



CANDAC OUTREACH 2011

Student-Researchers Atmospheric Collaboration

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Introduction

Outreach Program Goals:

1. Provide students with the opportunity to collect scientific data on their local environment with a focus on the atmosphere.
2. Allow students to share their ideas and collaborate with other students and scientists through the Internet and telecommunications.
3. Promote dialogue about and understanding of atmospheric science and its contributions to global environmental issues.

Program Participants:

1. Qarmartalik School (Resolute Bay, NU)
2. Pickering College (Newmarket, ON)

The Canadian Network for the Detection of Atmospheric Change (CANDAC) is a group of university researchers who strive to improve the state of observational atmosphere research and education in Canada. Our team has been measuring the Arctic atmosphere from the Polar Environment Atmospheric Research Laboratory (PEARL), located in Eureka, Nunavut, since 2005. CANDAC researchers have teamed up with students and staff at Pickering College in Newmarket, Ontario and Qarmartalik School in Resolute Bay, Nunavut to launch a new project that encourages young people to become active researchers who monitor atmospheric conditions using scientific instruments at their school. Researchers and students worked together to gather, compare, and analyze data to better understand the current state of the Earth's atmosphere. The CANDAC outreach program provides students and researchers with the opportunity to meet and then engage in relevant atmospheric science education. Our outreach team aims to help students make connections between the science curriculum they are learning and the research being conducted at PEARL and across Canada, and to gain an understanding of its relevance to their society and their environment. Hands-on activities, interactive demonstrations, and thought-provoking presentations have been effective modes for engaging students in a range of grades.

Similarly to CANDAC scientists, students monitored the atmosphere using scientific instruments. Temperature and wind were measured using a thermometer and anemometer. They made daily weather reports using both qualitative and quantitative observations. Their observations included: wind speed, cloudiness, perceived temperature and actual temperature. Students were then able to compare their observations with those made by the Environment Canada weather station in their community. A pyranometer views the sky from horizon to horizon and measures all of the sunlight (solar radiation) falling on it; in other words, it measures the amount of sunlight that a specific location on Earth is receiving. Students used the pyranometer to collect and analyze solar radiation, and then compared their results to those collected by CANDAC scientists. Scientists use long-term pyranometer measurements to study climate change. A sun photometer measures the intensity of direct sunlight over a narrow range of wavelengths. It allows scientists to calculate aerosol optical thickness, thus determining the amount of aerosol contaminants in the atmosphere. Aerosols are important to atmospheric scientists because they can have negative effects on human health and the ozone layer. Interestingly, aerosols also play a role in mitigating the warming effects of greenhouse gases. Students gathered measurements using the sun photometer and then compare their results to CANDAC CIMEL sun photometer data and MODIS satellite imagery.

A major portion of science education focuses on the impacts that science and technology have on society and the environment. This project provided an ideal opportunity for students to explore global environmental concerns while utilizing the expertise of scientists in the field. To conclude the project, the group of CANDAC scientists helped students graph and analyze their data to reveal the changes over time.

Analysis

Successful Areas:

- Discussing the importance of taking measurements of the atmosphere and its relevant relation to environmental research
- Allowing students to relate to CANDAC scientists and realize that anyone can be a scientist
- Using instruments that were hands-on, requiring students to learn and practice specific skills, which enabled them to feel responsible and learn something useful
- Properly handling delicate instruments, collecting and recording data; learning the importance of being consistent and accurate while making measurements, using equations to calculate values, etc.
- Creating PowerPoint presentations and discussions about the variables being measured (aerosols and their effect on climate)
- Involving the whole class/school in the project (encouraged sense of community)
- Graphing/presenting their data at the end of the project
- Discussing data, recognizing differences between their data and data collected by CANDAC in Toronto and Pickering College in Newmarket
- Having the Outreach Facilitator available to answer questions/trouble-shoot etc, was important to support the teachers' efforts by proxy
- The teachers were active and encouraged students to take measurements daily, accommodating the short (7 weeks) time period allocated for gathering data
- Individual students took leadership roles and kept other students interested and actively participating

Areas of Potential Improvement:

- Internet connection was an obstacle throughout the project
- Online database allowed teachers/students to input and view data, but slow internet connectivity made this time-consuming and difficult
- Stressing the importance of having up-to-date, accessible data because it allows students to track changes and make accurate comparisons
- Create a more appealing website to younger students by including graphics/visuals
- More time to train students with instruments (specifically the sun photometer)
- Sun photometer needs clear sky conditions
- Cold weather makes it difficult at times to go outside and collect data
- Communication between students in Resolute Bay and Newmarket did not exist beyond the project blog
- Would have been ideal to have students see each other and know that other students were also making measurements
- Setting specific dates for communication/meetings before the project begins so that teachers can consider these while planning
- More time for data analysis would be useful to help demonstrate the links between atmospheric studies and environmental problems

Graphical Results



Figure 1 – Temperature Graphs (K-3)



Figure 2 – Artwork (K-3)



Figure 3 – Temperature Graphs (K-3)



Figure 4 – Temperature and Anemometer (Gr. 4-5)



Figure 5 – Temperature and Anemometer (Gr. 4-5)



Figure 6 – Pyranometer (Gr. 6-7)



Figure 7 – Sun Photometer graphs (Gr. 8-12)

History of Resolute Bay

"The hamlet of Resolute Bay (in Inuktitut "Qausuittuq" which literally means "place with no dawn") got its start in 1953 as part of the High Arctic relocation. Efforts to assert sovereignty in the High Arctic during the Cold War led the Government of Canada to forcibly relocate Inuit in 1953 and 1955 from Inukjuak (northern Quebec) and Pond Inlet (of Baffin Island, NWT prior to the creation of Nunavut) to Resolute Bay. They were promised homes and game to hunt, but the relocated people discovered no buildings and very little familiar wildlife. They endured weeks of 24-hour darkness during the winter and 24-hour sunlight during the summer, something that did not occur in their former communities. They were told that they would be returned home after two years if they wished, but this offer was later withdrawn as it would have damaged Canada's claims to sovereignty in the area and the Inuit were forced to stay."

"The second northernmost community in Canada, Resolute Bay is located in the High Arctic on the south coast of Cornwallis Island. The gateway to the High Arctic, Resolute Bay is the major stopover for expeditions to the North Pole and to Quttinirtaaq (Ellesmere Island) National Park, and a base for scientific research.

"The site was a critical junction along the Northwest Passage, the famed route to Asia sought by European explorers in the 18th and 19th centuries. The hamlet is named after the HMS Resolute, a British ship that was in search of the lost Franklin expedition." Department of Tourism. (n.d.). *The Hamlet of Resolute Bay*.

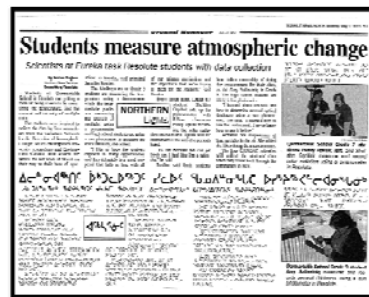


Figure 8 – Article from Nunavut News North, May 2, 2011

Inuit Qaujimaqatqangit

"Inuit Qaujimaqatqangit is traditional Inuit Knowledge. Inuit societal values are particularly relevant to the way their Government delivers its programs and services. Words of advice have often come from the elders who learned these values from their elders before them.

Pijitsirarniq: Concept of Serving

Aajiqatqanginiq: Consensus–Decision Making

Pilimmaksarniq: Concept of Skills and Knowledge Acquisition

Qanuqtuurungarniq: Concept of Being Resourceful to Solve Problems

Avatimik Kamattiarniq: Concept of Environmental Stewardship

Piliriqatqanginiq: Concept of Collaborative Relationship or Working Together for a Common Purpose"

Department of Human Resources. (n.d.). *Welcome Government of Nunavut*. Retrieved from www.gov.nu.ca/hr/site/beliefsystem.htm

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