How to write a testable Question

Unit 1: Thinking Like a Scientist

Sometimes scientists just like to explore….

~ If I do this...then what?

~ What happens if…?

~ I wonder why…?

~ ...etc ….

Exploring or making observations often makes scientists curious about **specific** questions. To answer those questions, scientists need to carry out investigations using testable questions

What is a "Testable Question"?

A testable question is one that can be answered by designing and conducting an experiment.

Sample testable Question:

Does changing the depth of water affect how many fish the bear can catch?

Testable questions are always about changing one thing to see what the effect is on another.

There is a word for these Purple and Gold things

Independent Variable

It's changing one thing…

EX: the depth of the water

Something I will change on purpose

It is The cause …

Dependent Variable

… to see what the effect is on another

EX: number of fish caught

Something I will wait to see, then measure

...and the effect

Another testable question

Does the mass of the bear affect the length of time of their hibernation?

Identify the independent variable (hint: what would you need to change?) **HIGHLIGHT/CIRCLE IN PURPLE**

Identify the dependent variable (hint: what would you wait to see, then measure?) **HIGHLIGHT/CIRCLE IN GOLD**

Students, draw anywhere on this slide!

Another testable question

Does the mass of the bear affect the length of time of their hibernation?

Identify the independent variable (hint: what would you need to change?) **HIGHLIGHT/CIRCLE IN PURPLE**

Identify the dependent variable (hint: what would you wait to see, then measure?) **HIGHLIGHT/CIRCLE IN GOLD**

Another testable question

Does the speed of the water affect how many salmon the bear can catch?

Identify the independent variable - **Highlight/Circle in Purple**

Identify the dependent variable - **Highlight/Circle in Gold**

Students, draw anywhere on this slide!

Another testable question

Does the speed of the water affect how many salmon the bear can catch?

Is this a testable question?

What makes a bear grow best?

Students choose an option

What makes a bear grow best? --- NOT testable!

How to turn a general question into a testable question:

Think of a cause and an effect related to your question:
"What makes a bear grow best?"

In this case, you can change something to affect something about how a bear grows

“What makes bears grow best?"

What are examples of things you can change?

What are examples of effects that you can wait to see, then measure?

Students, write your response!

“What makes bears grow best?"

What are examples of things you can change?

Examples:

~ Amount of water

~ Amount/Type of food

~ Amount of exercise

What are examples of effects that you can wait to see, then measure?

Examples:

~ Height of bear

~ Mass of bear

~Rate of growth

Finally, plug in the change and the thing you wait to see, then measure

(the cause…) (…the effect)

"How does _____ affect _____?"

"How does what a bear eats (their diet) affect the bear's mass?"

That's a testable question!

Here's another example…
Is this testable?

"What is the world's favorite type of bear?"

Is this testable?

“What is the world’s favorite type of bear?”

NOPE! But let’s make it testable!

"What is the world's favorite type of bear?"

What are examples of things you can change?

Examples:

~ ask people in different countries of the world

~ ask people in different age groups

~ ask people with different jobs

What are examples of effects that you can wait to see, then measure?

Examples:

~ the number of people who say their favorite bear is a POLAR BEAR

~ the number of people who say BLACK BEAR

~ the number of people who say BROWN BEAR

Finally, plug in the change and the thing you wait to see, then measure

(the cause...) (...the effect)

"How does _____ affect _____?"

"How does the country a person li[illegible]in affect their favorite bear?"

Controls - bear example

Controls for the bear experiment:

~ Types of bear that I include in my survey

If I give someone in Mexico this survey....And I give someone in Morocco this survey.....

Mexico:

What is your favorite type of Bear?

a) Brown Bear
b) Black Bear
c) Teddy Bear

Morocco:

What is your favorite type of Bear?

a) Brown Bear
b) Black Bear
c) Polar Bear
d) none

If I give someone in Mexico this survey….And I give someone in Morocco this survey……

Mexico:

What is your favorite type of bear?

a) Brown Bear
b) Black Bear
c) Panda Bear

Morocco:

What is your favorite type of bear?

a) Brown Bear
b) Black Bear
c) Polar Bear
d) none

…. Then my data will get screwed up! It will not be compatible!

Why? Well…..

~ What if someone in Mexico wanted to say "none" but didn't have that option?

~ What if someone in Morocco wanted to say "Panda Bear" but didn't have that option?

My **CONTROL** for this bear experiment is to include the **same bear options** on every survey

Here's another example…
Is this testable?

"How does a female polar bear care for her young?"

Students choose an option

Is this testable? No...but let’s change it to be testable!

NOPE! But let’s make it testable!

“How does a female polar bear care for her young?"

What are examples of things you can change?

Examples:

~ location of den

~ size of den

~ amount of food available

What are examples of effects that you can wait to see, then measure?

Examples:

~ rate of survival

~ mass of cub(s) (health)

Finally, plug in the change and the thing you wait to see, then measure

(the cause...) (...the effect)

"How does _____ affect _____?"

"How does _____ affect the _____?"

What are examples of things you can change? Examples:

~ location of den
~ size of den
~ amount of food available

What are examples of effects that you can wait to see, then measure? Examples:

~ rate of survival
~ mass of cub(s) (health)

Students, write your response!

Finally, plug in the change and the thing you wait to see, then measure

(the cause...) (...the effect)

"How does _____ affect _____?"

"How does the location of the bear's den affect the health of the young (measured by mass)?"

Controls - Polar Bear example

What do you need to keep consistent??

Students, write your response!

Controls - Polar Bear example

Controls for the polar bear experiment:

~ # of cubs

~ duration of time in den

~ relative size of female bear before hibernation

~ end ~