Teaching Climate Science to Elementary School Students using the NGSS

What Children and Their Teachers Need
Kim Cheek

• Teach science methods for elementary majors and combined science/mathematics methods for early childhood majors
• Taught 3rd-8th gr. for 11 years
• In-service teacher professional development (elementary and middle school)
Overview

• What children need
• What teachers need
What Children Need

- Foundational Knowledge
- Bridging Analogies
- Support to Engage in Practices
- Organizational Framework to Connect Concepts
Core Ideas

• ESS2: Earth’s Systems
• ESS3: Earth and Human Activity
• PS3: Energy
• LS2: Ecosystems: Interactions, Energy, and Dynamics

• Use bridging analogies—challenge of experience and scale
Science and Engineering Practices

• Develop and use models
• Analyze and interpret data
• Science talk practices (6-8): construct explanations, argue from evidence and evaluate others’ arguments
• Use sentence frames
• Practice with familiar examples
Sample Sentence Frames

• My claim is _______________________.
• My evidence is _____________________.
• My evidence supports my claim because
  _______________________.

Crosscutting Concepts

- Patterns
- Cause and effect
- Systems and system models
What Teachers Need

- Understandable Explanations
- Help to “See” Climate Science in Curriculum
- How to Connect to Other Subjects
- How to Integrate SEPs and CCs
- Materials and Instructional Support
Content Knowledge: Alternative Conceptions and “Seeing” Climate Science

• Typically few science courses
• Use formative assessment probes
• “Some children think....”
• Climate science connections to what I already teach
Connect to the Common Core

NGSS SEP

Patterns
Reasoning with models
Mathematical and computational thinking, data analysis

CCSSM SMP*

Evidence-based argumentation (discourse), critiquing others’ reasoning (orally and in writing)
Cause & Effect

CCSS ELA Anchor Standards

Patterns
Reasoning with models
Mathematical and computational thinking, data analysis

* SMP = Standards for Mathematical Practices
Connect to Other Subjects

US Energy Consumption by Source

- Petroleum 38%
- Natural Gas 25%
- Coal 21%
- Nuclear 9%
- Renewable 7%

Data source: US Energy Information Administration

Books:
- Coral Reefs
- The Magic School Bus and the Climate Challenge
Integrating SEPs and CCs

- Use NGSS bundles as starting point

<table>
<thead>
<tr>
<th>Kg. Topics Bundle</th>
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<tbody>
<tr>
<td>How do objects move and what happens when they interact?</td>
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<tr>
<td>What is the relationship between the needs of different plants and animals and the places they live?</td>
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<td>What can we observe about sunlight?</td>
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- Make integration explicit and topic-specific
Materials and Support for Teachers

- Infrastructure for dissemination and instructional support
- Short, online video clips from real classrooms
- Recording sheets, relevant children’s literature
- Make It-Take It workshops
Questions?

k.cheek@unf.edu