Seventh Grade Science

7th Grade Science: Activity 2
How do you support a scientific claim with evidence?

Directions: This handout goes with a KCS Teacher Video. If you have access to the video, watch the video while doing this activity. You can find the videos here
https://www.knoxschools.org/Page/21816

What makes an argument scientific?

People use **arguments** in everyday life to change someone's thinking or opinion about a topic. For example, I could **argue** that ham sandwiches are better than turkey sandwiches because I want our family to buy ham at the grocery store this week. To convince my family that ham sandwiches are better, I could provide my **reasoning**:

- Ham pairs better with cheese.
- I like the taste better.
- The colors of the ham, lettuce, and tomato look more appealing together.

The reasons that I believe ham sandwiches are better are NOT scientific because they are NOT based on **data**. The reasons I stated are just my opinions. In the field of science, **arguments use evidence and data** rather than belief or opinion to support a claim because evidence and data can be reexamined and retested, whereas beliefs and opinions cannot be verified.
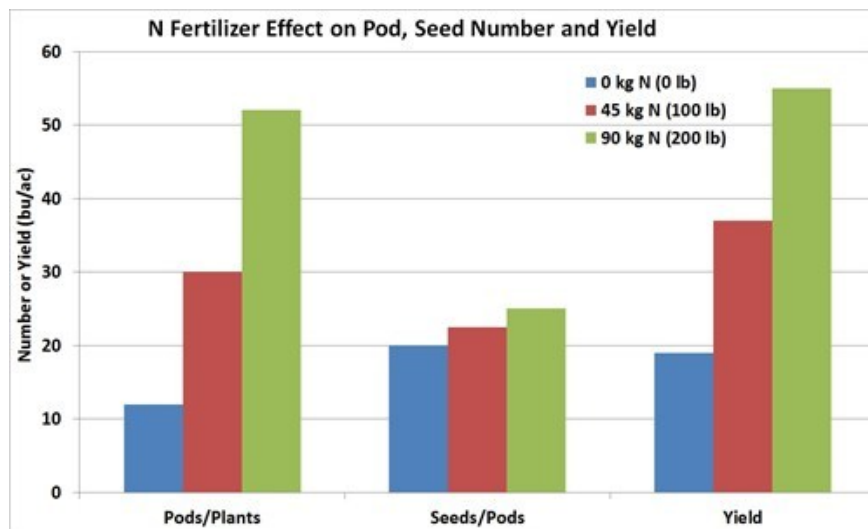
An example of a **scientific argument** could be that applying fertilizer (nutrients for plants) to bean plants is better than not using fertilizer at all. I can make observations and collect data to support that argument. When we look at the data to the left, we see that in the green bars (plants receiving 90 kg of fertilizer), the plants produced more pods and more seeds per pod. Therefore, I can say that growing bean plants with fertilizer is better because they will produce more beans.

It turns out that in science, ideas aren't right or wrong. Instead scientists identify ideas as weak or strong and they gather evidence to support or go against the idea to create an argument. The more data and observations you can use to support or go against your idea, the stronger the argument becomes. Scientists must explain how their data supports their argument, and not simply list data and expect the reader or listener to understand without an explanation.
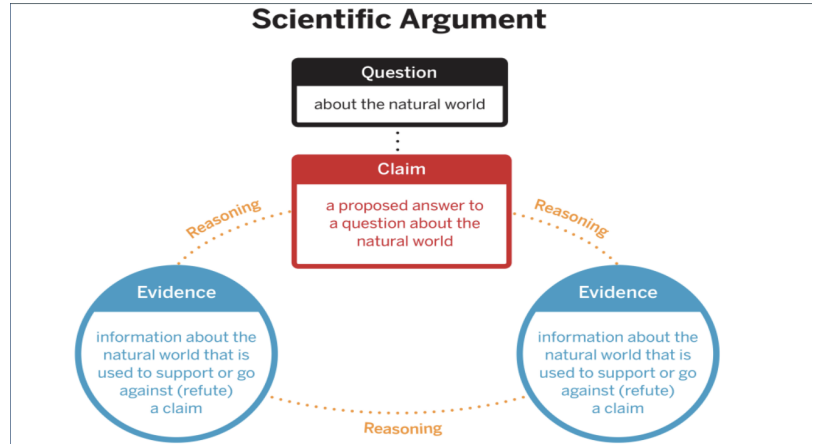
Parts of a Scientific Argument

As a student, you are often presented with data or collect data and then are expected to create a scientific argument. When we look at data, we are looking at evidence we can use to strengthen an idea. As scientists, we must find a pattern in the data to determine what the data can tell us. When we think we understand what the data is telling us, we call this idea our *Claim*. We then must explain *how* the **data** leads us to that **claim** so that others can understand, too.

These are the three main parts of a scientific argument:

Claim-the answer to the question or problem

Evidence-data or observations that support the claim

Reasoning-explains how the evidence supports the claim
-includes the scientific concepts needed to understand the evidence

Let's Practice

Today you will build a **scientific argument** using the claim-evidence-reasoning structure.

Start with this question: What is causing the global average temperature on Earth to increase?

Let's look at some Data

Choose the **CLAIM** that is supported by the data in the table to the right.

1. Global temperatures haven't changed over time.

2. Global temperature change is affected by natural and human factors.

3. Global temperature change is affected by natural and human factors.

*Separating Human and Natural Influences on Climate*
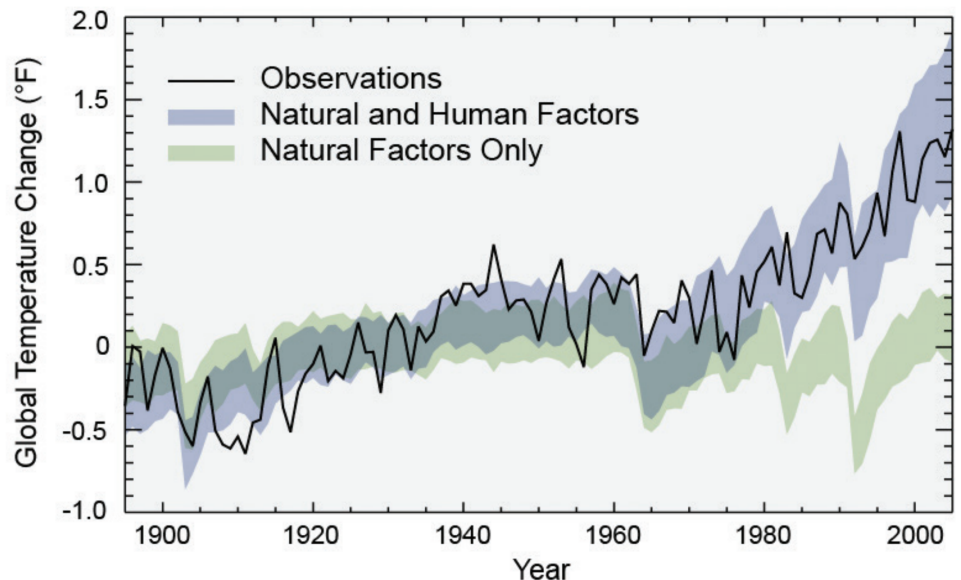
Now you need to explain WHY you are claiming that global temperature change is affected by natural and human factors. and explain the scientific concepts. To make a strong argument, include data from more than one source. Take a look at these graphs to identify data that will support your claim.

Figure 9 — World Population: 1950-2050
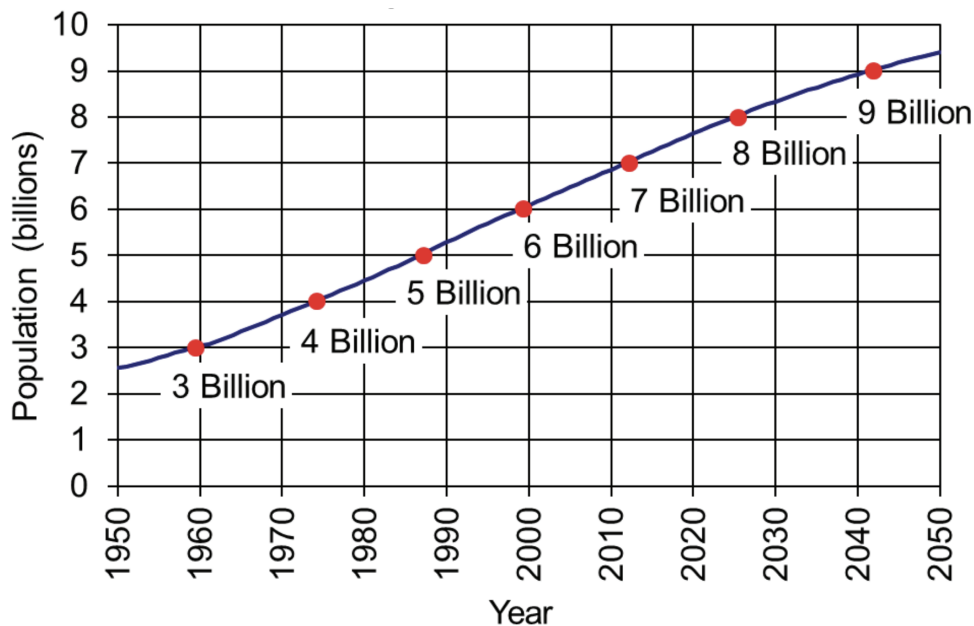
Figure 10 — Energy Consumption in the United States (1776-2014)

Energy consumption in the United States (1776-2014)
quadrillion Btu
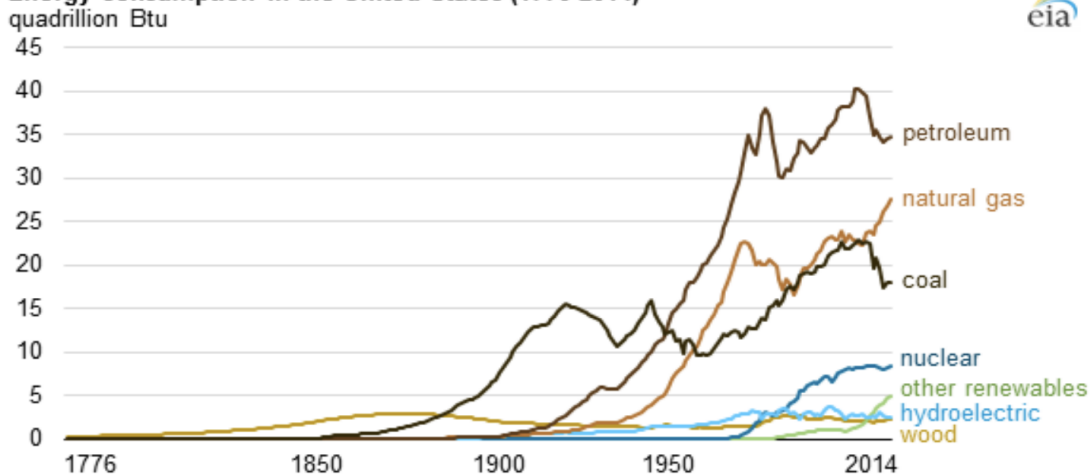
| Question: What is causing the global average temperature on Earth to increase?	
CLAIM *A statement or conclusion that answers the original question or problem. Usually just one sentence.* **Sentence Starters** I observed _____ when _____. I compared _____ and _____. I noticed _____, when _____. The effect of _____ on _____ is _____.	Global temperature change is affected by natural and human factors.
EVIDENCE *Scientific data that supports the claim. The data must be relevant to the claim. Not all data is evidence. Usually in bullet form.* **Sentence Starters** • The evidence I use to support _____ is _____. • Based on _____, the data shows _____. • The data collected indicates or suggests _____. • According to_____. • Based on this evidence, we must conclude that (rephrase your claim) because (your analysis)...	
REASONING *A justification that connects the evidence to the claim. It shows why the data counts as evidence by using scientific concepts. Usually in paragraph form.* **Sentence Starters** The evidence I use to support _____ is _____. Based on _____, the data shows _____. The most logical conclusion we can draw from this evidence is that _____ because_____. This means_____. This suggests_____.	

7th Grade Science: Activity 2 Rubric
How do you support a scientific claim with evidence?
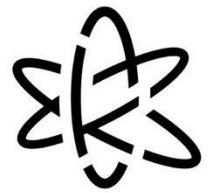
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Score your argument using the following rubric. After scoring, look for ways to make your argument stronger.

Claims, Evidence and Reasoning Rubric

Name: _____

Category	N/A	Beginning	Approaching	Meeting
Claim A conclusion that answers the original question.	Does not make a claim.	Makes an inaccurate claim.	Makes an accurate, but incomplete claim.	Makes an accurate and complete claim.
Evidence Scientific data that supports the claim. The data needs to be appropriate and sufficient to support the claim.	Does not provide evidence.	Evidence is inappropriate or it does not support the claim.	Provides appropriate, but insufficient evidence. May include some inappropriate evidence.	Provides appropriate and sufficient evidence to support claim.
Reasoning A justification that links the claim to the evidence. It shows why the data counts as evidence by using appropriate scientific principles.	Does not include reasoning.	Reasoning is not appropriate or does not link the claim to the evidence.	Provides reasoning that links claims to evidence. Repeats evidence and/or includes some scientific principles, but not sufficient.	Provides accurate and complete reasoning that links evidence to the claim. Includes appropriate and sufficient scientific principles.

Adapted from:
McNeill, K.L. & Krajcik, J. (2008). Assessing middle school students' content knowledge and reasoning through written explanations. In Assessing science learning: Perspectives from research and practice, eds. J. Coffey, R. Douglas, and C. Stearns, 101–116. Arlington, VA: NSTA Press