

Students' Scientific Evaluation of Astronomy Concepts

Archana Dobaria¹, Janelle M. Bailey¹, Svetha Mohan², Timothy G. Klavon², Josh Medrano², Joshua Jaffe², Doug Lombardi²
¹Temple University, ²University of Maryland

OBJECTIVES

- The aim of MEL activity is to provide students with detailed evidence, have them consider how that evidence connects to the competing explanations, and then to critically evaluate and make a plausibility judgment about each explanation of the phenomenon.
- This study aims to analyze students' critical evaluations and plausibility judgments about a scientific model using detailed evidence.

RESEARCH QUESTION

- What are the levels of students' evaluations when engaging in two instructional treatments?
- How do students' plausibility judgements and knowledge change over the course of these treatments?

METHODS

Consenting students with complete data sets include:

- 15 high school Earth science students
- 29 preservice science teachers

Use ANOVA to see the effectiveness of the scaffold and instruction on evaluation, plausibility judgments and knowledge

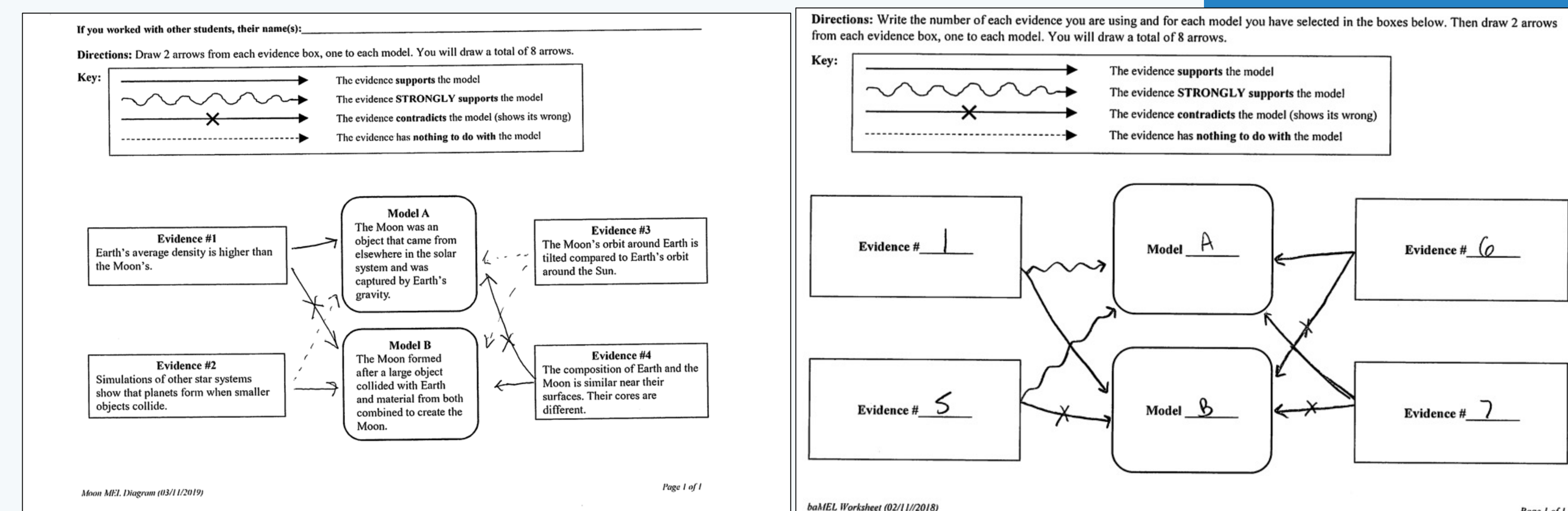


Figure 1: The Moon Formation preconstructed MEL (left) and the Origins of the Universe build-a-MEL (right).

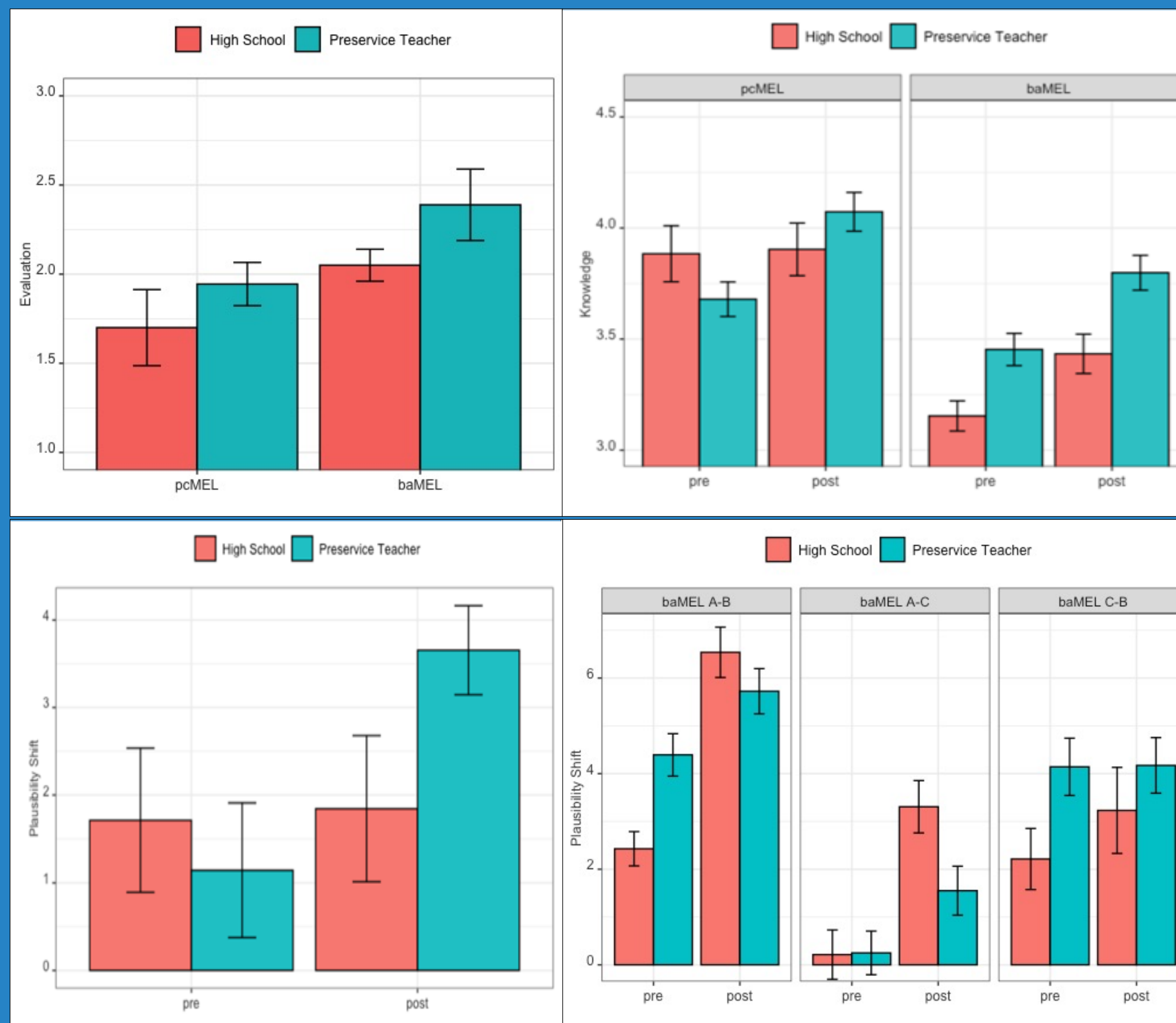


Figure 2: Evaluation (top left) (range: 1 (erroneous description)–4 (critical evaluation)) for each instructional treatment. Knowledge score (top right) (range: 1-5) for each instructional treatment. Plausibility score for MF pcMEL (bottom left) and OR baMEL (bottom right). Error bars indicated ± 1 standard error.

← Find the Moon Formation MEL and Origins baMEL materials at the website linked in the images

Find our project team website, including this poster and other research materials, through the QR code →



RESULTS

Evaluation

Preservice teacher showed higher evaluation score compared to highschool students in both scaffold For both grade level OR baMEL showed higher evaluation score compared to MF pcMEL

Knowledge

The effects of pre- to post-instruction, ($p < 0.001$, $\eta^2 G = 0.233$, medium) and scaffold ($p < 0.001$, $\eta^2 G = 0.097$, small) was significant

Plausibility

MF pcMEL:

Plausibility shift towards the scientific model from pre to post instruction, ($p < 0.05$, $\eta^2 G = 0.066$, small)

OR baMEL:

Plausibility shift towards the scientific model from each alternate model

- From model B to A ($p < .001$, $\eta^2 G = 0.193$, small)
- From model C to A ($p < .001$, $\eta^2 G = 0.128$, small)

Comparing the two alternate models, model B and C, the plausibility shift was towards model B (the steady state model)

DISCUSSION

Overall, the study showed that the Origins of the Universe build-a-MEL is robust compared to the Moon Formation preconstructed MEL in promoting students' learning. Students' agency and plausibility reappraisal can help students be more critically evaluative.



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