How Did the Moon Form?
Evaluating Alternative Explanations
Doug Lombardi and Janelle M. Bailey
Temple University

Abstract
Scientifically literate citizens need to understand how scientists evaluate competing explanations. Likewise, science learning demands that students increase their ability to critically evaluate scientific knowledge and weigh alternative explanations. An instructional scaffold—the model-evidence link (MEL) diagram—is designed to promote students’ ability to critically evaluate scientific explanations and knowledge of fundamental concepts. The structure and mode of MEL diagrams were originally developed by Rutgers University researchers under a NSF-supported middle school life science project (Chinn & Buckland, 2012). We adapted their format and created a MEL diagram around a compelling astronomy topic: the Moon’s formation. Students draw arrows in different shapes to indicate the degree of support between lines of evidence and two models of the Moon’s formation. By engaging in the MEL, students use critical evaluation in weighing the connections between these lines of evidence and the alternative explanations to gain a deeper understanding about the Moon.

Background
- Students need to deepen their ability to critically evaluate scientific knowledge and weigh alternative explanations (National Research Council, 2012).
- However, few high school graduates exhibit the reflective thinking needed to critically evaluate alternative explanations about a particular scientific phenomenon (King & Kitchener, 2004).
- Critical evaluation may be especially important for understanding scientific topic with a large plausibility gap (Lombardi, Sinatra, & Nussbaum, 2013).
- Plausibility Gap: Where individuals find competing—but non-scientific—ideas more plausible than explanations offered by scientists.

The Moon MEL

![MEL Diagram]


Facilitating Critical Evaluation
- Lombardi, Sinatra, and Nussbaum (2013) found that the model-evidence link (MEL) diagram promoted critical evaluation, plausibility reappraisal, and knowledge reconstruction in grade 7 students.
- Researchers at Rutgers University developed the structure and mode of the MEL (Chinn & Buckland, 2012).

What’s Next?
- The Moon MEL is one of four being used in 3-year research study on developing high school students’ scientific habits of mind. Other MELs include:
  - The Climate Change MEL (Lombardi, Sinatra, & Nussbaum, 2013).
  - The Fracking MEL, currently in development.
  - The Wetlands MEL, currently in development.

References