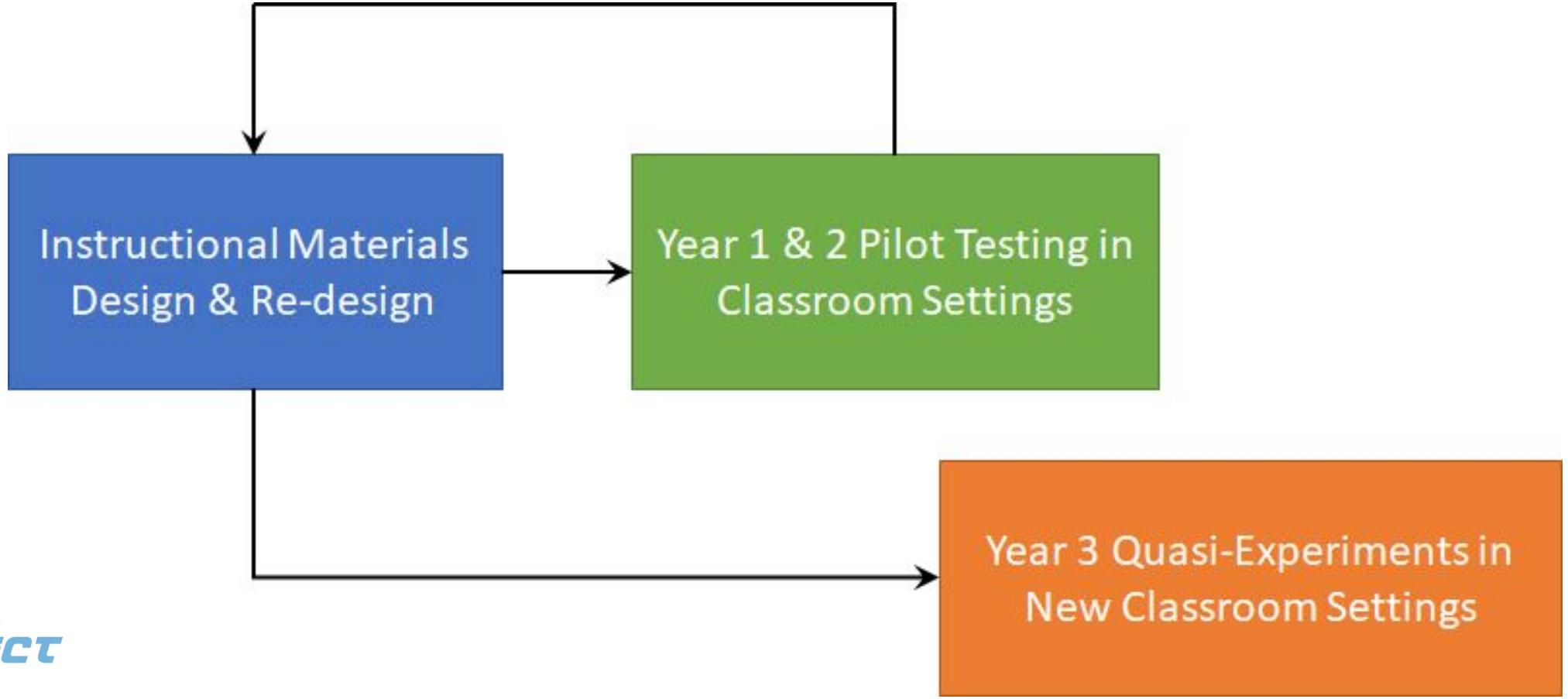
Educational Research Involving the MELs & baMELs

In “MEL1,” SLRG investigated HS students’ scientific thinking & learning about Earth & space science

Our research question: How does sustained instruction promoting evaluation result in plausibility reappraisal and knowledge changes about Earth science topics?



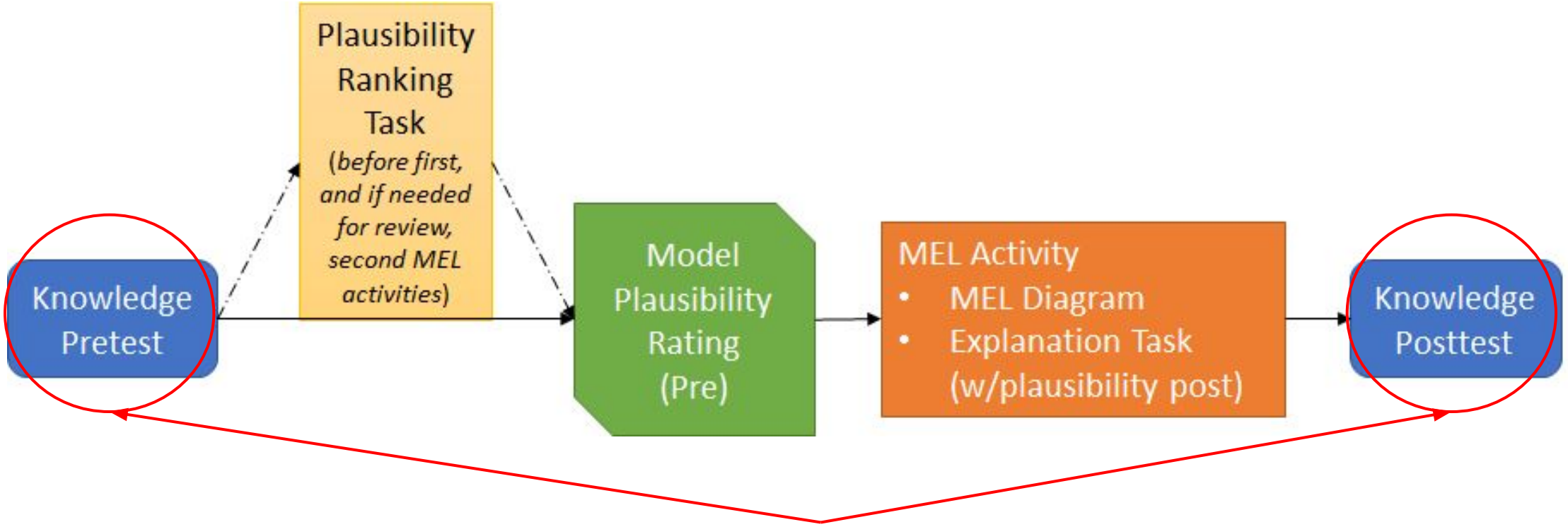
We involved 3 different school districts in MEL1 to gauge generalizability of the results

One was a very large urban district with a majority Hispanic population

Two were small & middle-sized suburban districts with a mostly White population

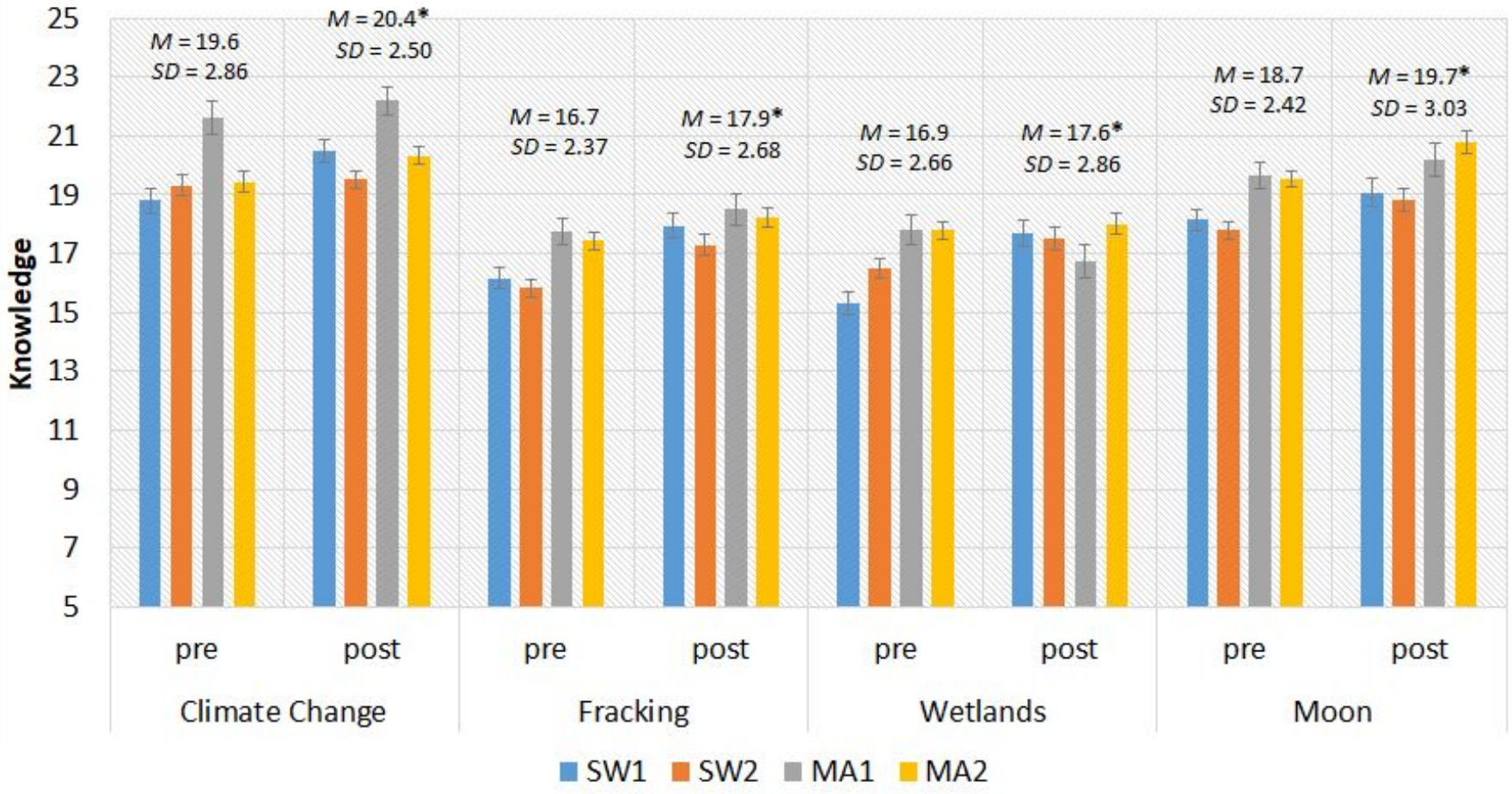
8 master teachers (4 from the NJ districts & 4 from the NV district) & hundreds of their high school Earth science students were involved in MEL1

In Year 2 (2015-2016), students completed all 4 pre-constructed MELs during the course of the school year



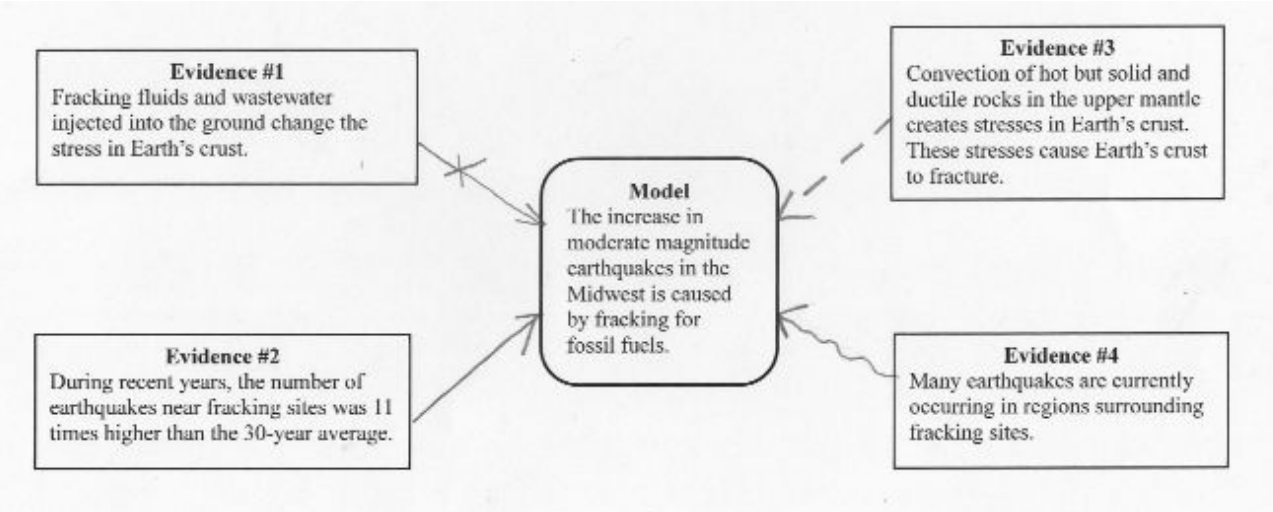
We developed these short (think pop quiz) knowledge surveys for research purposes only...i.e., they are not appropriate for classroom assessment

Year 2 results showed increases in knowledge (pre to post) for all MELs

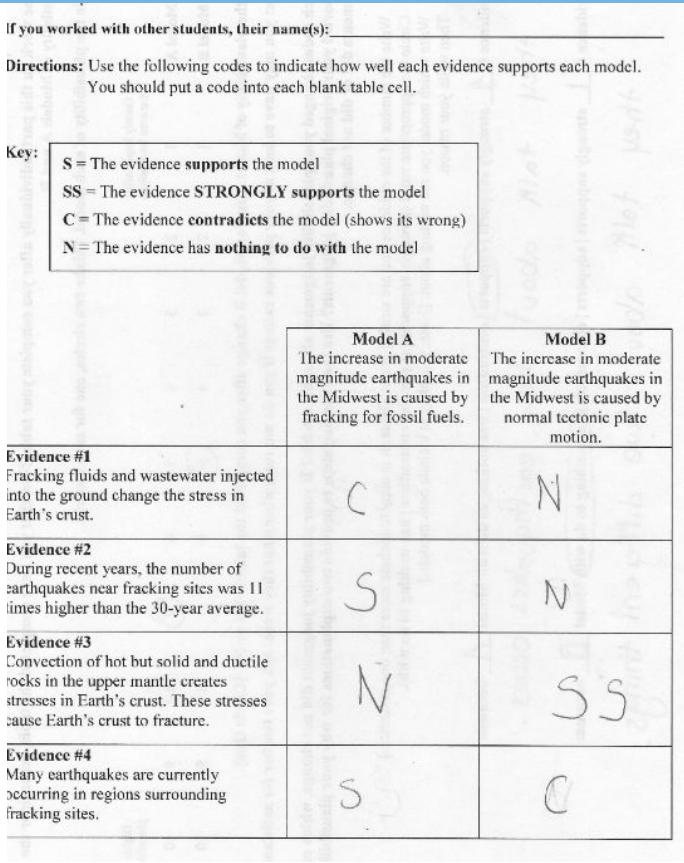


$F(12,546) = 15.1$, $p < .001$, $\eta_p^2 = .251$; Lombardi et al. (2018)

In Year 3, we conducted a quasi-experiment comparing the MEL to two different tasks



Mono-MEL (same lines of evidence, only the scientific model included)



If you worked with other students, their name(s):_____

Directions: Use the following codes to indicate how well each evidence supports each model. You should put a code into each blank table cell.

Key:

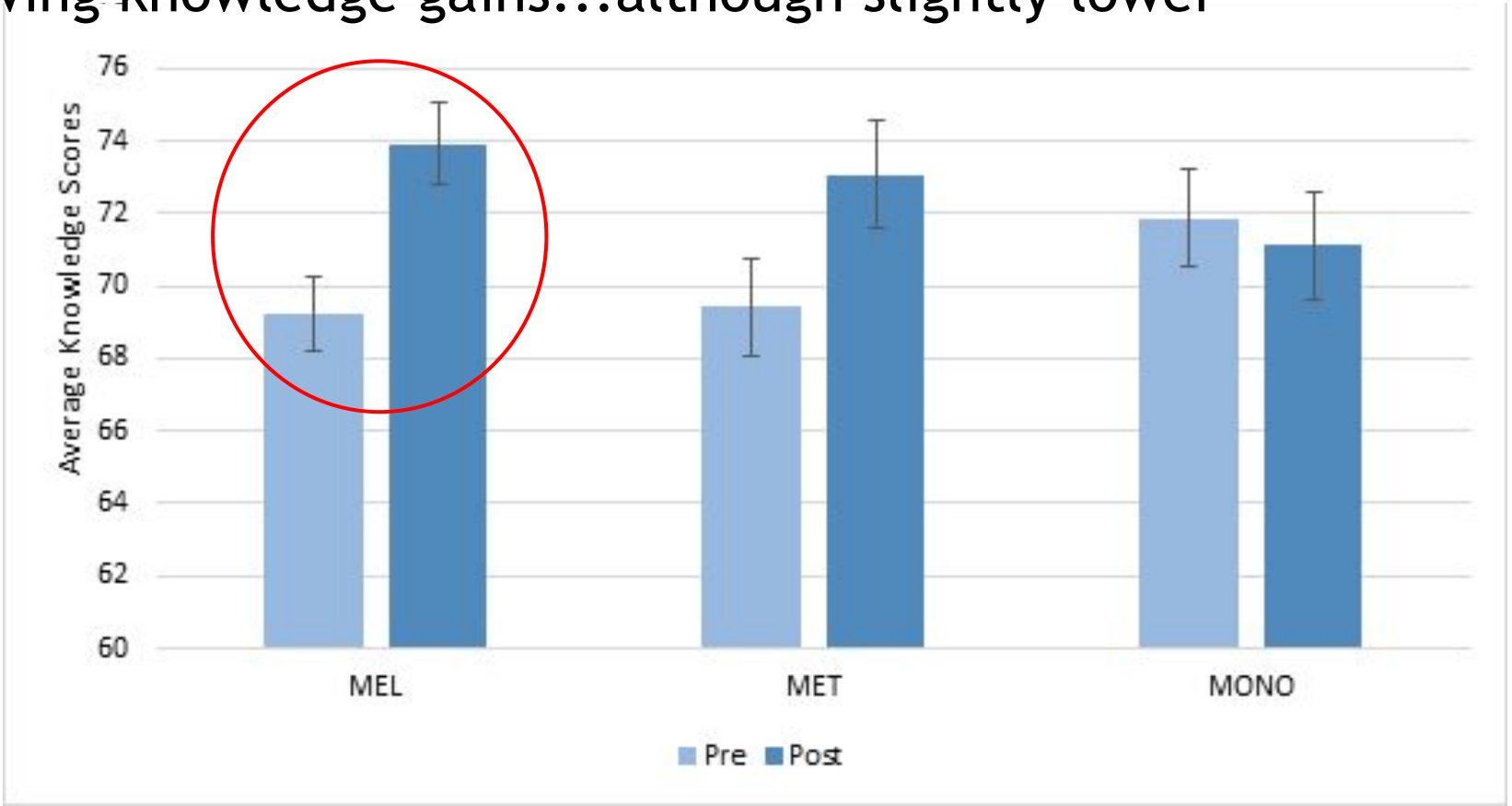
- **S** = The evidence **supports** the model
- **SS** = The evidence **STRONGLY supports** the model
- **C** = The evidence **contradicts** the model (shows its wrong)
- **N** = The evidence has **nothing to do with** the model

	Model A The increase in moderate magnitude earthquakes in the Midwest is caused by fracking for fossil fuels.	**Model B** The increase in moderate magnitude earthquakes in the Midwest is caused by normal tectonic plate motion.
Evidence #1 Fracking fluids and wastewater injected into the ground change the stress in Earth's crust.	C	N
Evidence #2 During recent years, the number of earthquakes near fracking sites was 11 times higher than the 30-year average.	S	N
Evidence #3 Convection of hot but solid and ductile rocks in the upper mantle creates stresses in Earth's crust. These stresses cause Earth's crust to fracture.	N	SS
Evidence #4 Many earthquakes are currently occurring in regions surrounding fracking sites.	S	C

MET (same lines of evidence, same models, but table format)

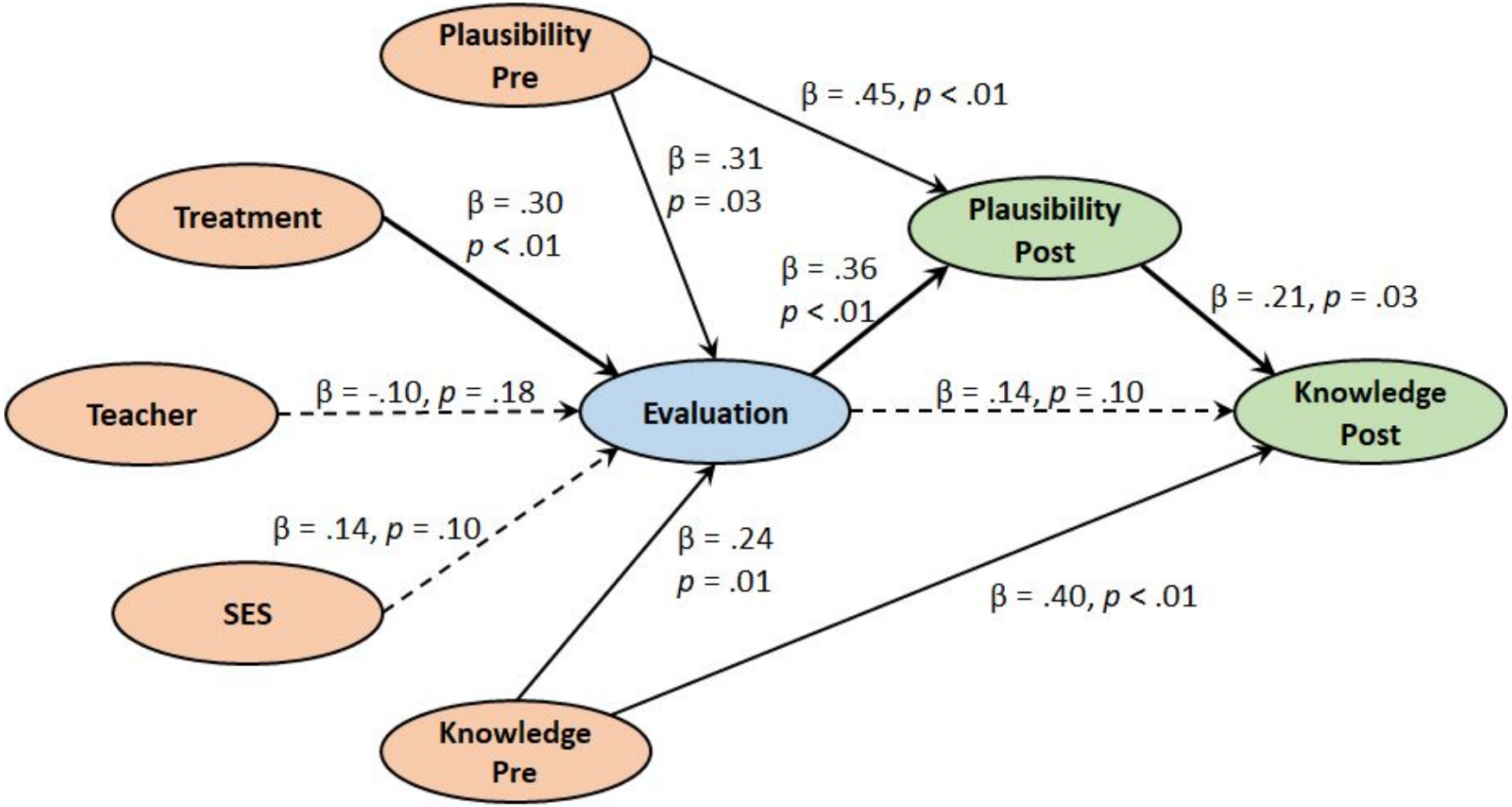
Combined knowledge scores increased when students evaluated alternative models

The MEL resulted in ~1 letter grade increase in knowledge, with the MET also showing knowledge gains...although slightly lower



Lombardi et al. (2018)

The pathway of evaluation, plausibility reappraisal, & knowledge was the mechanism driving learning



Lombardi et al. (2018)

Beyond the context of the MEL, student evaluations 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, t…

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.

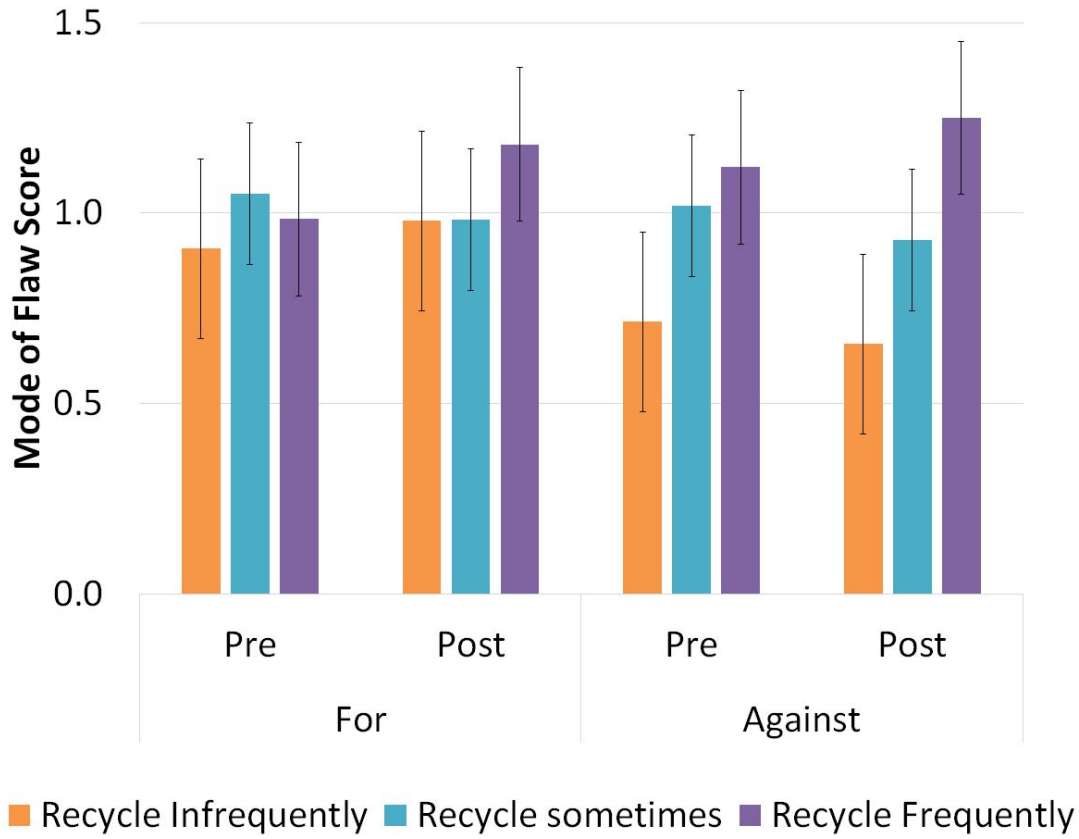
- There are people who read this information one time and think the argument is correct. We call these people "first look" people.
- There are people who after reading this again find flaws in this argument. We call these people "second look" people.

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:



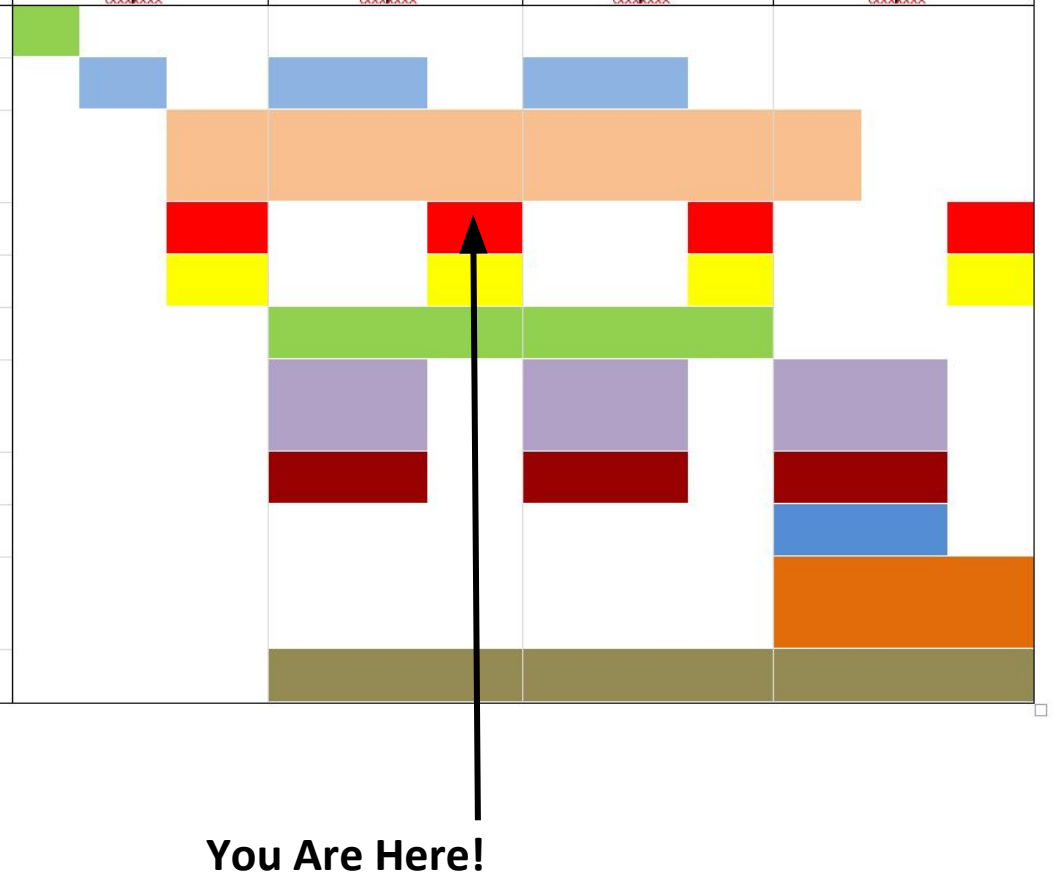
Only students who recycle frequently were more critical in their evaluations (Burrell et al., 2016)

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

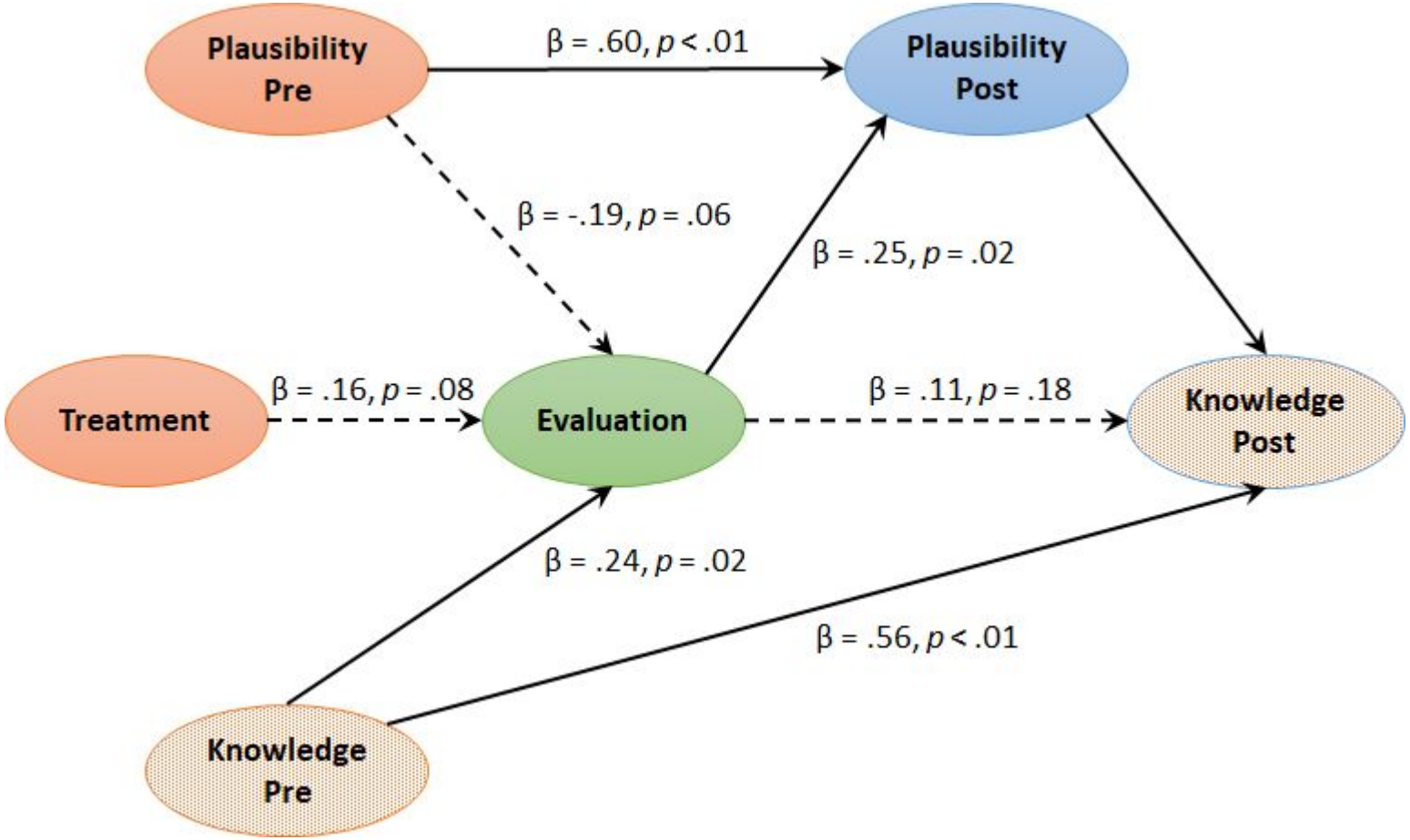
With your tablemates, come up with one question about the MEL1 project research

MEL2 increases the scope by introducing Build-a-MEL and observing students in their classroom learning

Activity	Year 1 Fall Spr Sum	Year 2 Fall Spr Sum	Year 3 Fall Spr 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				

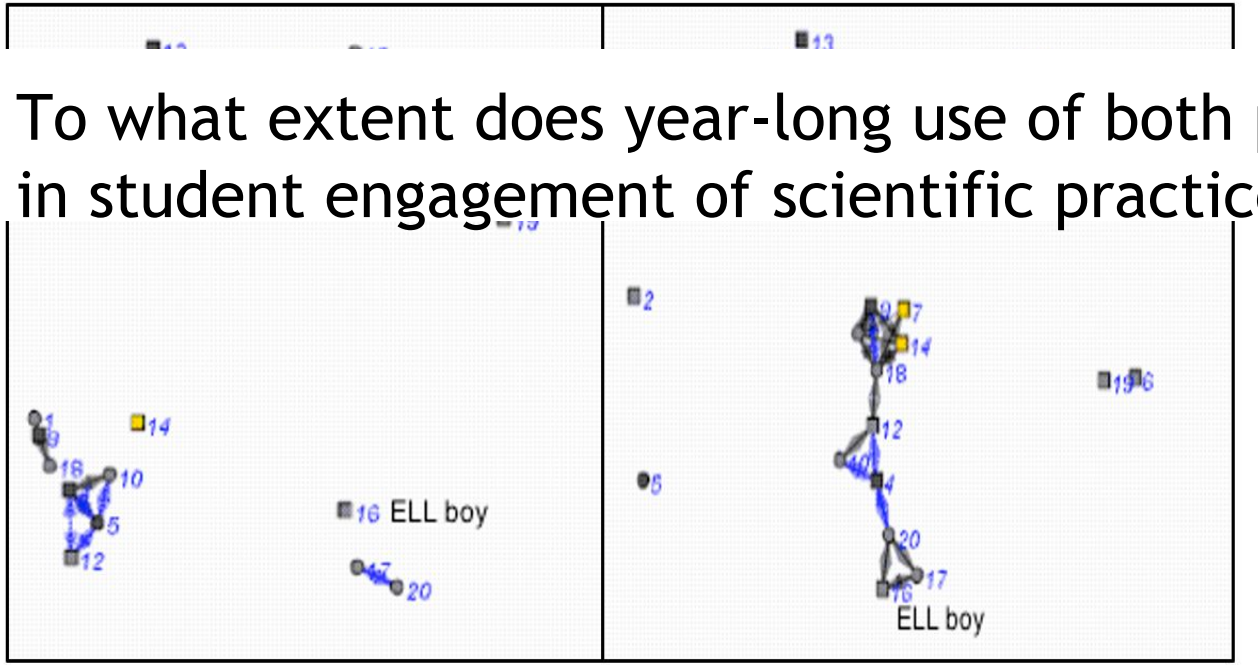


Initial analysis of this year's data suggest show the baMEL trending toward higher levels of students' evaluations

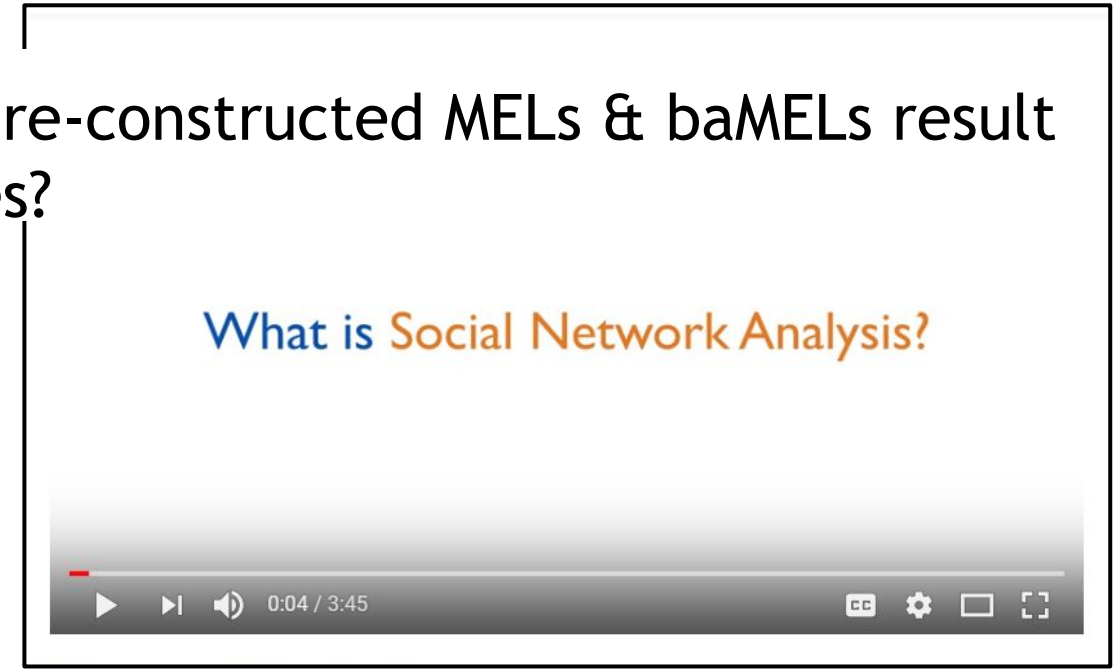


Lombardi et al. (2019)

MEL2 increases the scope by introducing Build-a-MEL and observing classroom learning



To what extent does year-long use of both pre-constructed MELs & baMELs result in student engagement of scientific practices?



We are specifically focusing on observing interactions between teachers & students groups, as well as within student groups

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

We hope to work with 4-5 teachers each in GA and NJ

We would visit your classroom 4-5 times during the school year

We would collect student work after obtaining assent & consent

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

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

If you are interested in being considered for participation in the research project please write the following on your index card:

Your name
Your email
Your school name
Your school district name
Yes or Maybe

You don't need to fill out a card if you do not want to participate.

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.

THE MEL PROJECT

ACKNOWLEDGEMENTS

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