“Why and how” climate change education?
Why climate change education?

- Climate change is the most relevant, pressing issue facing us all today.
- This generation of students will be most impacted.
Why climate change education?

- All students must be prepared to mitigate, adapt, innovate and work to enforce the policies being set today.
- We NEED students ready for Green Jobs!
Chart 1: Demand-supply gap for STEM skills in the US (2010-2020)  Source: CEB analysis
Support for climate change education

Support for global warming education in states with debates about science standards

Americans who believe schools should teach our children about global warming

Estimated % of state population, 2017 (National average = 78%)

Estimated % of county population, 2017 (National average = 78%)
Climate Change – A “Perfect Problem”
If we don’t understand the problem how can we possibly fix it?
How do we do it?

- Lead with solutions with a focus on building action competence
- Science based
- Interdisciplinary
- Attention to issues of equity across Place Based
- Emphasize the role of informal education
- Use the standards
- Active hope
Lead with Solutions

Many [educators] of climate change focus on simply educating their audiences about climate change by providing more understandable information about the science. Others focus on the possible and mostly negative impacts of climate change to motivate people into action... Instead ...discuss solutions, practical help and realistic hope.

To build a better future, we must imagine ourselves there.
Green Energy Progress

How Do Projections Compare With Reality?

2000 Projection

Worldwide wind capacity will reach 30 GW by 2010

Reality

By 2016 that goal was exceeded by a factor of 16

Data: International Energy Agency; Global Wind Energy Council; Bloomberg New Energy Finance
“Wind turbine service technician” is forecast to be the fastest-growing job category in the U.S. through 2024.
Solar industry jobs now outnumber coal mining jobs in the U.S.
OVER 250,000 AMERICANS WORK IN SOLAR

SOLAR JOBS BY SECTOR

- Installation: 129,424
- Manufacturing: 36,885
- Sales & Distribution: 30,912
- Project Development: 35,750
- Other (R&D, Finance): 17,300

SOLAR WORKFORCE DEMOGRAPHICS

- Women: 27%
- Latino/Hispanic: 17%
- Asian: 8%
- African American: 7%
- Veterans: 9%

MOST COMPANIES DO NOT REQUIRE A BACHELOR’S DEGREE FOR NEW HIRES

- 79% of solar companies overall
- 93% of solar installation companies

Image Credit: The Solar Foundation
Solutions offer the opportunity for innovation, creativity and make science relevant to student lives and future...
Science Based

- 97% Consensus (i.e. 97% of climate experts agree humans are causing global warming)
- Use Peer Reviewed Articles and Reports as Foundation for Resources
- Partnerships with scientific institutions
- Relationships and advisors in climate science
Interdisciplinary

- The “Perfect Problem”
- Opportunity and need for cross-curricular collaboration
- The causes and solutions are not only scientific, but economic, political and social.
- Fiction gives students the opportunity to “experience,” build empathy, and think outside the box.
- Integration of subject areas strengthens science learning for all students, particularly for students who have traditionally been underserved.
Climate Change

Economic and Social Systems

Ecological Systems

Power and Privilege

Stories

Change

Science

CLIMATE GENERATION
A WILL STEGER LEGACY
Place Based

[Students should]...build on and revise their knowledge and abilities, starting with their curiosity about what they see around them and their initial conceptions about how the world works.
Parks and Natural Spaces

- People are connected to places
- They have unique bonds with landscapes such as national parks and wildlife refuges
- People learn most effectively through meaningful hands-on activities in that cherished landscape, and
- People remember lessons and adopt behaviors when they feel a sense of responsibility and have knowledge of consequences.
An indigenous world view is holistic, taking into account the myriad of interconnections between living and natural entities (Costagno & Brayboy, 2008).

Promoting learning that is rooted in the unique history, environment, and culture of a particular place. Empowering students to learn from and about the local landscape’s response and vulnerability to climate change with a specific focus on cultural connections to the land.

Investigating local climate change issues using scientific data and protocols AND indigenous knowledge, observations, and phenology.

Culturally relevant approaches congruent with Native epistemologies

*Figure 2. The CYCLES framework for teaching Climate Change to American Indian Students.* (Roehrig, 2012)
Outdoor Learning

- We know- there is a significant decrease in time spent outside during the school day and after school.
- We also know- students that spend time outside during the school day:
  - Develop a sense of place
  - Connect with relevant learning experiences
  - Focus better in school and perform better
  - Experience health benefits

http://www.childrenandnature.org/
See your school as a Living Laboratory

Transforming Central
students + environment + community
Look to the standards
C3 Framework for Social Studies

- Climate change connections can be found in all dimensions

**Table 1. C3 Framework Organization (C3 Framework, 2013)**

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<thead>
<tr>
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<tbody>
<tr>
<td>Developing Questions and Planning Inquiries</td>
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<tr>
<td>Civics</td>
<td></td>
<td>Gathering and Evaluating Sources</td>
<td>Communicating and Critiquing Conclusions</td>
</tr>
<tr>
<td>Economics</td>
<td></td>
<td>Developing Claims and Using Evidence</td>
<td>Taking Informed Action</td>
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<td>Geography</td>
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</table>
Students who demonstrate understanding can:

**MS-ESS3-5.** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education:*

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
</table>
| **Asking Questions and Defining Problems**
Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.
- Ask questions to identify and clarify evidence of an argument.
| **ESS3.D: Global Climate Change**
- Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth’s mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.
| **Stability and Change**
- Stability might be disturbed either by sudden events or gradual changes that accumulate over time. |

Connections to other DCIs in this grade-band:

**MS.PS3.A**

Articulation of DCIs across grade-bands:

- **HS.PS3.B**
- **HS.PS4.B**
- **HS.ESS2.A**
- **HS.ESS2.D**
- **HS.ESS3.C**
- **HS.ESS3.D**

Common Core State Standards Connections:

- **ELA/Literacy - RST.6-8.1**: Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-5)
- **Mathematics - MP2**: Reason abstractly and quantitatively. (MS-ESS3-5)

**6.EE.B.6**: Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-5)

**7.EE.B.4**: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-5)
We know that barriers exist

We live in a beautiful area with 4 distinct seasons. It's difficult for them to see things beyond their remote area and limited experience.

I struggle with the politicization of the issue

My biggest challenge is ramping up my content knowledge and convincing students that it is acceptable to read science content in an English class.

I think the biggest challenges for me are the ideas and preconceptions students have acquired from parents or other sources before ever entering my classroom.

In teaching about climate, the biggest challenges I face are apathy, anxiety, and entitlement.
Climate Change Skeptic Group Seeks to Influence 200,000 Teachers

In partnership with: The groundtruth PROJECT

MARCH 28, 2017 / by KATIE WORTH Tow Journalism Fellow, FRONTLINE/Columbia Journalism School Fellowships

The Heartland Institute says it will send the book “Why Scientists Disagree About Global Warming” to every public school science teacher in the nation. (Brenna Verre, FRONTLINE)

Twenty-five thousand science teachers opened their mailboxes this month and found a package from the Heartland Institute, a libertarian think tank that rejects the scientific consensus on

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JUNE 18, 2015

How Climate Change May Lead to Bigger Blizzards
JANUARY 26, 2015
Fostering Authentic Hope

*Hope is a verb with its sleeves rolled up. In contrast to optimism or despair, hope requires that one actually do something to improve the world. Authentic hope comes with an imperative to act.*

• David Orr