Teacher-Research in the Climate Change Classroom: One Teacher's Story

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During the 2017-2018 school year I participated in a teacher-researcher program at my school. I centered my project on my climate change teaching and today's presentation is the story of my experience.

Teacher-Research is also called Action Research

“*Action research is any systematic inquiry conducted by teacher-researchers, principals, school counselors, or other stakeholders in the teaching/learning environment to gather information about how their particular schools operate, how they teach, and how well their students learn. This information is gathered with the goals of gaining insight, developing reflective practice, effecting positive changes in the school environment (and on educational practices in general), and improving student outcomes and the lives of those involved”.*

-Mills, Geoffrey (2002). *Action research: A guide for the teacher researcher*. Upper Saddle River, N.J.: Merrill Prentice Hall.

As a climate activist outside of the classroom, climate change is something I care about deeply.

Photo: Emily at a Sunrise Movement #ClimateLegacy Action in 2017

My climate change teaching has raised many questions....

What is the role of my own activism and how do I bring myself into the classroom?

Learning about the causes and effects of climate change can be emotionally upsetting for students—how can I help them cope?

How can I leverage these emotions to help students form a connection to a topic that might otherwise feel far away?

How do I balance evidence-based learning of the science classroom with discussions of politics, justice and feelings? Will these types of discussions upset parents and families?

How do I encourage climate action without polarizing students? What types of actions are appropriate? Should climate action even be a course goal?

My teacher-research project has helped me start to unravel these questions.

What is the appropriate balance of evidence and emotion that inspires students to care and act without feeling despairing?

Research Questions:

How much do my students learn about climate change?

How do my students feel as they study climate change?

What actions, if any, do they take in or out of class that connect to their learning or feelings?

Predictions:

An emotional connection to climate change will propel students to make meaningful actions in their own lives.

Emotional connections might trigger negative feelings such as guilt, despair, sadness and hopelessness that may get in the way of productive learning and/or action.

There might be pushback from students and/or families.

Environmental Science & Sustainability 2017-2018

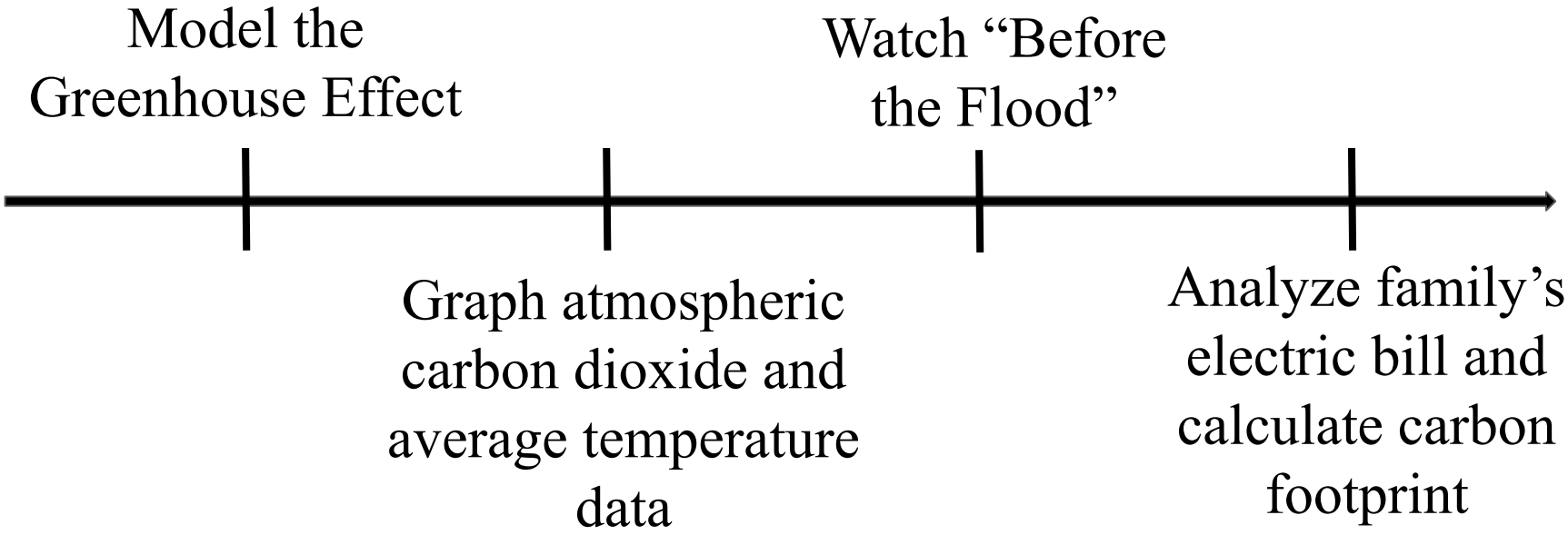
Unit on energy and climate change.

Class of seven students who were there by choice (12th grade elective).

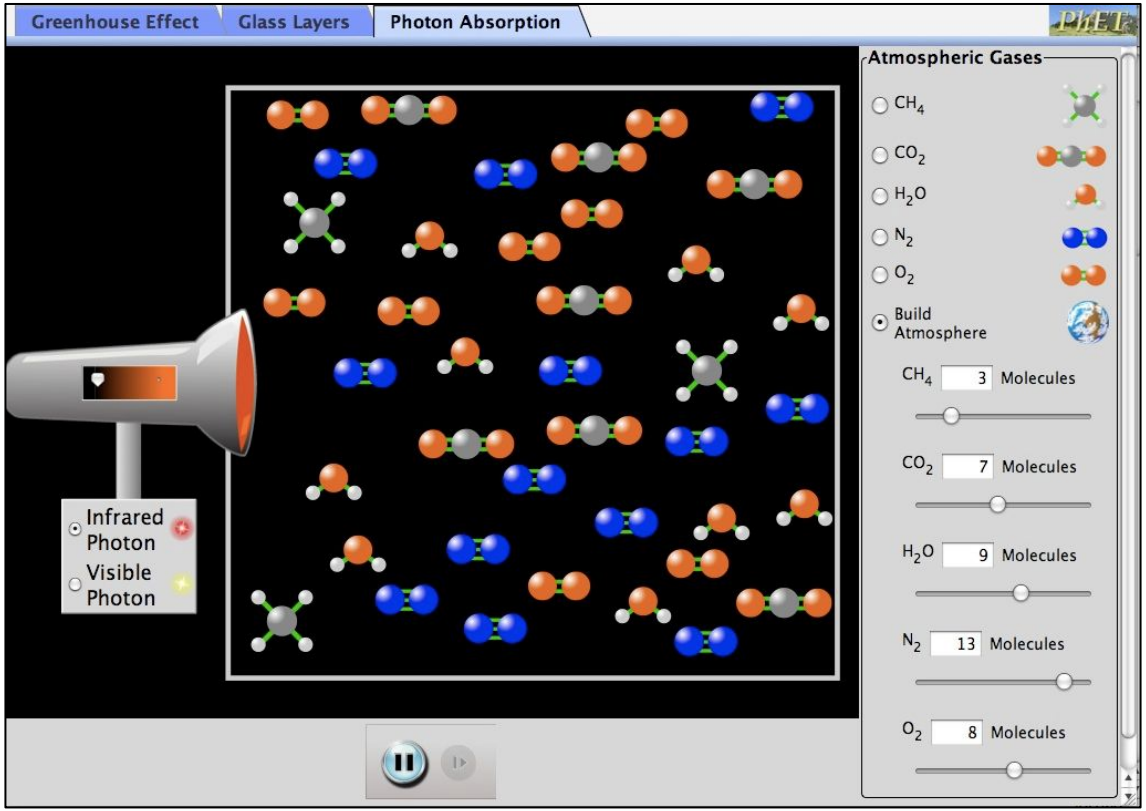
I collected student work and journal responses, and audio recorded to capture organic discussions.

Students and parents signed consent forms.

Learning Sequence



Model the Greenhouse Effect: PhET Activity



Graph atmospheric carbon dioxide and average temperature data

Carbon Dioxide Exercise

Jump to this Activity »

https://serc.carleton.edu/introgeo/interactive/examples/co2.html

Randy Richardson, SERC – Starting Point Collection

In this activity, students work in groups, plotting carbon dioxide concentrations over time on overheads and estimating the rate of change over five years. Stacked together, the overheads for the whole class show an increase on carbon dioxide over five years and annual variation driven by photosynthesis. This exercise enables students to practice basic quantitative skills and understand how important sampling intervals can be when studying changes over time. A goal is to see how small sample size may give incomplete picture of data.

Learn mor

US Historical Climate: Excel Statistical

Jump to this Activity »

https://serc.carleton.edu/introgeo/mathstatmodels/examples/XLstats.html

R.M. MacKay, SERC Starting Point

In this intermediate Excel activity, students import US Historical Climate Network mean temperature data into Excel from a station of their choice. They are then guided through the activity on how to use Excel for statistical calculations, graphing, and linear trend estimates. The activity assumes some familiarity with Excel and graphing in Excel.

Activity will take about two hours depending on the familiarity with Excel.

Learn more about Teaching Climate Literacy and Energy Awareness»

Watch “Before the Flood”

From Grid to Home Activity

From Grid to Home

https://serc.carleton.edu/NAGTWorkshops/energy/activities/32718.html

Marie Johnson, SERC – On the Cutting Edge Collection

Jump to this Activity »

In this classroom activity, students analyze regional energy usage data and their own energy bills to gain an understanding of individual consumption, regional uses, costs, and sources of energy.

Activity takes one class period.

Learn more about Teaching Climate Literacy and Energy Awareness»

NEXT GENERATION SCIENCE STANDARDS

See how this Activity supports the Next Generation Science Standards»

Middle School: 1 Disciplinary Core Idea, 4 Cross Cutting Concepts, 5 Science and Engineering Practices

High School: 1 Disciplinary Core Idea, 2 Cross Cutting Concepts, 4 Science and Engineering Practices

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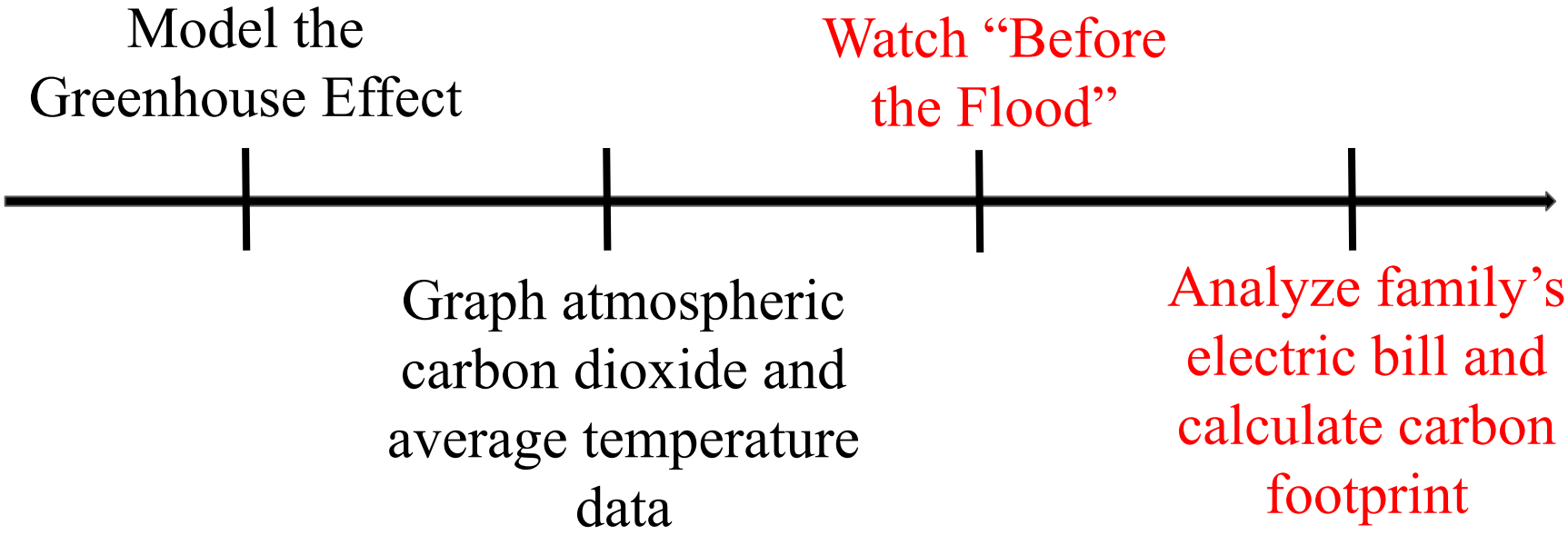

Two Student Journeys

Yael’s Responses

Initial Response to Film	End of Unit Reflection on Film
I didn't know that Leonardo DiCaprio was so concerned with climate change [...] I didn't know that climate change was very much due to fossil fuels. I think it's sad that almost everything we do releases carbon dioxide. We are so reliant on processes that require it, that it is almost insane to think about a world where we aren't reliant on it.	

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[our carbon footprint is equivalent to] 141,580 pounds of coal burned: this is a lot and very bad for the environment [...] this shows that we use a ton of electricity, and clearly need to cut it down.	My biggest takeaway was learning what I could do at home to improve my own impact on climate change. [...] After doing this activity, I showed my findings to my family and a month later we reduced our electricity usage by $200. I also talked to my family about installing solar panels, and we are looking into it.

Vered's Responses

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Vered's Responses

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[our carbon footprint is equivalent to] 5,282 miles driven by an average passenger vehicle- it's crazy to think that just through the electricity that my family uses in our house we've driven the equivalent of across the U.S and half way back, combined with the CO2 emitted by our cars this would be an even crazier number.	

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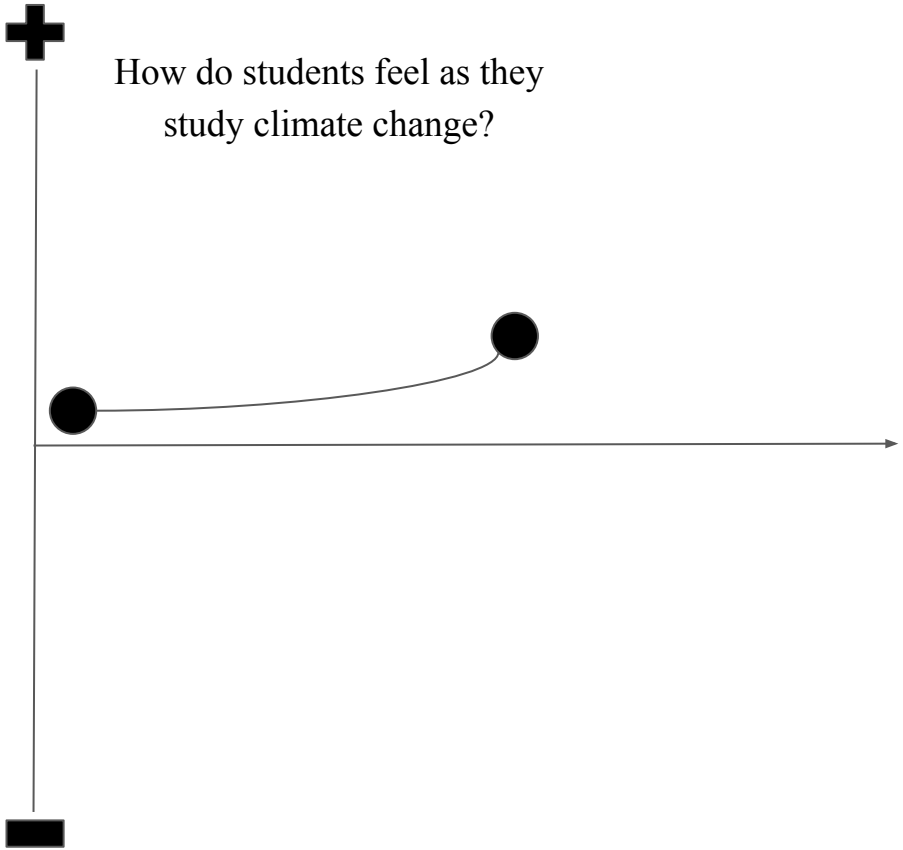
Same Learning Sequence

Two Very Different Journeys

Yael’s Journey

How do students feel as they study climate change?

What actions, if any, do they take in or out of class that connect to their learning or feelings?



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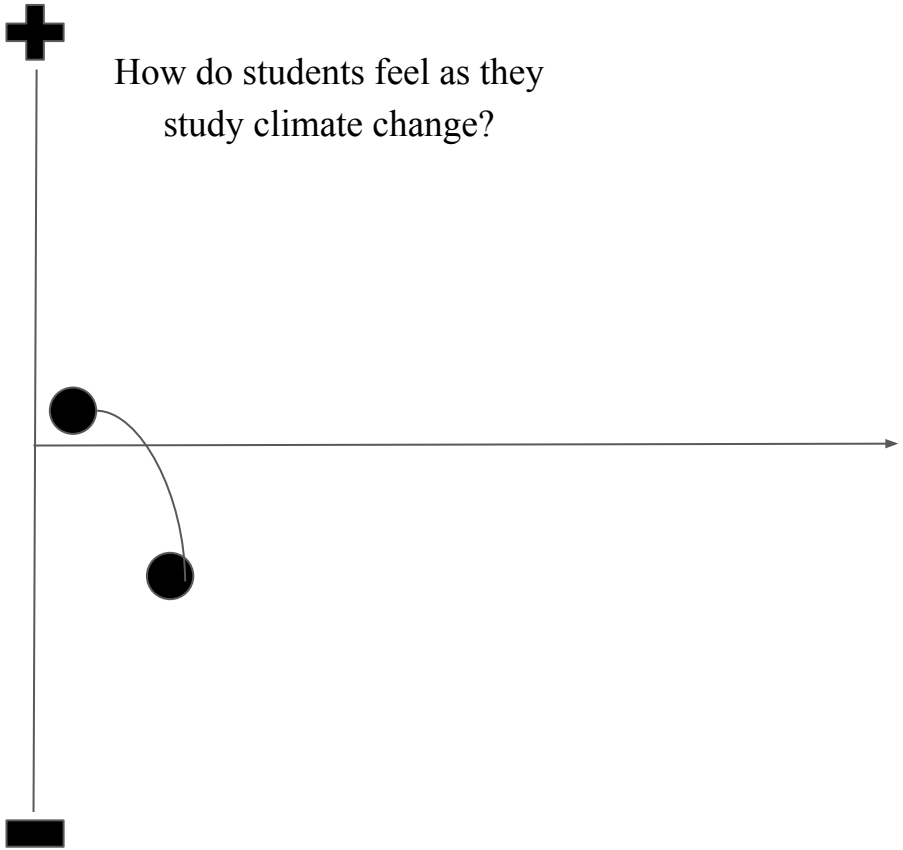
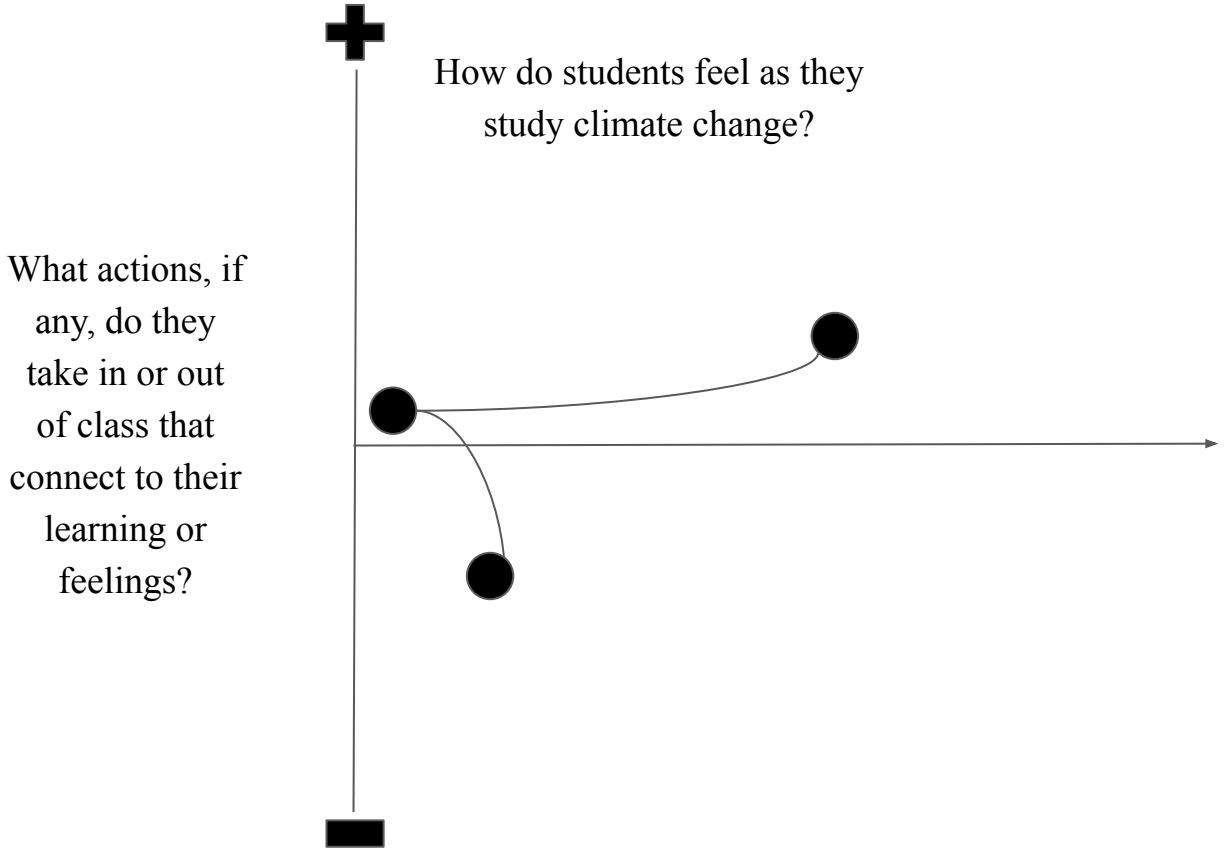


How do Yael and Vered's journeys compare?



Two Student Archetypes: Empowered and Defeated

Empowered Student: Yael

This student seems to have a more positive affect towards climate change and taking action.

It seems like the film and activity empowered her to connect with climate change and to take action.

However, we don’t know what will happen to Empowered Student in the long term.

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However, we don't know what will happen to Empowered Student in the long term. Will she continue to take action?

Defeated Student: Vered

This student left feeling more informed but with a negative emotional response that doesn't seem to have inspired action.

However, we don't know what will happen to Defeated Student in the long term. Will she take action in the future?

Did I serve this student well?

I'm not so sure...

Looking back on my predictions:

“Empowered Student” suggests that an emotional connection to climate change can propel students to take meaningful actions.

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“Empowered Student” suggests that an emotional connection to climate change can propel students to take meaningful actions.

However, “Defeated Student” suggests that emotional connections might trigger negative feelings that may get in the way of productive learning and/or action.

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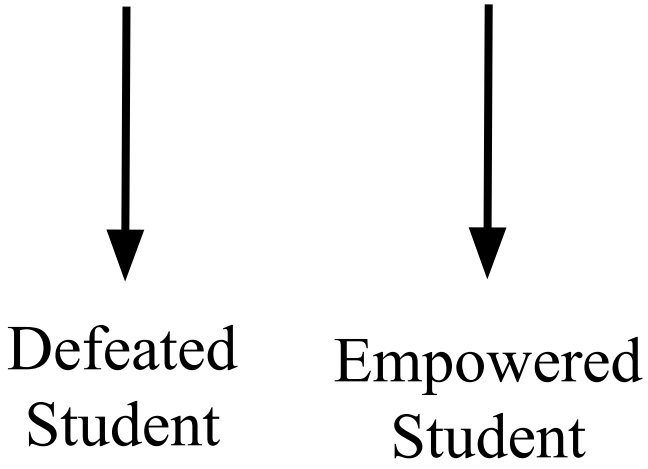

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Defeated Student

Empowered Student

Need for Differentiation Within my Climate Change Teaching

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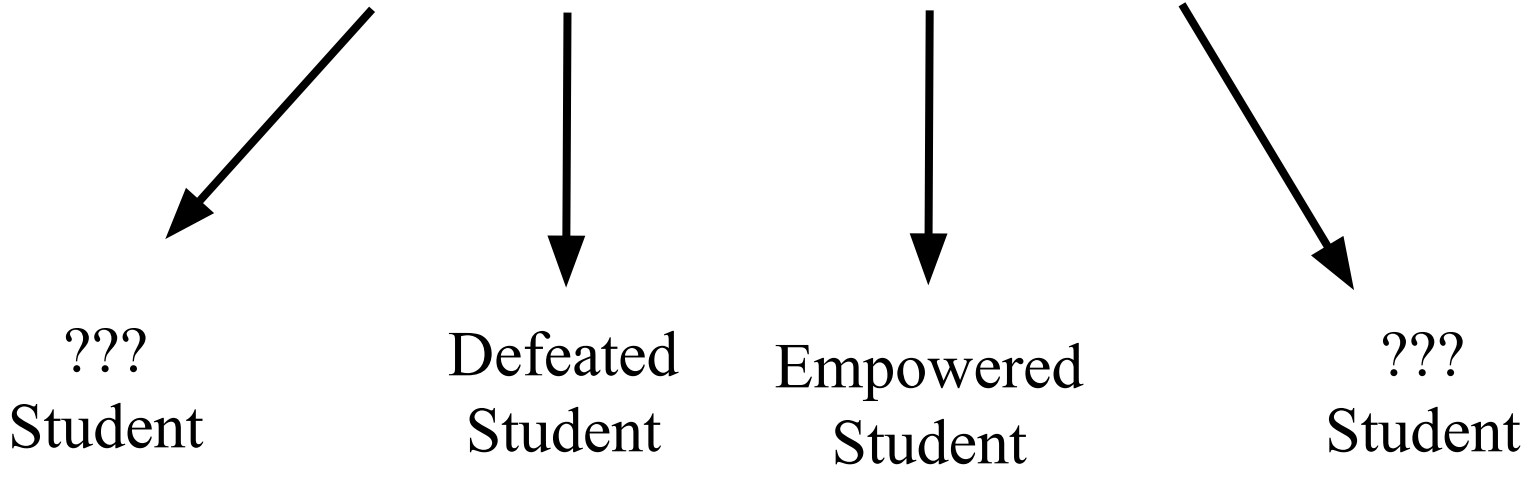

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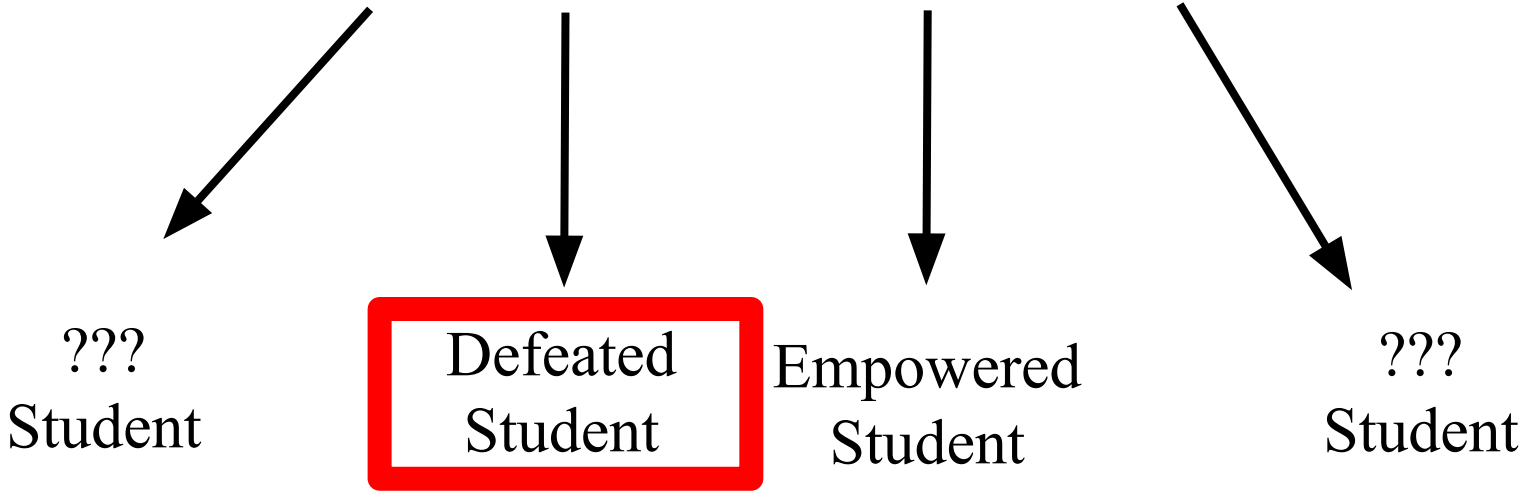


Need for Differentiation Within my Climate Change Teaching

New Questions I’m Thinking About...

What other student archetypes might I encounter while teaching climate change?

How can I better serve different student archetypes?

How do I actually differentiate climate and energy education for different students?

What is the role of civic education and engagement?

“I think that this unit was one of the most useful units, though I wish I learned about more tools to combat climate change. I know how to individually make small changes, but I want to learn more about the bigger changes people can make to create a larger change” -Yael

Environmental Science 2018-2019

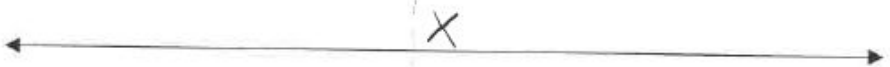
While I didn’t do a formal teacher-research project this school year, I carried last year’s learning with me.

I gave all the students pre-surveys before the unit to gauge their knowledge and feelings (potential archetypes) while developing the unit. However, the rest of the unit wasn’t differentiated by the students’ responses.

Environmental Science 2018-2019: Pre-Survey

Have you learned about energy and/or climate change in school before? If so, briefly list the topics you learned about: I've learned about energy/climate change on very basic levels. (general ideas of what they are)

On the scale below, put an "X" anywhere along the line to represent what you know about energy and climate change:



I don't know anything — I know a lot

When I think about climate change, I feel: (circle any/all that apply or write in "other")

Excited to learn | Scared | Confused | Hopeful | Anxious | Doubtful | Other:

Are there any specific topics that you'd like us to cover in class?

How exactly we can combat climate change

Environmental Science 2018-2019

I decided to drop the “Before the Flood” film and I did the climate mixer activity from the People’s Curriculum for the Earth by Rethinking Schools to make emotional connections.

Joined Our Climate for a Youth Lobby Day about carbon pricing policy at the MA Statehouse and integrated civic education and carbon pricing concepts into the unit.

Our Climate Youth Lobby Day for carbon pricing policy at the MA Statehouse

How did teacher-research impact my climate education practice?

Confidence!

Other Learnings from my Teacher-Researcher Experience

My mentor was an invaluable resource for talking about my climate change teaching and for planning the logistics of the project.

Balancing a research project alongside my other teaching commitments was challenging.

Access to primary literature is difficult and I didn't have much time to read articles. I struggled with feeling like my project wasn't rooted in literature even though action research is meant to be context-dependent.

Despite these challenges, doing teacher-research was still worth it!

Discussion Questions for CLEAN

What have other educators or researchers' experiences of action research on climate education been like?

Meeting regularly with a dedicated mentor to talk about my climate unit was just as important to me as the data I collected. Are there programs/projects that pair up educators with long-term "climate mentors"? Is this something you've thought about?

What are some ideas or best practices for including civic education and political action in a science-based climate unit?

What are some ideas for differentiating climate change instruction?

How do other teachers who are also climate activists handle those two roles in the classroom?

Thank You!

Please email me if you have questions or want to talk more! I'd love to connect: emilyrosehart@gmail.com