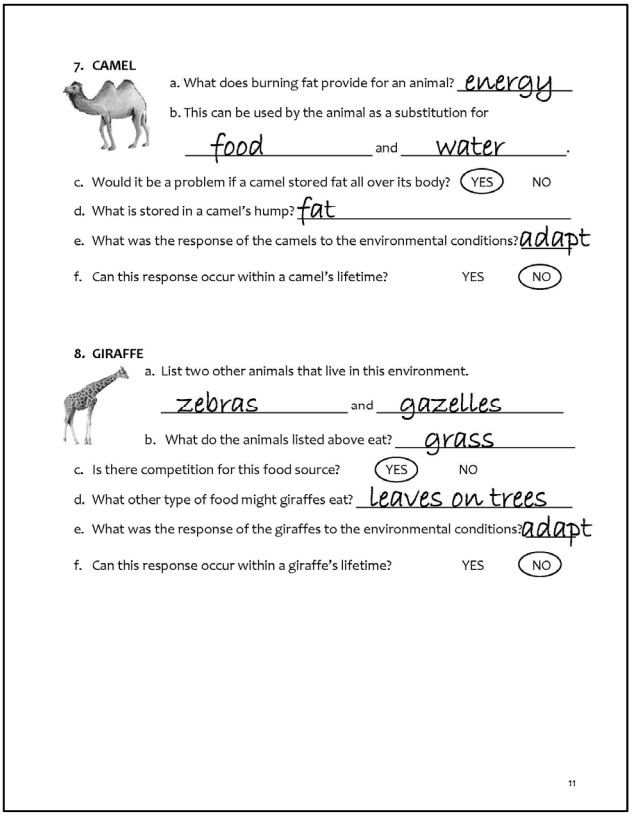
Picture Packet, Page 4

Picture Packet, Page 5

Adapt (15 minutes)

Picture Packet, Page 6

- 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? *7a*
        - 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? *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?
        - They might get too hot or they might not be able to go for long periods of time without food and water.



7. CAMEL

a. What does burning fat provide for an animal? energy

b. This can be used by the animal as a substitution for food and water.

c. Would it be a problem if a camel stored fat all over its body? (YES) NO

d. What is stored in a camel's hump? fat

e. What was the response of the camels to the environmental conditions? adapt

f. Can this response occur within a camel's lifetime? YES (NO)

8. GIRAFFE

a. List two other animals that live in this environment. zebras and gazelles

b. What do the animals listed above eat? grass

c. Is there competition for this food source? (YES) NO

d. What other type of food might giraffes eat? leaves on trees

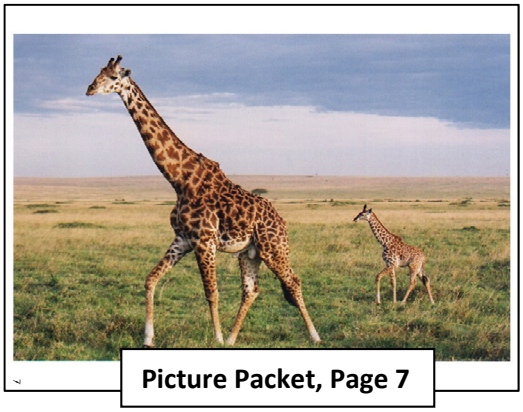
e. What was the response of the giraffes to the environmental conditions? adapt

f. Can this response occur within a giraffe's lifetime? YES (NO)

11

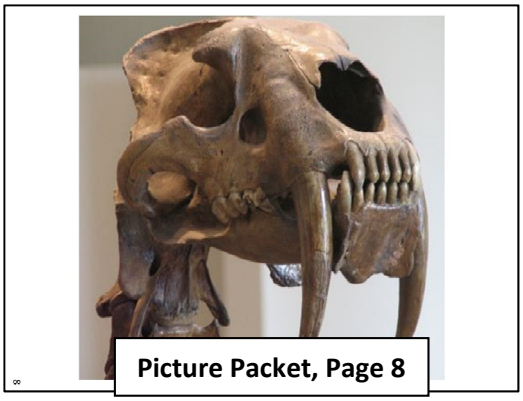
- If a camel was born in an area with lots of food and water, would the camel's hump go away?
    - No, it takes many generations to develop/lose adaptations.
- What was the response of the camel to its environmental conditions? *7e*
    - Adapt.
- Can this response occur within the camel's lifetime? *7f*
    - 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.



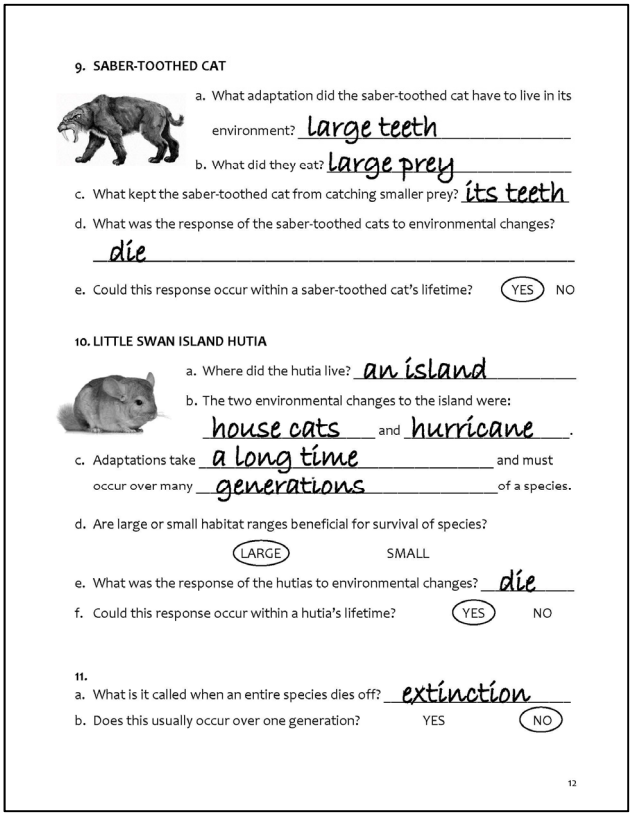
Picture Packet, Page 7

- 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.



9. SABER-TOOTHED CAT

a. What adaptation did the saber-toothed cat have to live in its environment? large teeth

b. What did they eat? large prey

c. What kept the saber-toothed cat from catching smaller prey? its teeth

d. What was the response of the saber-toothed cats to environmental changes? die

e. Could this response occur within a saber-toothed cat's lifetime? (YES) NO

10. LITTLE SWAN ISLAND HUTIA

a. Where did the hutia live? an island

b. The two environmental changes to the island were: house cats and hurricane.

c. Adaptations take a long time and must occur over many generations of a species.

d. Are large or small habitat ranges beneficial for survival of species? (LARGE) SMALL

e. What was the response of the hutias to environmental changes? die

f. Could this response occur within a hutia's lifetime? (YES) NO

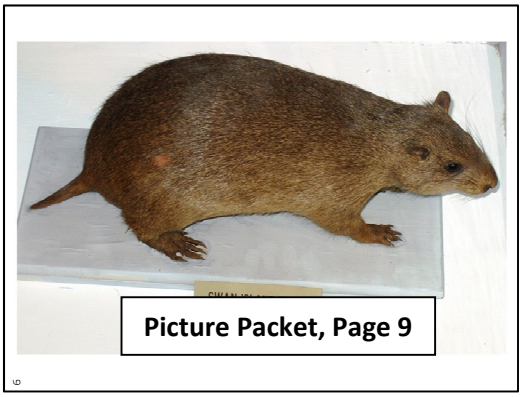
11.

a. What is it called when an entire species dies off? extinction

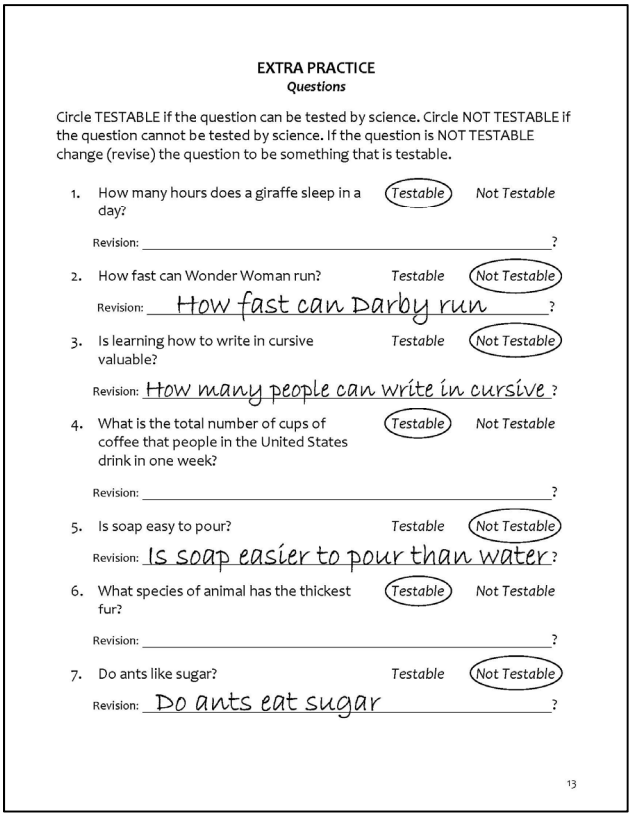
b. Does this usually occur over one generation? YES (NO)

12

  - 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? *(Testable)* *Not Testable*

   Revision: _____?

2. How fast can Wonder Woman run? *Testable* *(Not Testable)*

   Revision: How fast can Darby run ?

3. Is learning how to write in cursive valuable? *Testable* *(Not 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)* *Not Testable*

   Revision: _____?

5. Is soap easy to pour? *Testable* *(Not Testable)*

   Revision: Is soap easier to pour than water ?

6. What species of animal has the thickest fur? *(Testable)* *Not Testable*

   Revision: _____?

7. Do ants like sugar? *Testable* *(Not Testable)*

   Revision: Do ants eat sugar ?

13