Climate Change Education and Policy

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www.ClimateEdResearch.org
www.madeclear.org

Virden Center, Summer 2013
Photo by Emily Hestness

Context of the Presentation: MADE CLEAR, a USA National Science Foundation Supported Project

Maryland and Delaware Climate Change Education, Assessment, and Research (MADE CLEAR)

A multi-year project supported by NSF Phase I and II Climate Change Education Partnership (CCEP grant)

Partners include:

- Core institutions in DE and the University System of MD
- Maryland and Delaware Departments of Education
- Maryland Public Television

MADE CLEAR Research and Education Goals

- **Advance learning sciences research by use of learning progressions** to create new understandings of how individuals from diverse backgrounds learn about climate change.

- **Include climate change in professional development** for teachers of science in formal and informal settings.
- **Assess approaches to professional development** that foster changes in teacher knowledge, skills, and dispositions.

What We Know About Learning Progressions

- Descriptions of increasingly sophisticated ways learners can think about a science topic over time (Duschl, Schweingruber & Shouse, 2007)
- Generally organized into different levels of achievement (e.g., Alonzo & Steedle, 2008; Lehrer & Shauble, 2012; Mohan, Chen, & Anderson, 2009)
- Levels can serve as diagnostic tools, instructional targets (Lehrer & Shauble; Shea & Duncan, 2013)

Positive News

The Next Generation Science Standards (NGSS) are the first U.S. National science standards to explicitly include the topic of climate change. [See: *www.climateedresearch.org/publications]*

The participating states in the project, Delaware and Maryland, have formally adopted them.

Challenging News

Research has suggested that science educators may:

- **Feel ill-prepared** to teach about climate change (Johnson et al., 2008)
- **Have misconceptions** about climate science content (Ekborg & Areskoug, 2006; Wise, 2010)
- **Avoid addressing aspects** of climate change due to perceived controversy (Allen & Crowley, 2014)

Hopeful News

Prior research on climate change education in preservice and in-service science teacher education has suggested that such opportunities can help teachers:

- **Increase content knowledge** related to climate change science (Lambert et al., 2012)
- **Become aware of relevant resources** to support teaching about climate change (Hestness et al., 2011)
- **Develop communities of practice** (Lester et al., 2006)

Confounding News

- Delaware: Centralized System—one science curriculum; school districts (N=3) supported by state-provided curriculum materials (i.e., science kits); very limited teacher autonomy.

- Maryland: Decentralized System—a "voluntary" state curriculum that individual school districts (N=24) enact as they decide best for their needs. No state support of curriculum materials; high degree of teacher autonomy.

The MADE CLEAR 2013 Summer Climate Science Academy for Educators of Science in DE and MD

- Collaboration between practitioners, climate scientists, learning scientists
- 5-day residential experience at University of Delaware's Virden Retreat Center, DE
- N = 27 participants
  - 14 middle school science teachers
  - 7 high school science teachers
  - 4 informal science educators
  - 2 university educators

MADE CLEAR Climate Science Academy Design

Promote new ways of teaching centered around:

1. Accurate climate science understandings
1. Use of vetted curricular and technology resources
1. Pedagogical approaches consistent with teaching and learning of socioscientific topics
1. Alignment with NGSS disciplinary core ideas, practices, cross-cutting concepts, and learning progression ideas

Research Questions for Our Professional Development Academy on Climate Science Education

1) How might participants evolve in their **understandings of climate change** through participation in the professional development academy?

1) How might participants **understand learning progressions** as potentially informative for their science teaching practices related to climate change, particularly its regionally-relevant aspects?

Note: Our research team's answers to these questions will be presented at this conference on Tuesday, 2:30 pm to 4 pm, Strand 8 in the session, "Teacher Conceptions and Conceptual Change."

Professional development and learning progressions

- **LPs have the potential to coordinate curriculum, instruction, assessment** (Alonzo & Steedle, Berland & McNeill, 2010; Duschl et al., Furtak, 2012; Gunckel, Covitt, Salinas, & Anderson, 2012; Lehrer & Schauble; Shea & Duncan; Songer, Kelcey, & Gotwals, 2009)
- Emphasis on the **developmental nature of student thinking** over time (Furtak & Morrison, 2013)
- All responses as valuable **stepping stones to be leveraged** in instruction (Furtak, 2012)

Bottom line: What We Have Learned About the Policies and Practices of Climate Change Education

A recent change in USA education policy in science education has legitimized to a major degree the climate change topic in the public schools which is a very positive development. However, it has *not* taken away all public controversy concerning the topic.

Bottom line: What We Have Learned About the Policies and Practices of Climate Change Education

- We have much to learn about how to best prepare teachers to teach about climate change, so they can effectively teach it to their diverse learners in their contexts.

- We are hopeful that over time the research community will continue to make productive progress as a way to inform policy makers, but it will require a concerted effort with considerable support due to its complex characteristics.

MADE CLEAR Learning Sciences Research Team

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