Supported by NSF under CCEP Phase I

POlar **L**earning **A**nd **R**esponding:

POLAR Climate Partnership

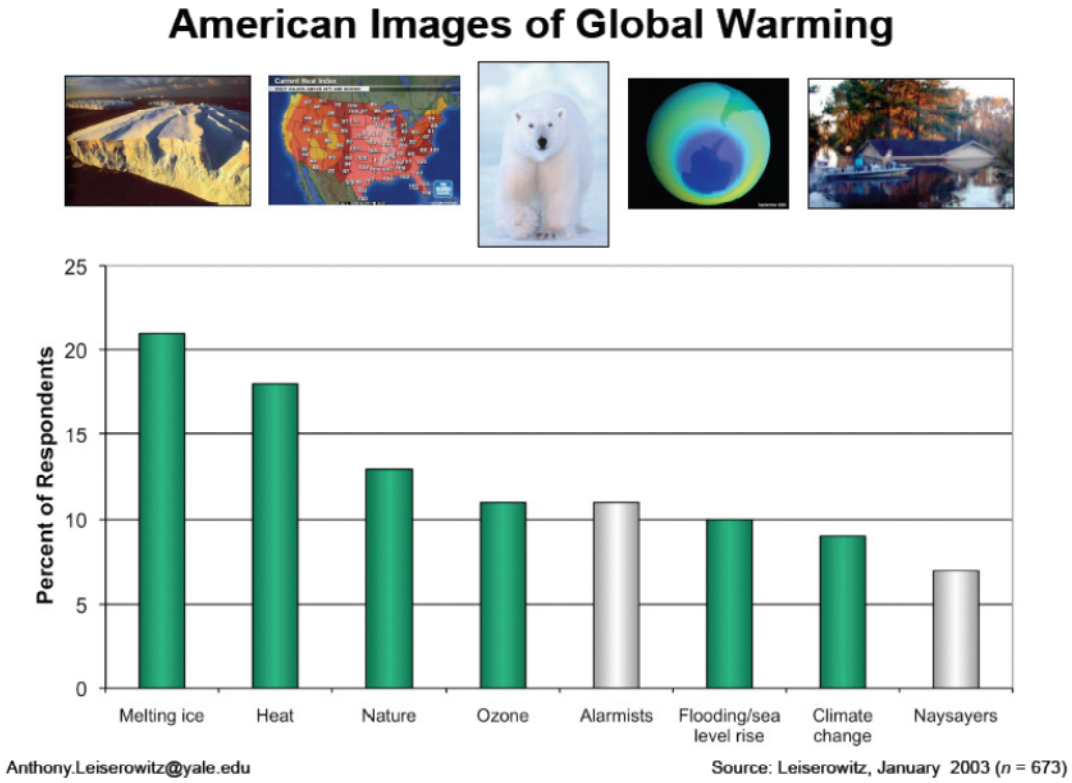
Partners: Columbia Climate Center at the Earth Institute, Columbia University Center for Research on Environmental Decisions; Barnard College; Teachers College; University of New Hampshire; University of Alaska-Fairbanks; American Museum of Natural History; International Arctic Research Center

The vision of the NSF-supported POLAR Climate Change Education Partnership is to use fascination with the changing polar regions and novel educational approaches to engage adult learners and inform public discussion and response to climate change.

Our Partnership

- Climate researchers
  - Columbia's Lamont-Doherty Earth Observatory (LDEO) and Columbia Climate Center (CCC), Barnard College
  - University of New Hampshire (UNH)
  - University of Alaska, Fairbanks (UAF)
  - International Arctic Research Center (IARC)
- Learning and decision experts
  - Teachers College (TC)
  - Columbia Center for Research on Environmental Decisions (CRED)
  - IARC
- Formal education practitioners
  - Columbia Center for New Media Teaching and Learning (CCNMTL), Barnard College UNH, & UAF
- Informal education practitioners
  - American Museum of Natural History (AMNH) and IARC

Focus on the Poles



- The poles are ground zero for climate change: the fastest changes occur in the Arctic and the Antarctic Peninsula
- These changes extend globally: sea level rise, change in albedo, and release of greenhouse gases from thawing permafrost
- The public
  - identifies global warming with sea ice, glaciers, and ice sheets, polar fauna
  - Is fascinated with and concerned about life in extreme polar environments

Focus on Adult Learners

- College students, pre- and in-service teachers, and life-long learners in the general public
  - Populations include future scientists, educators and citizens, to managers, youth in remote communities, and the general public
- They need to make decisions in their personal, professional and community lives, and yet many are confused about what is known and how to respond
- We are engaging stakeholders representing NGOs, business, community leaders, resource managers, and other decision-makers to identify and meet their needs

Focus on Game-like Approaches, Interactive Animations, Visualizations, and Social Networks

- Simulations, games, social networks, interactive data interfaces, reduced-complexity models, hands-on demonstrations reach different people in different ways.
  - Allow for independent discovery rather than one-way communication Interactive
  - They reach different people in different ways
  - Motivate people to pay attention
  - Help people sort through, evaluate and make decisions regarding complex material
  - Many are easily disseminated and used in diverse formal and informal settings

Inventory

Adult focused polar/climate activities, resources, data sets and model interactive approaches

1) The vast majority are focused towards professional development for high school teachers
2) There are significantly more Arctic than Antarctic resources available
3) The top 3 topics addressed in the inventory we have found are (in order) sea ice, marine ecosystems, glaciers
4) A variety of materials exist but a large amount represent satellite visualizations & short film clips/annotated films of either a scientists speaking about their work or a native individual speaking about local change – many created during IPY
5) For the general adult audience (non academic focus) the resources tend to fall into two distinct categories –
   (a) Animations and visualizations i.e. NASA's 'Tour of the Cryosphere', or
   (b) Institution or websites with collected information i.e. Woods Hole's 'Polar Discovery' site
6) Items that are not well represented in the inventory are
   (a) Polar games
   (b) Engaging simulations involving interaction or manipulation
   (c) Problem solving collaborative pieces

CRED: The Psychology of Climate Change Communication

1. Know Your Audience
2. Get Your Audience's Attention
3. Translate Scientific Data into Concrete Experience
4. Beware the Overuse of Emotional Appeals
5. Address Scientific and Climate Uncertainties
6. Tap Into Social Identities and Affiliations
7. Encourage Group Participation
8. Make Behavior Change Easier

Stakeholder Input

- Making issues local and/or personal makes them more meaningful
- Embedding responses to climate change into the context of sustainable development which firmly places climate change into the larger framework of jobs, health, legacy, etc. makes them more likely to gain traction with both individuals and organizations
- Stories are invaluable to communicate the complex, interconnected, and intergenerational aspects of climate change
- Person to person communication is important, even if the guide is an avatar
- Polar trends, predictions, and polar-global relationships need a systems framework for contextualization
- Focus on adults
- Trade-offs
- How personal/community actions make a difference
- Concept and consequences of being “reactive” vs. “proactive”
- Engaging communities as problem-solvers
- Variety of approaches/media

Future Coast

Where will the shoreline be in 2100?
How would that change your community?
What is the process of change going to be? How will the process of adaptation play out? What is actually going to happen to the coastal properties of today?

Gamification

Facilitates setting priorities and tracking behavioral change

iPad Polar Explorer

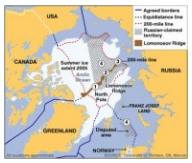
Interactive news platforms connecting to personally navigated tours of the cryosphere

AMNH Teacher Testbeds

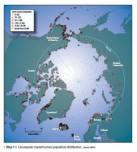
Arctic SMARTIC

Strategic MAnagement of Resources in TImes of Changing Climate
Players assume roles to engage in problem solving using real data

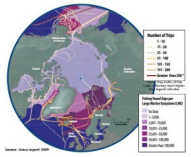
Country Claims



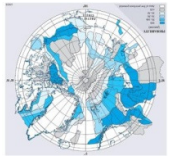
Coastal Communities



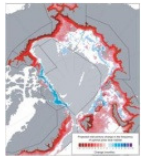
Ship Traffic and Fishing Intensity

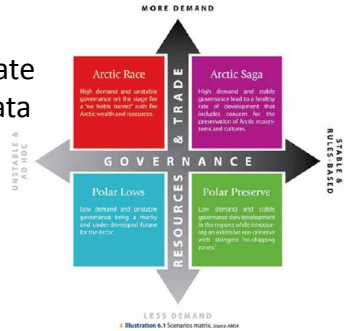


Oil and Gas Potential



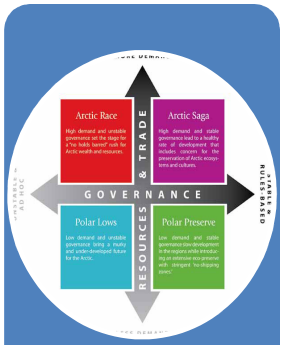
Polar Bear Habitat 2050





From Awareness to Decisions

Polar Explorer



Arctic Home

SMARTIC

AMNH Online Teacher Ed

Future Coast

Greenify

Awareness → **Decisions**

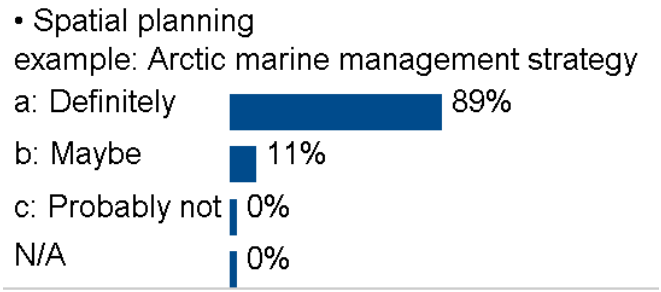
From the Classroom to the General Public

From Low-Tech to High-Tech

“Arctic Home” Card Game

- Learning
  - “Sense of how some species have variety of what to eat/fragility of system”
  - “How the food chain works, how vulnerable it is”
- Emotions
  - “At first excited to create and then sadness over loss”
  - “Sad, animals die, and then ecosystems die; competitive, excited”
  - “Sad for the ecosystem – urgency”
  - “Engagement; it was cool”

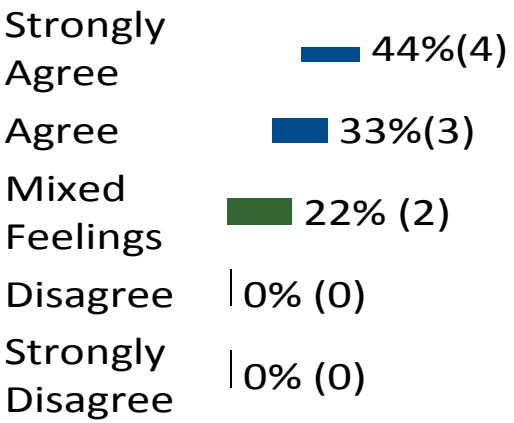
SMARTIC – Engaging in complexity



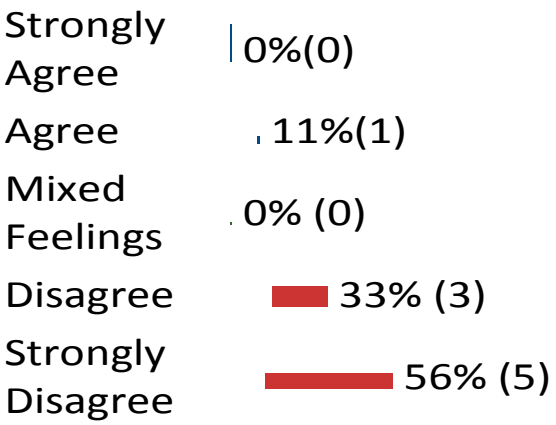
- "Responding to Climate Change" students
  - "This was a great, interactive way to gain exposure to different factors influencing the debate about the ever more desirable land and water in the Arctic. The most valuable thing that came out of this exercise was precisely the exposure and awareness of all of the different factors."
  - "The variety of stakeholders that exist makes coming up with viable solutions difficult. There are environmental and economic issues to consider in the short run and long run, as well as issues of international relations."
  - "Combining shipping route information and mineral abundance with high fish biodiversity and mammal hotspots, as well as the locations of the highest concentration of people, helps people to visualize where action and management practices need to occur first in order to impact the highest number of stakeholders. "
  - "… before this activity, I had thought of the stakeholders, but I thought they were all in conflict with each other; it turns out that only certain ones are in conflict with each other in certain areas. "

Overall RCC Course Evaluation

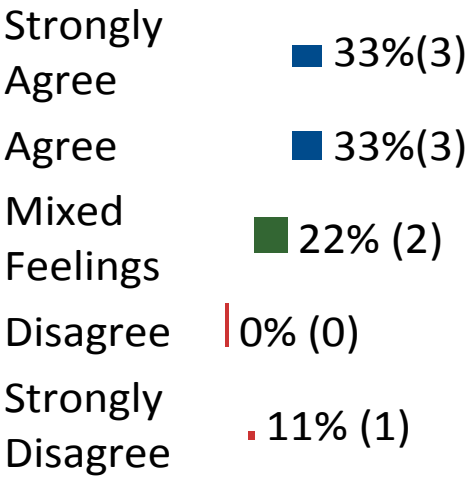
1: **I learned more from this course than a usual 3pt lecture course** n = 9



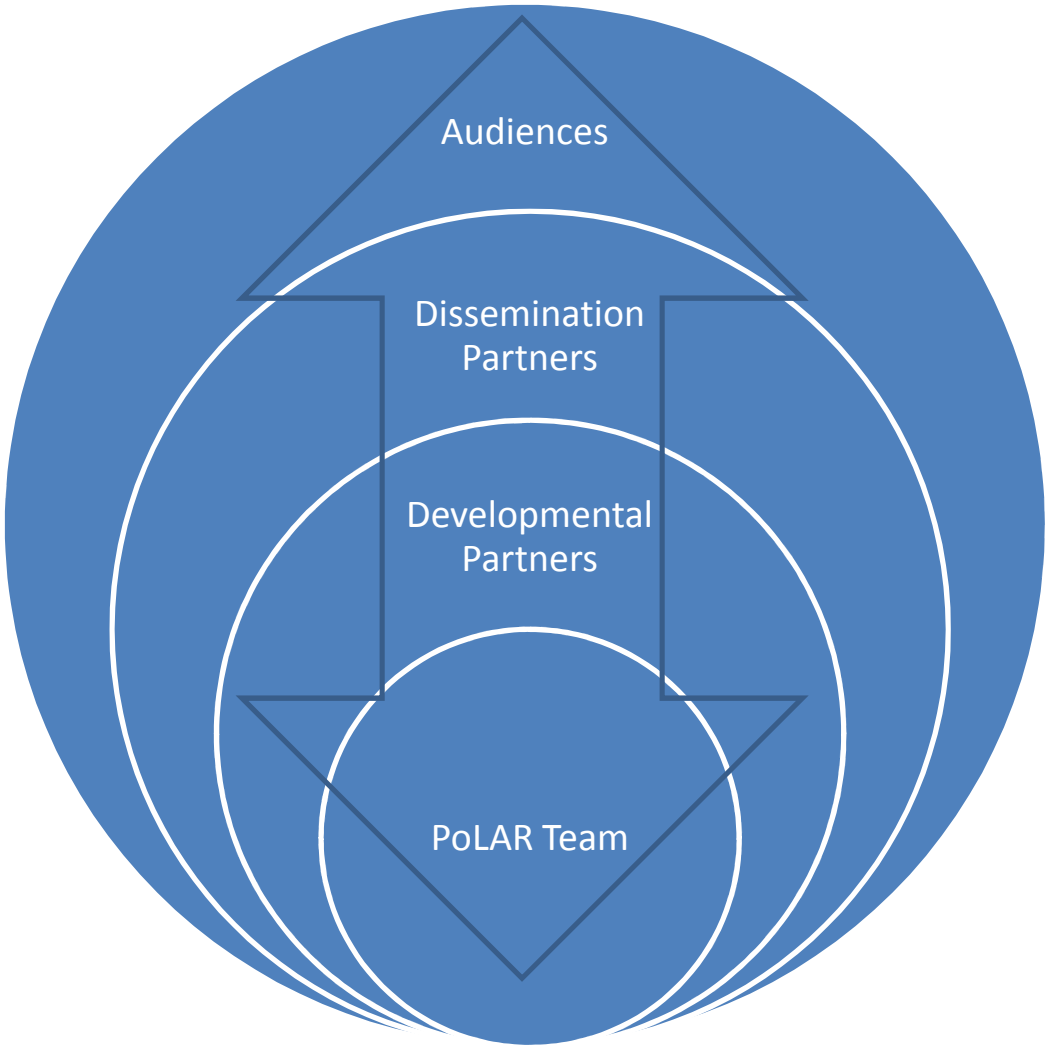
2: **I would have preferred to have more lectures and fewer activities** n = 9



4: **As a result of this course, I feel empowered to respond to climate change** n = 9



Engaging Stakeholders = Dissemination Partners and Audiences, for Ideas and Impact



PoLAR: *Using fascination with the changing polar regions and novel educational approaches to engage adult learners and inform public discussion and response to climate change*

- By using interactive activities and games:
  - We engage adult learners to deepen awareness and understanding of and inform responses to climate change, elevating it to a personal and community challenge.
  - Using the polar regions as a focal point, the partnership builds upon scientific evidence, learning theory, and education practice, including current and emerging technology, to catalyze new ways of learning about climate change.
  - The resulting approaches are transformative, easy to disseminate, and exciting to use by stakeholders in homes, museums, classrooms, and communities.

Your ideas …

- Experience using games and game-like approaches/problem solving? Positives, negatives?
- CLN and other contacts/venues for dissemination? Businesses, managers, etc.?