

Abstract

For the first time in the history of U.S. science curricula, the Next Generation Science Standards include performance expectations for global climate change, including an emphasis on anthropogenic effects. Middle school science is a critical juncture for developing climate change attitudes in students. However, questions remain regarding the readiness and capacity of middle school teachers to teach controversial topics. In the case of evolution, strong predictors of how teachers handle science conflict are:

1. Their personal values and dispositions
2. The deepness of their scientific knowledge and training
3. Their subjective assessment of their own expertise
4. Their pedagogical philosophy (Berkman & Plutzer, 2015)

Whereas several studies have surveyed K-12 teacher knowledge on climate change, no study has specifically explored how middle school teachers approach climate change education from the perspective of the teacher. We convened an online focus group of middle school teachers, currently teaching climate change, to examine motivations, dispositions and “what is working.” We transcribed and coded the conversation using a coding scheme guided by the above predictors. The results are informative for scientists, teachers, and education professionals. We suggest that continued discussions with teachers are beneficial along with fostering relationships between scientists and science educators.

Introduction

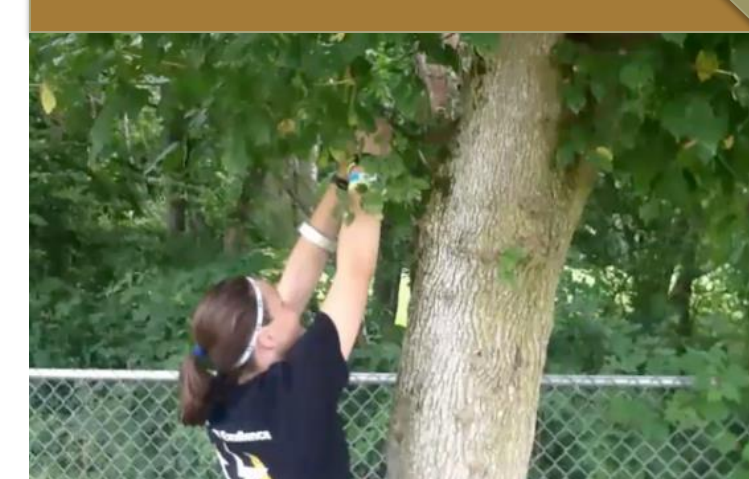
Amidst a social environment that is highly polarized and without strong organizational stimulus, there are numerous middle school teacher “warriors” who are teaching climate change. These teachers serve as examples for climate change education. They are uniquely situated to help us understand what is working.

My students Skype with a scientist in Antarctica who is launching weather balloons.

My students counted diatoms in mock core samples to reveal climate trends.

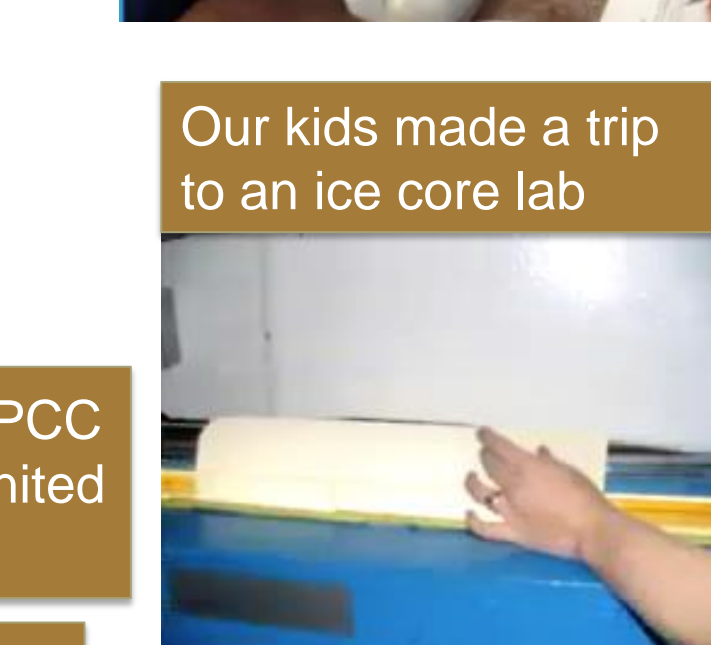


The students made Shoebein strips and hung them on trees.



Examples from classrooms: climate change education

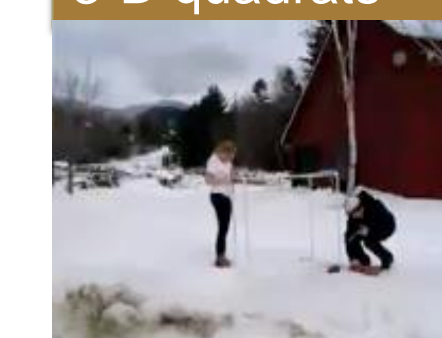
We monitor a classroom trout tank to see how temperature and pH affect fish



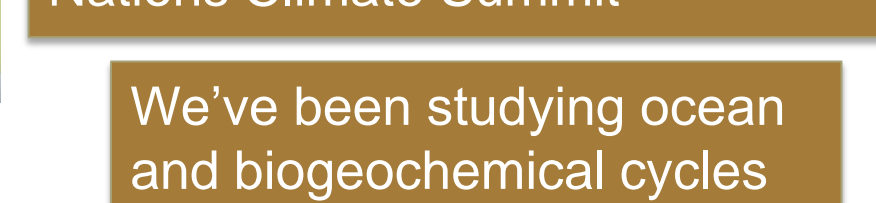
We make concept maps of how the carbon cycle relates to Earth systems



We did particle studies with 3-D quadrats



The students participated as IPCC representatives for a model United Nations Climate Summit



We've been studying ocean and biogeochemical cycles



Our kids made a trip to an ice core lab

Methods

Research question: What motivates teachers to teach climate change and how do they navigate the topic?

Conceptual framework: Berkman and Plutzer's (2015) predictors of how teachers handle science conflict

Methodology: single case study with a cross-section of teachers using an online focus group to collect data



Sample: four middle school teachers from different states representing public and charter middle schools

Data collection: a 90 minute discussion about experiences as climate change educators

Analysis: the conceptual framework produced a priori codes and open secondary coding identified salient themes

Strategies to ensure quality: member checking, memoing, and intercoder reliability

Results

What motivates teachers to include climate change in their curriculum?

To get kids thinking and making connections

To instill stewardship

It motivates kids

The science is compelling

It's a personal passion

I had a life-changing experience

Results

WHEN TEACHERS WORK TO BE CLIMATE CHANGE EXPERTS



AND NETWORK WITH SCIENTISTS



WHEN TEACHERS ENGAGE IN THE SCIENTIFIC PROCESS



AND COLLECT AND ANALYZE AUTHENTIC DATA WITH THEIR STUDENTS



THEN TEACHERS IDENTIFY AS A SCIENTIST AS MUCH AS THEY DO AN EDUCATOR

I'm a scientist first

Question: Are there other teachers at your school that teach climate change?

No

No

No

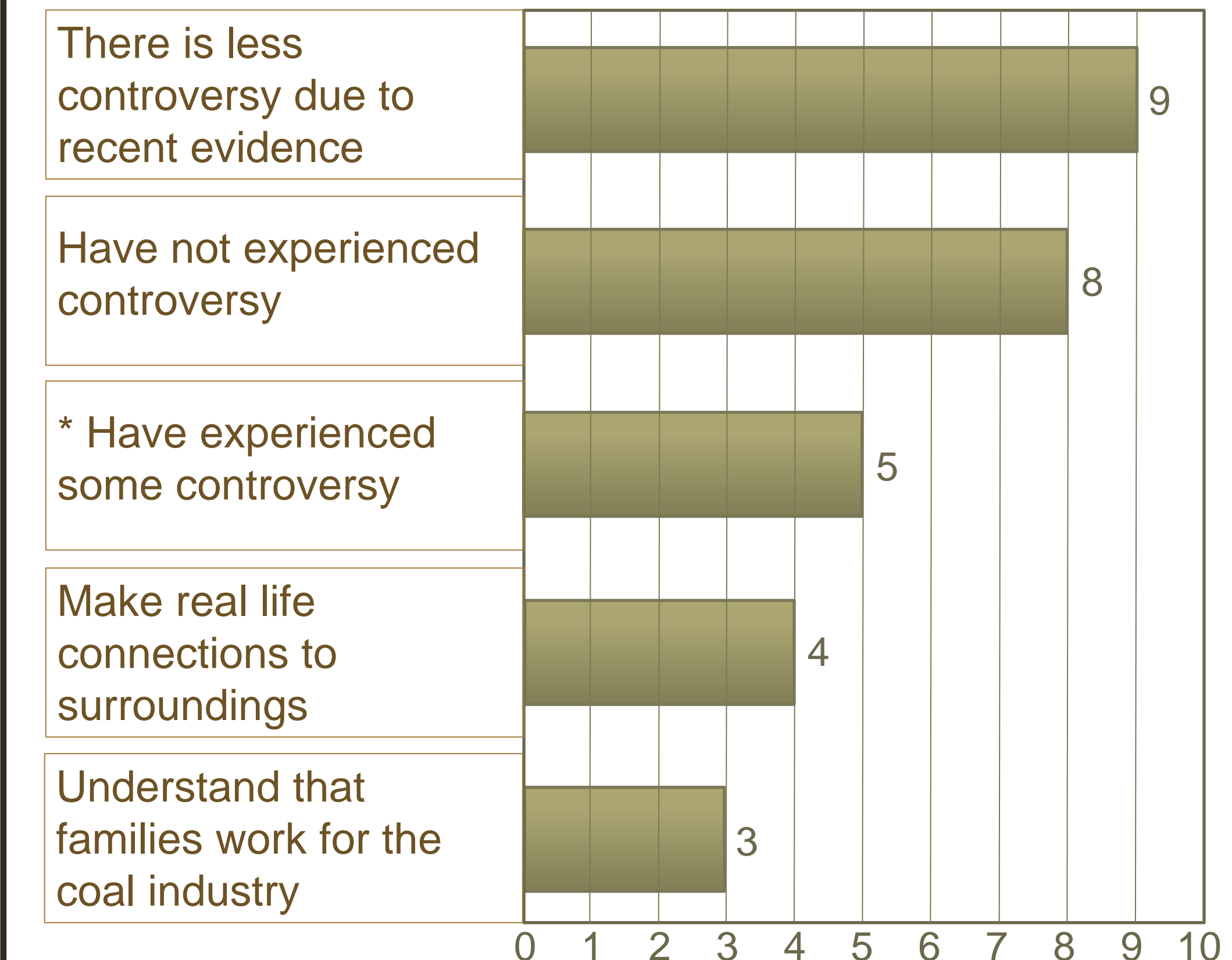
No

There needs to be work to bring other people on board.

Teaching needs to be cross-curricular

Results

Navigating Controversy: Frequency of Comments



* These comments came from a single participant. The controversy was with administration over teaching a topic not explicit in the standards.

What was *not* said:

- Next Generation Science Standards
- A connection to curricula standards as impetus for teaching climate change
- Any direction from education administration or professionals to teach climate change

Conclusions and Recommendations

- Identification as a scientist is key to being a “warrior” for climate change in the classroom.
- Controversy encountered over the science of climate change is very small according to this study.
- Teachers who teach climate change appear to be local beacons, dispatching climate change education in a noncommittal environment.
- Outside of the local environment, climate change teachers maintain strong networks and professional alliances.
- Recommend continued studies, especially to investigate dispositions of teachers not currently teaching climate change.
- Relationships between science educators and scientists should be fostered to a high degree.

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