



wasatch range writing project
By Macie Wolfe

Lesson Title: Footprints in the Forest: Inquiry, Scientific Research and Argument Writing

Burning Question: Can I combine the teaching of inquiry and argumentation to help students develop effective scientific reasoning skills and deeper understanding of science research writing practices in preparation for their advanced science courses?

Objective/Introduction:

This lesson incorporates the strategies of teaching argument writing with an adaptation of the Argument-Driven Inquiry Model. Students are introduced to John Muir's 1897 essay, *The American Forest*, in which he urged Americans to protect the forests that remained. Inspired in part by Muir, President Teddy Roosevelt created the U.S. Forest Service and was instrumental in preserving millions of acres of wilderness. Students are then taught to distinguish the major features of scientific arguments, i.e. claims, warrants (explanations) and evidence, while recognizing the basic differences between the concepts of logic and persuasion. Finally, they are asked to apply their learning to their own argumentative research in a collaborative scientific poster symposium to learn about and evaluate informational texts related to current global, national and local deforestation issues.

Context:

This lesson was created to be taught as a culminating activity in the 9th grade Honors Biology Ecosystems Unit. It could be adapted for other grade levels/subjects and could be useful in teaching argument writing and critical thinking/reasoning skills.

Note: Instruction to develop critical definitions, concepts and criteria related to the discussion of ecosystem dynamics and the influence of humans on those dynamics should be addressed prior to this lesson.

Materials: John Muir essay *The American Forest*; Argumentation and Persuasion Information sheet; a list of recommended websites for student argumentation research on deforestation; dictionaries; tri-fold poster display boards.

Time Span: 1-2 weeks depending on how much teacher desires to assign in class and as homework and how in-depth he/she wants to go with student collaboration, peer responding, etc.

Procedure:

1. Hand out *The American Forest* essay by John Muir and engage students in a critical reading activity: Assign sections of the essay to teams or partners and have them work through the following steps. Then using a document reader or overhead projector, discuss as a class while “marking up” the Muir essay and writing notes in margins to model critical analysis.

- a. **Highlight unfamiliar vocabulary words** and define meanings.
- b. **Skim and preview** to get an overview of the content and organization, and to identify the rhetorical situation. *Note any historical, biographical, and cultural contexts.* Read through the lens of your own or others’ knowledge and experiences.
- c. **Write any questions you have in the margin for every paragraph/section.**
Focus on main ideas and write in your own words.
- d. **Mark an X in the margin at each point where you feel a personal challenge** to your attitudes, beliefs, or position on an issue. Reflect about what you have read in the text that might have created the challenges and note the patterns.
- e. **Summarize and synthesize main ideas of the text.** Use your own words and condense important text.

2. Hand out and discuss the *Argumentation and Persuasion Info Sheet*. Ask students to read Muir’s essay critically in order to test the logic, credibility and emotional impact of the text. Write an answer to this Quick Write:

What was John Muir’s claim and what were his supports (reasons and evidence)?

3. Performance Assessment Task: Ask individual students, teams or partners to research deforestation from a local, national, or global perspective in order to make a claim and support it with logical reasons or evidence. Provide a list of possible research sites (see below). Have them present their research findings on a tri-fold presentation poster to be presented in a collaborative class-wide poster symposium.

Extensions: Students may also be assigned a more in-depth research paper or essay if there is time.

Rationale: In its *Framework for K-12 Science Education* the National Research Council (2011) outlines several practices critical to teaching in the science classroom: Four of these practices relate to this lesson directly: (1) Asking questions and defining problems (2) constructing explanations (in order to design solutions), (3) engaging in argument from evidence and (4) obtaining, evaluating and communicating information. As students move from generating and writing novice arguments based primarily on opinion and emotional persuasion to engaging in discourse and deep research of many perspectives to arrive at more informed arguments, they are better able to take a stand and defend it scientifically and academically when they enter more advanced classes.

Common core:

SL.9.1-4; W. 9.1, 7-10, RH. 9.8-9; RI.9.1, 2, 4, 5, 6, 8; RST. 9.1, 2, 4, 6, 8, 9; WHST. 9.1,4, 5-9

Utah Science Biology core:

Standard I: Students will understand that living organisms interact with one another and their environment.

Objective 2: c. Distinguish between inference and evidence in a newspaper, magazine, journal, or Internet article that addresses an issue related to human impact on cycles of matter in an ecosystem and determine the bias in the article.

Objective 3: e. Research and evaluate local and global practices that affect ecosystems.

Resources:

George Hillocks, *Teaching Argument Writing*.

John Muir, *The American Forest*. (An archival excerpt in honor of the Atlantic magazine's 150th anniversary.) Retrieved from:

<http://www.theatlantic.com/magazine/print/2006/05/nature-and-environment>

Argument-driven inquiry: A way to promote learning during laboratory activities. The Science Teacher, 76(8), 42-47.

Environmental issues in American Lit and Culture:

<http://aml24101629.wordpress.com/2010/09/15/muir-american-forest/>

Blog 1: Muir's American forest

Posted w/comments on [September 15, 2010](#) by [tgrange](#)

Blog 2: Rhetorical Analysis of "The American Forests"

Posted w/comments on [September 15, 2010](#) by [chelseamoeller](#)

Recommended websites/resources for student research:

U.S. Forests in a Global Context -David J. Brooks:

<http://www.fs.fed.us/global/pub/links/global.html>

American Forest Resource Council

http://www.amforest.org/resources/facts_research/forest_management_and_carbon_storage

National Geographic <http://environment.nationalgeographic.com/environment/global-warming/deforestation-overview/>

The Economic Value of Forest Ecosystems

<http://www.cbd.int/doc/external/academic/forest-es-2003-en.pdf>

Science Daily - Deforestation <http://www.sciencedaily.com/articles/d/deforestation.htm>

Discovery Magazine

<http://news.discovery.com/earth/amazon-extinctions-to-come-120712.html>

Patel-Weynand, Toral (2002). The National Commission on Science for Sustainable Forestry, Washington

[Biodiversity and sustainable forestry: State of the science review](#)

Kauppi, P. E.; Ausubel, J. H.; Fang, J.; Mather, A. S.; Sedjo, R. A.; Waggoner, P. E. (2006). ["Returning forests analyzed with the forest identity"](#). *Proceedings of the National Academy of Sciences* **103** (46): 17574–9.

<http://www.pnas.org/content/103/46/17574>

Tropical Deforestation (NASA)

<http://earthobservatory.nasa.gov/Features/Deforestation/deforestation>

Society of American Foresters

<http://www.safnet.org/publications/americanforests/index.cfm>

Forests for Tomorrow: Addressing U.S. Policy Challenges Summary Report of a National Conference Convened by the National Commission on Science for Sustainable Forestry Washington, DC May 20 -21, 2008

http://www.safnet.org/publications/ncssf/NCSSF_Forests_for_Tomorrow_Conference_Report_61008.pdf

Argumentation and Persuasion Info Sheet

What is *Argumentation*? Argumentation is *not* just having an argument with someone else. Argumentation is the use of logic and evidence to convince someone to adopt a particular opinion, fact, policy, or judgment. Authors sometimes make arguments that they want you to accept as true.

An argument has two essential parts: a **claim** and a **warrant** (support/explanation). The **claim** asserts a hypothesis -- an idea, an opinion, a judgment, or a point of view -- that the author wants you to accept. The **warrant** includes **reasons** (shared beliefs, assumptions, and values) and **evidence** (facts, examples, data or statistics, and authorities) that gives you the basis for accepting the hypothesis.

For the argument to be acceptable the support must be appropriate to the claim and the evidence must be credible, reasonable and truthful.

What is *Persuasion*? If a person uses emotional language and dramatic appeals to your beliefs and values in order to make their point, they are using persuasion.

Persuasion is used to motivate a person to adopt an opinion and take action. Suppose someone wants to convince their friend to carpool to work each day. They might begin by *arguing* that using carpooling saves money on gas and car maintenance and also cuts down on pollution. Such an argument, supported by documented facts and figures (data), would help convince money-conscious or environmentally-conscious people. However, to convince stressed-out commuters, they might also *persuade* their friends to consider letting someone else drive while they relax.

The ancient Greeks, who developed the ***basic concepts of logic***, isolated three factors that make a good argument: *logos*, *pathos*, and *ethos*. **Logos** is the use of evidence such as facts, statistics and examples to support your point. **Pathos** is the emotional power of language that appeals to the reader's needs, values and attitudes. **Ethos** is credibility or reliability.