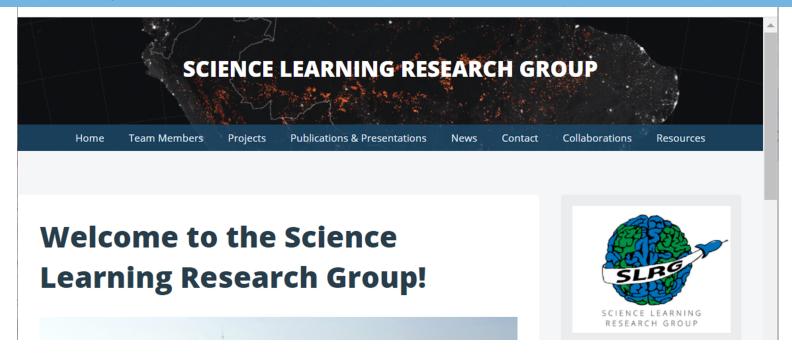


MEL Architecture Theory to Practice

Our research team (SLRG) consists of faculty and students, working directly with teachers



SLRG is funded, in part, by the US National Science Foundation (Grant Nos. 1316057, 1640800, 1721041, and 2027376).





"The Curious Construct of Active Learning": Doug Lombardi publishes in PSPI April 22, 2021 SLRG Team Member receives UMD COE Award April 19, 2021 New Publication in The Science

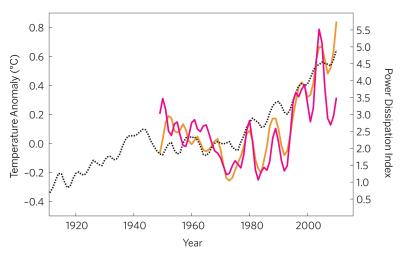
Our projects involve teachers and secondary students (*n* > 1000) in design-based and quasi-experimental research



Settings include urban, suburban, and rural classrooms and schools

Our projects examine ways to facilitate teaching of scientific reasoning & deepen knowledge about socio-scientific topics

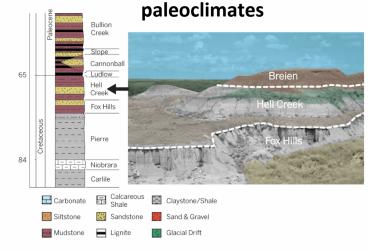
Climate change & extreme weather connections



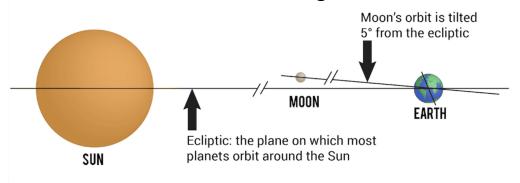
Value of wetlands & availability of freshwater resources



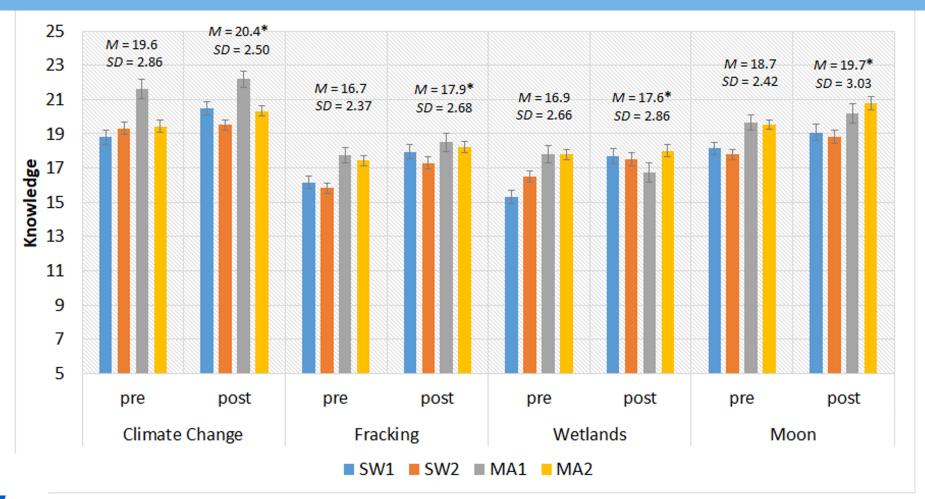
Fracking impacts, earthquakes, fossil evidence, &

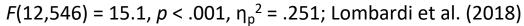


Formation of Earth's Moon & origins of the Universe



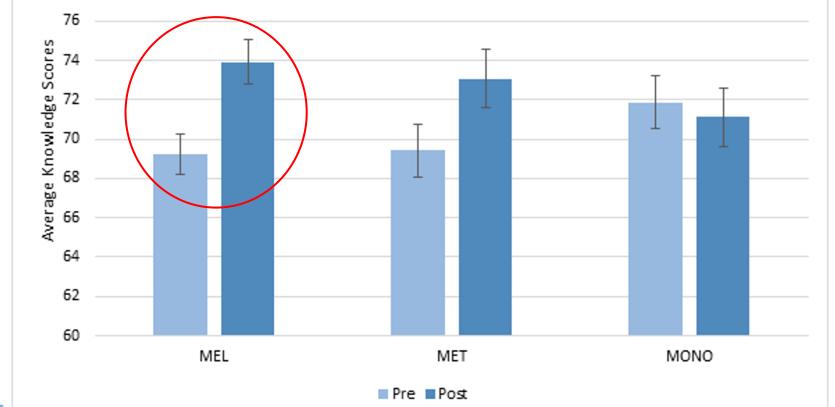
In the MEL project's first phase, students meaningfully increased their reasoning and knowledge





The MEL compared favorably to other types of instruction

The MEL resulted in ~1 letter grade increase in knowledge, with the MET (a table verison) also showing knowledge gains, but just a bit less





However, beyond the classroom context of the MEL, students' scientific reasoning were not as promising

A person who supports recycling makes the following argument:

Recycling reduces the need for materials obtained through logging, mining, farming, and drilling. Recycling reduces the land needed for waste disposal.

- There are people who read this information one time and think the argument is correct. We call these people "first look" people.
- There are people w people "second loo

Your role is to be a "seco argument again and find

The more flaws you find, th

In the space below, write a I think there is a problen A person who is opposed to recycling makes the following argument.

Recycling of contaminated products endangers public health. Recycling facilities consume energy and are still sources of water and air pollution.

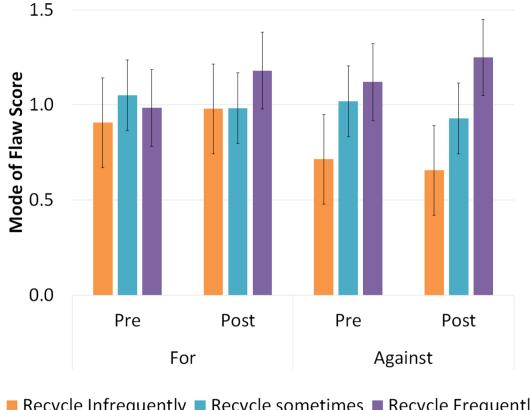
- There are people who read this information one time and think the argument is correct. We call these people "first look" people.
- There are people who after reading this again find flaws in this argument. We call these people "second look" people.

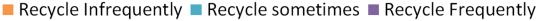
Your role is to be a "second look" person and find flaws in the argument. Read the framed argument again and find as many different flaws as you can.

The more flaws you find, the better debater you are!

In the space below, write as many different flaws as you can.

I think there is a problem with this argument because:







Only students who recycle frequently were more scientific in their evaluations and reasoning (Burrell et al., 2016)

Would an autonomy-supportive instructional form of the MEL scaffold increase students' agency and learning?

Evidence #1

Land use changes have generated large pressures on fresh water resources. These changes are affecting both water quality and

Evidence #2

The world's population is increasing. This stresses the supply of freshwater.

Evidence #3

Groundwater provides freshwater to many people around the world. In many places, people are using groundwater faster than it is

Evidence #4

Water reclamation and desalination costs are expensive. These costs vary depending on location.

Evidence #5

Advances in engineering have led to better access to quality drinking water. At the same

Evidence #6

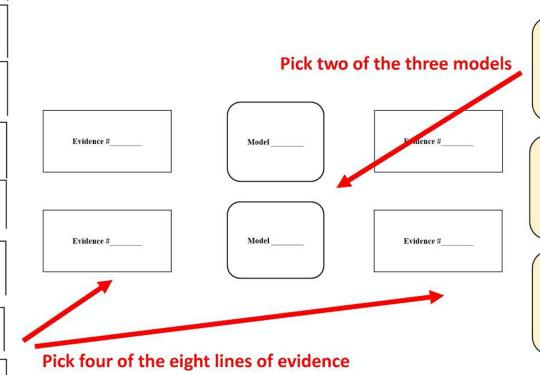
Glaciers are a source of freshwater in many parts of the world. Glacial ice mass is decreasing worldwide.

Evidence #7

Microclimates are climates of very small areas that usually differ from the surrounding areas. Scientists are developing high-

Evidence #8

In the contiguous US, average temperatures and precipitation have increased since 1901. From 2000-2015, the US was abnormally dry with some parts of the country in moderate to severe drought.



Model A

Earth's freshwater is abundant and will remain so even in the face of global climate change.

Model B

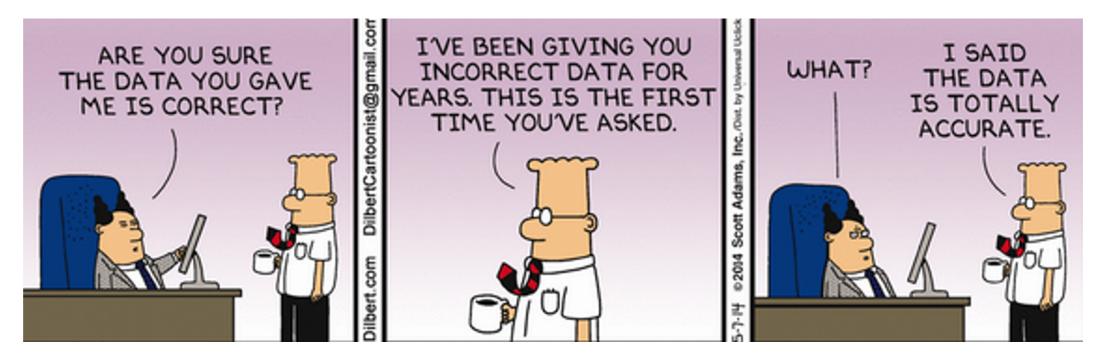
Earth's freshwater challenges will be solved by engineering solutions.

Model C

Earth has a shortage of freshwater, which will worsen as our world's population increases.

The build-a-MEL (baMEL)

Time to pause...what questions do you have?



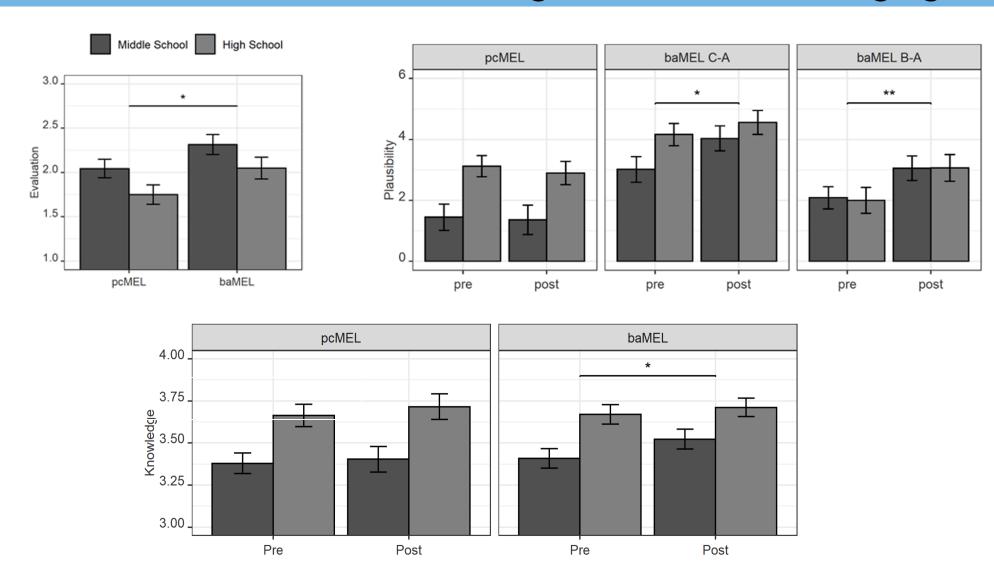
Any questions or comments: Please put these in the chat window



Over the past few years, we have developed the baMELs and and are observing students using them in classrooms

Activity	Year 1 Fall <u>Spr</u> Sum	Year 2 n Fall <u>Spr</u> Sum	3 and 4 Year 9 Fall <u>Spr</u> Sum	Year 4 Fall Spr Sum
Plan & initially develop 4 new baMEL activities				
Bench & pilot testing of materials & activities				
Collect & analyze classroom artifacts & instruments from bench & pilot testing				
Summer institute GA & NJ			^	
Meeting of advisory panel & external evaluator to review year				
Revise 4 baMEL activities based on test data results				
Conduct 5 observations each in 10 classrooms (5 in GA & 5 in NJ)				
Follow on PD (webinars + in person meeting)				
Quasi-experimental phase of comparative effectiveness				
Collect & analyze classroom artifacts & instruments from quasi-experimental phase				
Dissemination of results, materials, & activities				

Years 2-4 studies showed advantages for the baMEL vs. the preconstructed MEL in scientific reasoning shifts and knowledge gains



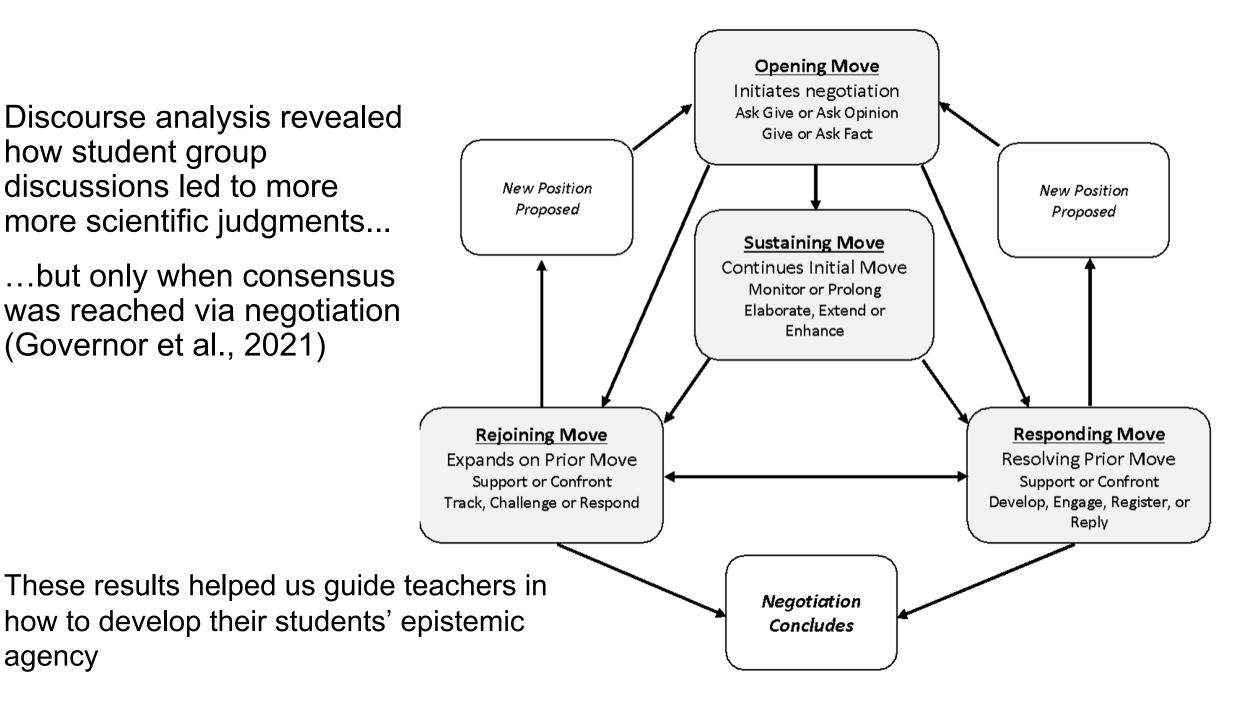
Analysis of student group discussions (audio/video recordings) allow us to understand how they evaluate connections

Argumentation Sequence Excerpt			
Student	Dialogue Turn	Move	
1	Well, it could contradict it by saying	Rejoin: Confront: Challenge: Rebound	
	Because to say, our current climate change isum caused by the Sun	Sustain: Continue: Prolong: Enhance	
2	You could be saying that humans have nothing to do with it.	Respond: Confront: Challenge: Rebound	
1	Yeah, that could be.	Respond: Support: Reply: Agree	
	If you're taking that as almost like an absolute.	Sustain: Continue: Prolong: Enhance	

Discourse analysis revealed how student group discussions led to more more scientific judgments...

...but only when consensus was reached via negotiation (Governor et al., 2021)

agency



Are you interested in you & your students being a part of next year's study?

We hope to work with a few teachers each in GA and NJ, and would visit these classrooms ~ 4 times in 2021-2022

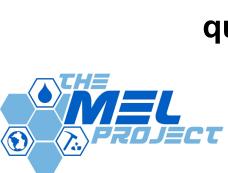
We would collect student work after obtaining assent & consent

We would offer an extra stipend to teachers involved in the study

We would like to have all of you complete a quick survey to gauge your research interest

https://forms.gle/VbxyDWqbdh1Dr3hC6

Please note, your interest does not commit either you or us at this time, but rather helps us be more focused in our selection process.





ACKNOWLEDGEMENTS















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