

Data Management Plan:

Purpose of Project

The purpose of this project is to engage high school students via hands-on and web-based experiences in atmospheric and geoscience research in the Arctic and in local environments to enhance climate literacy and understanding of earth dynamics. There are two overarching objectives for this project: First, to support climate literacy in high school students, specifically the concept of energy exchange between the Earth, atmosphere, and space; and second, to serve as an education and outreach mechanism for research projects that extends the ability to communicate important research to a broad audience. The project goal is to establish a robust model of education and outreach for remote science research that is scalable, accessible, and capable of engaging students, teachers, and content experts throughout the world. Over the course of the proposed three-week summer program experience, students will conduct scientific inquiry associated with *place* that then supports a more focused science content exploration. Academic year activities will include an Arctic Research Design competition for high school students to propose a project for implementation in Greenland during the following summer campaign. It is approximated that 80 students per year will participate in the hybrid learning environments as part of this project at multiple locations in Greenland, Denmark and the US. Anticipated products are: a web environment for students, teachers, parents/guardians and content experts to collaborate and interact; a model for education and outreach for remote scientific research; educational research on the development of science identity and agency; research on the usability and utility of the web environment for enacting AL framework principles; and assessment of student understanding of the nature of science and climate literacy.

Data Management

Types of Data Produced

A mixed-methods design will be utilized to collect diverse types of data and present a comprehensive report of the project impact. These data will be used to evaluate three main components of the project: 1) the impact of the AL approach on student climate literacy; 2) the impact of the AL approach on student engagement; and 3) the usability and utility of the AL approach for effective education and outreach for remote scientific research. Evaluation of impact will focus on the short-term outcomes.

Three forms of data collection will be used to evaluate the impact of the program. The first will involve pre/post surveys administered to student participants prior to and following the expedition activities. The surveys will assess knowledge of atmospheric science and scientific inquiry, interest and skills in cyber technology, perceptions and opinions regarding climate change issues, and perceptions of the program itself. Statistical analyses will be conducted with these quantitative data to determine change in student responses (i.e. change in knowledge and perception/opinion, over time).

The second form of data collection will be based on brief, weekly formative assessments embedded within the curriculum. The formative assessments will assess student understanding of the material being taught. Results will be used to inform instruction and address gaps in student understanding. Trail reports will also provide supplemental formative information. Each day, students will complete a trail report that elicits specific reflections on their experience. Upon completion each day, the project leaders will review the student trail reports prior to web publishing. Student preconceptions about climate science will be addressed in future instruction.

Finally, the third form of data collection will be based on semi-structured interviews. Interviews will be conducted with student groups in Kangerlussuaq, Greenland, McCall and Moscow, Idaho, and Nederland, Colorado directly following their expedition experiences. Semi-structured interviews will also be conducted with participating teachers. Supplemental information regarding program impact will also be gathered indirectly through artifacts and notes from the expeditions, tracking of website usage (past expeditions suggest that website traffic may reach 10,000 visits over the course of the three-week

expedition), trail report documents, and field notes of observations of students during the expedition. The field notes will be enhanced in a reflexive journal kept by PIs onsite. All qualitative data will be analyzed using constant comparative methods (Glaser and Strauss, 1967) to determine trends related to the evaluation questions. The Institutional Review Board approval process for Human Subjects has been completed for the scope of work outlined above.

Data Dissemination

Results from data collection and analysis for this project will be published by the fall/winter each year following summer campaigns. This timeframe is consistent with typical turn around on manuscripts submitted to peer reviewed journals. The plan is for writing to begin in the fall of 2013. Data will be continuously analyzed with manuscripts being submitted shortly thereafter allowing approximately six months for review by the specified journal. Data will be made publicly available within six months of publication. Dissemination efforts will include presentations at professional conferences such as the *American Education Research Association* annual meeting and/or the *American Geophysical Union* annual fall meeting.

Plans for Archiving and Preservation

PI _____ and co-PI _____ will manage data generated from the AL@Greenland project. Data will be collected through a variety of mechanisms. First, data that are directly collected by the external evaluator, senior personnel, and JSEP Scholars will be compiled and secured through local machines that are password protected with redundant backups. For hard copies of materials, identifying information will be stripped from data used for dissemination purposes. Data with identifying information will be secured under lock and key within offices of the PI.

As data is prepared for public release it will be archived with the Northwest Knowledge Network (NKN). NKN is a collaborative effort between UI's Research Office, Library, and Information Technology Services, Idaho National Laboratory, and Idaho EPSCoR project. The mission of the NKN is to: (1) Make research data more accessible, comprehensible, usable, and secure for data providers and data users; (2) Facilitate data usage across the disciplines by promoting commonly accepted policies, standards, and protocols; (3) Facilitate the application of modeling, mining, simulation and visualization tools; and (4) Supply data and computing services that are adaptive to changing data storage and management needs. NKN is a union of cyberinfrastructure (CI) research, a research data service center, and data sharing. The data-sharing cooperative helps provide increased access to data as well as ensures data persistence. The research data service center provides infrastructure (e.g., hardware, software, services, and staff) to help researchers manage and use data throughout its lifecycle. All data will be entered into the NKN repositories within one year of the conclusion of the project and will be in the standard formats for each repository.