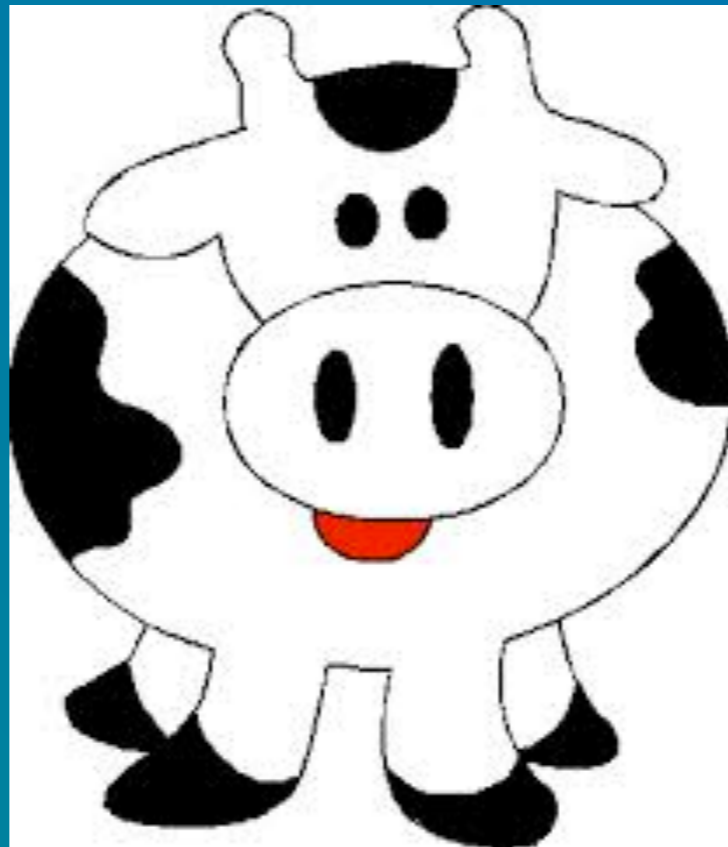


Scientific Inquiry

Remember: “Cows Moo Softly”



What is Scientific Inquiry?

- “Scientific” means: based on or characterized by the methods and principles of science
- “Inquiry” means: an act of asking for information; a formal investigation
- When we participate in Scientific Inquiry, we “do science” like Scientists do! We follow basic rules in order to have a fair experiment, or investigation.

There is no set order!

- Scientific Inquiry has a suggested order of “steps” but these are not necessarily linear, or in a set order.
- You can start with a question or an observation. Even a conclusion from one investigation may be the beginning of the next investigation!
- To make it simple for this lesson, let’s start with observation.

Observation

- An **OBSERVATION** is the process of collecting information from and about the world around us. There are two types of observations.

QUALITATIVE

These observations involve describing what the observer is experiencing using one or more of his/her senses.

These use WORDS.

This is also known as qualitative data.

QUANTITATIVE

These observations involve describing what the observer is experiencing using measurements.

These use NUMBERS.

This is also known as quantitative data.

Question

- After making initial, or beginning, observations, scientists usually have a **QUESTION** they want answered.
- This can start out as anything, but will eventually be refined into a “***testable***” ***question*** later in the inquiry process. (We’ll get to that later.)

Research

- The goal of research in Scientific Inquiry is to answer the question!
- Scientists often do **RESEARCH** from texts to confirm ideas they already may have, or to learn from other scientists.
- Research also takes place in the form of an experiment.
- We will be doing both!

Forming a Hypothesis

- A **HYPOTHESIS** is an educated prediction based on a scientist's prior knowledge. (In math this is a conjecture and in the humanities this is an inference.)
- We take what we have observed and researched and make a prediction. We write a hypothesis in this format: *If (IV), then (DV), because (rationale, or reason, based on research).*
- A hypothesis can be revised after the variables are defined, but NOT after the data is collected!

Plan an Investigation

- Before a Scientist decides on the steps he/she will take to answer the question that has been posed (asked), he/she must first **define the variables!**
- NOTE: Investigation and Experiment will be used as the same terms throughout the year!

Defining Variables

- Decide on ONE thing that is being CHANGED. This is the INDEPENDENT VARIABLE, or the “I change it” variable.
- Decide on what type of DATA, or observations, you will collect. This is the DEPENDENT VARIABLE, or the “measured” variable.
- Decide on what will stay the SAME each time you collect data. These are the CONSTANT VARIABLES.

Cows Moo Softly in a fair experiment



- **CHANGE** one thing: the INDEPENDENT VARIABLE
- **MEASURE** your data: the DEPENDENT VARIABLE
- Keep everything else the **SAME**: your constant variables

Planning an Experiment

- To have a fair experiment, the scientist must carefully define their variables.
- Once the variables are defined, then a formal “testable question” can be decided upon. What is the effect of (IV) on (DV)? How does (IV) affect (DV)?
- A procedure can then be written to account for the defined variables and repeated at least 3 times to ensure fair and accurate results when repeated.

Collecting Data

- Scientists collect data in a methodical way.
- This means that they carefully gather information according to a planned set of steps, or a procedure.
- Data should be collected multiple times to collect the most accurate information possible. If only collected once, the numbers or qualities found, may have been a mistake!
- For this reason, scientists conduct **REPEATED TRIALS** of an experiment.

Analyzing Data

- After collecting data, scientists analyze it, or look at it carefully.
- Part of analyzing data is representing it visually in a **GRAPH**. This allows the scientist to see the data in a new way which will help him/her see patterns or trends in the data.

Coming to a Conclusion

- Scientists take their data and try to make sense of it in order to learn something new or to confirm an idea they might already have.
- The conclusion is a thoughtful synthesis of information gathered through text research and the information gathered while conducting an investigation.
- The Scientist must reflect on his/her hypothesis after collecting the data. A HYPOTHESIS IS NEVERY RIGHT, NOR WRONG. It is only “SUPPORTED” or “NOT SUPPORTED” by the data collected.