

Lab Experiences and Students' Ideas About the Nature of Science

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KSUPER GROUP

What is IMPRESS?



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- ▶ Integrating **M**etacognitive **P**ractices and **R**esearch to **E**nsure **S**tudent **S**uccess
- ▶ Two week summer workshop
- ▶ 20 first generation and deaf/hard of hearing students
- ▶ Ends up being a fantastic source of data for research
 - ▶ Last year collected by REU students Ed Schenk and Alison Gomez

Research Goals & Guiding Thoughts

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Find something interesting about the videos

Existence proof

Avoid overfitting
the data

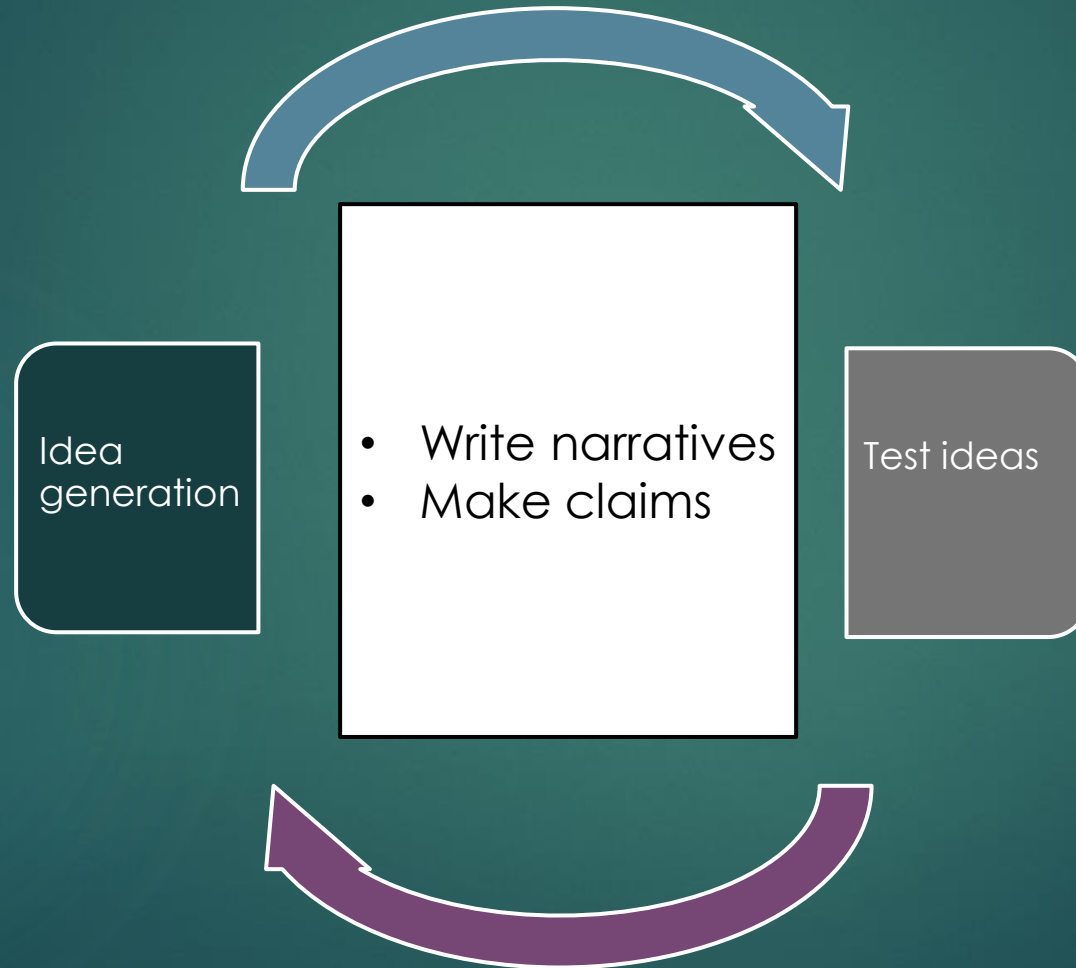
Students' actions
and words

Students' implicit ideas on
the nature of science

Theoretical
framework
&
hypothesis
refinement

IRR & clear
evidence from
data

Methodology



Theoretical Framework

- ▶ Developed by Dr. Paul Irving, Dr. Sayre, and past REU student Lauren Harris

B

- Brief: short comments or questions

E

- Embedded: part of larger project

S

- Spontaneous: unprompted

M

- Metacognitive: reflective

Claim: students have a resistance to side quests

You notice that you guys have a setup on your bench already for you: you've got a heat lamp, two bottles with thermometers in them, alright? You'll also notice you have some seltzer tablets... those seltzer tabs are gonna be a source of carbon dioxide.

So you're gonna drop those seltzer tabs in one of your bottles but not in the other. You're gonna turn on that light, and you're going to monitor the temperature in both bottles for about 20 to 25 minutes.



Do we want to control "night time" just to see a cooling temp? Or are we supposed to have the heat lamp on for the whole 20 minutes?

Are we doing another 25 minutes with it being "night time"?

Are we still doing the whole "night and day" thing?

I think we're supposed to have the whole thing with heat.



...so we'll just keep it on, I guess.



Claim: students don't feel the need to reach *explicit* consensus

You're going to try to figure out what's happening. Make a theory about what you think is happening in those bottles.



Well, carbon dioxide makes a difference... but I feel like it's more of a chemical reaction that's going on- um, that gave off the heat.

I keep coming back to that "molecules absorbing at different electromagnetic spectrums" idea, but **I still have no idea if I'm right about that...** Maybe carbon dioxide absorbs the visible light or ultraviolet light spectrum.

My head hurts



Later...

Would it be alright if we put water in the bin?

What for?

To put tablets in it... so we have carbon dioxide in that environment.

Is there another source that you could use for carbon dioxide?

Your breath.



Example of both claims

I want you to go back to your supplies and construct a representation of how that theory would affect the atmosphere.



I don't really know if we're doing an experiment right now though. **I thought** we were just trying to figure out our model, you know?



We should do an experiment without more carbon and then with more carbon? You're thinking?

Later...

What do we want our model to incorporate?

We want to incorporate the added CO₂... because that's what we did in the experiment.



Why This Matters



Next Year's
Students



Consensus
Building



Improve IMPRESS