Addressing Climate Change through Biology Concepts

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USDA United States Department of Agriculture National Institute of Food and Agriculture

Lack of Student Knowledge about Climate Change

- Only 25% would receive an A,B, or C on a test of climate change knowledge[1]
- Misconceptions about:
  - Causes
  - Greenhouse effect
  - Climate vs. weather
  - Impacts for humans[2]

[1] Leiserowitz et al., 2011
[2] Porter et al., 2012

Climate Change in the Classroom

- Climate change has not been included in most state standards[1]
- The Next Generation Science Standards include anthropogenic climate change
- There are different ways to include climate change in classes

[1] Wise, 2010

Carbon and Climate Change

- Carbon is an important part of climate change
- Required in the biology standards
  - "Analyze the movement of matter and energy through the different biogeochemical cycles, including, including water and carbon"[1]
- 95.6% of students take biology
- 27.7% of students take earth science[2]

[1] FL SSS SC.912.E.7.1
[2] Digest of Education Statistics

The Role of Student Attitudes

Connecting carbon concepts to climate change

- Could increase student interest by connecting carbon to real world issue[1]
- Could decrease student interest if they do not believe climate change has anthropogenic causes[2]

[1] Bennett et al., 2007
[2] Robinson, 2011

Factors Impacting Student Attitude

- A variety of factors outside the classroom that could influence student attitude:
  - Parents[1]
  - Politics[2]
  - Religion[3]
  - Knowledge[4]

[1] Eagles and Demare, 2010
[2] Leiserowitz et al., 2007
[3] Leiserowitz et al., 2007
[4] Kahan et al., 2012

Research Questions

1. Does teaching climate change and the carbon cycle and sequestration in an integrated manner increase student knowledge gain about carbon and interest in the activities?
2. What factors are associated with student attitude about climate change?

Population

- Science Quest:
  - Science program offered through the UF Center for Precollegiate Education and Training
  - Rising high school sophomores
  - Two one-week offerings
  - Summer 2012

Methods: Integrating Climate Change and Carbon Concepts

Week 1 - Activities in context of climate change (n=23)

- Pretest on carbon and climate change knowledge
- Activities
  - Carbon cycle and discussion of human changes
  - Measuring carbon in the forest, state's sequestration rate compared to emissions rate
  - Discussion of implications
- Posttest
- Interviews

Week 2 - Activities not in context of climate change (n=24)

- Pretest on carbon knowledge
- Activities
  - Carbon cycle
  - Measuring carbon in forest
- Posttest
- Discussion of human changes to carbon cycle, state's sequestration rate compared to emissions rate, and implications
- Interviews

Results: Teaching Carbon and Climate Change Together

	SQ 1 (n=23)	SQ 2 (n=24)	P Value	Standard Error
Mean Pretest Score	3.48 carbon 1.43 climate change	3.83 carbon	0.2247 carbon	0.2784 carbon
Mean Posttest Score	4.13 carbon 1.96 climate change	3.96 carbon 1.29 climate change	0.2951 carbon 0.0002* climate change	0.1622 carbon 0.1595 climate change
P Value	0.0102* carbon 0.0004* climate change	0.5430 carbon		
Standard Error	0.2319 carbon 0.1238 climate change	0.2025 carbon		

Results: Teaching Carbon and Climate Change Together

- **44/47** students indicated they felt knowing carbon is an important part of climate change made the activities more interesting because
  - It made the activities more **important**
  - It made the activities more **relevant**
  - Climate change is **controversial**
  - It gave them a better **understanding** of carbon concepts and climate change

Discussion

- Providing information about climate change can enhance activities in the biology classroom
  - Increase student interest
  - Increase student knowledge
  - More students learning about climate change

Questions?