Claims, Evidence, and Reasoning Guide

For our individual impacts to be positive, people of every age must practice speaking, arguing, and acting with clarity and precision based on carefully developed evidence. Today's complex social and environmental issues require nuance in expression, effective listening and speaking skills, and an ability to distinguish between closely related topics. Developing evidence for yourself, analyzing counter arguments, and making well-reasoned claims leads to confidence and assertiveness.

Key Terms and Concepts

Argumentation is the process of supporting claims, assertions, proposed solutions, conclusions, or models with solid reasoning based on valid evidence. This guide uses examples drawn from environmental science and policy; however, it is important to remember that arguing from evidence is an appropriate strategy for working in any career area.

The UC Berkeley Museum of Paleontology defines the word "evidence" as used by scientists and engineers as:

> *Test results and/or observations that may either help support or help refute a scientific idea. In general, raw data are considered evidence only once they have been interpreted in a way that reflects on the accuracy of a scientific idea.*

Notice that science is a conversation, an open process of testing ideas via practices that always converge on the use of evidence to revise knowledge. New evidence, once corroborated through peer review, will be used to revise existing theory. Engineers behave similarly and often use a process known as Evidence-Based Design, a method for everything from the design of buildings to medical studies. The emphasis is on observable, experiential, and testable phenomena.

Evidence is also important for professionals in legal and policy fields. Notice how the underlying principle of a claim being supported by evidence is expressed in the following definition from the California Legal Code:

> *"Evidence" means testimony, writings, material objects, or other things presented to the senses that are offered to prove the existence or nonexistence of a fact.*

For this project, we will define the terms "claim," "evidence," and "reasoning" as follows:

Claim:

As used for this project, a claim is a statement that answers the Challenging Question or an essential question developed by student teams. It will always be supported by evidence and scientific reasoning, and be consistent with logic. It is never an opinion, belief, or preference. Your ability to construct viable arguments, claims, and explanations rests upon obtaining, evaluating, and communicating from a foundation of evidence.

Evidence:

For this project we seek evidence in the form of organized data from relevant, reliable sources; direct observation of a phenomenon; experiments; or carefully constructed student surveys. Data must first be organized and interpreted before it is considered evidence supporting a claim.

Reasoning:

This is the link between your claim and the evidence supporting the claim. It is the rationale for why your claim is warranted based on your evidence. We can all recall a situation where a question was met with a dismissive "because it's in the text book." In this project we are looking for much more—typically three sources of evidence to support any claim.

Robust reasoning will have four distinct elements: First, you must clearly articulate your claim (your proposed answer to the Challenging Question). Second, describe any patterns or trends in the data cited. A complete description of how the data was obtained, what circumstances prevailed during collection, and any possible weaknesses in the evaluation process are markers of quality. Third, provide a statement of correlation that supports your claim. For example, if the claim is that "high park admission costs are a barrier to access for youth," a related correlative statement could be, "we expected an inverse correlation between admission price and park visits by young people. We did see this result in park data collected after price increases and in our surveys of 300 students." Finally, high quality reasoning considers alternative explanations for any claim or explanation: "We considered other explanations related to public transit access and availability of parking. These are factors, however our results strongly suggest that there is a relationship between cost and youth visits to parks."

Creating a Scientific or Policy Argument

Adapted from NSTA and the California NGSS Roll-Out

Goals: **1.** Create an argument consisting of a claim, supporting evidence, and reasoning. **2.** Revise the argument based on feedback from peers.

Our first draft of CLAIM-EVIDENCE-REASONING	Comments from peers on improving our work	Our improved draft of CLAIM-EVIDENCE-REASONING
CLAIM: Here is our claim (…we believe that X is caused by…OR we believe that Y has a role in how Z happens…)	Is the claim clear? Does it describe a cause and effect?	**Revised CLAIM**
EVIDENCE: Our evidence comes from (name the type of data and the activity it came from). We saw in the data (name the particular trend or outcome).	Is the data relevant to the claim being made? If two kinds of data or observations are being compared, do they make sense to use together? Is the data credible?	**Revised EVIDENCE**
REASONING: We think this evidence supports our claim because if these trends in data are happening, then it means that (state a brief causal chain of events—this chain has to be consistent with known science ideas/facts).	Do you need to make big inferences about what happened or why? Are there big gaps in the causal story here? If you saw this kind of data, does it mean that their claim can be the ONLY one that is true? Should they moderate their claim?	**Improved REASONING**