Biology Class NTI Packet Information

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Once signed up you may send me messages

NTI Assignment Instructions for Days #1 – 5 ***ASSIGNMENTS ARE DUE 3 DAYS AFTER NTI DAY IS USED!!!

Objective: Students will review the material covered during the 1st semester the reading of articles and completion of article summary questions.

For each NTI day listed below, you need to read the accompanying article and complete the included discussion and analysis questions.

Day #1 – *Coral bleaching and climate change*
Day #2 – *Yellowstone Grizzlies to Lose Protections*
Day #3 – *Fish fights*
Day #4 – *Variations of Traits*
Day #5 – *Marvelous Mud*

Standards Addressed by Projects Include:

HS - LS1-1, 1-2, 1 – 5, 1- 6, 1 – 7, 2 – 1, 2 – 2, 2 – 3, 2-4, 2 – 5, 2- 6, 2 – 7,

Coral bleaching and climate change
Featured scientist: Carly Kenkel from The University of Texas at Austin

NTI Day #1 Article

Research Background:

Corals are animals that build coral reefs. Coral reefs are home to many species of animals – fish, sharks, sea turtles, and anemones all use corals for habitat! Corals are white, but they look brown and green because certain types of algae live inside them. Algae, like plants, use the sun's energy to make food. The algae that live inside the corals' cells are tiny and produce more sugars than they themselves need. The extra sugars become food for the corals. At the same time, the corals provide the algae a safe home. The algae and corals coexist in a relationship where each partner benefits the other, called a **mutualism**: these species do better together than they would alone.

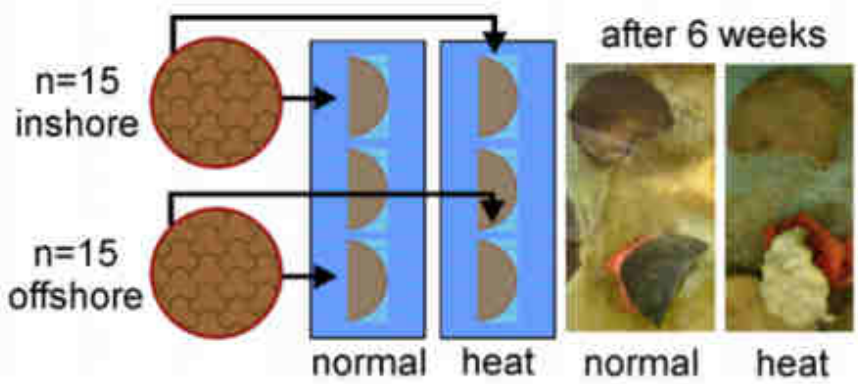
When the water gets too warm, the algae can no longer live inside corals, so they leave. The corals then turn from green to white, called **coral bleaching**. Climate change has been causing the Earth's air and oceans to get warmer. With warmer oceans, coral bleaching is becoming more widespread. If the water stays too warm, bleached corals will die without their algae mutualists.

Carly is a scientist who wants to study coral bleaching so she can help protect corals and coral reefs. One day while out on the reef, Carly observed an interesting pattern. Corals on one part of a reef were bleaching while corals on another part of the reef stayed healthy. She wondered, why some corals and their algae can still work together when the water is warm, while others cannot?

A Pacific coral reef with many corals

Carly observing a coral reef

Ocean water that is closer to the shore (**inshore**) gets warmer than water that is further away (**offshore**). Perhaps corals and algae from inshore reefs have adapted to warm water. Carly wondered whether inshore corals are better able to work with their algae in warm water because they have adapted to these temperatures. If so, inshore corals and algae should bleach less often than offshore corals and algae. Carly designed an experiment to test this. She collected 15 corals from inshore and 15 from offshore reefs in the Florida Keys. She brought them into an aquarium lab for research. She cut each coral in half and put half of each coral into tanks with normal water and the other half into tanks with heaters. The normal water temperature was 27°C, which is a temperature that both inshore and offshore corals experience during the year. The warm water tanks were at 31°C, which is a temperature that inshore corals experience, but offshore corals have never previously experienced. Because of climate change, offshore corals may experience this warmer temperature in the future. After six weeks, she recorded the number of corals that bleached in each tank.



Scientific Question: What is the effect of water temperature on corals from inshore and offshore reefs?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

Scientific Data:

Use the data below to answer the scientific question:

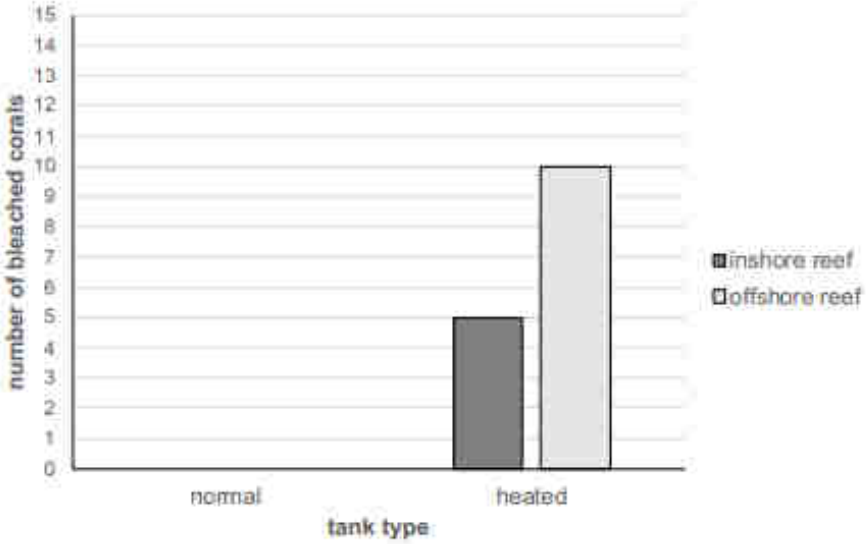
corals from	tank type	number of bleached corals
inshore reef	normal	0/15
offshore reef	normal	0/15
inshore reef	heated	5/15
offshore reef	heated	10/15

What data will you graph to answer the question?

Independent variable: _____

Dependent variable: _____

Below is a graph of the data: Identify any changes, trends, or differences you see in your graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.



Analyzing Data:

1. Make a claim that answers the scientific question.

2. What evidence was used to write your claim? Reference specific parts of the table or graph.

3. Explain your reasoning and why the evidence supports your claim. Connect the data back to how warm water affects the mutualism between coral and algae.

4. Did the data support Carly's hypothesis? Use evidence to explain why or why not. If you feel the data was inconclusive, explain why.

THE WALL STREET JOURNAL.

NTI Day #2 Article

Yellowstone Grizzlies to Lose Protections

By *Jim Carlton*
June 23, 2017

The Trump administration said it will remove endangered-species protections for the Yellowstone grizzly bear, a move that was initiated by the Obama administration after the numbers of the West's largest land predator rebounded sharply over the past four decades.

The decision, criticized by environmentalists, paves the way for grizzly-hunting to resume in some places after a 40-year ban.

Grizzly bears in and around Yellowstone National Park had plummeted to as few as 136 by 1975, when they were listed as threatened under the Endangered Species Act.

Because of a ban on hunting and other protections, the number of grizzlies in a Greater Yellowstone ecosystem that includes parts of Idaho, Montana and Wyoming has increased more than fivefold to an estimated 700, according to the Interior Department.

The federal government aimed to boost the population to 500 grizzlies. The animal can weigh up to 600 pounds.

Interior Secretary Ryan Zinke, a former Montana congressman who announced the delisting Thursday, hailed the recovery as one of the nation's greatest conservation success stories.

"As a kid who grew up in Montana, I can tell you that this is a long time coming and very good news for many communities and advocates in the Yellowstone region," Mr. Zinke said in a statement.

Environmental groups condemned the move and vowed to try to fight it in the courts.

Lawsuits filed by environmentalists succeeded in blocking efforts by the Bush administration to delist the grizzly in 2007, when their numbers already were considered recovered by the U.S. Fish and Wildlife Service.

Environmentalists say grizzlies have a slow reproduction rate and would be imperiled as a result of hunting and other dangers.

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Once the rule by the Fish and Wildlife Service takes effect later this year, states will regain their authority to resume trophy hunts that have been banned for 40 years.

The grizzlies would remain protected from hunting in Yellowstone and Grand Teton national parks.

"This premature decision to remove endangered-species protections could set grizzly recovery back by decades," said Michael Brune, executive director of the Sierra Club, in a statement. "The end result will be fewer bears restricted to an even smaller area," Mr. Brune said.

Supporters of the delisting, though, say there are so many Yellowstone grizzlies that conflicts with humans have increased, as well as attacks on livestock. "Grizzly bears have met or exceeded recovery objectives since 2003 and have long warranted delisting," Wyoming Republican Gov. Matt Mead said in a statement.

The Wyoming governor, among other Westerners, asked the Obama administration to resume the delisting process. In 2016, the Fish and Wildlife Service issued a draft notice to take the bears off the list, as states including Wyoming gave assurances they would continue to manage the grizzlies so their numbers remained healthy.

The debate over grizzlies is reminiscent of the one over the gray wolf, another iconic predator that was reintroduced to Yellowstone in 1995 under endangered-species protection.

But as the number of wolves exploded, they were delisted in both Idaho and Montana.

Article Analysis Day #2 Questions.

1. **What did the Trump administration decide to do regarding endangered species?**

2. **Supporters of the decision to remove endangered-species protections for the Yellowstone grizzly bear argue there are so many Yellowstone grizzlies that conflicts with humans have increased, as well as attacks on livestock. What do critics of this decision argue?**

3. **Read the following sentences:**

   Because of a ban on hunting and other protections, the number of grizzlies in a Greater Yellowstone ecosystem that includes parts of Idaho, Montana and Wyoming has increased more than fivefold to an estimated 700, according to the Interior Department.

   Based on this information, what can be concluded about the effectiveness of the ban on hunting and other protections for grizzly bears?

4. **Based on the text, what may have been one reason why the grizzly bear population decreased to just 136 bears by 1975?**

5. **What is the main idea of this text?**

6. **Read the following sentences:**
   "The Trump administration said it will remove endangered-species protections for the Yellowstone grizzly bear, a move that was initiated by the Obama administration after the numbers of the West's largest land predator rebounded sharply over the past four decades."

   What does the word "rebound" mean as it is used here in the text?
   a. **to bounce away after hitting something**
   b. **to recover or increase**
   c. **to decrease very quickly**
   d. **to change very little over many years**
7. **Choose the answer that best completes the sentence below.**
   A ban on hunting and other protections were put in place to help grizzly bear populations recover. _____, the number of grizzlies in a Greater Yellowstone ecosystem that includes parts of Idaho, Montana and Wyoming has increased more than fivefold.
   a. **On the contrary**
   b. **Especially**
   c. **Otherwise**
   d. **As a result**
8. **Explain whether or not endangered-species protections for the Yellowstone grizzly bear should be removed. Use evidence from the text to support your argument**

DATA Nugget

Fish fights

Featured scientist: Alycia R. Lackey from Michigan State University

Research Background:

In many animals, males fight for territories. Getting a good territory and making sure other males don't steal it is very important! Males use these territories to attract females for mating. The males that get the best territories are more likely to mate with females and have more babies. Only the males that have babies will pass on their genes to the next generation.

Stickleback fish use the shallow bottom areas of lakes to mate. Male stickleback fish fight each other to gain the best territories in this habitat. In their territories, males build a nest out of sand, aquatic plants, and glue they produce from their kidneys. The better the nest, the more females a male can attract. Males then use courtship dances to attract females to their nests. If a female likes a male, she will deposit her eggs in his nest. Then the male will care for those eggs and protect the offspring that hatch.

A male stickleback in his territory *(front)* and an intruding male *(back)*

Alycia is a scientist who is interested in understanding what makes a male stickleback a good fighter and defender of his territory. Perhaps more aggressive males are better at defending their territory and nests because they are better at fighting off other males. She used sticklebacks she collected from British Columbia to test her hypothesis.

In her experiment, 24 males were kept in 6 large tanks, with 4 males in each tank. Alycia watched each of the 24 males every day for 10 days. She recorded the behaviors of each fish when they were competing for territories, defending their territory, and building their nests. She also recorded the size of the males' territories and whether they had a nest each day.

As Alycia observed the fish, she measured three things:

1. Average Male Net Aggression: A number that indicates how many times the fish performed an aggressive behavior, like charging or nipping, minus the number of aggressive behaviors performed by another fish directed at that fish.
2. Average Territory Size: Each fish either had no territory (given the number 0), a small territory (1), or a large territory (2). Their territories changed during the experiment from one day to the next, so scientists averaged the values over the 10 days.
3. Days With Nest: The number of days over the course of the experiment that a fish had a nest.

NTI Day #3 Article

Scientific Question: How does aggressiveness in male sticklebacks affect their ability to defend their territories?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

Scientific Data:

Use the data below to answer the scientific question:

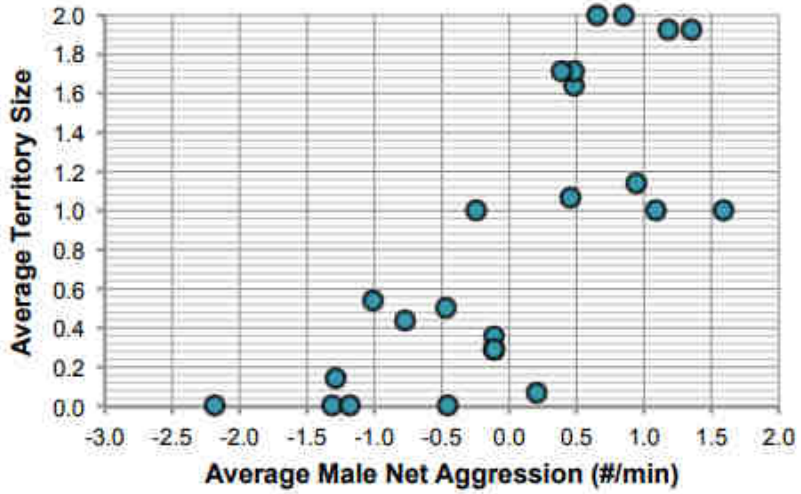
	Average Male Net Aggression	Average Territory Size	Days With Nest
Fish #	*(aggression performed minus aggression received per minute)*	*(0: none, 1: small, 2: large)*	*(number of days with nest)*
1	-1.28	0.14	0
2	0.20	0.07	0
3	-0.11	0.29	0
4	-0.47	0.50	0
5	-1.02	0.54	0
6	-1.32	0.00	0
7	0.94	1.14	0
8	-1.18	0.00	0
9	-2.18	0.00	0
10	-0.12	0.36	0
11	1.58	1.00	0
12	-0.24	1.00	0
13	-0.46	0.00	0
14	0.49	1.64	1
15	0.66	2.00	3
16	0.45	1.07	2
17	0.49	1.71	3
18	0.38	1.71	1
19	-0.77	0.44	1
20	1.18	1.93	4
21	-0.11	0.29	1
22	0.85	2.00	3
23	1.35	1.93	3
24	1.09	1.00	3

What data will you graph to answer the question?

Independent variable: _____

Dependent variable: _____

Below is a graph of the data: Identify any changes, trends, or differences you see in the graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.



Interpret the data:

Make a claim that answers the scientific question.

What evidence was used to write your claim? Reference specific parts of the table or graph.

Interpret the Data (*cont.*):

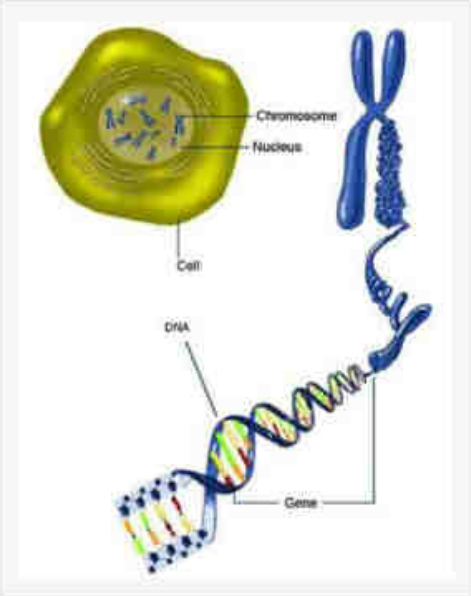
Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about the importance of territories for male sticklebacks.

Did the data support Alycia's hypothesis? Use evidence to explain why or why not. If you feel the data was inconclusive, explain why.

Variation of Traits

Article Vocabulary Question Set

NTI Day #4 Article



When two organisms create a third organism through reproduction, a number of variables come into play. It's a sort of complex lottery in which the third organism—the offspring of the first two—inherits a combination of the parent organisms' genetic material. The possible variations inherent in recombining the parents' DNA are very, very broad and infinitely larger than the pool of entries in the state lotto jackpot! That's why we get so much variation even within the population of a particular sexually reproducing species.

Each new organism receives two of each chromosome, and within those chromosomes, two versions of each parents' set of genes. These genes contain instructions for protein production within the body of the offspring, and the way those proteins are prescribed determines the traits of the offspring. So, although your unique collection of traits, the combination of characteristics, physical and otherwise, that make you uniquely yourself are originally the product of chance, there are machinations going on behind the scenes to which every freckle, hair and character trait can be traced.

Personality traits are another story altogether. When we think about how our personalities are formed, we can certainly think about genes we acquired from our parents—but we also have to think about other complexly intertwined factors like environment and upbringing.

For now, we'll simplify things by just focusing on the physical aspect of inherited traits. For example, if both parents exhibit the trait of red hair, their offspring have a greater chance of acquiring the genes that code for red hair. Certain traits are characteristically dominant or recessive, depending on the makeup of their alleles. This can make predicting traits tricky, but it is still very possible to estimate the likelihood, even the mathematic probability, that certain traits will manifest in the offspring of partners who exhibit those traits.

Red hair happens to be a kind of gene called incomplete dominant, which means it will blend with other genes, rather than dominate or be dominated. Since this is the case, the likeliest candidate to be coded for red hair is offspring with two red-headed parents.

It would be very, very unlikely for two parents with identically coded chromosomes to sexually reproduce. Even in the case of intrafamilial (or consanguine) pairings, which are discouraged in our society, the chromosome pairings would never be perfectly identical—that's a good thing for us as a civilization! As you will see, the absolute worst thing for our survival is for like to be paired with likes. It's in the best interests of our population that lots of different genes get mixed together in an evolutionary soup, so that many new variations on living organisms can be exposed to the environment, develop new adaptations to changing conditions, and promote the survival of the species.

Another variable that lets organism populations adapt to changing environments is mutation in genes. Sometimes, unpredictable changes in genetic code will appear within a new generation, not traceable back to a parental source.

Creators of superheroes like the X-Men and Teenage Mutant Ninja Turtles have used the idea of extreme mutation as a narrative device to invent colorful characters, bizarre scenarios, and literary metaphors. *Mutant* and *mutation* have exciting, exotic connotations to us, but actually, mutation is simply a necessary part of a species' evolution. Mutation can be something as mundane as two parents with brown eyes giving birth to a child with hazel eyes; or a type of moth whose wings are a different color from all the other moths in that species. Mutations are where new adaptations to existing or dynamic conditions are field tested in competition to whatever has worked for a population in the past. If a mutation pops up that happens to be advantageous for a particular organism within a population, that organism is more likely to survive, and therefore, more likely to procreate. Eventually, that chance mutation is reflected more widely in the community, and is passed on further to later generations. Once new challenges appear in the environment, new adaptations are likely to crop up for a fortunate few.

This is not to say that mutations are always helpful. Sometimes they are simply inconvenient, odd or unsupportable. They can even be indicative of a disruption in the environment.

Human interference in genetic coding is a pretty common practice these days. By deliberately engineering mutations in plants, most often food crops, humans can create larger, more resilient food sources. Since these "superfoods" are synthetically equipped with attributes that make them disproportionately competitive in the ecosystem they share with naturally grown food crops, they pose a threat to those populations. This is a controversial practice many food activists are working to curb.

Whether the mutation occurs naturally or is forced upon a population by biogenetic scientists, mutations are essential to the system by which ecosystems change and grow.

Article Analysis Questions:

1. What determines the traits of offspring according to the article?

2. Mutation in the genes of an organism is a cause. What is a possible effect?

3. Reproduction is "a sort of complex lottery in which the third organism – the offspring of the first two – inherits a combination of the parent organisms' genetic material." Give evidence from the passage that supports this statement.

4. What is the difference between physical traits and personality traits?

5. Summarize what this passage is about.

6. According to the passage, define mutation.

7. What can people create by engineering mutations in food crops?

8. Why might genetically engineered "superfoods" be a threat to naturally grown food? Support your answer with information from the passage.

NTI Day #5 Article

Marvelous mud

Featured scientist: Lauren Kinsman-Costello from Kent State University

Research Background:

The goopy, mucky, often stinky mud at the bottom of a wetland or lake is a very important part of the ecosystem. Wetland mud is much more than just wet dirt. For example, many species of microbes live in the wetland mud where they decompose (breakdown) dead plant and animal material to obtain energy. This dead plant and animal material is called **organic matter**. However, the wetland mud microbes do not have all the oxygen they need to decompose the plant and animal tissues quickly and efficiently. Because of this, the dead material in wetland mud decomposes much more slowly than similar dead material in dry soil.

As a graduate student, Lauren became fascinated with wetland mud and its interesting properties. She wanted to know how important all the mud and its organic matter is for wetlands. By talking with other members of her lab and reading scientific papers, Lauren learned that wetland mud can often be high in the element **phosphorus** and that phosphorus acts as a fertilizer for plants, including wetland plants and algae. However, nutrients, such as phosphorus can build up in wetland mud. Lauren thought it might be possible that the organic matter in the mud was the source of all the phosphorus in some wetlands. She predicted that wetlands with more organic matter would have more phosphorus. If her data support her hypothesis, it could mean that organic matter is very important for wetlands, because nutrients are needed for algae and plants to grow.

Although most mud is high in organic matter and nutrients, not all mud is the same. There is natural variation in the amount of organic matter and nutrients from place to place. Even within the same location mud can be very different in spots. Lauren used this variability to test her ideas. She measured organic matter and phosphorus in mud from 16 freshwater locations (four lakes, five ponds, and seven wetlands). She took cores that allowed her to sample mud deep into the ground. She then brought her cores back to the lab and measured organic matter and phosphorus levels in her samples.

You can tell that the mud in this picture is high in organic matter because it is dark brown and mucky (in real life you'd be able to smell it, too!)

Scientist Lauren holding a mud core. You can see that the tube has mud at the bottom, as well as some water at the top.

Scientific Question: What is the relationship between organic matter and phosphorus in mud from lakes, ponds, and wetlands?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

Scientific Data:

Use the data below to answer the scientific question:

Location	Ecosystem Type	Organic Matter (%)	Total Phosphorus (ug P/g d.w.)
Wintergreen	Lake	24%	528
Douglas Lake	Lake	55%	523
Jackson Hole	Lake	5%	105
Whitford Lake	Lake	1%	28
Pond 9	Pond	21%	556
Pond 18	Pond	24%	512
Pond 10	Pond	17%	537
Pond 23	Pond	19%	366
Pond 6	Pond	6%	177
Loosestrife Fen	Wetland	40%	773
FCTC	Wetland	80%	1441
Osprey Bay	Wetland	8%	167
Turkey Marsh	Wetland	15%	459
Sheriffs Marsh	Wetland	30%	1909
Brook Lodge	Wetland	18%	443
Eagle Marsh	Wetland	4%	130

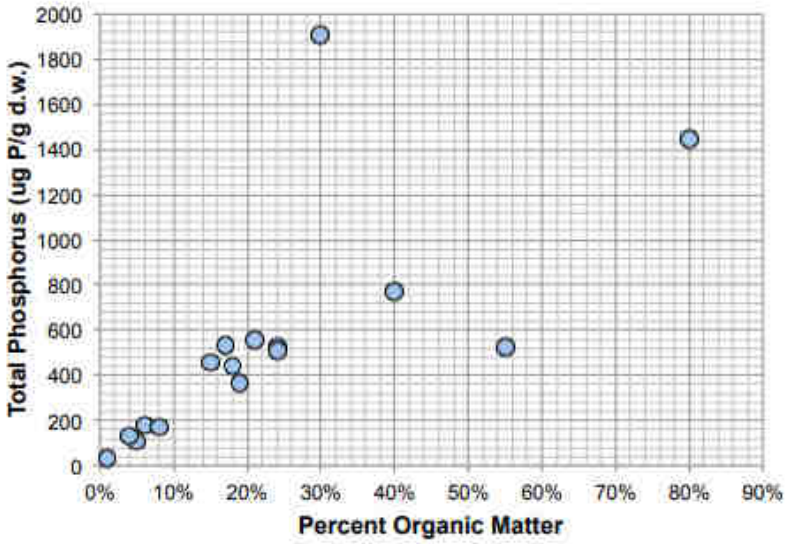
Data Nuggets developed by Michigan State University fellows in the NSF BEACON and GK-12 programs

What data will you graph to answer the question?

Independent variable: _____

Dependent variable: _____

Below is a graph of the data: Identify any changes, trends, or differences you see in your graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.



Analyzing Data:

1. Make a claim that answers the scientific question.

2. What evidence was used to write your claim? Reference specific parts of the table or graph.

3. Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about decomposition of organic matter in mud and how this differs from dry soils.

4. Did the data support Lauren' hypothesis? Use evidence to explain why or why not. If you feel the data was inconclusive, explain why.