Promoting Critical Evaluation in the Science Classroom

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Abstract
A Framework for K-12 Science Education states that critique and evaluation of scientific explanations has been underemphasized in many science classrooms (NRC, 2012). Consequently, this lack of instruction has, in part, contributed to students not being able to critically evaluate alternative explanations of natural and engineered phenomena. The Model-Evidence Link (MEL) diagram, originally developed by researchers at Rutgers University (Chinn & Buckland, 2012), is an instructional scaffold that promotes students to critically evaluate alternative explanations and increase their ability to understand complex scientific concepts (Lombardi, Sinatra, & Nussbaum, 2013). Our poster will feature four MEL diagrams that focus on the following science topics: climate change, wetland resources, fracking, and the Moon’s formation. These MELs are being developed as part of NSF-funded project, with all materials being freely available to instructors.

Background
- “Scientific knowledge is a particular kind of knowledge...justified and critiqued on the basis of evidence and...validated by the larger scientific community.
- ...alternative interpretations of scientific evidence can occur...such interpretations must be carefully scrutinized, and...the plausibility of the supporting evidence must be considered.” (NRC, 2012, p. 251)
- Critical evaluation may be especially important for understanding scientific topics with a large plausibility gap (Lombardi et al., 2013).
- Plausibility Gap: Where individuals find competing—but non-scientific—ideas more plausible than explanations offered by scientists.

The Project
- Researchers at Rutgers University developed the structure and mode of the MEL (Chinn & Buckland, 2012) for life science.
- We are developing MELs for Earth and space science topics:
  - Earth & Space Science
  - Wetlands & Water Resources
  - Current Climate Change
- Partnering with teachers in Nevada & New Jersey
- High school earth science students are participants

Project Website
http://sites.temple.edu/meldiagrams/
- The website contains all the MELs and associated materials for free download.

Research
- Starting in September 2015, we will be conducting a full year, quasi-experimental research project.
- Four new teachers will use the MEL activities for some classes, and use comparison materials for their other classes.

References