Final Evaluation Report

SageFox Consulting Group

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A. Overview

This final evaluation report provides an overview of evaluation activities of the International Polar Year (IPY) STEM Polar Connections project of UMass STEM Ed Institute conducted from 2008-2011. This report will also provide findings of the current year (2010-11) within the context of the overall project evaluation. SageFox Consulting Group, under Executive Director Alan Peterfreund, continued evaluation efforts begun under the previous evaluation sub-contractor Peterfreund Associates. SageFox fills its primary evaluation role in the collection of formative and summative data regarding the quality of the teachers’ professional development experiences and documentation of attitudinal responses regarding outcomes.

The report is organized in three major sections. The Overview section provides summary of the project, goals, and evaluation activities. The second section provides a summative evaluation of the project over three years of evaluation activities. The third section focuses on the evaluation activities and findings from the 2010-2011 project year.

1. Project Overview

As described in the original proposal, IPY STEM Polar Connections is an effort of professional development staff of the STEM Ed Institute, and UMass faculty and graduate student researchers, to promote the teaching of polar science in the New England, Mid-Atlantic, and Great Lakes Regions. Polar Connections is a curriculum development and professional development program that includes residential summer institutes at UMass and academic year online communication for teachers involved in the professional development of colleagues. During summer institutes, teachers are introduced to scientific research and knowledge about Polar Regions, processes of scientific inquiry, and curriculum modules for the classroom that address K-12 standards. Participants are predominantly from middle and high schools, however, and the project is geared toward secondary level. Participants explore techniques for effective inquiry-based teaching and formative assessments of student learning. Summer institutes aim to advance the teacher content knowledge of Polar Regions so that they can effectively implement and adapt curriculum modules for classroom use and dissemination to broader STEM teacher audiences at local, regional and national levels.
2. Project Goals

Project goals of the Polar Connections project articulated in the original proposal are to:

a. Develop Polar Connections Modules that effectively integrate the study of the physical environment and ecosystems of Polar Regions into the curriculum of STEM programs in middle and high schools.

b. Support the effort of STEM educators to enrich the process of meeting specific local, state, and national learning standards through the implementation of the Polar Connections Modules.

c. Provide opportunities for middle and high school students to participate in a scientific inquiry process that results in an understanding of the interrelationships of the physical environments and ecosystems of different regions.

d. Accommodate instructional strategies designed to meet the wide range of educational needs of middle and high school students and of underserved populations of students.

e. Advance the knowledge of the physical environment and ecosystems of Polar Regions among middle and high school STEM educators.

f. Utilize the evaluation of the field testing of Polar Connections Modules to develop a program of dissemination of the Polar Connections Modules.

g. Disseminate the Polar Connections Modules at the local, state, regional, and national level.

Overall progress toward these goals is addressed in the second and third sections of this report that provide summative analysis of the project.

3. Overview of Evaluation

Evaluation activities at the outset of the project in 2007 consisted mainly of participation in planning meetings during these development phases leading to the first summer institute in 2008. As such, the Project Years 1-3 are described in this report according to summer institute cohorts and their participation over the subsequent academic year. Annual evaluation activities since 2008 have focused on evaluation of the IPY Polar Connections Summer Institutes through pre-/post-institute teacher surveys, teacher focus groups, feedback surveys for occasional weekend seminars, and a teacher follow-up survey in the spring. Teacher pre-/post-institute surveys, along with the focus groups conducted at the summer institute, aimed to gather participant expectations and experiences at the summer institute in relation to content and pedagogy, relevance to classroom context, and anticipated integration of ideas in the coming school year. The follow-up survey administered at the end of the school year asked teachers to reflect again on the usefulness of the institute curriculum and how they have been able to apply new content knowledge, instructional materials and classroom strategies.

This annual evaluation cycle was followed for three cohorts from summer institutes 2008 (N=32), 2009 (N=30), and 2010 (N=33). The response rates for major evaluation activities are outlined below. Of note is the increase overall in response rate in Year 3 for all major evaluation
activities (Table 1). This is significant in contextualizing the Year 3 findings presented in this report as a culminating effort of the Polar Connections project.

### Table 1. Overview of Evaluation Activities & Response Rates

<table>
<thead>
<tr>
<th>Project Year</th>
<th>Academic Year</th>
<th>Participants (N=#)</th>
<th>Post-Institute Surveys</th>
<th>Teacher Focus Groups</th>
<th>Teacher Follow-Up Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>2008-2009</td>
<td>32</td>
<td>73%</td>
<td>35%</td>
<td>25%</td>
</tr>
<tr>
<td>Year 2</td>
<td>2009-2010</td>
<td>30</td>
<td>71%</td>
<td>43%</td>
<td>63%</td>
</tr>
<tr>
<td>Year 3</td>
<td>2010-2011</td>
<td>33</td>
<td>90%</td>
<td>50%</td>
<td>87%</td>
</tr>
</tbody>
</table>

### B. Project Evaluation Years 1-3

Results of evaluation activities across the IPY project are characterized by overwhelmingly consistent, positive feedback from the different stakeholders. The sections below provide a summary analysis of major project components of project leadership, summer institutes, follow-up & implementation, and dissemination.

**Project Leadership.** Evaluation evidences a strong leadership and coordinating role of the UMass STEM Ed Institute staff and their positive and successful collaboration with participating teachers. As reported since 2008, the IPY team has been successful with the recruitment of teachers and coordination of activities and program support across varied educational institutions of local schools and higher educations. This efficiency was the product of the experience and dedication of the project leadership, who have shown themselves very attentive to details of the program and to have strong and constant avenues of communication with all participants and members of the team, the result of years of developing relationships in the STEM in the local, state, regional and national contexts. UMass STEM Ed Institute has a large network of teacher alumni who attended multiple teacher professional development programs by STEM Ed Institute, or have recommended new participants.

**Summer Institutes.** There has been a consistently positive overall response to the summer institutes of the past three summers. Findings from post-institute surveys and focus groups have evidenced a strong institute curriculum that has new and relevant content knowledge, engaging presentations and activities, and relevant discussions on teacher pedagogy and curriculum. Moreover, teachers have generally commented that summer institute staff and instructors have been approachable, flexible, knowledgeable, and effective instructors. The important role of the instructors and the relationship with participants has been a key success in facilitating a hands-on, inquiry-based approach to teacher professional development that characterizes their Polar Connections.
The consistent outcomes of participation in summer institutes included the development of relationships with other teachers, enhanced knowledge about topics, new methods to introduce them to students, and inspiration to learn more. Some participants across the project were also interested in going to the Polar Regions themselves and many applied for programs (i.e. PolarTREC) for teachers to join polar research teams.

In terms of challenges to implementing new material in the classroom, attendees generally cited issues of time, funding and resources in their local school context. These are common structural issues that are inherent in schools and that challenge teachers in implementing or adapting new curriculum. Teachers often commented as well on the rigidity of their curriculum in needing to address state frameworks and adhere to demands for test preparation as a reason why follow-up was difficult.

**Follow-Up & Implementation.** Follow-up surveys administered in the spring semester following the summer institute explore teacher self-reporting on the impacts of participation in the Polar Connections program over the school year. The battery of survey items in the chart below summarize a broad view of teacher perceptions of program effectiveness in terms of content knowledge, activities, instruction, and professional community. Overall, these data show relative consistency of participant experience in the project and that their experiences were generally positive. Participants strongly rated the program a “success” each year, with an average of 4.67 out of 5 over three cohorts. A notable increase is in teacher responses to the sense of professional community that was developed through Polar Connections. Given the high response rate of 90% in Year 3, this increased sense of a professional network developed through the program is significant.

<table>
<thead>
<tr>
<th>Table 2. Follow-Up Survey: Teacher Responses Years 1-3</th>
<th>2010-11</th>
<th>2009-10</th>
<th>2008-09</th>
</tr>
</thead>
<tbody>
<tr>
<td>My confidence in teaching material related to climate and the Polar Regions has increased as a function of attending this institute.</td>
<td>4.7</td>
<td>4.5</td>
<td>4.8</td>
</tr>
<tr>
<td>I was better able to deal with student misconceptions as a result of this institute.</td>
<td>4.7</td>
<td>4.3</td>
<td>4.7</td>
</tr>
<tr>
<td>Overall, I felt this was a successful workshop.</td>
<td>4.7</td>
<td>4.7</td>
<td>4.6</td>
</tr>
<tr>
<td>Many topics introduced in the institute are easy to use with my grade level and subject.</td>
<td>4.3</td>
<td>4.2</td>
<td>4.5</td>
</tr>
<tr>
<td>I was able to use the provided activities/lab projects in my class.</td>
<td>4.3</td>
<td>4.4</td>
<td>4.1</td>
</tr>
<tr>
<td>I am more informed about a variety of instructional strategies as a result of this training.</td>
<td>4.4</td>
<td>4.0</td>
<td>4.1</td>
</tr>
<tr>
<td>I was able to maintain relationships with the workshop organizers and presenters.</td>
<td>4.0</td>
<td>4.2</td>
<td>4.0</td>
</tr>
<tr>
<td>I was able to maintain relationships with other teachers participating in the project.</td>
<td>4.0</td>
<td>3.5</td>
<td>3.3</td>
</tr>
</tbody>
</table>

*Scores are weighted average; 5 strongly agree to 1 strongly disagree*
Teacher-reported impacts of participating in Polar Connections have been positive over the project. In addition to the improvements to classroom instruction due to new content knowledge and instructional strategies, teachers have also recognized a general increase in their own awareness of climate issues in the news, local community, and their daily living. Many teachers shared that their increased consciousness has lead to small changes in their own behavior related to consumption, use and recycling.

Teacher-reported impacts on students were also consistent over the years. Teachers reported students having increased appreciation of polar issues and their relevance to real-world impacts on environment, wildlife, and people. They also reported that their students better understand the science behind climate change. Some teachers reported impacts on improved student performance, although insufficient and general responses to open-ended questions prevent any broader analysis.

**Dissemination.** Participants were active in disseminating new material from Polar Connections to the local, regional and national audiences engaged in STEM education. There was consistent reporting by teachers of sharing of ideas within their local school teams and often at district-level professional development events. Examples include:

- Training for middle school teachers in the Atlantic City School District
- National Science Teachers Association (NSTA) National Meeting
- Massachusetts Association of Science Teachers Conference
- Astrobiology Laboratory Institute for Instructors
- Washington Science Teachers Association conference
- NJ Science Teachers Convention

**C. Year 3 Evaluation Activities 2010-2011**

1. **Overview of Year 3 Evaluation**

This section provides an overview of evaluation activities conducted for 2010-2011 for the UMass STEM Ed International Polar Year (IPY) teacher development program, Polar Connections. The major evaluation activities for the IPY program included (1) a focus group with 2010 Summer Institute participants, (2) an on-line Post-Institute Survey, (3) and an on-line follow up survey for participating teachers in the spring 2011. In addition, evaluators participated in project meetings throughout the year which provides contextual understanding for evaluation activities, data analysis and reporting. This report integrates results from these evaluation reports to offer a broader analysis of IPY activities during the 2010-2011 school year. Details of these activities are outlined below, followed by an overview of the major findings of each activity.
a. **IPY 2010 Summer Institute Focus Group (July 2010)**

SageFox Consulting Group conducted a voluntary focus group discussion on July 16, 2010, during the fifth and last day of the Polar Connections Institute hosted by the UMass Amherst STEM Institute. Fifteen out of 30 institute participants (50%) participated in a focus group discussion about the overall experiences during the week. Participants included eight high school science teachers with varied loads of Physics, Chemistry, Biology, and Environmental Science. There were five middle school teachers, which included one teacher that taught technology and one teacher that taught science, math, and technology. Two of the participants were involved in teacher training, one working as a K-12 administrator and another doing outreach to schools from community college.

b. **IPY 2010 Post-Institute Survey (October-November 2010)**

SageFox Consulting Group conducted a survey in October and November 2010 of teachers participating in the UMass STEM 2010 International Polar Year (IPY) Summer Institute held from July 12 – 16, 2010 at the UMass Amherst campus. The goals of the survey were to get feedback from participating teachers on improvements in their content knowledge, new teaching strategies relevant to core curricula, and anticipated impacts on their classroom teaching. The survey was posted on-line and an email invitation to complete the survey was sent to participating IPY teachers. Two subsequent survey reminders were sent to participants. There were 27 responses out of 30 possible respondents, a response rate of 90%.

c. **IPY 2009 Teacher Follow-Up Survey (May-June 2011)**

SageFox Consulting Group conducted a survey in May and June 2011 of teachers participating in the UMass STEM International Polar Year program for the 2010–11 academic year. The goals of the survey were to get feedback from participating teachers on the impacts their participation had on their classroom teaching, as well as on the subsequent dissemination efforts by the teachers participating in the 2009 IPY Summer Institute. The survey was posted on-line and an email invitation was sent to participating IPY teachers, followed by two subsequent reminders. There were 26 survey responses out of the 30 possible respondents, a response rate of 87%.

2. **Summary of Year 3 Key Findings**

a. **IPY 2010 Summer Institute Focus Group (July 2010)**

The overall response to the institute was overwhelmingly positive. Participants described the week overall as ‘great,’ ‘fantastic,’ and ‘excellent,’ and ‘an A+ for sure.’ Another participant expressed interest in the next IPY institute saying, “There’s definitely a place for a part two.” One teacher reflected that unlike most professional development seminars, ‘nobody left early.’
The themes of focus group responses are summarized below, followed by samples of participant comments.

**Presentation of Relevant Content in Climate Change.** The response of focus group participants to the content presentations was very positive. Relevant and useful content material on climate change was presented throughout the curriculum. The information was well presented by expert speakers and expanded teachers’ own scientific knowledge. Respondents described presentations as ‘excellent’ and ‘really, good.’ Teachers appreciated ‘getting the data’ on climate change and felt better prepared to present the arguments about climate change to their students. Many were pleased and surprised to hear the science and social implications that are global, and not just related to Polar Regions. There were also respondents who expected an overemphasis on the presentation of data, but were pleased to learn about important human aspects of climate science. The balance between the science and real-world implications provided teachers with ideas and approaches to discuss climate change with students in a way that will spark interest and investment in the topic.

- Usually you go to a workshop and you can pick out a couple of speakers that you could have done without, but I don’t know what they could have left at. You don’t usually want another day after a conference and we all want another day
- [The presenters are] good communicators, they’re able to give us the information and not talk above us, but bring us up to the place [of understanding], using excellent PowerPoints and visuals

**Pace & Sequence of Institute Curriculum.** Teachers were pleased with the overall institute curriculum and the choice of presentations offered given a limited amount of time and information that can be included. They felt that there was an effective balance between content and pedagogy. The sequence of activities and lectures was well planned and that the instructional pace was good. Respondents also felt that there was an effort made to address a diverse audience with differing degrees of background knowledge on climate change and Polar Regions. Speakers were conscientious of the participants’ learning process and periodically checking in to see if clarification of terminology or concepts was needed.

- Pacing was good and reflected an awareness of participants level of familiarity with discussion
- The pace of lecture and activity kept it lively.

**Engaging Activities.** All respondents affirmed strongly that the institute was designed around effective and engaging activities, with opportunities for hands-on learning with model experiments. Activities were well-integrated with the presentation of content material. Teachers felt that the activities offered pieces that could be adapted effectively to their specific classroom context. Teachers also appreciated that most of the materials utilized were inexpensive and
realistic for classroom implementation. Teachers also appreciated the time for discussion to
debrief activities.

- **Great assortment of activities; there isn’t anything that they did that i couldn’t start using
tomorrow**
- **The hands on stuff is good for middle graders and freshman in college; the freshmen, it
really helps them stay interested**

**Curriculum Connection.** Participants recognized direct connections to core K-12
subject matter and shared ideas about how to utilize activities in their classroom. There was
opportunity for participants to engage in discussion about the usefulness of institute content and
applications to their classroom contexts.

- **Institute provided useful resources for content and pedagogy in the form of articles,
power point presentations, web resources and links, and expert guest speakers.**
- **It would be great to look at something like this and seeing how many state standards we
can hit. It’s a standards based environment. How can we reach across grade levels?**

**Professional Networking.** Participants appreciated the opportunity for professional
networking that they gained at the institute. There was an appreciation of a lot of sharing with
other teachers over the week. One teacher expressed: “Social aspect gives me a way to talk to my
colleagues, a way to start the conversation.” One teacher who commuted to the institute did
express, however, that “I felt like I missed out on some of the interaction with other teachers as
[a] commuter.”

**Resources & Support of STEM Staff.** Respondents responded favorably about the
UMass STEM staff and they appreciated the professional resources available in supporting
teachers. Teachers felt encouraged about having access to online resources and the support of
STEM staff for future activities during the school year. Participants felt that the STEM team and
the professors were available to them:

- **We could get credit at the graduate level at a low cost, a wonderful incentive for people
who are studying; most schools don’t have in their curriculum.**
- **Generous with stipend.**

**b. 2010 Post-Institute Survey Report**

The response to the 2010 IPY Summer Institute was overwhelmingly positive. All
respondents agreed, with 93% agreeing strongly, that the institute was a success overall and was
well organized. Teachers described the IPY Summer Institute experience generally as
‘excellent’, ‘enjoyable, and ‘extremely informative’. They responded very positively that the
institute provided opportunity to build professional relationships, increase content knowledge,
and learn new strategies for classroom teaching. All teachers agreed that their confidence and commitment in teaching about polar issues had increased because of their participation. All teachers also felt that the activities presented were relevant to their grade level and applicable to their classroom contexts. Teachers also responded very positively, except for one neutral response, that the institute facilitation addressed varied learning styles. Teachers responded positively, although with less certainty of five neutral responses, that they learned varied instructional strategies. The following are examples of teacher responses to the institute:

- “Overall outstanding, the quality and knowledge of the presenters, the variety of material presented, organization - all were the best of any classes/workshops I have taken.”
- “This was a great location and everything was wonderful. I’d come back again and recommend it to others.”
- “The entire team is just exceptional. High-caliber science researchers and educators with outstanding people-skills. I hope everyone stays on for the next workshop.”

Teacher comments on major outcomes of their participation included improved understanding of polar concepts, new activities and strategies for teaching students, and networking opportunities with fellow teachers and polar researchers. Teachers anticipated reaching an average of 122 students each this year with these new ideas and activities.

**Increased content knowledge.** All teachers agreed, with 89% of teachers ‘strongly agreeing’, that the institute increased their knowledge of polar science and climate issues. All teachers reported ‘very good’ or ‘good’ understanding of the role of carbon dioxide, polar ice caps & sea level, and earth-sun relationships in climate change. All teachers except one reported a good understanding of how climate data is collected. Teachers were least confident in their understanding of polar flora and fauna. All teachers felt that they were better equipped to deal with student misconceptions about polar issues. All teachers reported an increased motivation to build their knowledge of polar science and climate change. One teacher intends to apply to a Teachers at Sea program as an outcome of participating in the program. Another teacher anticipates that polar issues will be a major focus of his/her doctoral research.

**Relevance to science curricula.** Teachers felt overall that the institute sessions provided content and activities that were relevant to their core science curricula. Sixty three percent of teachers ‘agreed strongly’ that the institute labs and activities were relevant to their classroom setting. As of the survey completion, nearly half (13) of the teachers had already utilized some activities in their classrooms.

**Response to institute sessions.** Teacher responses to individual institute sessions were very positive overall. Teachers rated each institute session in terms of how it (a) increased their content knowledge, and (b) offered activities that are easily integrated into the school curriculum. Teachers responded positively overall that all institute sessions were effective in increasing their content knowledge. Teachers were less confident, however, that the sessions
could be effectively integrated into their standard curriculum. The session that received the highest responses on both items (a) and (b) was the session on Ice Sheets, Permafrost and Sea Level. Also rated high on both items were sessions on Sea Ice, and Understanding the Polar Regions and Climate Change. The session that teachers found the least effective on both items (a) and (b) was Albedo and Angle of Incidence. Teachers also gave positive comments about the variety of activities introduced, although several teachers expressed frustration that there was not sufficient time to debrief the activities. One teacher gave very positive comments about the Hands-on Sampler session: “The hands-on sampler was the best thing I’ve ever done at a workshop -- very valuable.”

Potential barriers. Teachers were asked about potential barriers to utilizing institute curriculum in their classrooms. The majority of teacher responses (15) identified limited time as a barrier to implementing new activities in their classrooms. Other barriers included money/resources (3 comments) and challenges of the required curriculum (4 comments). Two teachers identified students’ lack of engagement and critical thinking as a major obstacle. Five teachers responded that there were no barriers to implementing institute activities in their curriculum.

Networking & Dissemination. Teachers felt that the experience of the institute and follow up activities provided good opportunities to make new contacts and share new ideas. Ninety three percent of teachers felt that the institute provided a good opportunity for building relationships with other teachers. Many teachers said that networking opportunities and building relationships with like-minded teachers were important outcomes of their participation. One teacher reported having already conducted three in-service workshops for teachers. Another teacher plans to present polar curricula and report on experiences at the Summer Institute at a statewide conference in February 2011.

Recommendations. Participants made recommendations for strengthening future summer institutes. The principal recommendation related to wanting more time to do activities, debrief activities, and discuss their implications for the classroom. One participant recommended more information on indigenous peoples. Another teacher expressed interest in more time to see the science buildings and research labs in order to become exposed to current research.

c. IPY 2009 Teacher Follow Up Survey (May-June 2010)

The participant response to the IPY Summer Institute was overwhelmingly positive. All participants agreed that the workshop was a success and that their confidence in teaching about polar issues had increased as result of the institute. With the exception of one neutral response, all participants felt better equipped to deal with student misconceptions related to content. Participants also agreed that they learned a variety of instructional strategies with the exception of two neutral responses. All but one respondent reported that activities/labs were appropriate for
their grade level and useable in their classroom. The majority of participants felt that they were able to maintain relationships with other teachers and the workshop presenters. Some exemplary teacher comments include:

- “This was an amazing training; excellent resources and staff. “
- “Thank you to the institute faculty. They seemed dedicated, knowledgeable, and very available.”
- “Thank you, thank you, thank you. It was the best professional development I ever had.”
- “This was indeed a life-changing workshop for me and my family. I hope to continue to convey the message to my students for years to come. Thank you to all of you.”

**Dissemination.** All but one teacher reported that they had disseminated their learning through formal and informal activities over the course of the school year. Participants reported an impressive range of dissemination efforts and varied contexts for sharing their learning about polar issues. These included sharing ideas and curriculum with school colleagues, conducting school staff development workshops, and facilitating district-level teacher training. Many respondents presented at district, county, state, and national professional conferences at state and national levels. There were several notable examples; see results section for further details. One teacher presented at a school event and subsequently organized a school STEM conference through grant money received from the National Girls Collaborative Project which is dedicated to advancing gender equity in STEM. Two participants collaborated on organizing a Climate Change Conference at a local college where high school and college students interacted around high school students’ research projects. As outcomes of their dissemination efforts, teachers gave varied reports of increased interest among teachers, students, and community members. One participant shared that two local TV networks covered their dissemination event. Several respondents reported other teachers have used materials in their classrooms.

**Impact on Teaching.** When asked about impact on their teaching, many teachers reported that they had incorporated more hands-on learning strategies in their curriculum. Many teachers reported using and adapting materials, labs and activities from the institute. They said that their increased awareness and knowledge of polar issues had helped them integrate more frequent discussion on climate change. Several mentioned that they taught with more enthusiasm around these topics. One teacher provided a powerful reflection:

- “The 4 R’s Climate Change conference was absolutely the pinnacle of the 15 year teaching career. I have never had students so engaged as this unit and final project.”
**Impact Outside of Teaching.** In terms of impact on teachers outside of teaching, participants were more aware of and importance of climate change and reducing one’s carbon footprint. Several mentioned an increased interest in following polar issues through current events, building community awareness, and educating people. Two teachers had also applied for IPY professional development opportunities; one of which participated in PolarTREC, and the other is committed to gaining such experience in polar regions. There were several comments related to important relationships fostered at the IPY Institute, which speaks to the broader importance of building personal and professional networks that strengthen commitments to education:

- “I have a better understanding of polar sciences, more confidence, and I met three of my closest friends there!”
- “I developed several continuing friendships with teachers and researchers. I have a much more favorable opinion of UMass Amherst.”
- “I made several connections with fellow participants. Two of us are attending a workshop together this summer.”

**Impact on Students.** In terms of the impacts on students, teachers reported that students had increased appreciation of polar issues and that their students better understand the science behind climate change. Teachers consistently commented on increased interest and confidence of students in discussing polar issues and climate change. One teacher reported “higher grades and achievement.” One teacher’s report on student impacts is notable; see survey results for further responses:

“Many students were skeptics and I know of no skeptics any more. Students prided themselves on being able to teach adults about a topic they knew so well. All 70 students presented at the conference (science fair style). Students have taken a keen interest in the class since this unit. Students are working harder since the unit. It has been an amazing transfiguration.”

**Institute Sessions.** Participants were asked to rate the specific sessions of the IPY institute in terms of how much the sessions (1) increased their content knowledge, and (2) the ease of integration of session topics into the school curriculum. Participants felt that the most effective sessions in terms of content knowledge and relevance to their school curricula were (in descending order):

- Understanding Polar Regions and Climate Change
- Ice Sheets, Permafrost and Sea Level
- Global Warming and Arctic Climate

Participants’ ratings of institute sessions for content knowledge and ease of integration into curriculum also showed the least effective sessions to be (in ascending order):

- Polar Literature
- Globe Walk
Albedo and Angle of Incidence

Challenges and Recommendations. Participants were asked to share any barriers to the full success of the institute and challenges for implementation of new learning in their school context. Teachers cited a general lack of time as well as inflexibility in their require core curricula. Some teachers questioned the appropriateness of the institute materials for their particular classroom and student situations. Additionally, some teachers felt overwhelmed by the sheer amount of new information. Allotting more time for teachers to digest and discuss the new material, particularly about classroom applications, was suggested by teachers as a way of alleviating the initial shock and overwhelm mentioned above. One teacher felt the reimbursement process was “complicated.” Another teacher would have liked to see more information about indigenous peoples of polar regions.

Teachers hope to enjoy the continued support of and regular contact with the scientists who presented at the institute. Nine respondents felt there were neither barriers nor challenges related to the full success of the IPY institute.