

Encouraging A New Generation of Scientists



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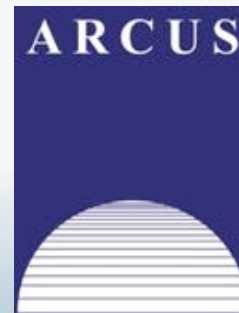
Today's Agenda

- Program Basics
- Our Successes
- Life after the TRE – Student Impacts
- Case Studies
- Resources for the Teacher

What is PolarTREC?

PolarTREC (**T**eachers and **R**esearchers **E**xploring and **C**ollaborating) is...

...a program where U.S. K-12 teachers spend 3-6 weeks participating in hands-on field research experiences in the polar regions. By fostering the integration of research and education, PolarTREC continues the momentum established during the International Polar Year.

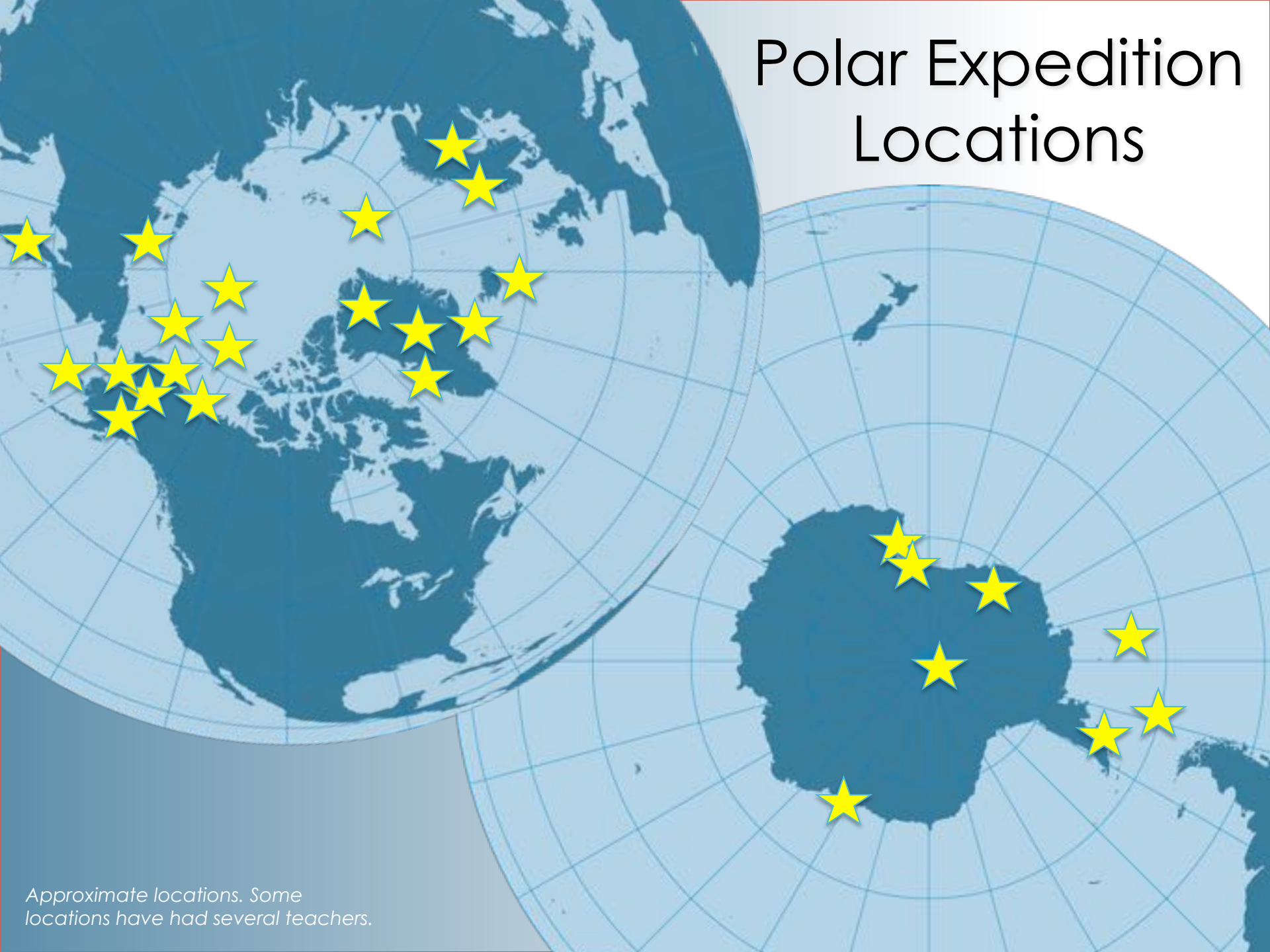


Teacher Research Experience

- Teacher matched with researchers and travel to locations in the **polar regions**
- Experience involves **intense** field work—teachers become **members** of the team
- Experience involves safety and classroom **training**
- Teachers **communicate** daily with public



Polar Expedition Locations



Approximate locations. Some locations have had several teachers.

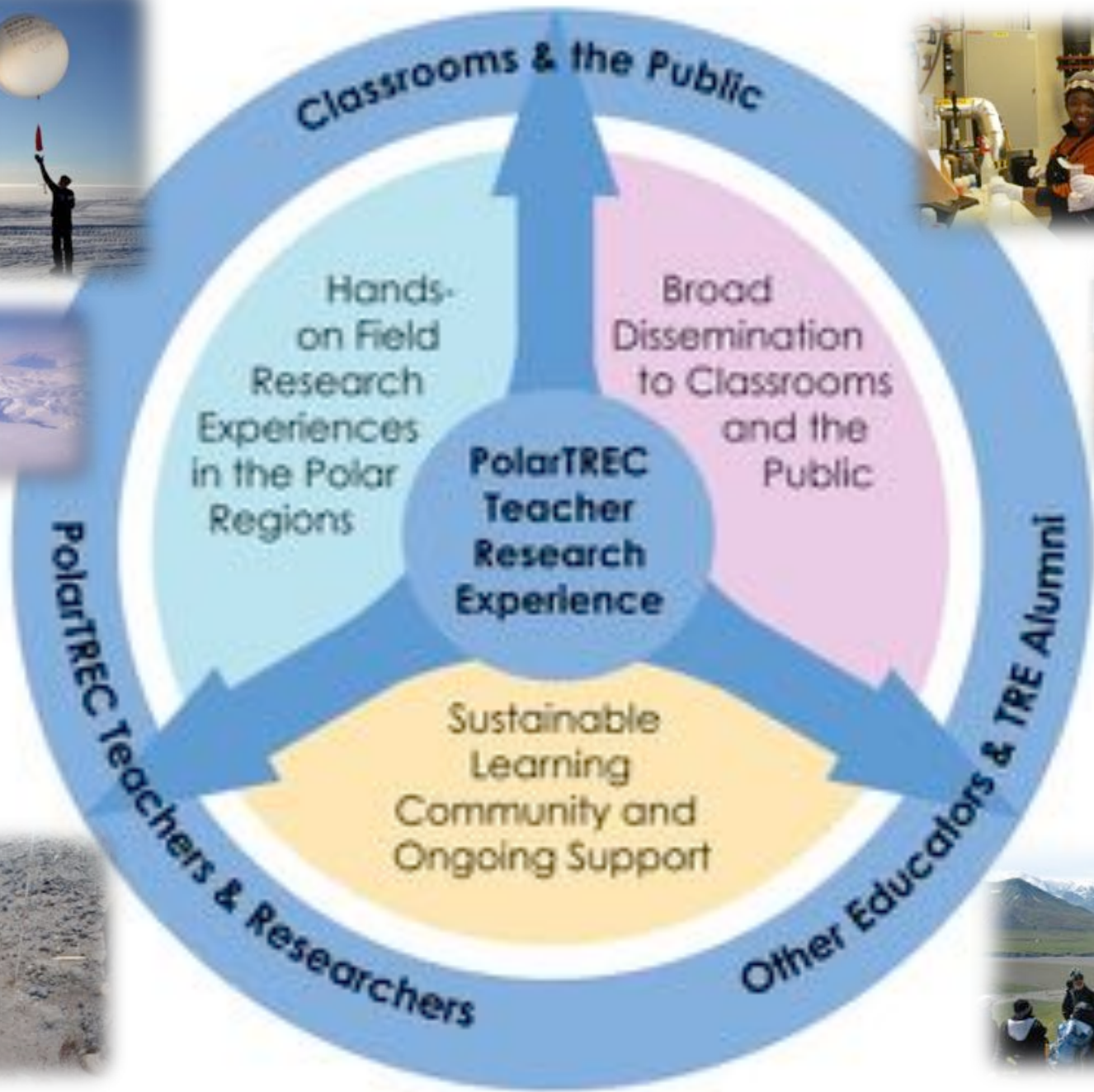
Our Program Objectives

- ◆ To **improve teacher science and content knowledge** of the Polar Regions and integration of topics into their classroom instruction.
- ◆ To **increase teachers' knowledge and use of science and engineering practices** with their students in the classroom.
- ◆ To develop teachers' educational **leadership skills**.
- ◆ To **increase students' understanding and engagement** in the Polar Regions and interest in polar science, technology, engineering, or mathematics (STEM) careers.

Professional Development



- Teachers are **immersed** in scientific content
- Teachers and researchers **work together** to bring the science into the classroom
- Teachers **utilize experiences** to develop lessons that meet District requirements and National and/or State standards



Key Program Activities

Intensive 1-Week Orientation

- Technology Training
- Education/Outreach Planning
- Polar Science
- Safety
- Cohort Team Building



Comprehensive Selection Process

Researchers Make Final Selections

Detailed Logistic Support

Substitute & Other Expenses Covered

Alumni Involvement

Pre\Post Expedition Travel Support

Long-term Access to Resources & Support

In the last decade **100+** teachers from **27** states spent 3-6 weeks in the field with researchers from nearly **100** separate institutions.



Products and Impacts



50,000
82%

Participants connected to the Polar Regions through live events.

Participated in these events for the first time. Archives of all events are available online.



100+

Lessons developed by participating teachers and vetted by research teams. Topics include polar science, inquiry-based learning, STEM, and the arts.



700,000

Unique visitors to our website. Access journals from the field, ask questions to the research teams, view photos, videos and more!



7

Learning Resource Collections provide volumes of multimedia available for teachers and students on scientific research. Resources are available in multiple languages.



Beyond the Research Experience

Encouraging A New Generation of
Scientists



Evaluation Design

The PolarTREC evaluation was designed to collect qualitative data from participating teachers, researchers, and the students of PolarTREC teachers utilizing Guskey's five-level framework for evaluating teacher professional development.

"I think the scientific process itself benefits enormously from having a teacher embedded in there..."
- PolarTREC Researcher

"Interactions with teachers brought out aspects of our science relevant to the public and students."
- PolarTREC Researcher

"Love being able to check in on my teacher when he is in the field...wish I was there too!"
- Student of PolarTREC Teacher



"We bring back a link to the scientific world that keeps growing stronger as teachers and researchers continue their collaboration beyond the expedition."
- PolarTREC Teacher

Evaluation Results

PolarTREC hopes to serve as a model for overall evaluation design and methodology. Each iteration of PolarTREC has been evaluated with the same objectives and methodologies. Reports are available.

- Teachers significantly increased their content knowledge of the Polar Regions
- Teachers significantly increased their confidence in their ability to use inquiry science practices and their actual use of inquiry practices with their students.
- Students reported increased experience using inquiry science practices, and knowledge about the Polar Regions.
- The majority of current researchers developed positive, professional relationships with their partnering teachers. These are relationships that the case study has demonstrated have the potential to grow into long-term partnerships.

“...PolarTREC has clearly achieved it’s goals and strongly suggests PolarTREC’s potential to **transform the nature of STEM education** by giving teachers the content knowledge, pedagogical tools, confidence, understanding of science in the broader society, and experiences with scientific inquiry **they need to promote authentic scientific research in their classroom.** “

(Goldstream Group Inc. 2014 evaluation to ARCUS for the PolarTREC program)

Student Impacts

The participating teachers increased knowledge and use of inquiry science practices led to increase in student interest and knowledge about the Polar Regions.





PolarTREC is Transformative!





Case Studies

Encouraging A New Generation of
Scientists

Elizabeth Eubanks, Teacher



Teaching Philosophy:

Elizabeth Eubanks sees her role as a middle school science teacher as that of a “facilitator of learning.”

Elizabeth Eubanks, Teacher

Impact of PolarTREC on use of science practices in classroom:
“You can't go out into the field and work with researchers and then come back in here and do the same old thing.”



Lollie Garay, Teacher



Teaching Philosophy:

Lollie Garay believes that her role as a science teacher is to teach her students to “ask questions, to want to learn.”

Lollie Garay, Teacher

Impact of PolarTREC on use of science practices in classroom:

Garay has incorporated her experience into the classroom by taking the students out of the classroom.





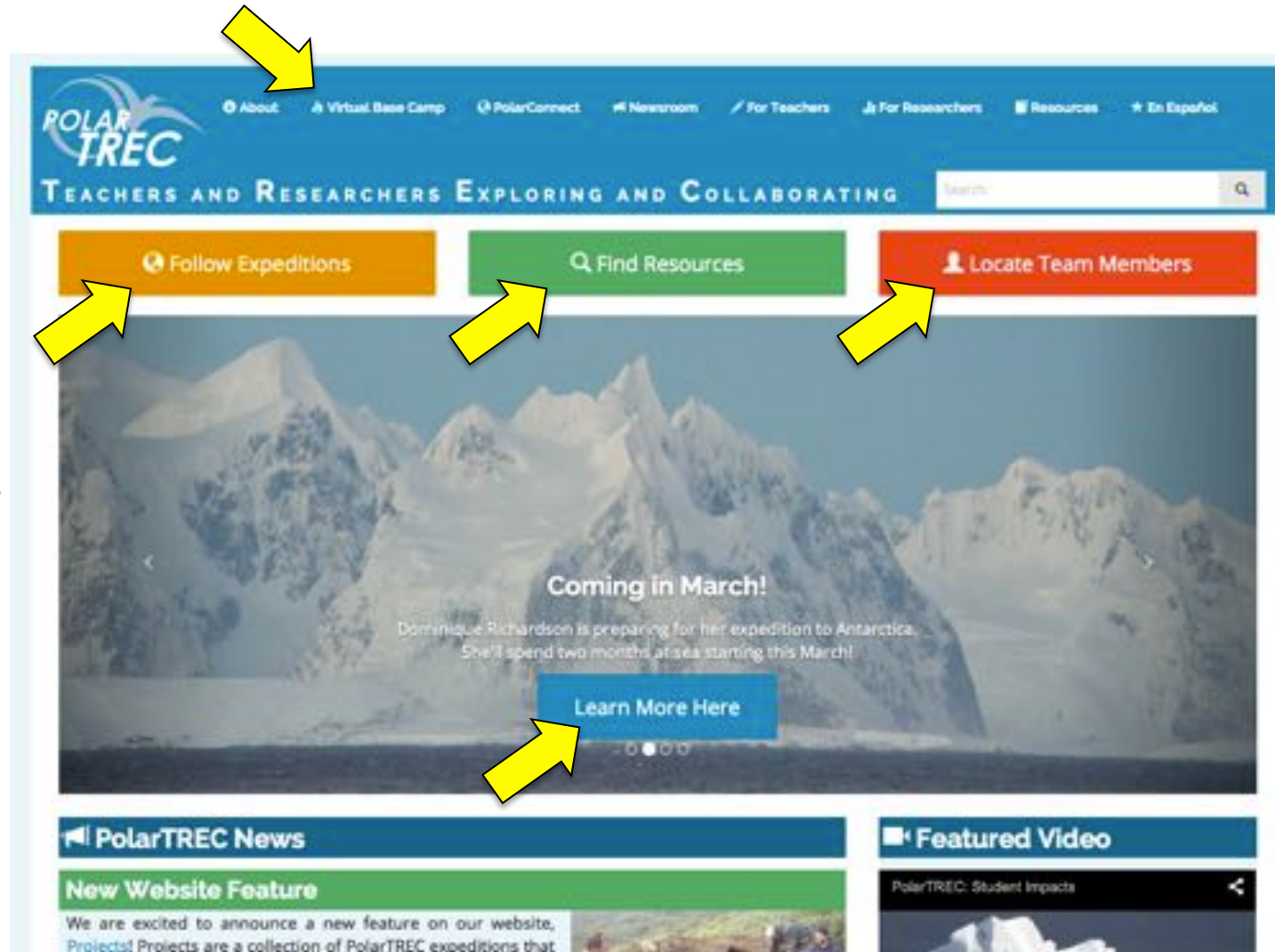
TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

PolarTREC Resources

Encouraging A New Generation of
Scientists

PolarTREC Resources

Homepage: www.polartrec.com



Menu Bar & Search

Follow Expeditions

Find Resources

Locate Team Members

Photo Carousel/Info

PolarTREC Resources

Homepage: www.polartrec.com

PolarTREC News & Updates

Featured Videos

Latest Journals, Comments,
and Resources

Subscribe to Journals

The screenshot shows the PolarTREC website homepage with several sections highlighted by yellow arrows:

- PolarTREC News**: A section titled "New Website Feature" with a "View Projects Here" button.
- Featured Video**: A video player titled "PolarTREC: Student Impacts" showing a person in a snowy environment.
- Join the Email List**: A section with a "Sign Up" button and an image of a person in a red jacket.
- Latest Journal**: A section titled "March 2015 The Microverse" with a "Read Journal" button and an image of a person in a hat.
- Follow PolarTREC Teacher on FB & Twitter**: A section with a "Sign Up" button and an image of a person in a red jacket.
- Subscribe to Journals**: A section with a "Subscribe" button and an input field for an email address.
- Latest Comments**: A section titled "Antarctic Ice Sheet Dynamics" with a "Flags" sub-section.

A close-up of the "Subscribe to Journals" form, showing the "Subscribe" button and the email input field. The form is titled "Subscribe to Journals" and includes the text "Get the latest updates from PolarTREC team members!". Below the form are logos for ARCTIC, NSF, and other organizations.

PolarTREC Resources

Virtual Base Camp

Find current and past expeditions to follow

POLAR TREC
TEACHERS AND RESEARCHERS EXPLORING AND COLLABORATING

Home Virtual Base Camp PolarConnect Resources For Teachers For Researchers

Virtual Base Camp / Virtual Base Camp

Virtual Base Camp

2015 2014 2013 2012 2011 2010 2009 2008 2007

Welcome to the Virtual Base Camp, the starting point for your exploration of the polar regions with PolarTREC teachers and researchers!

PolarTREC expeditions to the Arctic and Antarctica can be found here starting in 2007 to 2015. You can also access archived expeditions to the Arctic that took place through TREC in 2004-2006. Journals, photos, ask the team forums, and information about each expedition can be found by following the links to all the expeditions. Use the Expedition Search feature to narrow your choices or find a particular expedition or region. Use the Members feature to find teachers and researchers involved with PolarTREC expeditions.

A new feature to the Virtual Base Camp are Projects. Projects are expeditions that had teachers for more than one year. You can learn more about the science and see all the teachers and researchers involved in the research project over two or more years. You can also access all the related project resources (presentations, lessons, PolarConnect events, etc.) related to the projects.

2015

Antarctic Ice Stream Dynamics

Dates:
15 March 2015 to 30 April 2015

Location:
Research Vessel Nathaniel B. Palmer



Teacher: Dominique Richardson

What Are They Doing?
The movement of warmer ocean water through or around relatively cooler ice sheets has the potential to lead to increased melting of the ice sheets. This project will determine the potential vulnerability of key ice streams to the infiltration of warmer ocean water and whether this could explain any of the observed thinning of the ice sheet. It will provide...

[Follow Expedition](#)

PolarTREC Resources

Expedition Pages

- Details on each expedition:
- Location
- Science Goals
- Team Bios
- Events/Updates
- Journals
- Comments
- Resources

The screenshot shows the PolarTREC website page for the "Antarctic Ice Stream Dynamics" expedition. The page has a blue header with the PolarTREC logo and the tagline "TEACHERS AND RESEARCHERS EXPLORING AND COLLABORATING". Below the header is a navigation bar with tabs for "Overview", "Journals", "Photos", and "Resources". A social media sharing bar includes icons for Facebook, Twitter, Google+, and Email. The main content area is divided into several sections:

- ★ Update:** A section with a star icon and the heading "Update". It contains a paragraph: "Look who is getting READY FOR ANTARCTICA! Dominique Richardson has been busy and even though her expedition isn't until 2015, she's got lots of activities going on. Check out her journals for information about creating a flag for Antarctica. Also, she can be followed on Facebook [here](#) and @EastAntarctica on Twitter!"
- What Are They Doing?:** A section with a pencil icon and the heading "What Are They Doing?". It features a paragraph: "The movement of warmer ocean water through or around relatively cooler ice sheets has the potential to lead to increased melting of the ice sheets. This project will determine the potential vulnerability of key ice streams to the infiltration of warmer ocean water and whether this could explain any of the observed thinning of the ice sheet. It will provide important information about a particular section of the East Antarctic Ice Sheet and therefore will be critical for future ice sheet models and investigations into the ice sheet's contributions to sea levels." To the right of the text is a photograph of a snowy landscape with a dark foreground.
- Where Are They?:** A section with a location pin icon and the heading "Where Are They?". It features a photograph of the Nathaniel B. Palmer icebreaker, a red and white ship on a snowy field. To the right of the photo is a paragraph: "The research team will be traveling on-board the icebreaker Nathaniel B. Palmer. The expedition will begin in New Zealand or Australia and will travel along the East Antarctic Margin and return to Punta Arenas, Chile. The vessel is named after Nathaniel Palmer, the first American credited with sighting Antarctica. It can operate safely year-round in Antarctic waters, and is capable of supporting approximately four dozen scientists on expeditions that last for months. Learn more about life aboard the N.B. Palmer [here](#)."
- Journals:** A section with a pencil icon and the heading "Journals". It features a sub-heading "27 February 2015 Art Contest Winners!" and a paragraph: "The Results Are In... Thank you so much to everyone who entered. We had a lot of great submissions for the flag contest! Winning Designs Design by Eduardo L., 1st grade Design by Thomas V., 3rd..." To the right of the text is a small image of a flag design with red, white, and blue sections and a red arrow pointing upwards.

On the right side of the page, there are several vertical panels:

- Project Information:** A panel with a magnifying glass icon and the heading "Project Information". It contains the following details: "Dates: 15 March 2015 to 30 April 2015", "Location: Research Vessel Nathaniel B. Palmer", and "Project Funded Title: Vulnerability of East Antarctic ice streams to warm ocean water incursions".
- Meet the Team:** A panel with a person icon and the heading "Meet the Team". It lists "Teacher - Dominique Richardson" and "Researcher - Frank Nitsche".
- Subscribe To Journals!:** A panel with a checkmark icon and the heading "Subscribe To Journals!". It includes an "Email" input field and a "Subscribe" button.
- Latest Comments:** A panel with a speech bubble icon and the heading "Latest Comments". It features a sub-heading "Flags" and a paragraph: "We got almost 100 designs submitted! We had a great turnout. There were so many amazing designs it was hard for us to vote. The winning designs have been turned into real flags that we'll take on the..." Below the text is a green button with the text "→ Read Journal".

PolarTREC Resources

Learning Resources

Discipline and Location-based Collections

Recent Lessons, Activities Articles, Videos, etc.

Searchability

Learning Resources

PolarTREC Learning Resources is a collection of articles, lessons, activities, interactive media, and more for educators, families, students, or anyone interested in teaching or learning more about the science of the Arctic and Antarctica. Many of these resources have been aggregated into "Collections". The collections are a chance to find all types of resources that all pertain to a specific discipline or location.

Special Collections

International Polar Week: Celebrate the poles during the March and September equinoxes! This collection is for finding and sharing resources related to the bi-annual International Polar Week. Each celebration has a flagship activity that any one can do.

Bering Sea Ecosystems: A collection of lessons and resources developed during a four-day workshop that brought together teachers who had traveled to the Bering Sea during teacher researcher experience programs; Bering Sea community teachers from St. Paul, Emmonak, and Nome; as well as project scientists interested in gaining expertise in broader impacts activities.

Arctic Ocean Ecosystems: A special collection of materials for teaching about the Arctic Ocean and the impacts of climate change.

The Cyber-based Interdisciplinary Science Educator (C-ISE) Collection

The collections below are utilized during the C-ISE Professional Development course which is offered by PolarTREC and through the University of Alaska. To find out more about these professional development courses visit: [PolarTREC Online Course for Educators](#).

Life Science Collection - A collection of resource pertaining to life sciences in the Polar Regions.
Physical Science Collection - A collection of resources looking at physical sciences in the Polar Regions.
Earth Science Collection - A collection of resources centered on Polar Region earth sciences.
Social Science Collection - A collection of resources focusing on social sciences in the Polar Regions.

Recent Lessons

- Data Analysis with Team Squirts!
- Introduction to Inquiry-based Learning and Glaciers
- How We Can Use Isotopes to Study Glaciers?
- Playing with Mud: Sediment Deposition by Tidewater Glaciers
- Antarctic Adaptations
- Glacier Flow Predictive Modeling via Rubber
- Glacier and Ground Penetrating Radar Fact Finding
- Climate Change in the Media: Comparing Global and Local Perspectives
- Snow Runways, Fly or No Fly?
- Two Views of Changing Climate

Recent Articles

- The Graduates of Seal Team 6 Roxanne Beltran and Amy Kirkham
- Arctic Adventures Reinforces Lessons at CC - article

Recent Activities

- Mystery Solution Lab
- Scientific Poster Puzzle Dissection: Bowhead Whale
- Arctic Adventures Game
- Arctic Marine Life: Zooplankton and the Bowhead Whale Migration Simulation
- Visit To An Ocean Planet: Building A Plankton Net
- Is it Getting Warm in Here? Ecology - Carbon Cycle
- Conductivity of Freshwater vs. Seawater
- The Effects of Air Pollution on the Melting of Polar Ice
- How is Glacier Goo Similar to a Real Glacier?
- Flakes, Blobs and Bubbles - An Ice Core Art Project

Recent Polar Profiles

- Michael Sheriff
- Nick LaFave
- Aranda Koltz
- Seth Beaudreault

Resources

- Overview
- About
- Collections
- Media Archive
- Find a Resource
- Contribute
- Fast and Fun Facts

PolarTREC Resources

PolarConnect Events

Register for PolarConnect

We request that all participants pre-register to join PolarConnect live events. Anyone with an e-mail address can register, and registration and participation is FREE!

To register, please fill out the form below and click the "save" button at the bottom to submit your registration. Shortly thereafter, you will receive a confirmation email with instructions on how to join the webinar. If you DO NOT receive an email, that is okay, just follow these [instructions](#).

The events are listed first in the Alaska Time Zone. If you would like to convert this to another time zone you can use the [World Clock Meeting Planner](#) to convert to your time zone. From the pull down list, select a city for your time and select Anchorage as a representative city for the Alaska Time Zone. Participants can enter and exit the event as needed.

How will my information be used?

- We will only use your email address to respond to your requests for information, to assist you with set up and troubleshooting as needed. If there is a problem and we are not able to contact you by email, we may contact you by telephone. We will not sell or share your email address with anyone outside of the Arctic Research Consortium of the U.S. without your permission.
- We report annually to our funding agency about program participation and participant demographics. It is of great assistance to us if you complete the information below for our reporting purposes.
- Participant demographic information is shared with the presenting teachers and researchers so they are better able to structure the presentation to the participants online.

* indicates a required field

1. Event Information

Events

There are no events currently scheduled. Stay tuned!

You can access past events with slides, audio, and video in the [PolarConnect Event Choice](#) *

No events are scheduled.

Please register for one event. If you are interested in attending several separate form for each event.

2. Contact Information

Last Name *

First Name *

Organization/School



PolarConnect Archives

Archived Events

If you were not able to participate in a live event, you can access an archive of the entire presentation with audio and visual elements or you can download a separate audio file or PDF presentation from each event. Click on the archive and format you are interested in and follow the instructions for accessing the respective format below.

[Instructions for accessing archives](#)

Expeditions	Type	Video	Audio
<input type="text" value="All"/>	<input type="text" value="All"/>	<input type="button" value="Apply"/>	
Date	Archive	Video	Audio
22 January 2019	Nanini Bala and the West Antarctic Ice Sheet: Microstructures Expedition - Webinar 2	Watch on YouTube	<input type="button" value="▶ 00:00"/> <input type="button" value="⏪ 00:40"/> <input type="button" value="⏩ 00:00"/>
28 December	Nanini Bala and a Global Expedition Team	Watch on YouTube	<input type="button" value="▶ 00:00"/> <input type="button" value="⏪ 00:28"/> <input type="button" value="⏩ 00:00"/>
	Webinar	Watch on YouTube	<input type="button" value="▶ 00:00"/> <input type="button" value="⏪ 00:00"/> <input type="button" value="⏩ 00:00"/>
	Webinar	Watch on YouTube	<input type="button" value="▶ 00:00:00"/> <input type="button" value="⏪ 01:00:00"/> <input type="button" value="⏩ 00:00"/>
	Webinar	Watch on YouTube	<input type="button" value="▶ 00:00:00"/> <input type="button" value="⏪ 01:04:38"/> <input type="button" value="⏩ 00:00"/>
	Webinar	Watch on YouTube	<input type="button" value="▶ 00:00"/> <input type="button" value="⏪ 00:12"/> <input type="button" value="⏩ 00:00"/>
	Webinar	Watch on YouTube	<input type="button" value="▶ 00:00:00"/> <input type="button" value="⏪ 01:00:00"/> <input type="button" value="⏩ 00:00"/>
	Webinar	Watch on YouTube	<input type="button" value="▶ 00:00:00"/> <input type="button" value="⏪ 01:00:00"/> <input type="button" value="⏩ 00:00"/>
	Webinar	Watch on YouTube	<input type="button" value="▶ 00:00"/> <input type="button" value="⏪ 00:48"/> <input type="button" value="⏩ 00:00"/>
	Webinar	Watch on YouTube	<input type="button" value="▶ 00:00:00"/> <input type="button" value="⏪ 01:00:40"/> <input type="button" value="⏩ 00:00"/>



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

PolarTREC Lessons

Encouraging A New Generation of
Scientists

What makes an effective scientist? Interviews with Arctic Scientists

We want students to develop the habits, traits, and qualities of effective scientists. What better way for them to learn what

- Full Lesson
- Identify daily work of polar scientists
- Define qualities of effective scientists.
- Watch Videos and determine
 - What they Do?
 - Important Qualities
 - Noticing other important factors
 - Wonder – New Questions...



Data Analysis with Team Squirrel

Students in cooperative teams will use a spreadsheet and graphing program such as Google Sheets or Microsoft Excel to graph and evaluate a large data set. The data sets provided come from authentic arctic ground squirrel research completed at Toolik Research station in arctic Alaska.

- Full Lesson
- Graphing skills & analysis
- Examine data subsets
- Compare and contrast behaviors over time
- Links to journals and event archives.



	A	C
	Date_Time	Temp C
1	8/7/13 22:59	39.125
2	8/8/13 0:29	38.129
3	8/8/13 1:59	38.129
4	8/8/13 3:29	38.129
5	8/8/13 4:59	38.129
6	8/8/13 6:29	38.627
7	8/8/13 7:59	39.125
8	8/8/13 9:29	39.125
9	8/8/13 10:59	39.125
10	8/8/13 12:29	39.623
11	8/8/13 13:59	38.627
12	8/8/13 15:29	39.125
13	8/8/13 16:59	39.125
14	8/8/13 18:29	39.623
15	8/8/13 19:59	38.129
16	8/8/13 21:29	37.63
17	8/8/13 22:59	37.63
18	8/9/13 0:29	38.129
19	8/9/13 1:59	37.63
20	8/9/13 3:29	38.129
21	8/9/13 4:59	38.627
22	8/9/13 6:29	38.627
23	8/9/13 7:59	39.125
24	8/9/13 9:29	39.623
25	8/9/13 10:59	39.623
26	8/9/13 12:29	38.627
27	8/9/13 13:59	38.129
28	8/9/13 15:29	39.125
29	8/9/13 16:59	39.125
30	8/9/13 18:29	38.627
31	8/9/13 19:59	38.129
32	8/9/13 21:29	38.129
33	8/9/13 22:59	37.63
34	8/10/13 0:29	37.63
35	8/10/13 1:59	37.63
36	8/10/13 3:29	37.132
37	8/10/13 4:59	37.132
38	8/10/13 6:29	37.132
39	8/10/13 7:59	39.125
40	8/10/13 9:29	39.125
41	8/10/13 10:59	39.623
42	8/10/13 12:29	38.627
43	8/10/13 13:59	39.623

Climate Change in the Media: Comparing Global and Local Perspectives

This lesson allows learners to analyze and evaluate how the science of climate change and global warming are portrayed in various online media outlets.

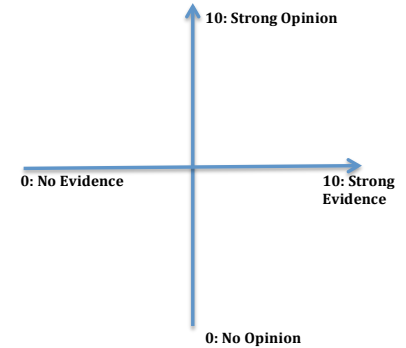
- Full Lesson
- Bridges disciplines
- For a scientifically literate public
- Writing analysis and evaluation
- Establish trends for use of scientific evidence and political opinion on local, national, and global scale.



e.) Please use your article to complete the following:

Article Title: _____
 Source/Website: _____
 Author: _____
 Expression of Opinion Score: _____ /10
 Reference to Evidence/Data Score: _____ /10

Please explain why you assigned these scores:

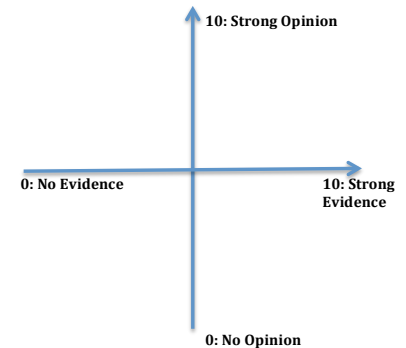


Part 2: Work Together

a.) Without sharing your scores with anyone else, please switch articles with some near you. Use the same procedures to analyze, evaluate, and score someone's article.

Article Title: _____
 Source/Website: _____
 Author: _____
 Expression of Opinion Score: _____ /10
 Reference to Evidence/Data Score: _____ /10

Please explain why you assigned these scores:



Part 3: Coming to Consensus

a.) Take a few moments to discuss with your partner the scores you each gave to both articles. Be sure to support your scores with proper reasoning.
 b.) Work with your partner to come to a consensus on your article's final score. Record it below.

Expression of Opinion Score: _____ /10 Reference to Evidence/Data Score: _____ /10

More Resources

Polar Educators International (PEI)

- Network promoting polar education and research to a global community.
- 500+ members @Facebook: Polar Educators International
- www.polareducator.org



Association of Polar Early Career Scientists (APECS)

- 4000+ up and coming scientists with strong commitment to education! Lots of events to take part in- Polar Week
- Cool Speakers List and local Alaskan polar scientists
- www.apecs.is



Thank You!

Questions? Comments?

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