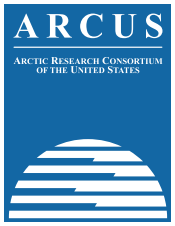
PolarTREC Public Science Report
Tina Ciarametaro
Shrinking Arctic IceCaps
Sukkertoppen, Greenland 2014

PolarTREC Expedition Page
http://www.polartrec.com/expeditions/shrinking-arctic-icecaps



This program is supported by the National Science Foundation under award 1345146. Any opinions, findings, and conclusions or recommendations expressed by this program are those of the PIs and coordinating team and do not necessarily reflect the views of the National Science Foundation.

Janet Warburton and Sarah Bartholow
Education Project Managers
Arctic Research Consortium of the US (ARCUS)
3535 College Rd. Suite 101
Fairbanks, AK 99709
(907) 474-1600
info@polartrec.com
www.polartrec.com

Why should a teacher go on a research expedition?

I believe a teacher should be a life longer learner. With modern technology and the growth of a global community, the field of science and our scientific understandings are changing constantly. I also believe that a teacher has the greatest impact with students if they model what they teach. It is one thing to discuss an article about glacial change, but another to share a personal experience hiking over the crevices created by glacial melt water.

The term research seems so foreign to most students confined to four walls. I believe that there are many misconceptions from students and the general population on how research is performed. Many students assume that research takes place in a lab, looking at test tubes. Very little, if any thought goes into how did the lab technician obtain the material that he/she is analyzing. Teachers are expected to model 'doing research' by performing inquiry based laboratory experiences within their classroom. It seems that if a teacher is doing inquiry based lessons, he/she is modeling how research is done. That assumption leads to misconceptions and treats research as simply having a curious idea. Participation in a research project provides first hand experiences of the complexities of research that can be brought back to the classroom and simulated for the students. One of the crucial lessons that can be emphasized is that lab work can be completed without field experience, but the ability to interpret the results is dependent on the actual field experience.

Research took place at remote locations in Greenland.

Teachers that choose to be part of field research are seeking out the opportunity to further their own understanding of the area of research. They are naturally going to ask probing questions and fully embrace the experience. Most teachers love to share new knowledge that they have gained and more likely than not; during and after the expedition, teachers will devote time to craft ways in which to share their experiences with larger community.

A teacher that is passionate about their material is more likely to stimulate curiosity about the material being presented. Students that are inquisitive about the material being presented are more likely to take educational risks and to formulate questions that foster life-long learners within them as well. Almost all of us can remember that one teacher that stimulated a curiosity that focused our own career paths.

Finally, teachers have the ability to communicate to the broader community about present day research that is taking place. Teachers have the tools necessary to help translate the scientific jargon into concepts that are easier to access by the general population. An educator on a research team can facilitate the dissemination of scientific findings in a variety of ways (curriculum, presentations, lectures, activities, media presentations). One would hope that these avenues could help educate the policy makers regarding the issues of the Arctic and the earth systems.

Description of Activities

There was never a question as to whether or not I was part of the research team. There were only five of us and in order to make sure we gathered as many samples as we could in such a short period of time we all had to fulfill our roles. Our team consisted of the main P.I. – Dr. Briner, his co-P.I. – Dr. Lifton, Ph.D. student – Avi Schweinsberg, Master's student – Alia Lesnek and I.

As it is with any new team, one must find the rhythm of the team. The first few days I worked on whatever needed to be accomplished: moving gear, setting up camp, recording data, 'captaining' the zodiac and/or communicating my experience to PolarTREC. I found myself gravitating to activities where my skills could streamline the process. I did not want my inexperience in field research to hinder the expedition in any way. My role on the team was not to improve my personal field experience; my role was to absorb the science, facilitate the team and to embrace the opportunity.

Tina tackles ommunications in the field.

For the first week of the expedition, I tried to grasp as much of the science as possible, actively listening to the decision making sessions, capturing the essence of field research, brainstorming ways to bring the experience back to the classroom and supporting data collection.

However, my role on the team changed significantly when our Ph.D. student had to leave unexpectedly on the seventh day. In addition to fulfilling the tasks that I already assumed, I now absorbed Avi's camp role – helping with meals, mapping lakes and taking lake sediment cores on days when we could not hike, utilizing my very raw understanding vegetation sample collection and owning the task. The success of this role depended on my ability to absorb and process my new scientific understandings immediately; and that was a challenge I gladly embraced.

For the remainder of the field research, I stopped recording in my field journal the raw data. Jason had assumed that role to aid Avi's research and he had Alia working on her field research note taking. I continued to work on mapping glacial lakes, obtaining lake sediment cores, marking the GPS coordinates for all locations, and collecting dead vegetation and erratic samples.

How are you going to link this back to your classroom? Refer to the classroom strategy and needs assessment.

My experience has been actively part of my classroom while I was on the expedition. My students that I will have in the fall of 2014 had a summer assignment in which they had to research PolarTREC's goals, Dr. Briner's research and post two blog questions to me while I was in the field.

When I return to the classroom, I envision my experience unfolding throughout the year depending on the topic being addressed (i.e. tools scientists use, observation/inferences, a scientific notebook, designing and planning an experiment, team roles for experiments, proxy data, GPS mapping, Google Earth's role in scientific research, impacts of a changing climate, erosional factors, sea level rise and a coastal community)

The following are ideas/concepts with projected timelines for final implementation.

1. Create a board game for elementary students featuring natural Greenland and Greenlandic people - Summer 2015

2. Create a sediment core simulation utilizing materials that simulate sediments, fossils, varves The goal of this simulation is that the activity could be utilized by an elementary teacher as well as a high school teacher depending on the depth of the discussion. – Fall 2015


Tina participated fully in field work.

3. Create a middle school/high school radioactive decay lesson that simulates how erratics are dated - Fall 2015

4. Google Earth lesson: Students access a KMZ file that contains images of the glaciers we visited in the field. The file contains images taken in 2012 as well as overlays from maps produced in 1950. Utilizing the area tool, students calculate the area of the glaciers for both past and present and determine the percentage of change for the glaciers. – January 30, 2015

5. Students hosting a community viewing of Taking Earth's Temperature (featuring Dr. Briner's research) w/follow up discussion with Dr. Jason Briner – January 30, 2015

6. Student/researcher podcasts: Students develop ongoing research questions and utilize researchers to bounce ideas off of – researchers record their answers via podcasts – Spring 2015

7. Research Question: **What can the mud tell us about the history of Ipswich?**
   Students will eventually spend four days in canoes taking sediment cores down the Ipswich River; a year-long research project examining watersheds, endangered species, understanding types of sediments, forces that cause sediments to move, the dynamics of a river/velocity at different sites; how do you gather data, where do you gather data, building sediment cores, etc. This is a multi-year project in which future grades will continue to add data to the project.

   Projected timeline:
   - Present: students have begun to study Blanding's turtles and will research whales spring

2015
- Winter 2015: students will build sediment core devices; explore forces of erosion (including glaciers)
- Spring 2015: students will practice with sediment core devices in marsh behind school
- Fall 2015: students on the river for 4 days collecting data
- Winter 2016: students creating watershed map of area of river they collected data from

8. Research Question: **How do the melting glaciers of Greenland impact Ipswich?** (measuring rate of change of Greenland's ice sheet, sea level change, mapping changes to Ipswich if the sea level rose by different increments, climate change, examining Labrador Current and impact of cold fresh water from glaciers, etc.)

   Projected timeline: 2015-2016
   - School / Community visits: ongoing

From your needs assessment, what are three to five things you expected to learn from your experience? Did you learn them? Why or why not?

I expect to gain a better understanding of…

1. "the decision making process as to where/what type of data will provide the most evidence for the research question/problem."

This was such an eye opener for me. Prior to the expedition, I was completely naïve as to how Dr. Briner chose where to collect samples or where we should set up base camp. I was captivated by the constant discussions between the researchers trying to read the natural landscape. Dr. Briner, Dr. Lifton and Ph.D. student, Avi Schweinsberg, would make inferences as to how they believed the glaciers had moved in the past. As we walked over and through the moraines, either their inferences became more solidified or their questions expanded. On our last hike, we were abundantly rewarded with erratic samples based on Dr. Briner's and Dr. Lifton's read of the area. I was envious of their ability to analyze this foreign landscape and their knowledge of how the process of change had occurred. I was rewarded much later when I was camping in Acadia National Park in October. We were hiking around Jordan Pond, a body of water formed by glaciers long ago. As I was walking on a path I had walked numerous times before, I found myself reading the landscape from a different perspective and sharing the information with fellow hikers.

Dr. Briner had forwarded me a KMZ file of tentative sample sites for vegetation collection. I learned firsthand that these sites were selected based on the appearance of the nanutaks on Google Earth. As we hovered over the potential sites in the helicopter, I began to develop an understanding of the flow of glaciers on a nanutak and the possibility of vegetation samples. It became a personal challenge of mine to predict whether or not we would find vegetation samples and it was gratifying that I was beginning to read the landscape.

I spent a great deal of time with Dr. Briner mapping glacial lakes and determining where

we should collect sediment cores. We evaluated the depth of the lakes, the surrounding land and the flow of water in and out of the system as well as where would be the best sample. Dr. Briner is a natural teacher in the field; he does not take the lead, but instead greets questions with questions and allowed me to discover understandings by trial and error. The task of taking a sediment core from a Greenland lake is a frigid, exhausting experience. I learned quickly how to read the lake so as to conserve our energy (both physical and thermal). Even though obtaining a lake sediment core is physically and mentally exhausting, the end result is so authentically gratifying.

2. "*the science involved in dating vegetation utilizing UV exposure and sediment core techniques-proxy data*"

I spent a great deal of time probing Dr. Lifton's expertise in radiocarbon dating. I explained to him that it is a difficult concept to explain to 8th graders that have limited chemistry and yet the science is crucial to the understanding of proxy data. Dr. Lifton took the time to brainstorm possible ways to demonstrate how to model radioactive dating with students. He helped me conceptually develop a demonstration that would allow students to visually see the sub particles traveling through the air that impacts the decay of atoms in the erratics we sampled.

I joined this team with a fundamental understanding of core samples as proxy data. However, my understandings were more focused on ice cores, rather than sediment cores and how to read the core once it was delivered to the lab. I had no working knowledge of how a scientist determined where the core sample should be extracted from. To be in the field and to determine the extraction site has become a priceless lesson for me. When my students take sediment cores from our school property and along the river that flows through our town, I will be able to facilitate their decisions.

3. "*the challenges that must be overcome in researching in remote locations*"

This expedition has been one of the most profound experiences that I have ever faced and it is due in part to the challenges we faced daily. Some challenges that were familiar to me included those that arose from tent camping in remote areas. The challenges that I would like to incorporate in my classroom include team dynamics, financial choices, developing contingency plans and technology challenges. I would like to help students become educational risk takers and confident problem solvers so that they eventually seek out and embrace challenges that are presented to them.

PolarTREC Teacher Tina Ciarametaro

From your needs assessment, what are three to five things concepts you would like to teach "better", or differently? How does this impact your students?

1. "I would like to provide more research projects that are student driven"

I believe that this has been addressed this year within my conservation of matter unit. Students have been provided the tools necessary to explore the impacts of their choices/ actions on the atmospheric levels of carbon dioxide. I also believe that this will further be addressed with the two community research questions, "What can the mud tell us about the history of Ipswich?" and "How can the melting glaciers if Greenland impact Ipswich?"

2. *"In any one unit, I would like to have a variety of projects being explored that meet the needs of the individual students but at the end of the unit, each project addresses the same common understandings/benchmarks"*

This concept is a long term project that will continue to grow as students are allowed to explore their own research questions. I believe that I will initially address this idea this spring with the researcher podcast project. Students will be encouraged to develop their own research questions and access researchers as mentors. Researchers will share their responses, ideas, etc. via podcasts that students can access throughout their research project.

3. *"I would like to provide more real-time data for students to access in their research projects to enable students to understand the importance of supporting ideas with actual evidence."*

I believe that I have begun to provide this real time data. As the data from the vegetation samples becomes available, Dr. Briner shares the files with me. Students have begun to utilize Google Earth as an analytical tool to interpret the results. We have future plans to develop lessons based on the sediment core data once the cores have been analyzed in the lab.

From your outreach plan, are there any activities that you will pursue, post-expedition that the public should know about? Other ideas on how you'll share this experience with the public and/or your peers?

I have begun to share my experiences with the larger community. To date (February 2015), I have given a community presentation, attended a local Rotary Club meeting, presented to the local school committee and I have been interviewed by a Boston television network. I have had three different newspaper articles written about the experience as well. I held a community viewing of the documentary, Taking Earth's Temperature, Delving Into Earth's Past (Dr. Briner's research was featured in the documentary). I was so fortunate that Dr. Briner was able to attend the community viewing and we were able to hold a Q & A forum following the documentary. I have contacted the local Audubon Society to develop a presentation and a future workshop. I am in the process of scheduling school visits in and around the North Shore/

Boston area. I have been contacted by the Ipswich Sustainable Educational Committee to attend their next meeting and I am in the process of completing an application that would allow me to present to the Adirondack Council and the Museum of Science. Finally, our team has committed to a long term partnership that will continue to nurture and foster the dissemination of the research occurring in the Arctic.

Flier from local community event organized by PolarTREC teacher Tina Ciarametaro with special guest, her PolarTREC researcher, Dr. Jason Briner.