Promoting Scientific Plausibility and Knowledge Shifts Through Modeled Evaluation Activities

Joshua Jaffe, BS, Josh Medrano, MEd, Doug Lombardi, PhD

Department of Human Development and Quantitative Methodology, University of Maryland, College Park

BACKGROUND

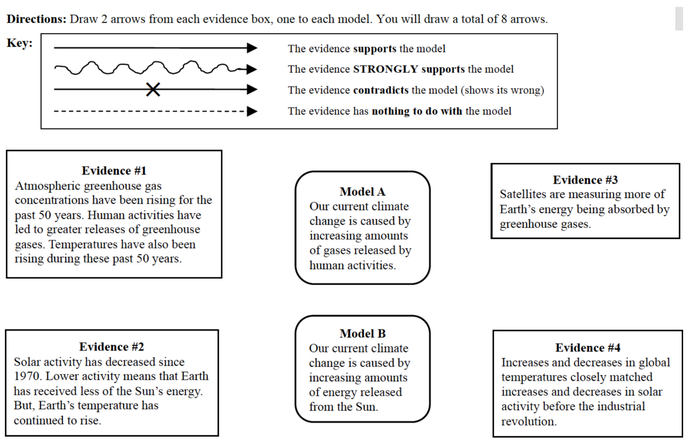
- The model evidence link (MEL) project is exploring the effectiveness of scaffolds to promote students' scientific thinking when confronted with controversial and/or complex Earth and space science topics through the pre-constructed MEL (pcMEL) and the Build-a-MEL (BaMEL).
- The pcMEL presents four lines of scientific evidence with two models (scientific and non-scientific alternative).
- The BaMEL presents eight lines of scientific evidence with three models (scientific, scientific alternative and non-scientific alternative). Students will construct their own diagram selecting four evidence lines and two models.

QUESTIONS

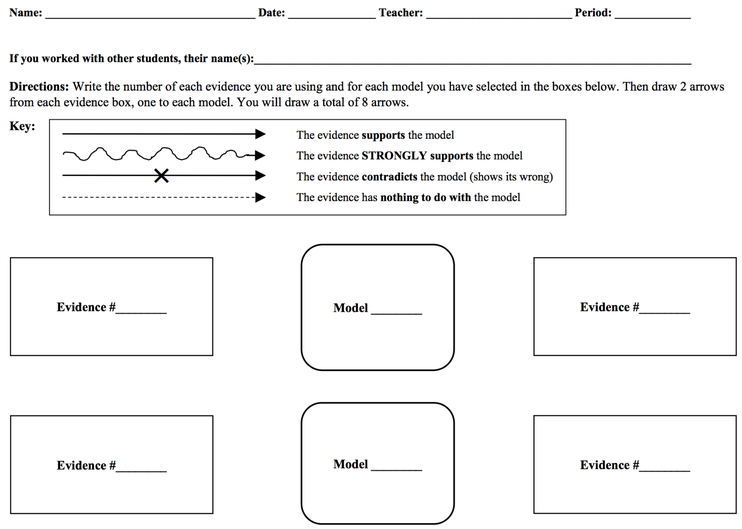
- Would the BaMEL increase conceptual agency and reveal deeper evaluations than the pcMEL?
- Would students shift their plausibility judgements towards the scientific and increase their knowledge pre – to post – instruction?
- Would outcomes differ with different classrooms/topics?

METHODS

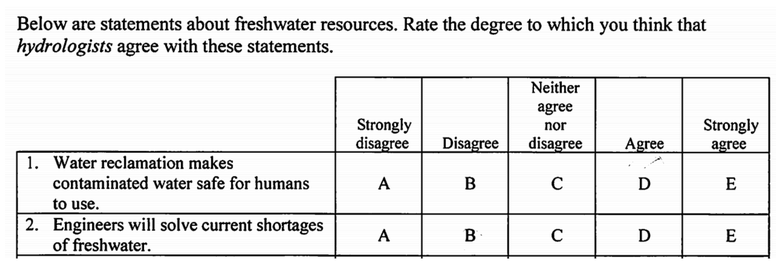
- *N* = 86, Participants were enrolled in science classes in 4 schools: 2 middle schools, 1 high school and 1 university
- Tested pcMEL and BaMEL for three different phenomena: climate change, water resource availability, and astronomical origins.
- All students completed 1 pcMEL topic.



- All students completed 1baMEL of the same phenomena as the pcMEL but in a different area (i.e. pcMEL – wetland resources; baMEL – freshwater availability.



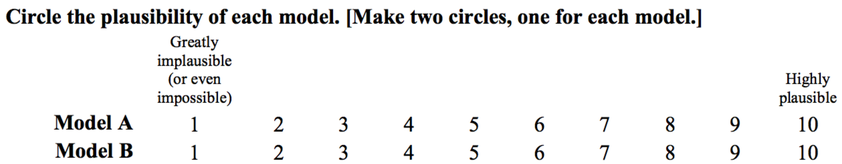
- Students completed knowledge surveys (5- 12 questions) pre - and post - instruction



Below are statements about freshwater resources. Rate the degree to which you think that *hydrologists* agree with these statements.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1. Water reclamation makes contaminated water safe for humans to use.	A	B	C	D	E
2. Engineers will solve current shortages of freshwater.	A	B	C	D	E

- Students completed plausibility ranking on a scale of 1 (completely implausible) to 10 (greatly plausible) pre – and post – Instruction.



Circle the plausibility of each model. [Make two circles, one for each model.]

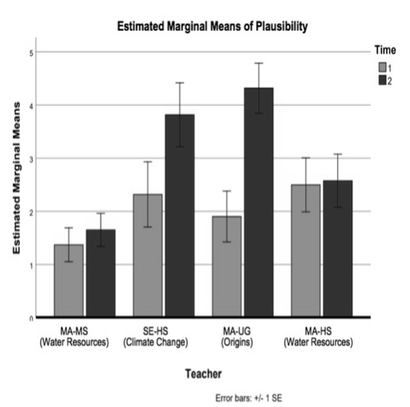
	Greatly implausible (or even impossible)									Highly plausible
Model A	1	2	3	4	5	6	7	8	9	10
Model B	1	2	3	4	5	6	7	8	9	10

This study was partially funded by an undergraduate research grant from the University of Maryland Individual Studies Program

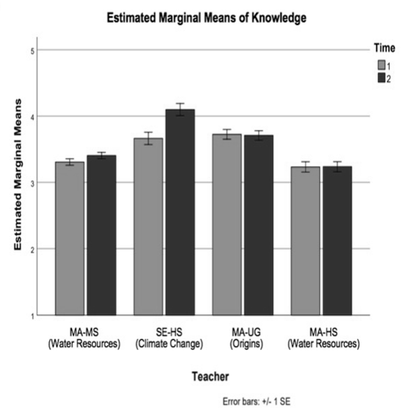
RESULTS

	Scaffold	Mean (Plausibility -9-+9 Knowledge 1-4)	Standard Deviation
Evaluation	pcMEL	2.23	0.80
	BaMEL	2.45	.81
Plausibility Pre	pcMEL	1.44	3.36
	BaMEL	2.19	2.29
Plausibility Post	pcMEL	2.22	3.60
	BaMEL	3.10	2.28
Knowledge Pre	pcMEL	3.45	0.66
	BaMEL	3.40	0.40
Knowledge Post	pcMEL	3.45	0.43
	BaMEL	3.60	0.55

a



b



CONCLUSIONS

- BaMEL did not result in greater evaluation scores compared to pcMEL
- BaMEL resulted in increased knowledge scores with both scaffolds shifting students plausibility toward the scientific.
- We found differences between the different classrooms/topics
  - Origins resulted in greatest plausibility shifts
  - Climate change resulted in largest knowledge changes.

UNIVERSITY OF MARYLAND 1856 COLLEGE OF EDUCATION

SLRG SCIENCE LEARNING RESEARCH GROUP