

Unit
1Handout
8

Lesson 1: Writing a Scientific Argument

Purpose: To provide initial guidelines for how to write an argument.

Guiding Questions: How do scientists argue a claim?

Instructions: Follow along as we discuss the components of a scientific argument. Use this sheet in the future to help you construct an argument for your claims.

General Argument Format

1. Claim
2. Evidence
3. Analysis/Reasoning

Sometimes you can fit all three components into one paragraph. Other times parts 2 and 3 will become their own paragraph. You may have to write multiple paragraphs if you have multiple pieces of evidence.

Claim

- Claims are what you believe to be true based on the data you have gathered.
- Claims are concise (short and to the point).
- Claims do not explain (i.e. don't use the word because).

Examples of concise claims:

- The rock is igneous.
- Heat decreases the time for the chemical reaction to occur.
- Mints have no affect on students' test performance.

Bad claims:

- The rock is metamorphic because it shows change.
 - This is a bad claim since it is not concise. It begins to explain why the claim is true. The underlined portion is not needed.
- Mints have no affect on students' test performance for a variety of reasons.
 - The is a bad claim since it is not concise. It gives the reader information that is not necessary. The underlined portion is not needed.

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Evidence

Any data you collect during an investigation or information you use from research can be used as evidence. You cannot cherry pick your evidence. This means you cannot ignore some data in order to make your claim valid. For example, if 90% of the results show an increase and 10% show a decrease, you would have to use all of the data. You can't claim that there was only a decrease or only an increase.

What counts as evidence?

- Data from your experiments/investigations
- Third-party sources such as books, peer-reviewed articles, academic journals, etc.

Credibility

- You are responsible for determining the credibility of your data. This means you need to provide the reader with information that explains how you obtained your data. If you are using third-party sources, you need to determine if what they are saying is true. This is typically done by providing citations to other work.

Plagiarism

- If you are using a third-party source, then you need to properly cite it. There are many citation styles (e.g. APA, MLA, etc.). Mr. Ower is most familiar with APA style and can help you with that.

Units

- When providing quantitative data, you need to include units. For example, you need units for temperature, speed, mass, etc. (Ex: 100g or 100 grams; 15°F; 32 mph)

Examples of Evidence

- The car traveled at 20 mph for 3 minutes.
- The bird's feathers are mostly red. The tips of its wings are yellow.
- We read, "higher air temperatures leads to an increase in stormy weather," (Smith, 2014, p. 18)

Bad Examples of Evidence

- The car was going 20.
 - This is bad evidence since no units are provided.
- On Wikipedia it says that storms can occur anytime of the year.
 - This is bad evidence since the reader doesn't know where on Wikipedia you found this information. Plus, the information may not be credible. Wikipedia is a great place to begin research. However, verify the information on there with additional sources.

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Analysis/Reasoning

Analysis is your reasoning for why your evidence supports your claim. Typically you will want to tell the reader two things about your evidence:

1. How you collected the evidence.
2. Why the evidence is important.

You can provide this information in this order or you can provide it in reverse (3-2-1). If you are unable to tell the reader the how and why of the evidence, don't include it in your argument.

Example of Analysis/Reasoning

- The average score of the class on the first test without the mint was 85%. The average score of the class on the second test with the mint was 82%. We determined this by testing students with and without mints. Students took a math test with 20 questions. We graded the tests and gave 1 point for each correct answer. We did not tell the students their scores. A week later we gave them the test again. But we let them have a mint while they took the test. We graded the tests and gave 1 point for each correct answer. This evidence is important because it tells us if there is a score increase or decrease when students can eat a mint. The evidence shows that the scores decrease, making us believe that the mints do not improve student performance on a test.

Bad Example of Analysis/Reasoning

- The mints smell nice and the students were happier. We gave the students a test and graded it. Then we gave them the test again and graded it again. We found that the scores didn't change that much.
 - What's wrong?
 - The analysis doesn't explain how they determined their evidence (about the smell of the mints).
 - The analysis doesn't explain how the evidence connects to the claim.
 - The analysis doesn't explain **how** the scores changed. Nor does it tell us why this is important or how it connects to the claim.

Writing Mechanics. As always, your submitted work must have proper grammar and punctuation. All words are spelled correctly. Your writing flows and the reader can easily understand your argument. You write formally and do not include informal language. You may use personal pronouns (I, we, they, etc.) as this is very common in professional science writing.

While this may seem like a lot of information, it is important that you follow all these rules while writing your arguments. Throughout the year we will talk about how different experiments/investigations require different formats of writing arguments. We will also talk about ways to expand your argument, such as addressing counterarguments, identifying weaknesses, and explaining what you would do differently if you were to repeat the experiment/investigation.

On the next page is a graphic organizer you can use to help you write your arguments.

Graphic Organizer for Writing a Scientific Argument

Claim

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Evidence and Analysis/Reasoning

Evidence:

How you collected the evidence:

Why the evidence is important:

Repeat the evidence and analysis/reasoning box for each line of evidence

Evidence Sentence Starters:

- We discovered...
- We learned...
- In our investigation we observed....

How You Collected Evidence Sentence Starters:

- To determine this we...
- What we did was...

Why the Evidence Matters Sentence Starters:

- This is important because...
- We need this because...