

Group Color: _____



How Science Works

Grade 3

Module 1

Class Question:

What variables affect the number of mealworms in each compartment?

Scientist (Your Name): _____

Teacher's Name: _____

SciTrek Volunteer's Name: _____

VOCABULARY

Science: The study of the material world using human reason. The scientific method is the way humans reason and apply logic to data to help gain knowledge of the world.

- **Observation:** A description using your five senses. This could include contents, mass, size, color, temperature, smell, texture ...
- **Opinion:** Something you believe or feel. Not a fact or observation.
- **Inference:** A guess based on past experiences.
- **Testable Question:** A question for which an experiment can be designed to answer.
- **Non-Testable Question:** A question for which an experiment cannot be designed to answer. For example, questions involving things that cannot be measured/observed or things that are not well defined/opinions.
- **Experimental Set-Up:** The materials, changing variable, and controls that are needed for an experiment.
- **Experiment:** A test or trial to discover something unknown.
- **Procedure:** A set of steps to conduct an experiment.
- **Controls:** The variables that are not changed in an experiment.
- **Changing Variable (Independent Variable):** The variable that is purposely changed in an experiment.
- **Results/Data (Dependent Variable):** The measurements/observations of the experiment, which are influenced/determined by the changing variable.
- **Prediction:** What you expect to happen based off of previous measurements/observations.
- **Scientific Practices:** A series of activities that scientists participate in to both understand the world around them and to communicate their results with others. The specific practice worked on in this module is identifying testable questions.
- **Technique:** A method for a specific task.
- **Reproducibility:** The ability to duplicate data from one trial to the next.
- **Median:** The middle number of a given set of numbers listed in increasing order.
- **Maximum:** The largest value in a given set of numbers.
- **Minimum:** The smallest value in a given set of numbers.
- **Compartment:** A section of something.
- **Habitat:** The natural home or environment of an animal, or plant.
- **Mealworm:** A type of insect.
- **Species:** A specific type of animal.
- **Adapt:** The process by which a plant/animal, over many generations, becomes better fit to its environment.
- **Migration:** When animal move from one place to another during certain times of the year.
- **Extinction:** The dying out of a species.

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 |
| 2. | Do bears <u>like</u> to swim? | Testable | Not Testable |
| 3. | Are black bears <u>smarter</u> 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 <u>fearsome</u> ? | Testable | Not Testable |
| 6. | How much honey does <u>Winnie the Pooh</u> 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 <u>fast</u> ? | Testable | Not Testable |
| 9. | Is putting panda bears on the endangered species list <u>important</u> ? | Testable | Not Testable |
| 10. | Can a mother bear find her cub among 6 other cubs? | Testable | Not Testable |

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): _____

Discuss with your group how you think your changing variable will affect the number of mealworms in each compartment.

QUESTION

Question our group will investigate:

- If we change the _____,
insert changing variable (independent variable)
what will happen to the _____,
insert what you are measuring (dependent variable)
_____?

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

EXPERIMENTAL SET-UP

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

Changing Variable: _____ / _____ and _____

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	/
_____	/	_____	/
_____	/	_____	/

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

1	2	3

Prediction:

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

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	
Rocks	3, 5, 2, 5, 4	
Grass	15, 19, 17	
Dirt	13, 10, 11, 17, 13	
Wood Chips	12, 9, 10, 10, 11	

PROCEDURE

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

RESULTS

Table

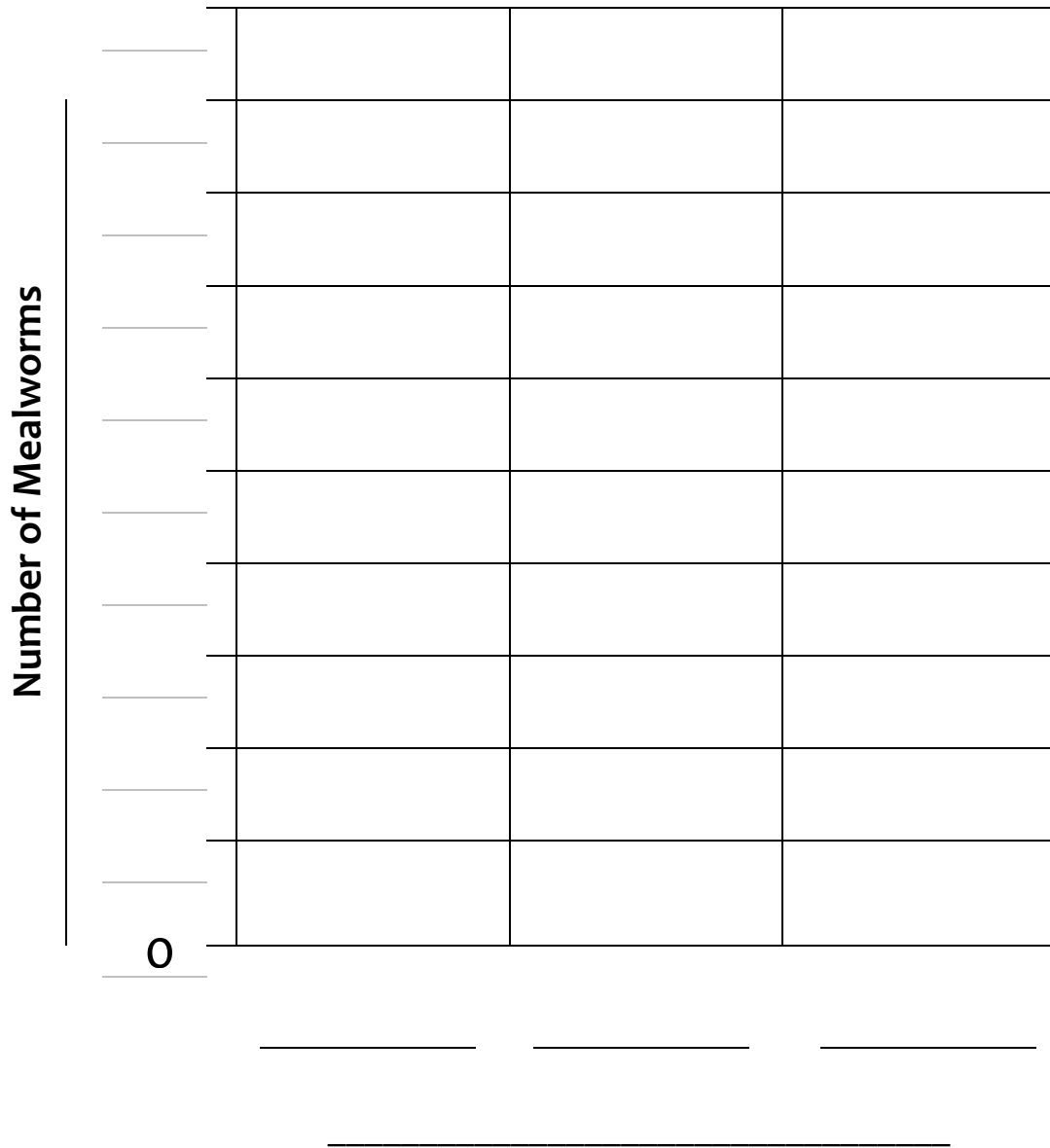
Fill out the table for each of your compartments in your container. For the variables that remain constant, write the value in *Compartment 1*. Then, draw an arrow through each box indicating the variable is a control.

Variables	Compartment 1	Compartment 2	Compartment 3
Insect Type:	Mealworm	→	
Time:			
Food Type:			
Bedding Type:			
Light Amount:			
Container Type:			
Data	Compartment 1	Compartment 2	Compartment 3
Measurements:	Initial Number of Mealworms:		
	Final Number of Mealworms:		
	Put Final Number of Mealworms in Increasing Order:		
	Median:		

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

RESULTS

Graph and Summary



My experiment shows _____

I acted like a scientist when _____

TIE TO STANDARDS

1. From the class experiments, write 2 factors you would expect to find in a mealworm's ideal habitat.



a. _____ b. _____

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

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

a. _____ b. _____ c. _____

4. PANDA



a.

What were the environmental changes that caused the panda's habitat to decrease?

b. What type of changes were these? POSITIVE NEGATIVE

c. What was the response of the pandas to this environmental change? _____

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? _____

b. What type of changes were these? POSITIVE NEGATIVE

c. What was the response of the locusts to this environmental change? _____

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?

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

c. What are possible reasons animals may do this? _____

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

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

7. CAMEL



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

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

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? _____

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

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

8. GIRAFFE



a. List two other animals that live in this environment.

_____ and _____

b. What do the animals listed above eat? _____

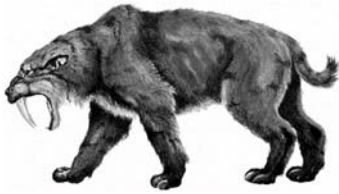
c. Is there competition for this food source? YES NO

d. What other type of food might giraffes eat? _____

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

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

9. SABER-TOOTHED CAT



- a. What adaptation did the saber-toothed cat have to live in its environment? _____
- b. What did they eat? _____
- c. What kept the saber-toothed cat from catching smaller prey? _____
- d. What was the response of the saber-toothed cats to environmental changes?

- 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? _____
- b. The two environmental changes to the island were:
_____ and _____.
- c. Adaptations take _____ and must occur over many _____ 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? _____
- f. Could this response occur within a hutia's lifetime? YES NO

11.

- a. What is it called when an entire species dies off? _____
- b. Does this usually occur over one generation? YES NO

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: _____?

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

Revision: _____?

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: _____?

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

Revision: _____?

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

Revision: _____?

WORD SEARCH

T Z B E H M G M H N E T V C H R
W E V E E A R A V O T X O C A E
B O S D D O G I H I G M O A B P
M Q I T W D F U X T P I D F I R
P A T L A V I P Y A G W C A T O
N U A D I B Y N R R E H C Y A D
M E N O Q M L T G G S K O A T U
M M O O E F M E Y I T P A D A C
Z J D F I E T R Q M O V T I L I
W S N E N T A H I U Q U K A H B
Z R Q T K D C C G G E F U T H I
S P E C I E S N E I E S I R Y L
H T J E S I G Y I M L D T Y W I
D N F D E X M E U T A M G I O T
C L I T K E M Q F C X C U B O Y
N O I T A V R E S B O E W R V N

Adapt	Habitat	Move
Bedding	Light	Observation
Compartment	Mealworm	Reproducibility
Extinction	Median	Species
Food	Migration	Testable Question



SciTrek is an educational outreach program that is dedicated to allowing 2nd - 12th grade students to experience scientific practices firsthand. SciTrek partners with local teachers to present student-centered inquiry-based modules that not only emphasize the process of science but also specific grade level NGSS performance expectations. Each module allows students to design, carry out, and present their experiments and findings.

For more information, please feel free to visit us on the web at chem.ucsb.edu/scitrek/ or contact us by e-mail at scitrekelementary@chem.ucsb.edu.

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