



TEACHERS AND RESEARCHERS  
EXPLORING AND COLLABORATING

# Welcome to *PolarConnect*

With Emily Dodson and the Climate  
Change and Pollinators in the Arctic  
PolarTREC Expedition

**Monday 16 June 2014**

11:45am AKDT

[12:45pm PDT, 1:45pm MDT, 2:45pm CDT, 3:45pm EDT]

Slides will be shown here

Exit the presentation

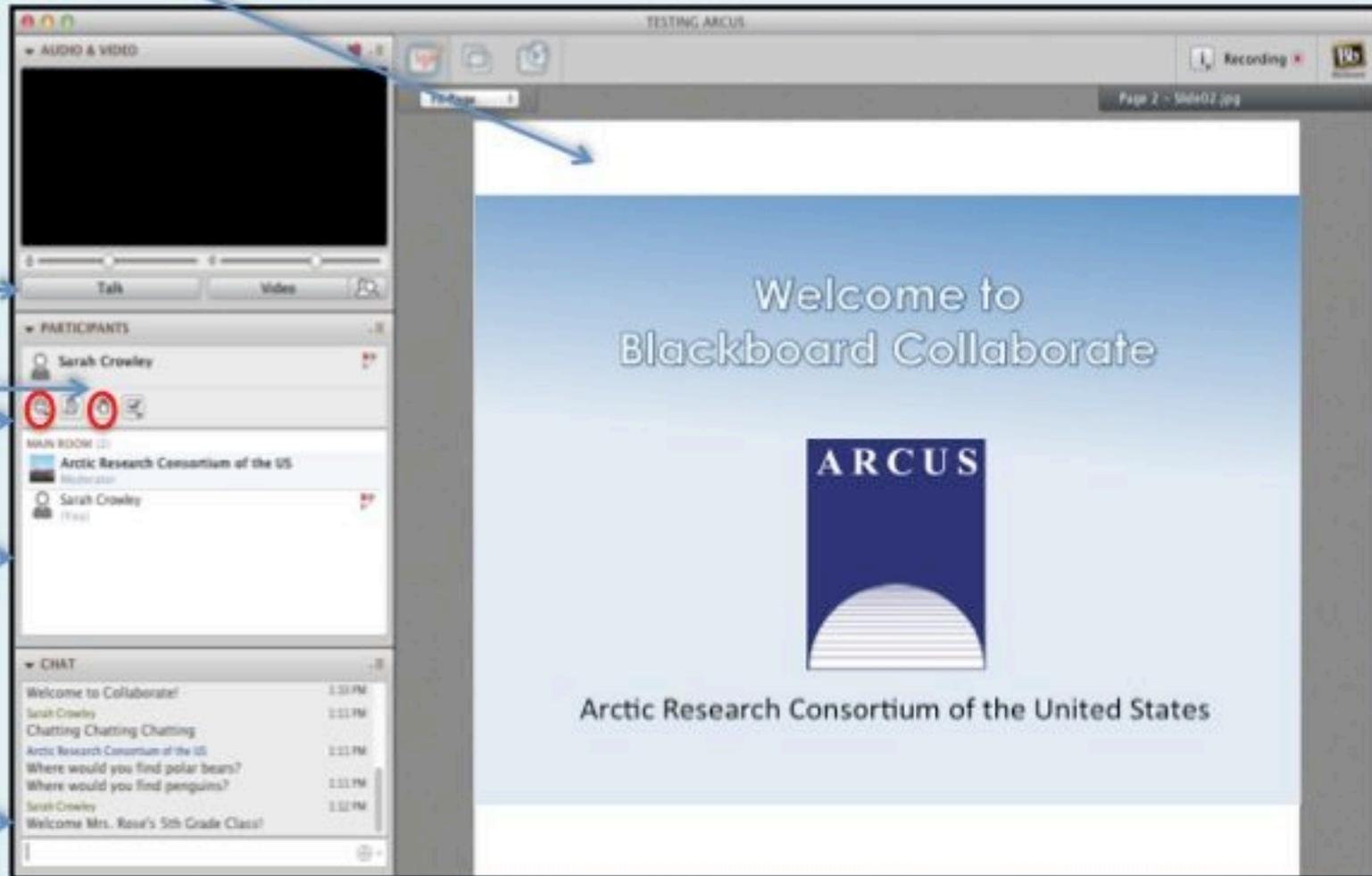
Click to Talk, Unclick to finish talking

Raise your hand to ask a question

Share with emoticons

List of all participants

Chat with one person or the entire group



The screenshot shows the Blackboard Collaborate interface. The main window displays a presentation slide titled "Welcome to Blackboard Collaborate" with the ARCUS logo and the text "Arctic Research Consortium of the United States". The sidebar on the left contains several sections: "AUDIO & VIDEO" with a microphone icon and "Talk" and "Video" buttons; "PARTICIPANTS" with a list of participants including Sarah Crowley and Arctic Research Consortium of the US, and icons for mute, unmute, and hand-raising; "MAIN ROOM" with a list of participants; and "CHAT" with a list of messages and a text input field.

## Please Note:

- Participants using the telephone can mute/unmute by **pressing \*6** on the phone.
- Today's event will be recorded and archived.

# Participant Introductions

**Please type in the chat box:**

- ✓ Name
- ✓ Affiliation (School, Institution, Etc.)
- ✓ The number of students and adults participating with you in the same location

# What is PolarTREC?

PolarTREC is a professional development experience in which K-12 teachers are paired with researchers for 2-6 week research experiences in the polar regions.

From 2010-2015, nearly 70 teachers from around the United States will join scientists in the Arctic and Antarctica to learn about science, the polar regions, and to share what they have learned with their students and communities.

# Questions

## During the Presentation:

- Type your question in the text chat box

## At the End of the Presentation:

- Raise your hand with the “hand button”.
- PolarTREC staff will call on you.
- Speak loud and clear and directly into the phone to ask your question.

**Click on the Talk button to speak.**

**Unclick when you are done.**

# **CLIMATE CHANGE AND POLLINATION**

A large, multi-colored ice block, likely a glacier calving, sits on a dark, rocky beach. The ice is white and blue, with some brownish-grey sediment visible. A person stands next to the base of the ice block for scale. In the background, there is a body of water and a glacier under a clear blue sky.

**KANGERLUSSUAQ, GREENLAND**

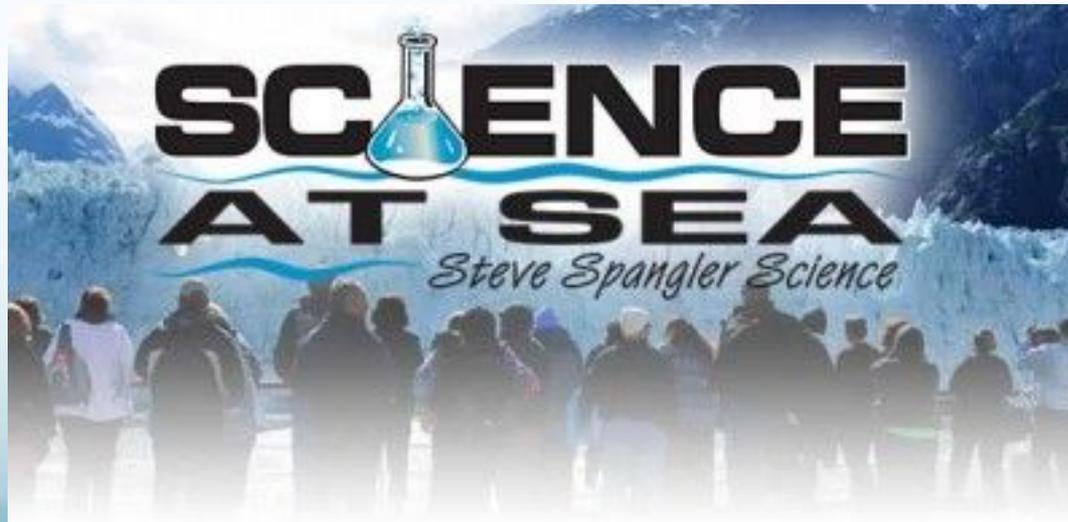
**JUNE 9-30, 2014**

**EMILY DODSON: TEACHER**

**CHRISTINE URBANOWICZ: RESEARCHER**

# HOW DID I COME TO BE HERE

- I was looking for a grant to go on the Steve Spangler cruise which leaves out of Alaska
- I found PolarTrec which is based in Alaska
- I applied and now here I am!



# The Process

- I applied at PolarTrec.com at the beginning of the school year (after waiting for a couple of months for the application to open up)
- I heard in Sept. that I was in the top 45
- I was called in Nov. and told that a researcher wanted to interview me (a researcher interviews 3 people)
- In late Nov. I interviewed
- On Dec. 13<sup>th</sup> (my wedding day) I found out I had been selected!
- I traveled to Fairbanks, AK for training in Feb.



# Who

- Christine Urbanowicz: A PhD student in the Ecology and Evolutionary Biology graduate program at Dartmouth College
- Becca Novello: She recently graduated from Dartmouth with a BA in Biology and Math. She is serving as a research assistant
- Ruth Heindel: She is a Dartmouth graduate with a BS in Earth Science and is now earning her PhD in earth science. She is not part of our team but stays at the camp with us. (She use to be a teacher)
- Emily Dodson: A FCPS science teacher/PolarTrec teacher

# The Team



# Where

- Kangerlussuaq, Greenland (West Greenland)
  - Has the biggest airport in Greenland
  - Farthest inland you can get in Greenland
  - You can reach the ice sheet from “Kanger”
  - Has the longest road in Greenland (use to serve as a test track for car endurance)
  - Serves as a base to a lot of polar research scientist
  - Diverse area (Musk Ox, Arctic Hare, Caribou, Mosquitoes, bumble bees, Arctic Foxes, birds, the occasional polar bear – very rare)

## The Longest Road in Greenland



The main Greenlandic Airport

# Wildlife



# Tundra

- The research will occur in Greenland's vast tundra
- The Arctic tundra is a stark landscape where the the soil is permanently frozen (permafrost)
- Because of this frozen soil it is very hard for trees to grow. Their roots need to grow deep
- Instead, the tundra produces lots of moss and woody plants

# Tundra



# My Home



- I live in a tent!
  - It is in the field
  - It's fun
  - More like car camping (stationary site with a full kitchen set up)
  - Make all of our own food
  - Live in the sand dunes
- Sometimes we stay at KISS (Kangerlussuaq Internation Science Services) to shower and charge science instruments



# Why (For the Environment)

- 1/3 of our produce depend on pollinators
- 98% of wild flowers depend on pollinators
- Climate change could cause a change in the type of species or number of pollinators which will effect plant communities
- Range shift could occur and new species would need to replace current pollinators
- Improve Public Awareness

# Public Awareness



# Why (For the Classroom)

- To build a relationship with a real researcher to use in the classroom (Skype, classroom visits)
- Bring real life science in the classroom and to increase students' knowledge of careers in Polar science
- Improve my content knowledge in Polar Science in order to better instruct my students
- Improve my Science and Scientific and Engineering practices in order to better instruct my students
- NGSS opportunities which I will get to later

# Postcard from my Students

- Students drew pictures of what they think Greenland looks like and I took them to Greenland with me to mail then back with official Greenlandic postage



# What

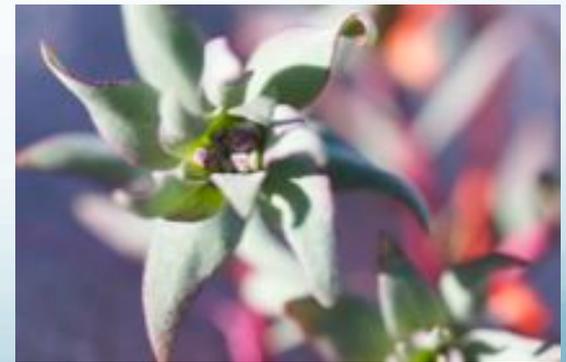
- We will be studying how climate change is influencing pollination
- Use the temperature difference between town and the ice sheet as a temperature gradient to model climate change
- We will be studying three types of flowers
- There will be 9 sites for each flower with 3 being close to town, 3 being near the ice sheet, and 3 in-between town and the ice sheet

# Ice Sheet



# The Flowers

- Salix Glauca (gray leaf willow)
- Vaccinium Uliginosum (blueberry)
- Chamerion Latifolium (Niviarsiaq, river beauty, dwarf fire weed).



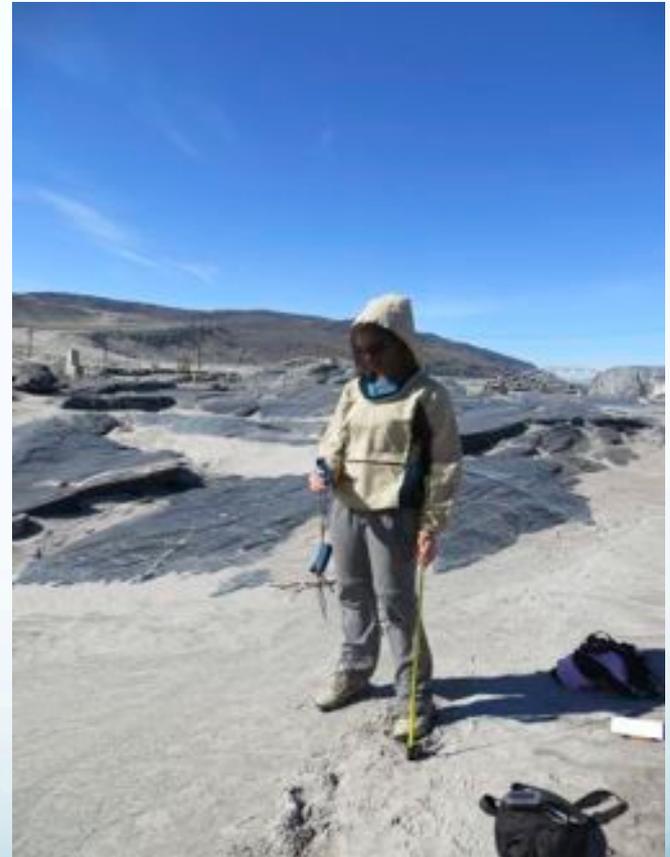
# How – Setting Up a Site

- Three Treatments are applied (marked by colored string)
  - Bagging-no pollinators – is pollinating even making a difference
  - Open pollination (control)
  - Supplement (add pollen) – if more pollinators visited the plant would the plant produce more fruit



# Setting Up a Site

- Collect abiotic variables:  
wind speed, temperature,  
aspect
- Determine vegetation  
coverage – determine  
types of vegetation in an  
area
- GPS the location



# Typical day

- Visit 4 sites a day
  - Supplement the pollen (add pollen)
  - Count the number the pollinators – using voice recorder and watching each plot (15) for 4 min.
  - Measure flower density



# Determining Pollinator Activity

- Counting the pollen grains by collecting stigmas
- Counting pollinators
- Trapping pollinators



# End

- Pick berries – dry and dissect later (stigmas still attached in order to count pollen grains)
- Determine percent of flowers that develop berries
- Count the number of berries produced



# Determining Results

- Determine number of fruits (fruit set) and the number seeds (seed set) that are produced
- Hoping to see a difference because of the gradient (direct)
- Number of pollinators (indirect)



# NGSS

- This study is very applicable to the new standards
- For Example...

## **LS2.A: Interdependent Relationships in Ecosystems**

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (06-LS2-1)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (06-LS2-1)
- Growth of organisms and population increases are limited by access to resources. (06-LS2-1)

# NGSS

- **Developing Models**

- Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
- **Develop a model to describe phenomena. (06-LS2-3)**

- **Analyzing and Interpreting Data**

- Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- **Analyze and interpret data to provide evidence for phenomena. (06-LS2-1)**

- **Constructing Explanations**

- Constructing explanations in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- **Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (06-LS2-2)**

# NGSS

- **Cause and Effect**

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (06-LS2-1)

- **Energy and Matter**

- The transfer of energy can be tracked as energy flows through a natural system. (06-LS2-3)

- **Patterns**

- Patterns can be used to identify cause and effect relationships. (06-LS2-2)

# Engineering Practices

- We use the term “engineering” in a very broad sense to mean any engagement in a systematic practice of design to achieve solutions to particular human problems (NRC 2012, p. 11-12).
- The Framework recommends that students explicitly learn how to engage in engineering design practices to solve problems
- By asking questions and solving problems science becomes more relevant

# Engineering Practices

- Students can learn about my research and make their own experiments
  - Determine their own flowers to study
  - Determine if they want to study pollinators, the “plant’s attractiveness,” or something else
  - Ask their own questions
  - Set up their design
  - Determine their results
  - Reflect on what could be improved
  - The best part is that they are learning ecology through this whole process

# Sources

- C. D. Thomas et al., *Nature* 427, 145 (2004). [2] A. S. Jump, J. Penuelas, *Ecol. Lett.* 8, 1010 (2005). [3] O. Bykova et al., *J. Biogeogr.* 32, 2191 (2012). [4] K. J. Gaston, *Proc. Biol. Sci.* 276, 1395 (2009). [5] S. J. Hegland, *Ecol. Lett.* 12, 184 (2009). [6] G. A. algeirsdóttir, Danish Climate Centre Report 08-06 (Danish Meteorological Institute, 2008). [7] J. Ollerton, *Oikos* 120, 321 (2011).
- National Research Council (NRC) 2012. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

End



# How

- Neat things
  - Predicting an increase in rainfall (next 70 years West Greenland 3 degree Celsius increase)
  - 40% increase in rain
  - Greenland ice free by 2030
  - 1/3 produce is created by pollination

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# Teachers: Join PolarTREC!

[www.polartrec.com/about/join](http://www.polartrec.com/about/join)

Every teacher can participate in different ways:

- **Following Expeditions**
- **Participate in PolarConnect Events**
- **Join the Polar Education Email List**
- **Become a PolarTREC Teacher!**

# Upcoming Events

Watch for and register for upcoming events at [www.polartrec.com!](http://www.polartrec.com)

# Thank You!

*An archive of the event will be available shortly.*

<http://www.polartrec.com/polar-connect/archive>

