“Scientifically educated citizens are place-conscious, see themselves as part of the planet rather than ruler of the planet, stay informed about scientific developments, and are aware of the impact of science on the planet and its subsystems”

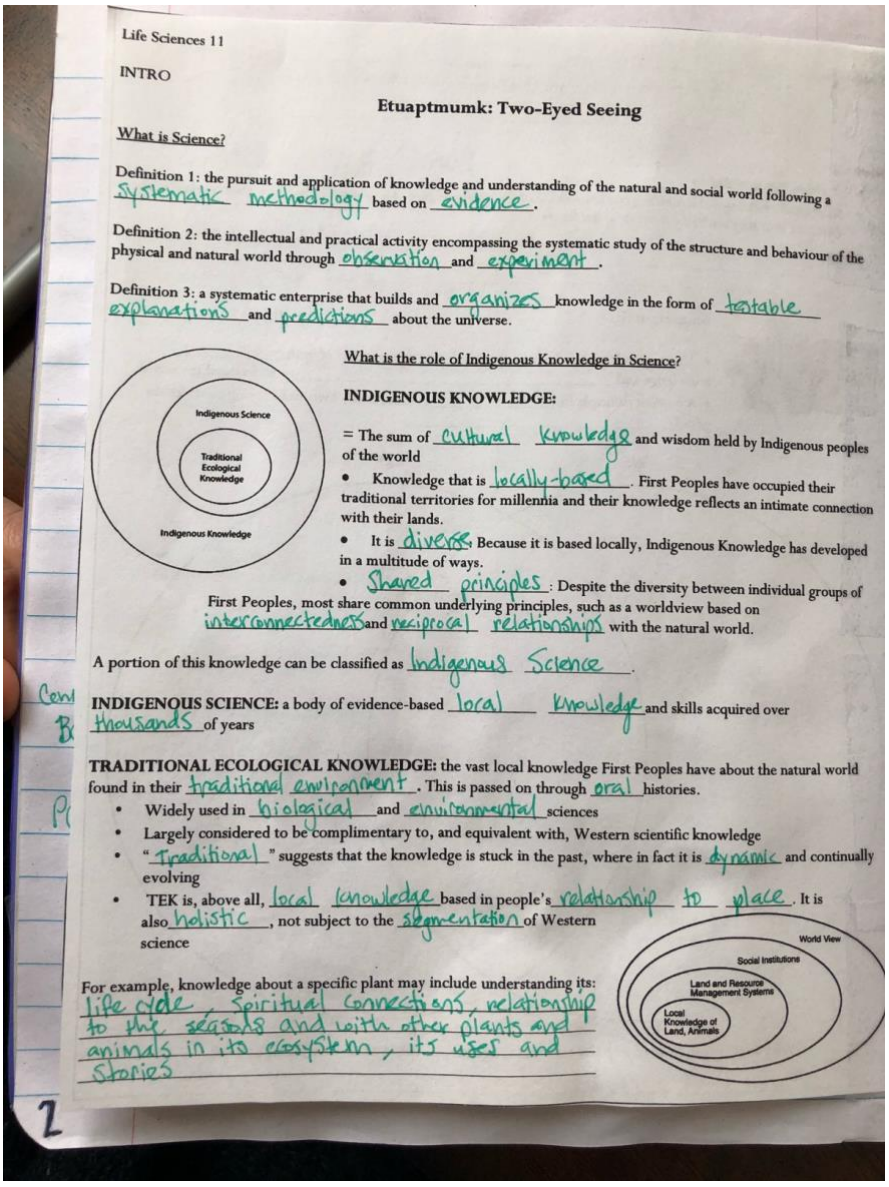
To me, scientific literacy is mult-faceted, encompassing many aspects of not only science, but life. In this unit we explored questions like:

“What is Science?”

“What role does/can Indigenous Knowledge play in Science?

“What [then] is Scientific Literacy?”

“What role does Numeracy play in Scientific Literacy?”



Life Sciences 11

INTRO

Etuaptmumk: Two-Eyed Seeing

What is Science?

Definition 1: the pursuit and application of knowledge and understanding of the natural and social world following a systematic methodology based on evidence.

Definition 2: the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment.

Definition 3: a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe.

What is the role of Indigenous Knowledge in Science?

INDIGENOUS KNOWLEDGE:

= The sum of cultural knowledge and wisdom held by Indigenous peoples of the world

- Knowledge that is locally-based. First Peoples have occupied their traditional territories for millennia and their knowledge reflects an intimate connection with their lands.
- It is diverse. Because it is based locally, Indigenous Knowledge has developed in a multitude of ways.
- Shared principles: Despite the diversity between individual groups of First Peoples, most share common underlying principles, such as a worldview based on interconnectedness and reciprocal relationships with the natural world.

A portion of this knowledge can be classified as Indigenous Science.

INDIGENOUS SCIENCE: a body of evidence-based local knowledge and skills acquired over thousands of years

TRADITIONAL ECOLOGICAL KNOWLEDGE: the vast local knowledge First Peoples have about the natural world found in their traditional environment. This is passed on through oral histories.

- Widely used in biological and environmental sciences
- Largely considered to be complimentary to, and equivalent with, Western scientific knowledge
- “Traditional” suggests that the knowledge is stuck in the past, where in fact it is dynamic and continually evolving
- TEK is, above all, local knowledge based in people’s relationship to place. It is also holistic, not subject to the segmentation of Western science

For example, knowledge about a specific plant may include understanding its: life cycle, spiritual connections, relationship to the seasons and with other plants and animals in its ecosystem, its uses and stories

Learners watched videos on *Etuaptmumk*, engaged in discussion about this idea, and defined Traditional Ecological Knowledge, searching for their own local examples in *Plants and Medicines of Sophie Thomas* (2002).

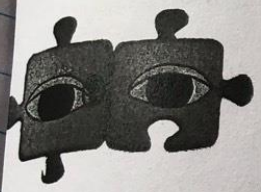
→Recognizing the role of Indigenous Knowledge in Science, and even simply acknowledging that Western Science is only one way of studying the world is a part of Scientific Literacy.

Local examples: 1. _____
2. _____
3. _____
4. _____

} FIND YOUR OWN

Science is…

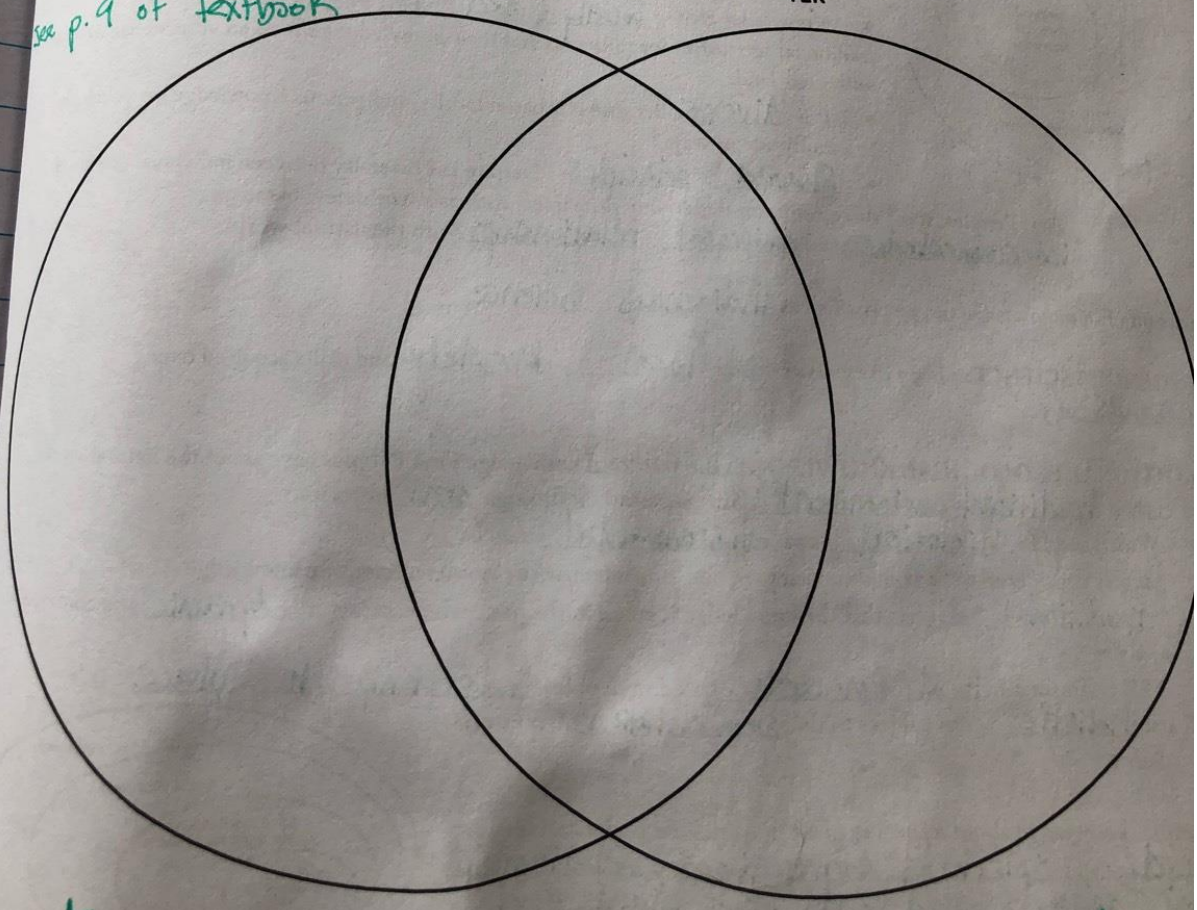
- A global human endeavor
- Continually refining and expanding our knowledge of the universe; how things work today, how they worked in the past, and how they are likely to work in the future.
- Science consists of observing the world by watching, listening, observing and recording. Science is CURIOSITY in thoughtful action about the world and how it behaves.



Etuaptmumk

- A term developed to describe a way of using the strengths of both Indigenous knowledge and Western Scientific Knowledge to understand the world
- A guiding principle for intercultural collaboration, Two-Eyed Seeing provides the gift of multiple perspectives.

see p. 9 of textbook



Why is it important to see the natural world from more than one perspective?

Visual representation Two-Eyed Seeing

→ Demonstrate your understanding of Two-Eyed Seeing

What are the similarities and differences between TEK + Western Science? How can they come together to create a stronger understanding of Science?

This can be a visual or written response.

Brainstorm: What is Science?

CLASS BRAINSTORM

- How the universe works
- study of everything
- understanding why
- making sense of the world
- continually expanding + growing
- methods

FYI:

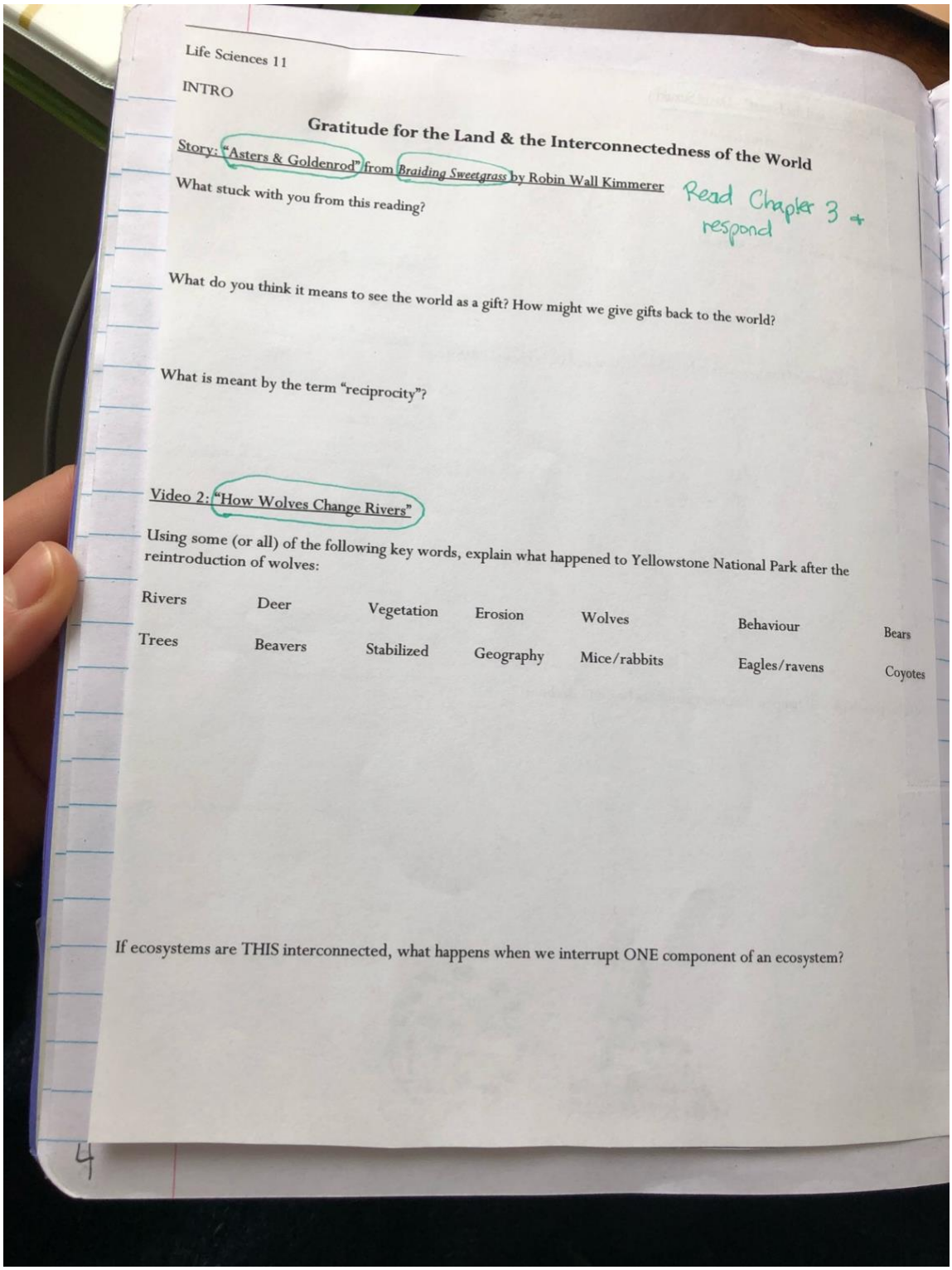
WORLD — PREFERRED: Indigenous / Aboriginal

CANADA — First Nations | Métis | Inuit

Central/Northern BC — Dakelh (PREFERRED) (Carrier)

PG — Lheidli T'enneh
"where the rivers meet" "People"

Storytelling has been a staple in my Science class. Whether it is a small piece of history, fiction, mine or theirs, I tried to connect to my learners by exchanging stories with them. I began the quarter reading to my learners and having them respond and discuss the chapter that was read to them aloud. In addition, we responded to two other relevant videos: “How Wolves Change Rivers” and “Salmon and the Forest”.



Life Sciences 11

INTRO

Gratitude for the Land & the Interconnectedness of the World

Story: “Asters & Goldenrod” from *Braiding Sweetgrass* by Robin Wall Kimmerer

Read Chapter 3 + respond

What stuck with you from this reading?

What do you think it means to see the world as a gift? How might we give gifts back to the world?

What is meant by the term “reciprocity”?

Video 2: “How Wolves Change Rivers”

Using some (or all) of the following key words, explain what happened to Yellowstone National Park after the reintroduction of wolves:

Rivers	Deer	Vegetation	Erosion	Wolves	Behaviour	Bears
Trees	Beavers	Stabilized	Geography	Mice/rabbits	Eagles/ravens	Coyotes

If ecosystems are THIS interconnected, what happens when we interrupt ONE component of an ecosystem?

4

Video 3: "Salmon and the Forest" - David Suzuki

In what ways do salmon need the forest?

In what ways do forests need the salmon?

Draw a simple diagram of the interaction between salmon and BC's coastal rainforests.

What do you think will happen if salmon numbers begin to decline?

Blackline Master 1-4

Responsibilities to the Land

1. Here are three quotes from First Nations leaders about our responsibilities to the land. As you read them, annotate the quotes by highlighting key words. Add comments and questions in the margins.

> As long as the sun shines, the rivers are flowing and the grasses are green we will remember our sacred responsibilities to the lands as our relatives.
> Chief Peguis, 1817.

> Man did not weave the web of life – he is merely a strand in it. What ever he does to the web, he does to himself.
> Chief Seattle, Susomich, 1854

> Our responsibilities are reminders to ensure the health and well-being of the seven generations that are coming.
> Oren Lyons, Ondondaga-Seneca, 2007

2. Find another quote that expresses a First Peoples perspective about our relationship with the land. Give the source of your quote.

3. What is your point of view? Add your own words that express something about our relationship with the land.

Life Sciences 11

INTRO

Date: _____

The Importance of Scientific Literacy

Video Intro: Scientific Literacy by Neil deGrasse Tyson (2:52)

What is science literacy?

You are probably aware that the term "literacy" refers to the ability to read and write, and "numeracy" refers to the ability to work with and understand numbers. At its core, "scientific literacy" is the ability of an individual to look at science related issues in a scientific manner, through the eyes of a scientist.

Definition 1: the knowledge and understanding of scientific concepts and processes required to make personal & societal decisions.

Definition 2: to be "scientifically literate" you must have the ability to combine a basic understanding of science and its processes with reasoning and thinking skills.

Why should you become scientifically literate?

Even though you may not always be aware of it, science plays a big role in our everyday lives. It is important to be scientifically literate so that you can…

1. Make informed decisions
2. Be part of the solution
3. Nurture scientific curiosity in others

We should all strive to become educated individuals who can participate in discussions about important issues and support policies that reflect your views.

STAY CURIOUS
Why? Why? Why?

+

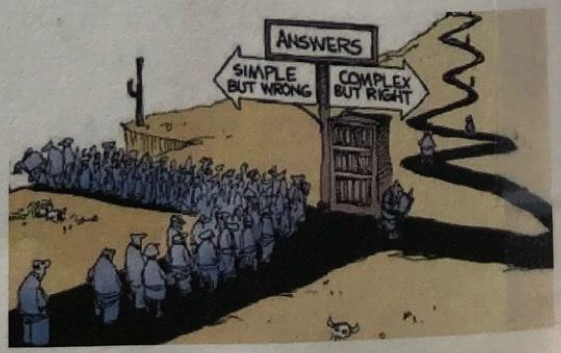
ASK QUESTIONS
Lots and lots of questions!

+

BE SKEPTICAL
Hmmm?? Really??
How can that be??

Confirmation Bias

Occurs when people seek out, or interpret, only the information that supports their existing beliefs and IGNORE all other evidence.



Watch: TED Talk - The danger of science denial (Michael Specter)

HOW TO SPOT FAKE NEWS

CONSIDER THE SOURCE

Click away from the story to investigate the site, its mission and its contact info.

READ BEYOND

Headlines can be outrageous in an effort to get clicks. What's the whole story?

CHECK THE AUTHOR

Do a quick search on the author. Are they credible? Are they real?

SUPPORTING SOURCES?

Click on those links. Determine if the info given actually supports the story.

CHECK THE DATE

Reposting old news stories doesn't mean they're relevant to current events.

IS IT A JOKE?

If it is too outlandish, it might be satire. Research the site and author to be sure.

CHECK YOUR BIASES

Consider if your own beliefs could affect your judgement.

ASK THE EXPERTS

Ask a librarian, or consult a fact-checking site.

IFLA
International Federation of Library Associations and Institutions

Controversial Science Topics

Nurture vs. Nature
Climate change
* Evolution / Creationism (Science vs. Religion)
Parenting
Vaccines
Flat earthers
Abortion
Animal testing
Electronic time
Cloning
Genetic modified *
Cybernetics (?)
Safe injections sites
Hallucinogens (microdosing)
Medical drug usage
Recycling
Pipelines
Nuclear energy
Space Exploration (funding)
Logging

hormones, chemicals, preservatives (food)

treatment of addiction

the danger of

My thoughts on Scientific Illiteracy at both a personal and societal level...

UNIT 1 Cells & Viruses

UNIT 2 Evolutio

Life Sciences 11

INTRO

Scientific Writing

Writing in Science is a little different than writing in other classes like English and Social Studies. We use scientific vocabulary, use concise language that gets right to the point, and MATH is often our method of communication. Our framework is The Scientific Method:

Hypothesis

Before we conduct a scientific experiment, we usually have a HYPOTHESIS, that is, a guess at what we think may be true.

Example: Osmosis egg experiment. *What do we think might happen?* …Let's test it!

Purpose

One or two sentences. Briefly describe why and how you will conduct your experiment.

√ Good: "In this experiment, we will immerse two de-shelled chicken eggs into two different solutions (corn syrup and distilled water) in order to study the concept of osmosis." *Sometimes a hypothesis is also stated in this section.

Not-so-good: Were gonna put eggs in two solutions to see where the water goes.

Materials/Method(s)

Briefly list and/or describe the equipment you used and the steps you took in your experiment. It is sometimes acceptable to simply refer to a book or manual; for example, "See page 76 of The Made-Up Lab Manual"

Data & Observations

-Figures (graphs, diagrams, pictures, etc.) – these are labelled neatly BELOW the figure
-Tables – these are labelled neatly ABOVE the figure
-Sample Calculations – if you used math to process any data, write the mathematical steps you took in your computations
-Any additional observations (qualitative or quantitative) that seem important

Conclusion

This is perhaps our most important section. Essentially, we must summarize all of the other sections in a paragraph or two.

How to write a CONCLUSION.

Restate – What was the aim of the experiment?
Explain – What was the experiment trying to find out?
Results – What are the results of the experiment? Include data (measurements with units, etc.) if applicable.
Uncertainty – What were the uncertainties, errors, or uncontrolled variables?
New – What did you learn and how can you take this knowledge further?

Writing conclusion paragraphs in a science lab report

A conclusion paragraph contains a description of the purpose of the experiment, a discussion of your major findings, an explanation of your findings, and recommendations for further study.

Address the following points in paragraph form (don't just number off and answer each question)

1. Restate the overall purpose of the experiment (include IV and DV in this sentence.)

   One format: The purpose of the experiment was to investigate the effect of the (IV) on the (DV)

   Example: The purpose of the experiment was to investigate the effect of stress on the growth of bean plants by comparing the growth of bean plants subjected to stress for 15 days with a control (non-stressed plants.)

2. What were the major findings? (Summarize your data and graph results)

   Example: No significant difference existed between the height of stressed plants and non-stressed plants. As the graph shows above, the average height of all the stressed plants was 10.2 cm and the average height of all the non-stressed plants was 10.4 cm.

3. Was the hypothesis supported by the data?

   One format: The hypothesis that (insert your hypothesis) was (supported, partially supported, or not supported.) Please do <u>not</u> ever use the word "prove" – we do NOT prove hypotheses true in science.

   Example: The hypothesis that stressed plants would have a dramatically lower mean height was not supported.

4. How could this experiment be improved?

   Example: This experiment relied on an artificial source of stress – just digging out the plants at one time and replanting them. Perhaps this experiment could be improved by simulating real-life stressors, including drought and lack of nutrients in soil.

   NOT acceptable: This experiment would have been better if we had done it correctly – we did sloppy work and made careless measurements.

5. What could be studied next after this experiment? What new experiment could continue study of this topic?

   Example: Additional investigations using various sources of stress at more frequent intervals would be a good additional experiment. Also, other crops could be subjected to the same experiment, such as corn and squash. Perhaps scientists could find a chemical that the plants release during stress.

Rubric for conclusion paragraphs in lab reports

Purpose restated	
Major findings stated, refers to graph or data table	
Revisits hypothesis (supported or not supported)	
Suggests improvement to lab procedure	
Suggests extension to lab	

Modified from worksheet by M.J. Krech – http://home.earthlink.net/~mjkrech/design.htm

Graphing Practice

Directions: Read the following statement, examine the data, line graph it, and then answer the questions that follow.

The number of shark species varies with the temperature of the environment. Some sharks are not found in areas where the water is too cold, or too warm. The reasons for this occurrence are varied. Some biologists believe temperature affects the abundance of the shark's food supply. Below find data collected over a period of one year in an area off the coast of Long Island, N.Y.

(15, 22)

Temperature °C	Great White Shark	Hammerhead Shark	Tiger Shark
15	22	5	8
18	18	12	11
20	10	18	15
25	9	4	25
30	2	2	22

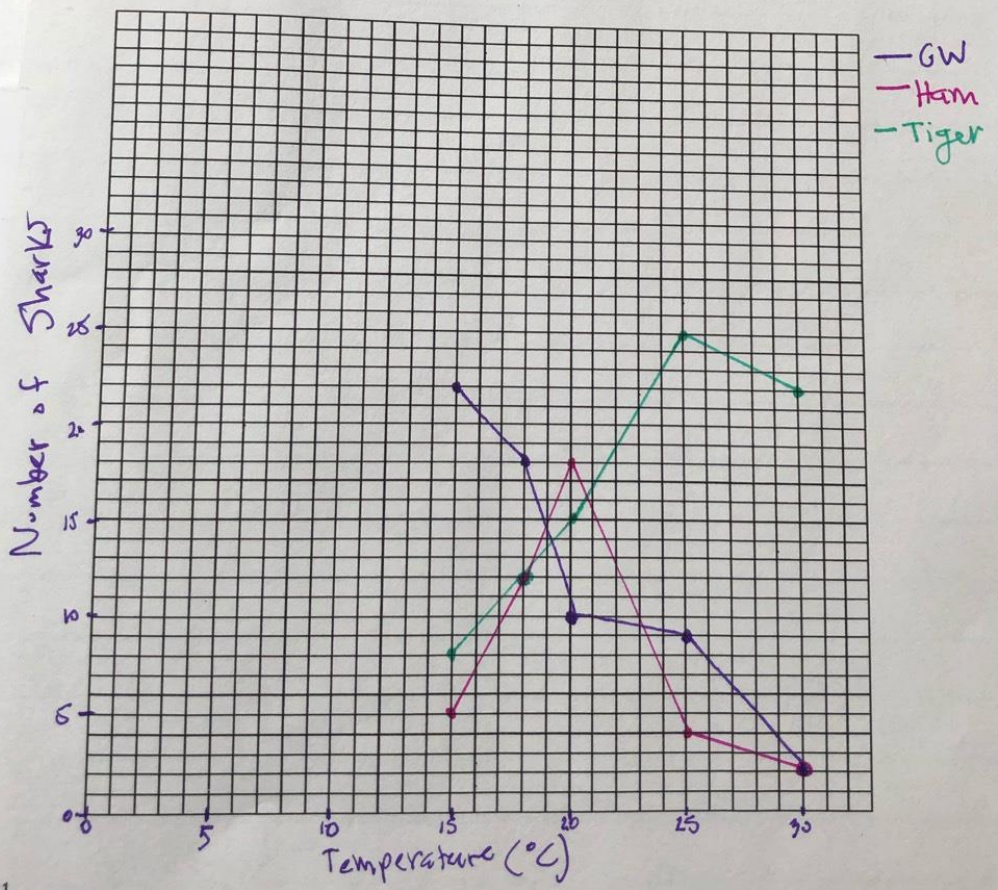


Figure 1.