Teaching Climate Science in Rural Communities

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Project Intention

- Develop and pilot standards-based pilot climate change curriculum.
- For middle / high school grades
- Can be implemented by formal and informal educators
- Develop final curriculum.



Approach

- Research: Literature Review, 6 Teacher Interviews, Online Survey
- Assess Available Climate Change Curriculum
- Develop Draft Curriculum
- Conduct Pilot and Evaluate
- Create Final Curriculum

Research Questions

- What are ways that others are teaching climate change in Middle School?
- What are the learning objectives that other educators are trying to achieve?
- What is the state of climate knowledge of students and teachers? Are there common misconceptions?
- What are barriers to climate change instruction?
- What resources or assistance do local teachers need to support their own teaching of climate change?
- How can informal educators best influence climate changerelated behavior change in formal Middle School climate change education.

Pilot School – Darrington Elementary K-8 school

- Darrington School District educates approximately 570 children each year on a single K-12 campus and is a Title 1 School.
- Pilot program included 6th 8th grade. Each lesson was a mix of 6th
 - 8th grade students, 4 teachers involved.
- Total number of students was 95.
- 40% of 8th grade students were meeting science standards.



OSPI Washington State Report Card

The Community of Darrington

- The estimated population in 2016 was 1385 residents.
- Primary economy is the timber industry.
- At 550 feet above sea level Darrington is near the Mt. Baker-Snoqualmie National Forest, wild and scenic rivers and 3 wilderness areas.
- Hiking, fishing, rafting and rock climbing are some of the most popular recreational activities.



Communication Basics



Teaching Approaches – Overview

- Literacy Principles
- Systems Approach
- Teaching the Nature of Science

Students will "...understand the essential principles of Earth's climate system; know how to assess scientifically credible information about climate; communicate about climate and climate change in a meaningful way; and can make informed and responsible decisions with regard to action that may affect climate change." Beatty 2012



Teaching Approaches

- Place-based / Geospatial Learning
- Teaching the Controversy
- 89% of teachers currently teach "all sides" of climate change debate
- More than 1/3 of teachers receive some pressure to teach both sides, mirrored by local teacher preferences.
- National Academy of Science calls it a teachable moment.

	Pros of Teaching Controversy	Cons of Teaching Controversy
	Learners can explore who owns science, controls its production, dissemination and use and how human norms influence our perceptions and acceptance of scientific truth.	Viewed as delegitimizing science
	Learn how to deal with scientific uncertainty	Creates doubt about what scientists agree on.
y 	Provides a form for diverse viewpoints and worldviews and other ways of knowing, supports dialogue.	May increase student misunderstandings and misconceptions
	Promotes independent decision making by giving students skills to make decisions rahter than telling students what to think	

Our Approach: Place-based and Outdoor Learning Opportunities

- Used existing curriculum from different sources.
- 9- week pilot, 50 minute sessions, mixed classes of grades 6-8.
- Local research that focused on local Climate Change impacts.
 - Stillaguamish Tribe/UW Climate Impacts Group Reports on Impacts and Adaptation.
- Expert Involvement NCI, NFS, GPI, WSU, Stillaguamish Tribe.



Our Approach – Standards and Systems Based

- Tied to Next Generation Science Standards and climate, ocean and energy literacy principles.
- Started with the basics; weather vs. climate, long-term trends, greenhouse gases, carbon cycle and earth energy budgets.
- Took a systems approach to integrating what these basic scientific concepts had to do with climate change.



Our Approach

- Integrated the "Claims, Evidence and Reasoning" model into every lesson and many homework assignments.
- Teacher involvement pre-work and background information provided to teachers ahead of lessons.
- STUDENT binder that included: climate change glossary, each weeks in-class lesson materials and homework assignments.



Barriers to Instruction

- Outside Influence / Pushback;
- Lack of Resources;
- "Not in Standards";
- Teacher Demand for Impartial Resources;
- Courses with Climate Change are not as common or becoming electives (in high school and college);
- Lack of clearly understood local threats or impacts from climate change.
- Lack of Teacher Knowledge;



Our Experience

- Chose to teach the scientifically accepted view of climate science and did not receive comments from students such as "climate change is a hoax" or any of the other memes used by more conservative individuals or groups that question climate change.
- Did not receive any push back from teachers, administrators or parents. On the contrary we received a lot of support from teachers and the principal of the school.
- Overall students seemed neutral on the subject.
- A small percentage seemed relatively knowledgeable about climate change and expressed concern.

Our Experience

- Teacher knowledge on climate science varied but overall teachers appreciated gaining more knowledge on the subject.
- Because time for teachers to prepare or teach this subject is consistently identified as a barrier or challenge this pilot allowed them additional resources they wouldn't normally have such as:
 - Background information in the form of online videos, websites and pre-work for each weeks lesson.
 - Funding from BIA allowed us to purchase many of the materials needed to teach lessons, labs and field experiences.

Next Steps

Teacher Workshops to enhance climate science knowledge.

Mitigation and Adaptation needs to be further developed, provide a sense of hope!

Improve evaluation process.

Share our current lessons as a 9 week program or as individual lessons with other schools.

Curriculum Resources

- Birch Aquarium Greenhouse in a Bottle
- Smithsonian National Museum of Natural History Atmosphere: Changes in the Air
- Facing the Future The Carbon Link
- NOAA Teaching Climate
- Stanford School of Earth, Energy & Environmental Sciences Climate and Weather, Energy Budget
- Visualizing Change Toolkit NOAA and the National Science Foundation

Thank you!

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