MADE-CLEAR CCEP Grant

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The Context for Climate Change Education

Sensitive Topic Definition

- “Issues that deeply divide a society, that generate conflicting explanations and solutions based on alternative value systems, are considered controversial [sensitive]” (Harwood & Hahn, 1990).

Identified Earth System Sensitive Topics in Science Education (USA)

NESTA Survey of Earth and Space Science Teachers about Needs/Concerns

Sensitive Topic	% Feeling Difficulty or Pressure from Parents, Students, Administrators, or Other Community Members
Evolution	68%
Age of the Earth	47%
Climate Change	43%
Solar System Formation	22%
Planetary Formation	13%

There were 275 respondents to this survey (Johnson, 2011).

PEW Survey on Public Attitudes in USA (1/11-16/2012)

Public's Agenda for President and Congress 2001-2012

% considering each as a "top priority"	Jan 2001 %	Jan 2002 %	Jan 2003 %	Jan 2004 %	Jan 2005 %	Jan 2006 %	Jan 2007 %	Jan 2008 %	Jan 2009 %	Jan 2010 %	Jan 2011 %	Jan 2012 %	
Strengthening nation's economy	81	71	73	79	75	66	68	75	85	83	87	86	+18
Improving job situation	60	67	62	67	68	65	57	61	82	81	84	82	+25
Protecting environment	63	44	39	49	49	57	57	56	41	44	40	43	-14
Reducing influence of lobbyists	--	--	--	--	--	--	35	39	36	36	37	40	
Dealing with illegal immigration	--	--	--	--	--	--	55	51	41	40	46	39	
Strengthening the military	48	52	48	48	52	42	46	42	44	49	43	39	
Dealing with global trade	37	25	--	32	32	30	34	37	31	32	34	38	
Improving roads, bridges, and public transportation	--	--	--	--	--	--	--	--	--	--	33	30	
Reducing military spending	--	--	--	--	--	--	--	--	--	--	--	29	
Reforming campaign finance	37	23	--	24	--	--	--	--	--	--	--	28	
Dealing with global warming	--	--	--	--	--	--	38	35	30	28	26	25	-13

Teaching Strategies for Sensitive Topics

- "The formulation of **evidence in support of knowledge claims** is central to scientific practice and has been identified as a pedagogically inventive way to engage students in meaningful discussions related to controversial scientific issues such as global climate change" (Schwizer & Kelly, 2005, p. 75).
- Begin by teaching **relevant science content**, then discuss related policy or economic issues, and end by having students explore their own personal stances (Kirk, 2011).
- Invite guest speakers to come and speak (McGinnis & Simmons, 1999).

MADE-CLEAR RESEARCH

MADE-CLEAR Project Research Prospectus

Maryland and Delaware Climate Change Education Assessment and Research

- A focus on teachers learning how to teach climate change to their students guided by the Common Core (defined by the Next Generation Science Standards, once approved).
- Research guided by theory (learning progressions with a socioscientific issues perspective[1]).

[1] A socioscientific issues perspective adds a personally and socially relevant approach to learning progressions.

MADE-CLEAR Project Research Prospectus

Maryland and Delaware Climate Change Education Assessment and Research

Goal: Embed climate change science into formal and informal education in the region.

Objective: Advance learning sciences research in the areas of conceptual change and learning progressions to create new understandings of how students from diverse backgrounds engage in learning about climate change.

- Assessments will draw on students experience and make student thinking visible, which will improve instructional interventions (see Smith et al., 2004) .

MADE-CLEAR Project Research Prospectus

Maryland and Delaware Climate Change Education Assessment and Research

Goal: Embed climate change science into formal and informal education in the region.

Objective: Assess new approaches to professional development (PD) that foster changes in teacher knowledge, skills, and dispositions through inquiry and the exploration of the relationships of science and technology to society.

- Assess outcomes of PD activities that incorporate learning sciences principles and climate change science through quasi-experimental design, case studies, and survey research.

LEARNING PROGRESSIONS

Learning Progressions

- More advanced understanding over time

Definition of Learning Progressions

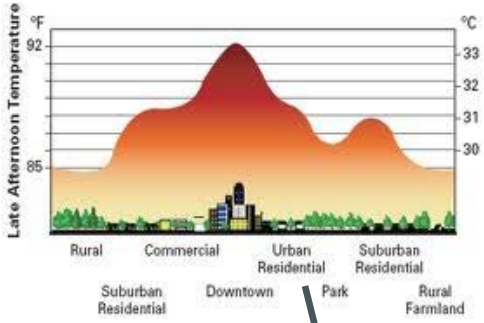
- "Learning progressions are descriptions of the successively more sophisticated ways of thinking about a topic that can follow one another as children learn about and investigate a topic over a broad span of time (e.g. 6 to 8 years). They are crucially dependent on instructional practices if they are to occur" (National Research Council, 2007, p. 214).

Example: Sea-Level Rise

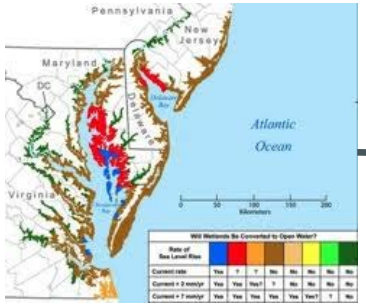
	Level 1 (Lower Anchor) "Informal Accounts"	**Level 2**	**Level 3**	**Level 4** (Upper Anchor) "Qualitative Model-Based Accounts"
Potential SLR LP indicator based on Gunckel, Covitt, Salinas & Anderson (2012, p. 854) "SM" stands for scale and mechanisms	SM1: Students explain sea-level rise on a macroscopic scale only, focusing on immediately visible structures or phenomena without including mechanisms for phenomena.	SM2: Students explain sea-level rise on a broad macroscopic to large-scale focus across familiar and visible dimensions. Students can identify a mechanism, though they rely on actors or agents.	SM3: Students explain sea-level rise on the microscopic to the landscape scale, though they may refer to smaller particles such as atoms or molecules. Students are able to put events in order, but do not include driving forces or constraining factors.	SM4: Students explain sea-level rise on the atomic-molecular scale. Students use driving forces (e.g. gravity), as well as constraining factors (e.g. topography) to explain changes in sea-level.

Three Climate Change Learning Progressions

1. Urban Heat Island Effect



2. Sea-Level Rise



3. Extreme Weather

Research Goals with Learning Progressions

To investigate:

1. how teaching a particular climate change impact helps students in a particular geographic region to learn about climate change science.
2. how teachers can use these learning progressions to teach about climate change science.
3. growth over time of students' knowledge of climate change.

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