Summative Evaluation of

POLAR-PALOOZA!

for Geoff Haines-Stiles Productions, Inc.

Selinda Research Associates, Inc.

March 2010

ACKNOWLEDGMENTS

This evaluation would not have been possible without the efforts and cooperation of many individuals and institutions. We would like to thank all the museums, zoos, schools, and other collaborating organizations that willingly opened their doors and allowed us to sit in on their activities. We appreciate the support of the project PIs and Co-PIs, Geoff Haines-Stiles, Erna Akuginow, and Jayne Aubele and their commitment to ongoing refinement to help ensure the highest quality visitor experience.

We are deeply appreciative of the National Science Foundation's funding of this study and ISE's ongoing commitment to and support of visitor studies and research.

Finally, and most importantly, we thank each and every respondent for this study. We are unable to name you individually, but your willingness to give so generously of your time and to honestly share your experiences with us cannot be overstated.

Credits

This report was written by Deborah Perry and Eric Gyllenhaal of Selinda Research Associates, with input from Geoff Haines-Stiles and Erna Akuginow of Geoff Haines-Stiles Productions, and Jayne Aubele of the New Mexico Museum of Natural History and Science. All photos included in this report are courtesy of Selinda Research Associates with the exception of the following:

- pg. 22: photo courtesy of Geoff Haines-Stiles Productions
- pg. 55: photo courtesy of Geoff Haines-Stiles Productions

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EXECUTIVE SUMMARY

Introduction. POLAR-PALOOZA (PPZA) was a traveling informal science education program, developed and funded by the National Science Foundation (NSF) and NASA as part of the International Polar Year (IPY) and managed by Geoff Haines-Stiles Productions, Inc. (GHSP). PPZA was a collaborative venture that included a wide range of informal science institutions as partners. These partner organizations, such as natural history museums, science centers, and libraries, served as host sites for two- to three-day visits by groups of scientists and Alaska natives who conduct research in polar regions. These presenters — called *Travelers* — included a diverse group of geologists, glaciologists, biologists, wildlife researchers, and anthropologists who work for a variety of research institutions, including universities and NASA. Each team of Travelers was selected, in part, to represent the diversity of researchers working in polar regions, (when possible) including women, Alaska natives, people of color, and both young and more established researchers. The Travelers took time away from their research and teaching duties to participate in PPZA.

Program structure. The centerpiece of each PPZA program was a multimedia stage presentation — *Stories from a Changing Planet* (*SfaCP*) — featuring the Travelers talking about the poles and their own research. The Travelers stood in front of high-definition video projections of polar scenes, including scenes of them engaged in research and daily activities like cooking meals, traveling across snow and ice, and having fun on the job. Each presentation also incorporated authentic artifacts such as scientific instruments, polar clothing, and at some venues, an actual polar ice core. Each venue also included an array of outreach events that highlighted the Travelers and their work, such as university seminars and symposia, interviews with local media, educator workshops, presentations for school groups and for business and community leaders, and Family Days open to the public.

PPZA began its tour in fall 2007 and visited communities around the United States, from Florida to Alaska, New York to San Diego. The tour continued through spring 2009 and visited a total of 24 sites. The project also developed an interactive website with a public archive of video and audio footage of polar research, teacher resources, and additional information and links that can be accessed by educators, students, and others, as well as an archive of over 500 hours of high-definition video documentation of major IPY research projects in the Arctic and Antarctic.

Evaluation. An integral component of the PPZA project was a naturalistic evaluation guided by the research question: "In what ways and to what extent is POLAR-PALOOZA contributing to audiences' understandings of and excitement about polar science? How can what we learn about their experiences help inform the ongoing program development?" The evaluation was conducted in two phases: (a) a formative/remedial study to inform the ongoing development and evolution of the program, focused on the second part of the research question, and (b) a culminating summative evaluation to assess the ultimate effectiveness of the program at achieving its intended outcomes and engagements, and focusing on the first part of the question. This report deals exclusively with the summative evaluation.

The evaluation design included (a) first-hand observations of the program by a total of four researchers at four different venues: San Diego, Albuquerque, Raleigh, and Chicago; (b) telephone and face-to-face depth interviews; (c) a written survey for participants in the educator workshops; and (d) a review and analysis of existing documents such as summaries, communications, websites, and handouts. Although the major focus of the evaluation was the *SfaCP* stage presentations, evaluators also collected and analyzed data about the outreach events and other aspects of PPZA in order to gauge the overall effectiveness and impact of the project. Following is a brief summary of the main findings from this evaluation study.

Commitment to quality. The data indicated that the overall PPZA project was characterized by a solid commitment to producing a high-quality public product and a spirit of ongoing refinement and improvement. Each site visit was a whirlwind of activity for the Travelers and production crew, with every spare moment packed with planning meetings, orientation sessions, writing and rewriting presentations, and rehearsals. This was necessary because, particularly at the first few venues, some of the Travelers had never met one another before, each venue had a different assortment of Travelers, and each new grouping of Travelers had to hit the ground running. Between site visits, PPZA staff analyzed the results of earlier visits and planned improvements for the next round of programming.

PPZA Model. There were strong indications that the POLAR-PALOOZA model of using real scientists and Alaska natives as presenters worked very well for most PPZA audience members, whether they attended and participated in the *SfaCP* presentations, the educator workshops, and/or the outreach activities and events. Under the guidance of PPZA staff working with them both in advance and "on-the-fly," the Travelers' presentations and the multimedia framework of graphics and high-definition video formed an engaging and coherent whole for most respondents. The model of live scientists speaking in front of high-quality audio and video footage of them working in the field, worked extremely well for audiences comprised of adults, teachers, and highly motivated children. However, the data indicated that this model was less effective for families with younger children and for many large school groups.

***SfaCP* presentations**. Respondents overwhelming indicated they appreciated the high production value of the *SfaCP* video and audio. They also indicated they enjoyed seeing and hearing from real scientists, and especially seeing these scientists standing in front of video footage that featured them doing their research. When props — such as the ice core and polar clothing — and activities — such as the inserted quizzes and question-and-answer sessions — were an integral component of the *SfaCP* presentation, audience members' experiences were more interesting and memorable. However, for many audience members, the *SfaCP* presentations were too long.

After the formal *SfaCP* presentation. The group question-and-answer sessions at the conclusion of the *SfaCP* presentation were well received and served to extend and personalize audience members' experiences. During these Q & A sessions, the entire audience benefited from hearing other audience members' questions and comments.

Once the Q & A ended, many audience members gathered around the stage to ask the Travelers additional questions, touch the props, get "glossies" autographed, and/or to have their pictures taken with the scientists. When after-program tabletop discussions were included as part of the program, these extended visitors' experiences and provided important additional one-on-one

time with Travelers that was not always possible when crowds gathered around the stage. These one-on-one opportunities were highly valued social interactions, eliciting interesting and personalized conversations between scientists and audience members, both adults and children. Data indicated that one-on-one interactions with Travelers helped some children become more interested in polar science and supported other children who were considering careers in science.

***SfaCP* learning outcomes**. The data suggested that most audience members left the presentation with some new information and/or appreciation for polar research. There were indications however that the most powerful outcomes from *SfaCP* exceeded mere knowledge. Many audience members had powerful and memorable experiences, and there were indications that some young lives may have been changed in lasting ways. People were reminded of things they already knew but had forgotten, and they were encouraged to care and to make a difference. Having the opportunity to interact with real scientists talking about real research, and explore real artifacts and various accoutrements of polar science created lasting impressions and memories.

As is characteristic of much learning in informal settings, most of the knowledge gains discussed by interview respondents were either general understandings about the poles, their geology, or the animals that lived there, or idiosyncratic facts related to respondents' personal interests. Most people tended to see the program as either (a) an informational program about any of a variety of issues related to the poles and/or global warming, (b) a career program for children interested in science, or (c) a program about polar animals.

After participating in *SfaCP* or outreach events, some respondents expressed concern about the changes at the poles but felt relatively helpless. They asked for suggestions of things they could do and/or places they could go to find additional information. (Based on this early finding, PPZA staff later developed a handout that answered these questions.)

The family experience of PPZA. Ancillary events such as Family Days, were effective and important strategies for reaching family and other small groups with children, traditionally underserved audiences, and schoolchildren. The experiences of these audiences in particular were greatly enhanced when audience members engaged in concrete and personalized ways. Tabletop displays and activities — often staged by host museum staff but with participation of the Travelers — provided children and their adult companions with (a) the chance to interact with Travelers in an intimate and personalized setting; (b) important concrete experiences with the artifacts, including such activities as trying on polar coats and boots, drilling through ice, touching seal and caribou skins, etc.; and (c) the opportunity to engage with the content and concepts in a variety of ways, making them more memorable and the subjects of later discussion with family and friends. The concrete experiences with real things were crucial for younger members of the audience.

The educator experience. Teachers and other educators who participated in the educator workshops were enthusiastic about their experiences. Data indicated that they placed the most value on (a) new materials and activities they could use directly in their classrooms and (b) the opportunity to hear directly from, and speak with, the real polar researchers. There were strong indications from the data that many workshop participants intended to change something in their teaching based on their participation in the workshop.

The data indicated that, when educators participated in PPZA only by bringing their students to a large-group presentation, their experiences were less meaningful than the workshop participants' experiences. These teachers tended to see their role as exposing their students to a positive experience rather than as a learning or professional opportunity for themselves. In addition, most teachers who participated in this way were not aware of the wealth of online resources available to them. However, there was evidence that some of these teachers had students who followed up on their PPZA presentation in meaningful ways, such as doing a class project.

The student experience. Most students experienced PPZA as members of large groups attending *SfaCP*-derived presentations, either at their school, at some other off-site location (like a zoo or cultural center), or in the auditorium or theater of a host museum. Teachers often appreciated the opportunity to expose their students to outside speakers and sometimes followed up on the presentations in their classrooms.

Experiences of underserved audiences. PPZA staff and partner institutions reached out to traditionally underserved audiences in a variety of ways, including assembling diverse panels of Travelers at each venue, setting up events targeted at specific underserved communities, and even — after data collection for this evaluation study was completed — producing a rap-influenced music video. One important venue for reaching non-traditional audiences was the school group events, as these were often attended by large numbers of diverse and traditionally underserved audiences. Teachers of underserved students were particularly grateful that their students experienced an opportunity they would not otherwise have encountered, especially when the program came to their schools.

Partnerships and the collaborative experience. PPZA was an ambitious endeavor with wide-ranging goals, and it was clear that it worked best at partner institutions that embraced the collaborative working relationship. The ultimate effectiveness of PPZA for audience members was — at least to some degree — a function of the effectiveness of the collaborative relationships. At some venues, achieving this collaboration proved to be easier than at others.

Data indicated that partner institutions that hosted PPZA found this to be a good way to present their audiences with programming about the poles and global warming/climate change, something that many institutions wanted to do anyway. By hosting PPZA, achieving this educational goal became much more possible and this experience gave them the ability to execute it in a much larger way than they would have been able to otherwise.

Data indicated that the host institutions' experiences tended to be positive for the most part. Host staff respondents indicated that they received appropriate support and guidance from the PPZA staff and that the PPZA experience generally went smoothly. Many host staff however did not anticipate the intense time and resource commitment that PPZA would require. The marketing and promotion of PPZA was difficult for most sites, as was dealing with the facility and technology limitations of many outreach venues. The program appeared to operate most successfully in venues where the host institution had a solid history of presenting such events for its visiting public; hosts with less experience at presenting these types of events struggled more.

The Traveler experience. Data indicated that the PPZA experience for most of the Travelers was extremely positive, with the largest drawback being the amount of time required. However, for the most part this was easily offset by their strong desire to participate in PPZA and

contribute in a meaningful way to the furthering of the public understanding of science. The data indicated that there were numerous ways Travelers benefited from participating in PPZA, and that the program often contributed in unanticipated ways to their professional careers. Most Travelers appreciated expanding their tool kits and learning new ways to present and talk about their science. Participating in PPZA also gave the Travelers access to additional resources (for example, video clips and podcasts) to use later.

INTRODUCTION

Overview of the POLAR-PALOOZA Project

POLAR-PALOOZA (PPZA) was an International Polar Year education and outreach project funded by the National Science Foundation (NSF)— grant # 0632262 — and NASA and managed by Geoff Haines-Stiles Productions, Inc. (GHSP). PPZA was a collaborative venture that included a wide range of informal science institutions as partners. The partner organizations, such as natural history museums, science centers, and libraries, served as host sites for two- to three-day visits by groups of scientists who conduct research in polar regions. These scientists, referred to as "Travelers," included a diverse group of geologists, glaciologists, biologists, wildlife researchers, and anthropologists who work for a variety of research institutions, including universities and NASA. Each team of Travelers was selected, in part, to represent the diversity of researchers working in polar regions, (when possible) including women, Alaska natives, people of color, and both young and more established researchers.

POLAR-PALOOZA was a traveling informal science education program that included (a) a multimedia stage presentation — *Stories from a Changing Planet* (*SfaCP*) — featuring a diverse group of scientists who have been conducting research in polar regions and Alaska natives (the Travelers) giving in-person presentations accompanied by high-definition video and audio footage and (b) an extensive array of ancillary outreach events and activities, such as media interviews, educator workshops, school programming, Family Days, and presentations for business and community leaders, all planned by each individual host site. Two additional PPZA components were also developed, but these were not part of this evaluation: (c) an interactive website which includes an extensive public archive of video and audio footage of active and ongoing polar research, podcasts, blogs, teacher resources, and additional information and links that can be accessed for multiple uses by multiple audiences and (d) an archive of over 500 hours of high-definition video footage of polar research. For a more detailed description of the PPZA project, see Appendixes A, B, C and D.

At each venue, *SfaCP* intentionally included multiple presenters from the many disciplines involved in polar research, from studies of wildlife to climate change and exploration and adventure. From the beginning, POLAR-PALOOZA chose to include the participation of Native Alaskans who would be able to report on climate change in first-person ways with stories from America's only Arctic state.

SfaCP began its tour in fall 2007 in San Diego and made a series of two- to three-day visits to science centers and natural history museums in communities around the United States, from Alaska to Louisiana, California to North Carolina. The tour continued through spring 2009, with a weekend of final events in Baltimore, Maryland, and visited 24 communities.

Overview of the Evaluation

An integral component of the PPZA project was an extensive naturalistic evaluation planned and conducted by Selinda Research Associates, Inc. (SRA) in collaboration with GHSP. Data were

gathered from most host sites via survey and some telephone interviews. In addition, comprehensive site visits with multiple researchers, and including depth interviews and unobtrusive observations, were conducted at four of the venues.

The evaluation of PPZA was divided into two primary phases: (a) a formative/remedial study to collect data during the early development of the tour and provide feedback to the program developers so that they might use it to inform the ongoing development and evolution of the program, and (b) a culminating summative evaluation to assess the ultimate effectiveness of the program at achieving its intended outcomes and engagements.

The formative/remedial findings were shared with the project team throughout the first year of the project and are not the focus of this report. This report deals exclusively with the summative evaluation, which focused on the *SfaCP* presentation. As mentioned previously, this study does not include an evaluation of the wealth of materials on the website or the extensive archive of high-definition video. With a primary focus on the *SfaCP* presentation, the evaluation also looked at some of the accompanying outreach or ancillary activities, because there was often significant overlap among the various components. In particular, a considerable amount of data was collected on the educator workshops that were offered at most venues.

This report includes data from the program's first 12 months on the road, during which time PPZA visited 14 (out of a total of 24) primary venues.

DESIGN OF THE STUDY

Methodology

> A research method is a technique for (or way of proceeding in) gathering evidence…. A methodology is a theory and analysis of how research does or should proceed. (Harding, 1987, p. 2)

A naturalistic *methodology* was used for this study. Naturalistic inquiry is a rigorous and systematic approach for collecting and analyzing data in real-life settings. The goal of naturalistic methodology is to provide a holistic understanding of participants' experiences from a variety of perspectives and using a variety of *methods* (Lincoln & Guba, 1985). In this case, it included collecting both qualitative and quantitative data from a variety of sources and triangulating those data to develop a thorough understanding of the audiences' experiences. It included approaching respondents in natural settings, talking with them using a natural conversational style, and observing their natural behavior. This approach has proven to be a particularly rich and fruitful way of understanding complex environments such as informal science learning experiences.

One of the strengths of naturalistic evaluation is that unanticipated findings often emerge from the data, often in visitors' own words. Naturalistic inquiry allowed the researchers to follow up on these threads and themes as they emerged and allowed the evaluation team to develop a rich understanding of the ways in which participants reacted to, interpreted, and learned from the PPZA project.

Naturalistic inquiry is guided by a different set of criteria than experimental or positivistic research. In judging the quality of a particular naturalistic study, constructs such as credibility, transferability, dependability, and confirmability take the place of more familiar constructs such as reliability, validity, and generalizability (Allen et al., 2007). This study adhered to professional standards for naturalistic evaluation. Any exceptions are described in the "Limitations" section below.

Research Question

The following two-part research question guided the PPZA evaluation efforts:

> In what ways and to what extent is POLAR-PALOOZA contributing to audiences' understandings of and excitement about polar science? How can what we learn about their experiences help inform the ongoing program development?

The focus of this question reflects the desire of the project team to both assess the effectiveness of the program, as well as to identify ways the program might be improved. As described above, this document reports on the summative evaluation and hence concentrates on the audience experiences part of the question. Although some program development recommendations are included, they are not a primary focus of this evaluation.

Research Design

At the beginning of the project, a detailed evaluation plan was developed and later revised as the needs of the project evolved (see Appendix E). As part of developing the plan, a detailed topical framework was developed (see Appendix F). A topical framework is an outline of issues, or topics, the team wishes to explore. While every attempt is made during the initial planning to identify as many issues as possible, the topical framework typically evolves during the project to include new topics that emerge in the process of data collection. In addition to the "Topical Framework," an "Intended Outcomes and Engagements by Audience" document was also developed (see Appendix G). This document defined the primary intended audiences for the program and identified intended outcomes and engagements for each audience. While this final report does not share the organizational structure of either of these two documents, the documents worked together to provide a foundation and framework that grounded and guided the entire study.

The primary sources of data were site visits to four venues by four Selinda researchers over a 12-month period of time from October 2007 to September 2008: San Diego, CA, October 18-21, 2007 (one researcher); Albuquerque, NM, October 22-25, 2007 (three researchers); Raleigh, NC, May 23-25, 2008 (two researchers); and Chicago, IL, September 19 & 20, 2008 (three researchers).

Data collection venues were purposively selected (see "Description and Selection of Respondents" below for an explanation of purposive sampling). San Diego was selected because it was the first major site, and it included a multi-institutional series of events. Albuquerque was selected for its strong Native American audience and because it is a desert site, where one would not expect a great awareness of or interest in the poles. Raleigh was selected because PPZA was the linchpin for a weekend of related museum events and extension activities. Chicago was selected for convenience and logistical reasons (it is the home of three of the four Selinda researchers) and because it was a major component of the kickoff event for a larger citywide yearlong science program.

Each site visit included observations of all presentations of *SfaCP* as well as most of the outreach activities. (See Appendix C for a detailed list of all events at the venues covered by this report). The researchers conducted on-site and follow-up interviews, each concluding with a written debrief summarizing and reflecting on the data. Interviews were tape recorded when possible and with respondents' permission, and later transcribed. Between site visits, documents — including materials posted on the PPZA website, press materials, post-program summaries by host sites, e-mail communications from program participants and audience members, etc. — were reviewed, and the PIs were debriefed/interviewed about their experiences. At the conclusion of every educator workshop during the 12-month data collection period, written surveys were completed and the data entered into a spreadsheet for analysis. Workshop survey data were not collected at one venue (National Geographic, Washington, DC) due to an oversight.

During data collection, the researchers used a variety of instruments and protocols. With the exception of the written survey (described below), and in accordance with standards for conducting naturalistic evaluation, protocols were adapted to the unique needs of each data collection session. In general, however, when conducting observations and interviews, evaluators used a standard set of four types of engagements to frame their data collection: emotional, intellectual, social, and physical (Perry, 1993). These are described in more detail in the "Intended Outcomes and Engagements by Audience" document in Appendix G.

Methods

In accordance with standards for conducting naturalistic evaluation, a number of data collection methods were used in this research study. Each strategy is briefly described below. (For a detailed list of all the "Sources of Data," see Appendix H.)

Observations

Observations during site visits were an important data collection technique. Two types of observations were conducted.

Unobtrusive observations consist of inconspicuously watching naturally occurring phenomena and behaviors. During observations, data collectors take notes, describing and time stamping events in as much detail as possible. When appropriate, direct quotations are captured, and in certain instances audio recordings may be made. Although the observations are unobtrusive, respondents are informed beforehand that they may be observed — usually via a sign or other announcement — and every effort is made to ensure their anonymity and not intrude on their experiences. At the conclusion of each observation session, researchers sit down and write a *debrief*. This is described in more detail in the "Data Analysis" section below.

In this study, unobtrusive observations were conducted during as many of the presentations and outreach events as possible, including each of the *SfaCP* and educator workshop presentations. Data were also collected during gatherings of the Travelers, such as during transportation to/from outreach events, at rehearsals, etc.

The advantage of unobtrusive observations is that they allow the researcher to collect descriptive data in natural settings without unduly influencing the experience to any great degree. A limitation of this kind of data is that the researcher has to rely on what can be observed.

Participant observations are similar to unobtrusive observations with the exception that the researcher becomes a participant in the experience. Instead of (for example) just riding along with the Travelers as they journey from one location to another and observing what occurs, a participant observation enables the researcher to talk with the Travelers and to participate fully in the experience. The advantage of participant observations is that they allow the researcher to gain a more intimate understanding of the respondent experience. The disadvantage is that the researcher influences that experience to some extent.

In this study, evaluators conducted participant observations during many of the experiences with the Travelers such as the one described above. In a few instances, they were conducted with audience members.

Interviews

Interviews were an important source of data for this study, primarily as a way to follow up and understand observations more fully, as well as to triangulate findings. All interviews conducted were *depth interviews*.

Depth interviews are open-ended interviews conducted with respondents. Depth interviews begin with a general outline of issues to be explored, but during the course of the interview, unexpected twists and turns are taken and unanticipated leads are followed. Depth interviews often feel more like conversations than interviews and, similar to natural conversation, continue for as long as both the researcher and respondent desire.

The advantage of depth interviews is that a strong rapport and trust is built between the researcher and the respondent, resulting in a rich and intimate understanding of the respondents' experiences that is more difficult with other prescribed and predetermined interview protocols. Depth interviews also allow unanticipated findings to emerge, helping to ensure the findings accurately reflect the complexities and subtle nuances of the respondents' experiences. The disadvantage of depth interviews is that — in accordance with standards for conducting naturalistic inquiry — they require *prolonged engagement* and consequently tend to take a long time to conduct.

In this study, depth interviews were conducted face-to-face, via telephone, and in a few cases, via e-mail, and were conducted with audience members from as many of the PPZA programs and outreach events as possible including the educator workshops. In addition, depth interviews were also conducted with PPZA "staff" including the Travelers, museum staff at the host sites, and the program developers and project PIs. (The respondents are described in more detail in the section "Description and Selection of Respondents" below.) Whenever possible, interviews were conducted face-to-face and followed (or were part of) an observation. In many instances, timing and location required interviews be conducted via telephone. When given the choice, a few audience member respondents opted to be interviewed via e-mail.

Most of the depth interviews were conducted as soon as possible after an experience, but in some instances, the researchers were interested in determining what respondents remembered and how they might have followed up on their visit. In these situations, the researchers conducted follow-up interviews one week to four months after a visit.

Written Surveys

During the planning stages of the evaluation, it was determined that it would be beneficial to collect data from all educator workshop participants during the first year of the program. A written survey was developed (see Appendix I) and distributed at a total of 10 of the first 11 venues that held workshops. As stated previously, survey data were not gathered at National Geographic, Washington, DC due to an oversight.

Review of Documents
Because naturalistic inquiry attempts to develop as complete a picture as possible, review of additional documents is often an important component of the data set. In this study, documents that were reviewed included (but were not limited to) materials posted on the PPZA and host websites, press materials, handouts, post-program summaries completed by the institutions, and e-mail communications from program participants and audience members.

Description and Selection of Respondents
Respondents for this study included members of all of the target audiences described in the "Intended Outcomes and Engagements by Audience" document in Appendix G, as well as the Travelers, host museum staff, and project staff. While most interview respondents were individuals, in many cases, particularly following an *SfaCP* presentation or at an outreach event, researchers conducted observations and interviews with small social groups. Children who appeared younger than 18 years old were not approached except with permission from their accompanying adult caregivers.

Because the goal of naturalistic inquiry is to describe a wide range of experiences, *purposive sampling* is often used instead of the more familiar random sampling (Lincoln & Guba, 1985). In purposive sampling, respondents are deliberately picked because they will likely have a different perspective or describe a different type of experience than previous respondents.

> The goal of purposive sampling is to ensure that a broad range of audience diversity is included in the study, and that the interactions with any particular respondent are extended and rich. (Allen et al., 2007, p. 238)

In this study, most respondents were individuals or groups who had chosen on their own to participate in some aspect of PPZA. Usually these respondents were observed during an event or approached immediately following the event and invited to participate in an interview. Because opportunities to interview respondents immediately following an *SfaCP* presentation were limited, at some venues the researchers handed out slips of paper inviting audience members to submit their contact information so researchers could contact them later via telephone or e-mail. Children who were at PPZA as part of a school field trip were observed and their spontaneous conversations unobtrusively listened to, but they were not interviewed except in situations when their parents were present to give permission.

In addition to the respondents who had chosen on their own to participate in some aspect of PPZA, at some venues a modified purposive sampling *snowball* technique was used to identify individuals or small groups prior to the event and invite them to attend an *SfaCP* presentation and then participate in a depth interview afterward (Miles & Huberman, 1994). These "pre-selected" respondents were given small tokens of appreciation after the interview was concluded, and in most cases their lunch, parking, and/or mileage was compensated.

A total of 233 people hours of observations and interviews were conducted.

Data Analysis

Data analysis for this phase of the evaluation was an ongoing process using a modified inductive constant comparison approach, whereby each unit of data was systematically compared with all previous units of data (Lincoln & Guba, 1985). Immediately after each data collection session was completed, researchers wrote debriefs of the observation or interview, fleshing out their notes, reflecting on and analyzing their findings, comparing the data to the data from all previous data collection sessions, and developing preliminary conclusions. Analysis continued as data and findings were compared among the researchers and among host venues. Periodic group debriefing sessions were held to triangulate findings and resolve any contradictory findings.

Although researchers employed a variety of data collection strategies as described above, in accordance with standards for naturalistic inquiry, these data were not treated separately but were integrated to enable a comprehensive and multifaceted understanding of different issues from a variety of angles. The reader of this report will not find (for example) a separate section on interview findings or an overview of observation results, but rather will find information about (for example) the experiences of teachers, *SfaCP* audience members, and museum hosts. These reported findings are a compilation of results that emerged from all the data — observations, interviews, documents, and surveys — taken together.

Reading the Report

As is characteristic of most naturalistic inquiry, the findings in this report are presented in a narrative style in order to capture the richness and diversity of the audience members' experiences using their own words whenever possible. Unlike the PPZA formative evaluation study, which was centered on the specific interpretive strategies and the design of the program, the summative evaluation focused on the respondents' experiences and the ways in which and extent to which the goals and objectives — as outlined in the "Topical Framework" and "Intended Outcomes and Engagements by Audience" (see Appendixes F and G) — were achieved.

Whenever possible, direct quotations from respondents are used. This enables the reader to "hear" what the participants said in their own words. Each quotation included is an example of a larger finding that emerged from the data. When reading the report, it is important to remember that the number of quotations does not necessarily represent the strength of each of the particular findings. In some situations, many respondents were particularly articulate about a topic so there are many quotations, whereas in other situations, respondents spoke with less clarity and so there are fewer examples. When quotations are unique or indicate an atypical response, this is noted. In some cases, quotations from the researchers' notes have been used to illustrate a point. These instances are noted.

The reader may wonder why percentages of respondents who held a particular opinion are not included. As mentioned above, purposive sampling — as opposed to random sampling — was used. When purposive sampling is used, statistical analyses are generally contraindicated. When data for this study were collected in a manner that allowed for a statistical presentation, they were reported as such, for example, the survey data presented in Appendix J.

As is customary in many naturalistic studies, throughout this report the qualifiers *most*, *many*, *some*, and *few* are used to indicate the relative strength of a particular response. While reading this report these terms should be interpreted as they would be in natural conversation, i.e. to indicate general tendencies, not statistical categories. When participants are referred to with no qualifying adjective, it can be assumed that almost all respondents shared this view (Wolf & Tymitz, 1980). For a more in-depth discussion of naturalistic evaluation, the reader is directed to the list of resources in the "References" section at the end of this report.

Limitations

As mentioned previously, data for this report were gathered during the first 12 months of the program, and the study included data from only the first 14 of the 24 venues. Because the program continued to evolve throughout the entire 2-year period, data were not gathered on some components that were added after data collection was completed. For example, a rap-influenced music video, *Take AIM at Climate Change,* was incorporated into the program after data collection was completed. Although there were indications that the video was well received, there were no evaluation data to assess its impact on audience experiences. Audience members' experiences after October 2008 may have been different from those of participants during the first 12 months of the program. This report covers only the PPZA program and audiences' experiences between October 2007 and September 2008.

As with all research and evaluation studies, resources for this study were finite. As mentioned previously, only 4 site visits — out of a potential 14 PPZA venues during the first year — were possible. While it would have been desirable to see more venues, additional data were gathered via interviews and a careful review of existing documents.

Conducting follow-up interviews with non-pre-selected audience members to the *SfaCP* program proved more difficult than anticipated. When audience members were approached after a program, they willingly shared their contact information but were often reluctant to participate in a follow-up interview when contacted later. This may be due to the gap in time between the program and when they were contacted. It may also have been because for many people it was easier to decline via e-mail (or not respond at all) than to refuse a face-to-face encounter with someone holding a clipboard. Because the nature of the *SfaCP* presentation was that most audience members tended to leave en masse, and because only one to three researchers were on site at any given program, the number of post-program interviews conducted was limited. Also, as noted previously, many children could not be interviewed directly because they were attending without their parents.

When conducting an evaluation study using naturalistic methodologies, it is standard practice to continue collecting data until a *state of redundancy* is reached. Redundancy is the point at which no new information is gleaned despite repeated attempts to elicit additional findings. While redundancy was reached on most topics, due to finite resources not all issues reported resulted in redundancy. Whenever this was the case, it was noted in the report.

FINDINGS & DISCUSSION

The PPZA Model

There were strong indications that the POLAR-PALOOZA model of using real scientists and Alaska natives as presenters worked very well for most PPZA audience members, whether they attended and participated in the *SfaCP* presentations, the educator workshops, and/or the outreach activities and events. Under the guidance of PPZA staff working with them both in advance and "on-the-fly," the Travelers' presentations and the multimedia framework of graphics and high-definition video formed an engaging and coherent whole for most respondents.

Seeing and hearing from scientists was something that most adult respondents mentioned and appreciated in particular.

> Seeing the actual people on the stage [was] helpful — as opposed to simply having the video convey the information. [A2136]
>
> Having real people on stage, people who have made personal sacrifice to be there and to be at the poles. This indicates how important the message is. [A21138]
>
> [The most memorable thing was] actually seeing and hearing the same scientists who were there [at the poles], as well as the pictures. [B2265]

> [*from a middle school student*] It was pretty cool that they were actual scientists who had been to the North Pole and who were relating their actual experiences. And it wasn't some guy that was talking about how "Oh, they are doing stuff and they are like finding out about this and this." Instead it's like, "I found this out and we did this and we did that." [A55142]
>
> Getting the personal stories helps you kind of care about the person and care about hearing their story and then finding out that their story is really interesting. [A3139]

Having the opportunity to hear from many individuals during the same presentation was also an important component.

By having this many people … it kept it fresh. [A237377]

The other big difference I think is I don't ever recall going to a presentation where they had all these — this number of experts sitting there. It's usually like one of these people that would have been the speaker. And this format, it wasn't really like it was a panel discussion, it was like, "We all have a message and we're all sequentially telling it." [A2344377]

[*from researcher's notes*] [The respondent] appreciated the many points of view shown by the panel. He said they provided "lots of pieces of the puzzle," and he particularly appreciated hearing the Native American perspective. [B34411]

[*from researcher's notes*] [The group] agreed that it was important to have all six scientists in the program … because they bring "all different aspects of the puzzle." They said they liked their stories and their humor, and that each contributed to their understanding of the "lifestyle" at the poles. They said they recognized that they made a huge commitment to travel this far, and they appreciated that. [A91425]

At the conclusion of most *SfaCP* public presentations, many audience members walked to the front of the room and gathered around the stage to ask the Travelers additional questions, sometimes waiting in line for long periods of time. These one-on-one opportunities were highly valued social interactions, eliciting interesting and personalized conversations between scientists and audience members, adults as well as children.

Data from the first two venues indicated that after the *SfaCP* presentations at these locations, between 40% and 75% of the audience stayed behind to interact with the Travelers. (Similar data were not collected for subsequent venues.) Also, there was strong evidence that most teachers valued their interactions with Travelers both during and after the educator workshops. Data indicated that the most effective aspect of the Family Days and at least some of the school programs involved Travelers standing beside tables with hands-on gear and specimens related to their science, talking about and engaging in activities with students and families.

[The scientists] were set up [around the museum], like, for example, the Alaskan guy was there in the Anthropology Hall. And so when we went through there were people all around him asking him questions, and he was teaching them how to

> dance and play the drum…. He was very outgoing and, you know, pulled people in to like, you know, teach them how to do this dance and show them a video on how it works, you know, and told them all what it meant…. And he was kidding with them. He said, like, "Don't make any mistakes. If you make a mistake you insult me and my people." And then he laughed. [B240377]

Data indicated that this worked well both as a way to get children interested in polar science and to support children who were considering careers in science (see the example in the "Meet-the-Travelers" section below).

Part of the PPZA model worth mentioning was the "rock star" phenomena. At many venues, audience members crowded the stage after the performance, seeking autographs or the opportunity to get their photographs taken with the Travelers. At some venues, 8½ x 11 glossies were available that featured photographs and names of each of the Travelers along with the PPZA website address. These glossies were often used by audience members to get Travelers' signatures. This seemed to be an enjoyable experience for the Travelers as well as the audience members.

I'd rate it a 10 [out of 10]. I wanted to meet a scientist, and I got everyone's autograph! [A2145]

[*from a middle school student*] Oh yeah, [Mary] was really cool. [A0142]

[*from a Traveler*] You know, we're doing science; we don't view ourselves with all this big music in the background and the wide screen and it's just like "Holy cow!" [B21134]

Even the media picked up on the rock star phenomena.

> [*from KPLU website*] Ever since "Lollapalooza" merged rock stars and social causes, the concept has spread. Now, a road show called "Polar-Palooza" is making rock stars out of climate-research scientists. The multimedia extravaganza aims to make people aware of rapid changes in the world's polar regions, wrought by climate change (Banse, 2008).

It is important to note that even though we saw many examples of this "rock star phenomena," many of the respondents also indicated they appreciated the opportunity to see the Travelers' everyday lives as scientists, and to meet them personally and ask them questions. As was described in the "Intended Outcomes and Engagements by Audience" document, one of the intentions was that PPZA participants would feel that scientists are real people just like them, and that they, too, could become scientists and conduct research at the poles.

They were real people — could be neighbors next door. [A2136]

[I never realized that] it was possible for me to go! [SND33]

I <u>really</u> want to participate in polar research. [OK38]

The *Stories from a Changing Planet* Presentations

As was noted earlier, the cornerstone of the POLAR-PALOOZA project was the *SfaCP* presentations. The following section focuses on visitor responses to various aspects of the program.

Production

The *SfaCP* presentations were well designed and executed. The final product was carefully orchestrated without being overly produced, in spite of the fact that some of the Travelers had never met one another before and each group had limited rehearsal time. The audience particularly appreciated the high-definition video and audio and often remarked on the professional quality of the presentation.

> The photography was so spectacular…. I mean, the lighting and, you know, the resolution was great and here, you know, because the screen is so huge you're just like, here's this polar bear that's just right there and just — you can see the detail. [B230377]

> It's probably the most high-tech [presentation] I've ever seen. … You know multimedia. Most of the presentations I go to are pretty boring or else they might have a slide show. [A21200377]

> The projector, I don't know what they used but definitely their system was a lot better than what I use in my classes. It was obviously bright and high resolution. And the slide transitions were really interesting. They kind of, like, rotated from one slide to the next. [B8956377]

The Use of Authentic Artifacts

On-stage artifacts — such as the fragile ice cores and bright red polar coats — were remembered and particularly valued by many audience members. The props helped to bring home, enliven, and make concrete experiences and ideas that were sometimes difficult for audiences to grasp or fully appreciate. Months after attending an *SfaCP* presentation, when details of the program were becoming fuzzy in respondents' minds, memories of the props and what they learned remained sharp.

> They're taking all of this time and effort [to collect and store ice cores] and I thought it was a very interesting to see, you know, all of them. I mean, you know

like the warehouse thing. That was something. I would have never — I never thought that they would keep … all of this — you know, this ice. It never would have entered my mind that this stuff was happening. That they were actually. Okay so they dig it, you know, they evaluate it and then that's that. But to keep it and to warehouse it? That's really something. So that was really interesting. [A21140]

[I remember the Traveler] bringing out the fossil afterwards and letting everyone touch them. [B21140138]

[The scientist was] even wearing the coat that was in the video. [A234138]

When they brought out the ice core that was cool…. That was really cool. [A20142]

It was interesting to note that some audience members were concerned about the fragility of the ice core in particular.

> It was kind of neat when they had that ice core that they actually brought with them. I did wonder how did they keep those things cold through all the transport and how devastating it would be if their freezer failed. [A2139139]
>
> I was wondering, you know, that ice thing that they showed us; it's like, what was the point of that? Isn't that just melting? You know, I mean so they took an ice core I don't know had all the scientific proof in there or evidence and they're just letting it melt. So I don't know if that — you know, I mean I thought to myself if this is … such a valuable … piece of scientific evidence and here you're just bringing it out to show it to us and you're letting everything disappear into water. And so, you know, I kind of thought about that. It's like, well is that a wise thing to do? [B226140]

Animals

In developing the *SfaCP* program, PPZA strategically designed the program to use the natural appeal of animals and natural history as a bridge to more abstract concepts like rising carbon dioxide levels. Not surprisingly, in addition to the artifacts mentioned above, the video footage of animals was particularly popular, helping many of the audience members connect with the important messages about climate change.

> The only parts I liked in there were, like, that video of penguins and the pictures of the animals…. The penguins are so awesome…. I was looking at the video and the penguins were just so curious about the camera and they were so cool…. Oh yeah the seals were awesome [too]…. It's awesome how the babies, like, weigh so much when they're born and stuff…. And then they grow into the really big, huge adults. [A21141]

While inclusion of animal footage was particularly appealing to children, its appeal was not limited to this age group by any means. Many of the adults we interviewed also talked about the animals.

> Here is the polar bear on ice and the polar bear on brown land, you know, brown green land and [they were] talking about how when you see that … you know something is wrong because that's not where the polar bear wants to be. The polar bear wants to be on ice. And if it's not, it's indicating that things are out of whack. [A24377]

> They talked about how … the seals they fed on — I'm trying to remember how that worked, the polar bears were having trouble getting — they go after seals that were breeding on the ice pack…. Yeah the Arctic seals. I mean, I remember thinking that's different than the ones we see in Oregon, the harbor seals. But they look quite similar. I mean they have the gray … and everything…. They showed the polar bear trying to break through the dens … where the seals are. [The seals] have a little den underneath the ice and [the polar bears] would jump up and down on it trying to break it to get into it … rather than just snatch it off the ice…. That was cool. [B26377]

The Use of Quizzes

In some of the *SfaCP* presentations (especially when audiences included younger visitors), questions to the audience were inserted directly into the program. Introduced to the audience as "quizzes," these included asking audience members to identify a sound such as a penguin vocalizing or identify what was wrong with a picture. When these quizzes were used, audience members jumped right in, and there were indications that most enjoyed the opportunity to engage.

> Another thing that I thought was neat was how they catered to the children. There was one fellow who was a teacher as well as a researcher, and he did, like, a little question and answer in between each of the segments. And, you know, the kids got excited and raised their hands. [A3139]

> [*from a staff member*] Veteran IGY researcher Charley Bentley [one of the Travelers] engaged a large audience of predominantly minority youngsters with what could best be described as a "Where's Charlie?" modeled on "Where's Waldo?" He showed pictures of himself as a young man (he was in his late 70s during PPZA) in Antarctica in 1957-58, and asked the audience to say which one his younger self was. Kids excitedly called out, "The one on the left!" "No, the middle," as he showed pictures of travel and daily life. [B42130]

Although the quizzes may have had the appearance of being a kid-centric activity, data indicated that many adults enjoyed the questions as well and that they learned things they did not previously know.

> The first one was there was a picture that had a polar bear and penguins in the same picture, and I didn't know that they're not in the same place, but some kid in the audience did. And then later on they played some sounds and someone in the audience knew what they were. I didn't [know what those sounds were]. [A15139]

While the inserted quizzes worked well at engaging most of the audience, there was some evidence that they did not work as well for a few respondents.

> [It] was kind of cool, but then they started doing the whole thing like identifying the sounds…. I didn't like the sound thing. [B9142]

End-of-presentation Q & A

The moderated group question-and-answer sessions at the conclusion of the *SfaCP* presentation were also well received and served to extend and personalize audience members' experiences. During these Q & A sessions, the entire audience benefited from hearing other audience members' questions and comments. In addition, the Q & A time was an opportunity for the Travelers to clear up misunderstandings about topics raised during the program.

> When it got to the question-and-answer period then the kid said, "Well you're drilling holes in the ice. Aren't you causing further damage?" That got everyone's attention. So it was kind of interesting.… And his response was that "if you know the holes are about this size, and [the hole is in] an area the size of the United States … it's relatively very small"…. But the kid didn't let him go. He said, "Yes, but those holes are going to get bigger…. they'll just get bigger." And the guy said, "Well no, they actually don't…. You might think that, but they fill up again because the pressure of the ice all around them makes the hole close." So … that was a good exchange, I thought. [A24377]

Although in most instances the Q & A session furthered audience members' understandings, in a few instances, the answer to a question was not particularly helpful.

> An adult asked, "How do you … use that information to determine the temperature?" And he answered, "With the isotope ratio" which … I think went over the head of almost everybody there, because they didn't further explain how by looking at the isotope ratio they could tell what the temperature [used to be]…. He said it's a little complicated. [B259377]

Questions asked by audience members covered a wide range of topics and represented a wide range of interest and prior knowledge. To illustrate the range of questions, here is a sample of some of the questions asked during one Q & A session early in the project [A24106]:

> There are changes in the sun, solar spots, storms — some say these may contribute to global warming. Is there any hard evidence [for this]?
>
> There is so much evidence, but you still can't predict what's going to happen. What do you need to predict better and faster?

What is the oldest ice ever studied?

Is Earth the only place with global warming?

The earth's weather is random — is there any randomness in here [global change]?

[*from a child about 10 years old*] In 30 years, would we be under water right here?

[*from a child about 10 years old*] CO_2 rates are going up and hard to stop. When it [CO_2] takes up most of the volume, what will happen?

[*from a young child*] Do scientists know how old the Arctics are?

Is the freshwater from melting going to change the chemistry [of the oceans] to change the weather?

What should we be doing?

[*from a child about 10 years old*] If the earth were to flood, would organisms adapt to it?

Meet-the-Travelers Opportunities

Opportunities to meet the Travelers after the *SfaCP* presentations were also invaluable, particularly as a way to extend and personalize the audiences' experiences. At most venues, Travelers stayed around the stage immediately following the formal presentations to talk with audience members, have their pictures taken, and sign autographs as described above. At some venues, Travelers then took their gear and some activities and re-convened at tabletop displays in the lobby outside of the theater. These after-program tabletop events provided rich opportunities for intimate and personally meaningful exchanges. At one venue, one young girl of about 10 years old approached the Traveler who had covered the geology portion of the *SfaCP* presentation.

> [*from researcher's notes*] There was what I presumed to be a family group of Mom, Dad, 13-year-old boy, and his 10-year-old sister. They were at [the Traveler's] table and talking with her about her research. [The Traveler] had the boy and girl trying on the coat and they all seemed to be having a good time; lots of smiling and joking, lots of talking. The girl was listening to [the Traveler] attentively and then the dad said, "You know, she's really interested in geology." [The Traveler] picked up on this and asked the girl what about geology she was interested in, whereupon the girl lit up and talked about her rock collection, and how she likes learning about all the different kinds of rocks. They kept talking for a bit and [the Traveler] encouraged her to take all the geology courses she possibly could and to keep learning all she was able to. The girl appeared to really appreciate this conversation … and the dad was very supportive too. When [the Traveler] encouraged [the girl] to continue pursuing her geology interests, the dad chimed in that "Yeah, that way you can get to travel to all kinds of really cool places too." [A209486]

Data indicated that these post-presentation opportunities to talk one-on-one with the Travelers were most effective when the scientists were dispersed at tables in the lobby with their gear and activities, rather than when they were bending or sitting at the edge of the stage to meet with a

crowd of audience members who had pushed to the front of the auditorium. When they were at the tables in the lobby, they were able to engage in more meaningful conversations with visitors, especially small social groups comprised of mixed ages. In these situations, there were plenty of things to touch and activities to participate in for all members of the social group, regardless of age or experience. When audience members crowded the stage to talk with the Travelers, most of the observed behavior (except for getting autographs and photographs) was either standing and listening, or waiting patiently (or in some cases impatiently) for the person(s) asking the questions.

Hands-on Opportunities

At some venues, time, space, or other logistical constraints prevented the possibility for hands-on and up-close interactions with the Travelers immediately following the *SfaCP* presentation. In these situations, some audience members noted this.

> It would have been cooler if they took [the ice core] out of the bag and, like, brought it around. Let us take a look at it. You're taking a look at the past. [A211142]

> I wanted to touch it. I wanted to feel the ice core. [A278144]

> I really thought there was going to be something tactile…. I thought it was kind of interesting that they came out with the red coats. But … I'm wondering how heavy is the coat? Is it really thick?... You know can you try it on?... I remember being a little boy here [at the museum] and … I actually put on one of the EBA space suits and it was not even the whole thing … [but] I remember it was incredibly heavy. I literally sank to the ground putting it on…. I never would have figured that the suit was heavy…. You know, it looks like a big marshmallow when you see it, but to actually feel it and put it on. So I'm, like, wondering "Are these coats really — you know, what are they insulated with?" [A239144]

When hands-on opportunities were available, they presented powerful learning opportunities for audience members. In some instances these were missed opportunities to connect the experiences to the important educational messages.

> [*from researcher's notes*] The kids were really enjoying trying on the clothes and [the respondent's] daughter was clomping around with the boots. [The respondent] explained that "my dad has some of those boots." She asked her daughter if she had asked the Traveler what size they were, which the daughter then did, but [the Traveler] missed the opportunity to connect the boots to the poles, or doing polar research. [A2491]

This girl's experience of trying on the clothes while interacting with the Traveler was initially very similar to the experience of the girl mentioned above in the "Meet-the-Traveler" section. But the outcome of the experience was markedly different. For this respondent, it was primarily a fun activity, but it had little to do with the content of PPZA, i.e. polar research or climate change, or even "You can be a scientist, too." The connection to science was made much more explicit for the first girl, and the exchange resulted in a richer, more meaningful experience.

Local Connections

One of the goals of the *SfaCP* program was for audience members to make local connections and to understand how what is occurring at the poles affects them in their local communities. In spite of PPZA including many strategies to achieve these local connections, many respondents indicated that they struggled to make connections between what they were seeing and their own personal lives and communities.

> I don't recall anything trying to link [the scientists'] observations to … local [issues. It] … would have been a good question … actually to ask, you know … "What changes should we observe here? How would you think this would affect us?" [But] … that's not what they're studying. [A20377]

> They just basically showed us all their stuff without really tying it to something that is a personal message or something we can use to set policy or whatever…. It was just like, "Here's a cool thing we're doing about global warming." [A272377]

> [Making a local connection] might have required another person on their panel. You know, somebody familiar with the local issues. [B292377a]

> But they didn't really talk about the effects of what the global warming is. I mean, I know that the ice is disappearing, but then what does that really mean to us? I mean, they said a little bit that it was going to … affect all of us. But they really didn't tell us how…. I remember them talking about … the waters rising and … the weather pattern shifting and all that stuff. But … it would have been nice, especially with kids, to kind of give more concrete examples. [A1140]

> They didn't give me enough reasons — aside from, like, oh my God all this stuff is melting — they didn't give me enough reasons to be worried…. I mean, they didn't tell me anything to make me think, oh you know, aside from the ice disappearing and that the polar bears are going to have to adapt or maybe they won't or whatever. And like the animals, the penguins and how they're all dependent on the ice and the ice is disappearing … and so I feel, you know, for the animals and the species, but how is that going to affect me personally? [B2140]

> You want to leave [the program] going, "How is this going to affect [me]?" I think Southwest Texas [in the Midwest] sounds great; I love that weather…. They still need to kind of grasp people and say, "How does it affect you? How can this really hit you? Why does this matter?" Because for the average person, you know, I hate to see a polar bear die but I'm never going to see a polar bear, you know what I mean? [A4144]

The data indicated that the ability to make local connections varied somewhat by venue. For example, in San Diego, young audience members asked about flooding from the rising ocean, and in Chicago, several respondents remembered one slide that superimposed Illinois over Texas. It should be noted, however, that making local connections was less a function of the geographic location, but was influenced to a greater degree by whether and how meaningfully explicit and concrete examples were brought up and reinforced by the Travelers. When local connections were made in appropriate and interesting ways, this carried a powerful message to audience members.

Enjoyment

There were strong indications that most audience members thoroughly enjoyed the *SfaCP* presentation.

> So I would give it an 8 [out of 10] because that's how much I enjoyed it, and I felt as though I learned from it, learned things that I can share with my family. You know, we all can go online and do more detailed research about it on our own as … [an] individual. [A278144]
>
> It was captivating. It was like I was there. [B201145]
>
> I would definitely give it a 9 [out of 10]…. The participants were very interesting. They made you relate to them as, you know, human beings first and then scientists second, I guess. The way that it flowed was really good…. The changing of the media from a person speaking, to the film, and back and forth with that was really nice…. The fact that they kept switching … was a really strong … point. [A56139]

Although most audience members spoke highly of the program, some respondents were less enthusiastic. Some middle and high school students in particular tended to become bored.

> It was boring…. The only parts I liked in there were, like, that video of penguins and the pictures of the animals. But the rest was boring; all the talking, talking, talking. [A2141]
>
> Well, to tell the truth the — although I'm somewhat interested in the geology part, that was kind of the places where I started to zone out more. Yeah, it's like you can only talk so much about rocks. [A240142]

A challenge encountered at many venues was the presence of young children in the audience when the program had specifically been marketed as an event for visitors who were in their early teens and beyond. Not surprisingly, many younger children showed signs of boredom, becoming restless (except when videos were showing) and sometimes falling asleep, especially during evening programs.

Educational Outcomes

When discussing educational outcomes, educators often focus on facts and concepts that people learned. With PPZA, the primary outcome was a powerful and memorable experience. For many

attendees, it was about being in the presence of real scientists — i.e. the rock star and person-next-door phenomena described above.

> I liked seeing what the scientists did and how they drilled down and how they analyzed what they found…. I liked learning about the process of them doing research there and what it was like to live there for so long and more the human side of it. [A3146]

> [*from researcher's notes*] [The respondent said that] what it did was give her a concrete sense of precisely how the science was done. [A90137]

In addition to the powerful and memorable overall experience, however, there were indications that most people also acquired a new item of information or some new knowledge. Most respondents talked of something they had learned, ranging from a fact, such as "polar bears and penguins don't live in the same places" to a broader realization such as "I could go to the poles too."

> I never knew that the Arctic was an ocean. I thought that was pretty interesting. [A12140]

> [I learned] there really isn't anybody living on the South Pole … except for the scientists or whatever. Whereas in the northern area there are, you know, the Alaskan — the native peoples are living up there. [B25140]

> I enjoyed that part about the seals and about the polar bears and the penguins and how dependent they are on the ice. [A91146]

> [We learned that] people at the poles used tractors. [A5153]

> [We learned that] the Eskimo got to his town by plane. [A90153]

> [*from researcher's notes*] They said that [they learned about] polar bears vs. penguins — they don't live in the same region. [B84153]

> I certainly didn't know about those seals nursing for like six months or whatever it was. It's like, oh my God. [A4146]

> I guess I didn't know that it used to be that green and warm down there. So many million years ago, 50 million years ago when you showed that one slide. I didn't know that it used to be that green and that warm. I just didn't know, period. I don't know that I would have told you, well it never was. I just didn't know. So that was kind of interesting to see how much it's changed over time. [A92146]

In some cases, respondents indicated that the program reminded them of something they knew before but had not thought of recently, or that it reinforced something they already knew.

> Well, some of the scientific data I was already aware of with regard to the warming of the planet and the CO_2 levels, the way it goes up and down over the last millions of years. So that was all stuff that I had heard before. [A26139]

Although some respondents mentioned specific facts they learned, most indicated that, as is typical in much informal learning, the things they learned were general and/or impressionistic.

> For me it's kind of all background knowledge. [A5377]

> Yes, there were some things [that I learned] but I can't recall them just now. I make jewelry that honors the earth and the polar bear, so I have read up on these issues. Well, one thing I do remember is that the changes seem to be happening faster than I thought. [A2265]

> You know, I mean I think it's not like [I had] some big gap. If you were to have asked me yesterday, you know, "What do you know or think about the poles?" you know, I would have had like a big blank. And now I feel like, well, it's important. The research they're doing down there is important. It's probably going to help us anticipate what might be happening climate-wise and how we might be able to turn things around. Or at least it could help us monitor whether positive changes are occurring; if we are able to make some changes in our use of energy…. I feel like it's important for that reason. [A42146]

> I didn't really think about [global warming] affecting the people in Alaska. Like, I knew it was affecting the animals. But I didn't really think about how it's going to affect a village or the water levels going up and that kind of thing…. You know, it made me more aware of [global warming's] effect on the people. [A88146]

> You know, there is definitely a piece of knowledge there that wasn't there before. And feeling like the work they do is important. And I'm glad that they do it, because I certainly wouldn't want to. And, you know, I feel like they're well intentioned and trying to figure out what's going on and how to preserve, you know, the right balance of nature on those poles…. So I guess that's — you know, that's the way I see it. So it's a positive. Positive. Positive feeling. [A95146]

Some respondents mentioned learning things that were idiosyncratic and resonated with them personally. For example, one young boy was an avid bird-watcher, and so the penguins in particular caught his attention [A02141]. Another respondent had experienced a local river flooding and talked at length about the effects of the sea level rising [A99145]. A respondent with a background in biology and an interest in birds claimed not to have learned very much that was new, but later described learning about one bird species replacing another as a result of global warming.

> [I found out about] the bird researcher, his — what was he researching? Arctic Guillemots or something. And they were being displaced as puffins — the weather or the water temperature is changing the food, the species are changing, the bird species are starting to shift. That was interesting. [A62377]

Another respondent was particularly interested in learning about Native American culture.

> The other new thing was the whole Alaskan Eskimo, you know, culture. That was new to me to just kind of see how Eskimos live today…. You know, you have this idea of how they used to be, but you don't know really what they're like in today's society. So that was a new perspective for me and just how committed he was to his culture. To that culture and perpetuating it and that kind of thing. I thought that made an impression on me. It helped me want to learn more about it. [A6146]

One exception to this trend of general, and/or personal learning was that many respondents of all ages, backgrounds, and experience, weeks and even months after attending the *SfaCP* program, mentioned the ice core in particular, and that they learned that you could find out about the atmosphere thousands of years ago by studying the air in the bubbles.

> But I [liked] the part about how, like, they were, like, digging out the cores of ice…. That was cool. And then, like, the air bubbles inside it where they can, like, take the air, and then from the air that was in the little bubbles in the ice they could tell what the atmosphere was like…. That was something new to me. [A33142]

> [*from researcher's notes*] The boy (and Mom chimed in here) began talking about the digging that was spoken of, how years of ice had accumulated, what could be told from the air in the bubbles. The boy said it was new to him to think that rock could be read like a book. [A25153]

> The way they drill and then look at the ice crystals and use the ice to figure out what the climates were in previous times and all that. I thought that was pretty interesting. [B70146]

Most respondents were positive about the program and what they learned, but a few people indicated they were confused, or mis-remembered information.

> [I learned] what the atmosphere was like from, like, 100 million years [ago] or something. I thought that was really cool. [A21142]

> When they talked about Antarctica, and there was the Norway station, I'm thinking, "Is Norway down there? I thought Norway was like North." I was confused…. It almost made it sound like it was Norway or near Norway or something, which I don't think is true. But I'm still not sure. Because I'm so bad on geography. I think they're talking about the South Pole … but then why is Norway down there? [A78146]

> You know, just keeping the poles straight. Like, I found myself several times going, "Okay which one are they talking about now?" and "Is that the one that's the continent or is this the one that's kind of ice?" [A934146]

With a large presentation program format such as this, it is difficult for audience members to double-check or have what they are learning reinforced.

Finally, some respondents compared PPZA to the movie *An Inconvenient Truth*.

> I saw the movie [*An*] *Inconvenient Truth*. And so some of it felt like a duplication of that in terms of the global warming. But it didn't go into as much detail obviously as [*An*] *Inconvenient Truth*. [B12140]

> I had seen a little bit about [air bubbles trapped in ice] in *The [*sic*] Inconvenient Truth*, but this kind of like expanded about it. [B12142]

> We went to see Al Gore's thing, and I think there are lots of adults that have — you know, that want to be educated about [global warming] and want to learn, and have an interest in what's happening in the world. [A12377]

> It was a rehash of [*An*] *Inconvenient Truth*. [A01135]

The Big Idea

Early in the planning stages of the project, it was decided to collaboratively develop a big idea to provide focus for the PPZA program.

> A big idea is a sentence — a statement — of what the exhibition is about. It is a statement in one sentence, with a subject, an action, and a consequence. It should not be vague or compound. It is one big idea, not four. It also implies what the exhibit is not about. A big idea is big because it has fundamental meaningfulness that is important to human nature. It is not trivial. It is the first thing the team, together, should write for an exhibition. (Serrell, 1996, p. 1)

While the concept of a big idea was developed by Serrell to guide and facilitate an exhibition development process, the project team determined that it would be useful for the PPZA program. The team came up with the following big idea: *The changes occurring today at the poles reflect the health of our planet and foreshadow important changes that will be happening in your region and community*. Later on, this big idea was written as three key messages for audience participants. These messages appeared at the beginning of the handout described above and were articulated in a variety of forms at each of the *SfaCP* shows, both on screen and as part of the Travelers' presentations: (a) Climate change occurs first and most dramatically at the poles; (b) what happens at the poles affects weather and climate where you live; and (c) understanding Earth's changing poles can help us make more informed individual choices and shape national policy.

A few respondents we talked with indicated that they walked away with the big idea that what is happening at the poles foreshadows things that will affect them locally in the near future.

> [The program was about] showing you how the poles are important — that they really are the bellwether of climate change; and their presentation showed you the way in which evidence is collected to show it. [A89144]

The data indicated that most audience members however tended to take from the presentation a range of diverse perceptions about the purpose and focus of *SfaCP*. Participants tended to

perceive the program as being about one of three main areas: (a) an informational program about climate change or global warming, (b) a program to encourage young people to pursue careers as scientists, or (c) an educational program about animals (this latter topic was particularly prevalent among children).

When respondents talked about PPZA as an informational program to teach them about global warming and climate change visitors described a range of overarching themes.

> The main theme was global warming. [A205144]
>
> The big idea is that the world is changing and that we're partly responsible for it. [A20139]
>
> If people say there is global warming, well how? Why? This [program is about] what's been used to show it. [A89144]

When they described it as a career program for children telling them that they can be scientists and/or conduct polar research, they described it as follows.

> [The *SfaCP* presentation] was all about the career [schoolchildren] could get into. I mean, that's the biggest hook they had about it I think. [A22377]
>
> What I thought the message was is … it's like, "Try hard and maybe take a trip to the Antarctica, get more involved." [A5144]

And a few, especially younger visitors, described it as a program that was about the animals that live at the poles.

> I was looking at the video and the penguins were just so curious about the camera, and they were so cool. [B622141]

Many respondents had a difficult time articulating a core message or theme.

> It didn't feel like any one message was trying to [come through]. [A66144]
>
> [*from researcher's notes*] [He said] he couldn't [describe the program], saying that it "covered so many different subjects." He said it "hit on so many different things — there was a lot to take in." [He said] that it was "a nice shotgun" of topics. [A4145]
>
> It was like a giant information session about Antarctica; the South, North Pole, and Alaska…. It just seemed like … an informative information session. [A66144]

Length of the* SfaCP *Program

Although the majority of individual Travelers' presentations were well scripted, tightly focused, and mostly interesting for many audience members, some of the presentations exceeded their allotted time. An unfortunate consequence of this was the necessity for the group question-and-answer period to be shortened or even eliminated. Although this was not a frequent occurrence, in a few instances, Traveler presentations were unfocused, rambling, and/or accompanied by a

weak conclusion. There were numerous indications that many audience members felt the program was too long.

> It was long for kids. [B20153]
>
> In my opinion [the *SfaCP* presentation] kind of went on a little bit. I was thinking about it with my students…. We don't even make college students sit down for more than 50 minutes. Well we actually do…. But still … I think that was a long time for a presentation. [B20377]
>
> I think they could have made each scientist's presentations a bit shorter…. Some of them went, like, on and on and on…. It's like, "Okay I got the information; you're just repeating it." Just, like, [give me] the information, nice and quick. [A2142]
>
> It was a tad long. Maybe 15 minutes too long. [B2135]
>
> It went on too long. [A29136]
>
> It could have ended sooner. I was getting tired of taking in information, or maybe it wasn't the right kind of information at the end. Maybe visuals of animal life at that point. [A23138]
>
> [The part where they had those real big machines and they were traveling all the way across Antarctica], that was boring…. It was too stretched out and they kept on showing the same footage and it was like half an hour. [A24141]

Throughout the first year, the program developers conscientiously worked to tighten and streamline the presentation, monitoring the Travelers' presentations, keeping them to the amount of time they were allocated, and even reducing the number of Travelers. The data indicated, however, that the overall length of the *SfaCP* presentation continued to be a challenge for many audience members.

Taking the Next Step

A souvenir of a museum visit can be a positive and powerful reminder of a museum experience and can serve to extend the learning that takes place in meaningful ways. At many venues, audience members were delighted when they could get "glossies" of the presenters, or have their pictures taken with the Travelers, or — as happened at one venue — put on a big, red NSF polar coat and get photographed against an Arctic backdrop.

Many respondents, however, also wanted to know where they could get additional information and wondered what they could do next. Two primary categories emerged from the data. The first category included those participants who were depressed at the state of affairs and felt helpless and somewhat hopeless.

> I don't want to walk away just feeling sad. [A24485]
>
> [After being at *SfaCP*] I'm more just resigned that it's too late…. I was close to that before, but I'm even more so [now]…. I would say I'm two-thirds of the way to hopeless. I mean, I already do a lot…. I recycle…. I try not to waste stuff. I pull

> [my husband's] recycling out of the trash and put it in the recycling…. I don't know how much more I can do. I'm just really angry at, you know, the industrial world for denying it for so long. [B2139]

Participants in the second category were moved in a positive way and indicated they wanted to do or learn something more. However, in most cases they stated that they did not know what they could do or where to go to get additional information.

> The underlying message [from *SfaCP*] clearly is that we have to do something to slow down the rate of climate change. If [the presenters] really wanted to sort of reach parents and children, there's nothing really there that offers, "What can you do at home to help?" As a parent, [you want to] help show your child, "Okay we can do this to help improve for the future." Not just "oh well, maybe you should go get a science education" but, you know, is it recycling materials? Is it turn the light off when you leave the room? Some practical things maybe that could have been brought forth. [A29144]

> I needed some follow-up. How do you carry this to the next step? At the end of the presentation there could have been a handout that lists the websites of the presenters. These are the courses you need to take. Everybody gets flipped up; they've got to have some way to help me learn more about this. [A26138]

> [*from researcher's notes*] [The respondent] suggested that we suggest to the planners that they include a handout with a "course of action," who to write to, someone to call, websites to visit, something for them to do. [A20485]

It was clear from the data that audience members wanted additional information and ways to take the next step. There was also evidence that some Travelers also needed something to give audience members. For example, when asked by a university student if there was a website where they could get additional information about climate change, one Traveler responded, "No, [I don't have a website]. Google my name and all my research will come up." [A20485]

It should be noted that when presented with this finding, PPZA staff followed up on these suggestions and procured additional funding to put together a professionally designed and produced handout summarizing important information, listing websites, and suggesting actions people might take (see http://passporttoknowledge.com/polar-palooza/handouts/). Once it was printed and made available, the handout was distributed to everyone who attended the *SfaCP* presentation as well as all the educator workshop participants. Because data collection for this study was completed before this aspect of the program was implemented, there are no data to indicate whether or to what extent this handout was effective at satisfying audience members' desire to know more.

SfaCP *Audiences*

Data indicated that most of the audiences for the evening *SfaCP* presentations tended to be adult, middle- to upper-class, well educated, White, and interested in (and often well informed about) science and the environment. There were strong indications that this audience in particular was well served by the *SfaCP* presentations. Daytime presentations of *SfaCP* also appeared to work

well for this audience, and also for some children, especially those who were already interested in science and polar animals, and also for those children who were considering careers in science.

Participant Experiences

The above section of the report focuses on audiences' experiences while attending the *SfaCP* presentation, the centerpiece of the PPZA program. The following section outlines the experiences of additional targeted audiences. Most of these experiences took place during participation in ancillary and outreach events, for example, educator workshops or an adapted school group performance.

The Educator Experience

Overall, educators tended to have rich and valuable PPZA experiences, especially those who participated in educator workshops. This section includes information about participants in the educator workshops (teachers and informal educators) during the first year of the national tour, as well as teachers and chaperones for school groups that attended an *SfaCP* presentation.

The PPZA educator workshops were an important component of the project, ultimately having the potential to serve a large number of students. The workshops were carefully planned with a strong interplay of presentation, demonstration, and hands-on activities. Data indicated that the educators seemed to appreciate and be inspired by three main elements of the PPZA format: (a) the Travelers themselves, (b) the educational activities, and (c) the projected videos/images.

The workshop participants connected well with the Travelers and enjoyed and were inspired by the Travelers' *SfaCP*-derived presentations (especially when they were tailored to teachers' needs). There were strong indications that interacting with scientists was an important contribution to their experiences.

In response to the question "The best part of the teacher workshop was …" participants repeatedly mentioned the value of interacting with the scientists.

> I loved hearing from people who are actually studying what is currently happening. [SND18]
>
> The women scientists! [SND33]
>
> Speaking with the actual dynamic scientists. [ABQ21]
>
> Listening to the scientists who do the work. [ABQ35]
>
> Mike Castellini's enthusiasm for blubber. [BAY16]
>
> I loved being able to hear what research scientists are doing! And being able to ask questions directly about their research. [BAY18]

It was wonderful to hear the different scientists speak on their areas of study — in their own words. [BTR13]

The Alaskan native because he connected all the information. [SLC3a]

[The Travelers] answered questions about CO_2 conc[entrations] that I didn't understand. [OK38]

Most educators indicated they also enjoyed and valued the many activities. Many of the responses to the question mentioned the activities.

Activities, holding the ice core. [ANC8]

The hands-on experiments. [FAI7a]

Hands-on activities to enforce info learned by scientists. [BTR25]

The activities were simple, but GREAT models! [BAY13b]

Hands-on experiments. [SND13b]

The data indicated that teachers also valued the still and video images used during Travelers' presentations, especially once they realized that many of these images were available online for their classroom use. These responses to the question about the best part of the educator workshop reflected that view.

I loved the part about the animals, penguins, seals, and how dependent they are on the ice. The video clip was neat. [FAI11]

Video clips and lessons. [BAY2]

Websites — visuals. [BAY4]

Seeing the video footage and doing the simple experiments. [FAI1]

In fact, when survey respondents were asked to rate on a scale of 1 to 5 how useful various aspects of the workshop were, the "take-home packet with activities and extensions" received a higher percentage of 5s (87%) than any other aspect, followed by "audiovisual parts of the presentation" (86%) and "presentation by workshop leader" (85%). Interestingly, survey data indicated that "meeting with and working with the scientists" ranked a little lower than the first three (81%). This statistic was not verified with the observation and interview data.

[*from researcher's notes*] During a break, found out that … teachers felt that listening to the scientists was the most valuable part of the workshop. [A23435]

Nor was it confirmed with the narrative survey responses, where workshop respondents overwhelmingly mentioned the scientists as being one of the best parts of the workshop. This discrepancy could have been a result of the wording of the question. Respondents may have interpreted the question to be asking about directly working with the scientists, whereas in most cases, the scientists gave presentations and answered questions. In this case, respondents may have been responding to "meeting and working with" more than "the scientists."

There were strong indications that educators who participated in the workshop would likely change something in their teaching because of PPZA. Ninety-nine percent of the survey respondents said they would teach more about the poles, with more than half (53%) indicating they would use some of the topics discussed, and 61% who said they would adapt an activity for use in their classroom. (See Appendix J for responses to the Teacher Survey questions.)

Many educators participated in PPZA not as part of an educator workshop, but instead when they brought their students to a large group presentation of some version of *SfaCP*. In these situations, teachers tended to see their role very differently from workshop participants. They described it as primarily to expose their students to a positive experience rather than as a learning or professional development opportunity for themselves. The data indicated that most teachers who participated in this way were not aware of the wealth of online resources unless they had been part of the planning for an in-school event. When teachers were aware of the materials, there was some evidence that they used the materials later, or at least sought them out [A2379]. There was also evidence that at least some of the teachers had students who followed up in some meaningful way, such as doing a class project. This is described in more detail below in "The Student Experience" section.

Although informal educators were originally considered a distinct audience, few special informal educator events took place. When informal educators were involved as an audience, they tended to be part of the educator workshop audiences. During the first year of POLAR-PALOOZA, 6% of the educator workshop participants indicated they were informal educators. The data showed that informal educators had similarly positive experiences compared to the teacher participants.

The Student Experience

A number of school programming events were set up as part of PPZA. This section covers the experiences of children who were audience members at group presentations to relatively intact school groups. It includes presentations by Travelers at schools and other off-site locations like zoos, or cultural centers, as well as when school groups came into the host museum.

There were indications that the large school group presentations were interesting events for many children.

> [*from a staff person*] [The students] seemed pretty interested and excited. [A21382]
>
> Oh [my students] were really hyped up about it. As they looked at the Arctic and the different life forms that were there, they were really amazed. [B266378]

Events that used a large-group presentation format, however, tended to be less effective for many audience members. Data indicated that while teachers often appreciated the opportunity to expose their students to outside speakers, neither the Travelers' own PowerPoint presentations nor their adapted *SfaCP* presentations seemed to excite or inspire many of these children.

> [*from a staff person*] I don't think it was as effective as it could have been. And I don't think … it was … like the most amazing experience these kids ever had. I think it was probably okay. And that … the students did get something useful out of it. How much useful I'm … still not sure. [A25382a]
>
> [*from a student*] [The presenter] was for adults, and I'm a kid. He used too many big words. [B43436]

It should be noted that there were some exceptions to the schoolchildren experiences described above. For example, although we did not reach redundancy on these findings, preliminary data suggested the large group presentation to schoolchildren at certain venues included significant audience involvement including clapping of hands, rapt attention, and high levels of enthusiasm [A341131, A19381].

When programs for school children were presented at sites other than the host museums, technical issues such as acoustics and the size of the projection screen were often a challenge. And when there were limited projection facilities, or when the screen was relatively small for the size of the audience, the critical importance of the PPZA images/videos was emphasized.

Although in general the modified *SfaCP* presentations to school groups were less effective for their targeted audiences than the public *SfaCP* presentations, in some situations teachers took it upon themselves to make sure the students' experiences were extended through other opportunities, even if this was just talking about polar topics in class.

> [*from a teacher*] So it was good for us for the rest of that semester to just talk about it when we could. [A24495]
>
> [*from a teacher*] [My high school students and I] did talk about that in terms of the effect on the atmosphere with the fact that a lot of that tundra area that's not being under ice anymore is going to be releasing a lot of carbon dioxide and greenhouse gases into the atmosphere. [A29495]

In a few instances, seeing the *SfaCP* program seems to have motivated students to pursue some of the issues in more detail.

> [*from a teacher*] Really, it was the bears and the ecology because see [in my sixth-grade gifted class] we do current events in social studies. And after [the presentation] I started getting a lot of current events about Arctic environments. [A21495]

> [*from a teacher*] And I'm going to tell you the most recent thing was some kid saw a show about the polar bears and the grizzly bears hooking up. And I remember a conversation about that. You know, about the polar bears and the grizzly bears mating. I sure did. So I know that it had an effect on them because, you know, they talked about it months after. You know, this was not just the thing, "Well okay, we went and we saw that. That's over." You know, they talked about it for months after. [A233495]

> [*from a teacher*] [The] students had … learned things they hadn't known, had been interested, and had been actually talking about it afterwards and making reference to current news stories about global warming and climate change and research. [A23496]

Another challenge that constrained the school group experience was that there was often a wide age range in the audience. When the program went out to a school, it was not unusual for the school to want to include as many students as possible, so the audience included (for example) middle school as well as high school students. Because the connection and bridge to the content for the younger children was usually about the animals, whereas for the older children it was more about a career in science, or even the science of global warming and climate change, it was difficult to provide meaningful experiences for both audiences simultaneously. In general, the off-site presentations tended to work better for the high school than for the middle or seventh-to ninth-grade audience.

> [*from a teacher*] The audience was 7th through 12th graders…. We could have maybe broken it up into two sections, maybe with our high school getting most of the information directly from those scientists. And then maybe something a little bit more — a little bit more fun and hands-on with the younger kids. I know that sometimes when you have your presentation geared, you want to try and hit as many people from all those different age ranges as you can, but my experience with doing some of those has been sometimes you bring all the touchy-feely stuff when you have the little kids and play things…. We always found out that the little guys always like that touchy-feely stuff. I think you know it would have been a big blast to get a little kid out there and try on all that polar stuff…. And then for the older kids, like I said, a little bit more about … why those scientists decided to do what they're doing. And what got them to that point. I think those kids would get a little bit more out of that. [A24379]

> [*from a teacher*] A lot of the younger kids that I have in some of my classes … thought it was kind of fun to see all the pictures of the polar bears and didn't really relate a lot of that idea to what's happening to those animals. And looking at the garb of the scientists that they were displaying and put on. That was primarily what they took from it. And then the kids that were kind of boring [drilling] some ice there on the gym floor, that was kind of cool for them to remember. But in terms of the impact

> of what was the message of the climactic change for them … it wasn't as evident to them, the younger [ninth-grade] kids. It was more for the older students. [A256379]

Underserved Audiences

One of the challenges of informal science education in general is appealing to, attracting, and serving audiences that usually do not visit museums on their own. A wide array of PPZA opportunities were provided specifically to appeal to traditionally underserved audiences. These strategies included such techniques as ensuring diverse panels of Travelers were at each venue, producing a rap-influenced music video about climate change, making special trips to underserved schools, and holding targeted events such as a presentation at Albuquerque's Indian Pueblo Cultural Center, and arranging for two of the Travelers to appear on the locally-produced and nationally-broadcast *Native America Calling* radio show.

In general, the data indicated that the experiences of underserved audiences paralleled the experiences of other audiences, with the exception that there were relatively fewer audience members from traditionally underserved communities at the public *SfaCP* presentations.

One important venue for reaching non-traditional audiences turned out to be school group events, as these were often attended by large numbers of diverse and traditionally underserved audiences. For most large school group audiences, participating in these modified *SfaCP* presentations tended to be primarily about being exposed to something they would not have been aware of otherwise, and this was especially true of underserved audiences. Teachers of underserved students were particularly grateful that their students experienced an opportunity they would not otherwise have had, especially when the program came to their schools, even though they were sometimes frustrated that some children did not really appreciate what they were experiencing.

> I was kind of getting on them for not wanting to learn or know about this. [B20379]

Working with underserved and/or younger audiences required adapting the program in important ways. In some situations, the Travelers had limited prior knowledge about who the audience was going to be and limited time to plan special strategies to engage a particular audience.

PPZA utilized a number of important techniques for reaching underserved and younger audiences, including emphasizing common, non-jargon language, and having (for example) a Native American presenter talk to an audience comprised primarily of Native American schoolchildren.

Some additional techniques that have worked for other programs include such things as: making connections to local issues, institutions, organizations, people, and geographical features; including hands-on, tactile, and interactive opportunities, especially for younger audiences; identifying appropriate bridges to the content for each unique audience; and referring to teachers or principals by name during the presentation. Many of these techniques are appropriate for all school group audiences, and are not unique to underserved audiences.

Providing opportunities such as participating in a PPZA program was extremely important for underserved audiences. There were indications that teachers in underserved schools were aware of and appreciated the tension between serving large numbers of traditional audiences and making the extra effort to serve students who tend to have fewer opportunities.

> You always want to address the largest number of kids with the limited resources that you have in whatever program that you have, and sometimes that's how we get dropped through the cracks. We don't have the kind of … equipment that [one] needs to do a better presentation or we might not be the number of students that you need to address, and sometimes that's what drives some of the monies to do these programs, is numbers. And I can understand that. But if some of those programs can get out to some of our rural schools, I think it does, like I said, more benefit than some of those programs will realize…. [When you go to the larger, better-funded schools] you address more students, and maybe you'll get more kids going into polar research when you do that. But then you also leave out a good segment of the students that don't have ready access to that. [A26379b]

Data indicated that most teachers in underserved schools greatly appreciated the PPZA efforts to include them in the program offerings.

> Certainly schools like ours that are rural and isolated and service the kind of cultural communities that we serve, it helps us more than you guys will realize because [our students] don't have this opportunity all the time, and years will go by that we don't have people like these scientists come and tell us things like that. [A22379]
>
> Don't leave us out of the loop of those kind of programs! [B29379]

Employing a variety of techniques for reaching out to and engaging underserved audiences was essential. With the PPZA program, most of the opportunities for traditionally underserved audiences were either large school group presentations or less formal, tabletop activities at outreach facilities. An analysis of the teacher survey data also indicated that 71% of the teachers who participated in the PPZA educator workshops worked at schools where at least one quarter of the students were eligible for the free or reduced lunch program. It is likely that many of these students will also realize the benefits of the PPZA program indirectly.

The University Student Experience

University students were not a primary target audience, but the evaluators gathered a limited amount of data about their experiences. For the most part, this audience seemed to have positive experiences, and appeared to greatly appreciate the opportunity to hear directly from the scientists. The questions the students asked at the end of the presentations were thoughtful and insightful, demonstrating careful attention to the content of the presentations.

> What are the stress factors for the spruce? [A485]
>
> How long has climate change impacted your community? [A485]
>
> Do you think, now that there is more awareness, that things will get better? [A485]

> What avenues are there that people can go through [to become more involved]? Is there an indigenous peoples' climate change conference? [A485]

> How has the lake responded since 1960 when the ozone hole came in? [A484]

For university students, hearing directly from scientists was a somewhat common opportunity, and PPZA seemed to fit neatly into an already existing university structure that brings in current research and researchers. University students tended to value and appreciate hearing directly from the Travelers in a way that younger, public school audiences sometimes did not, recognizing on the one hand that having the chance to hear directly from the experts was a familiar opportunity, while simultaneously recognizing and appreciating the importance of this in a way that younger audiences were unable to.

The Host Institution Experience

While not a primary focus of this evaluation study, some limited data were gathered about the experience of the museum hosts. These data indicated that the host museum experiences tended to be positive for the most part. Respondents indicated that they received appropriate support and guidance from the PPZA staff and that the PPZA experience generally went smoothly.

Most respondents did not anticipate the intense time and resource commitment required. (See Appendix D for a sample checklist given to host institutions). While a few institutions were able to get additional support for marketing or food, there were indications that not receiving a stipend limited many museums' ability to adequately host PPZA. [A21382]

> It was … logistically complicated. It took a lot of staff time here at the institution. [A26382]

> You know, just a small amount [of money] … [to] use for marketing, for programming, for food, for, you know, for staff, for rental, for whatever … would have — would have helped. [B23672382]

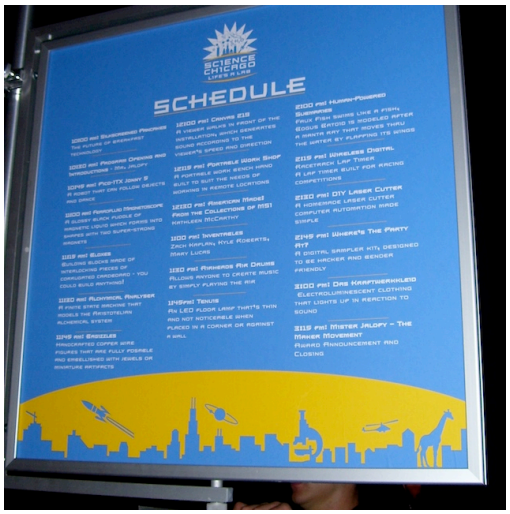
The program appeared to operate most successfully at venues where the museum had a solid history of presenting such events for its visiting public. When this was the case, PPZA tended to fit into an existing framework that was familiar to the institution. Those museum hosts with less experience at presenting these types of events struggled more.

For many host institutions, PPZA was a good way for them to offer something about the topic of global warming/climate change that they wanted to present anyway. By hosting PPZA, achieving this educational goal became much more feasible and gave them the ability to do it in a much larger way.

> [The museum] had been going to do something about climate change in the coming year anyway … so this was a perfect way for them to do it without reinventing the wheel themselves. [A200382b]

When PPZA went to a large institution, there was evidence that it sometimes got lost, whereas smaller institutions may have valued it more and hence been more successful.

[*from a staff person*] In general you would expect … that in most cases, a bigger institution has more staff members, more resources, more ability to put on a project like this or a program like this. But it can also get lost in a big institution, too, and not be a very high priority because they're already doing big stuff. For a medium size institution, it can be a little bit more of a challenge financially or staff-wise. But on the other hand, it's a big deal for them, and they're going to be really excited about it and try their hardest to pull it off. [A23382]



In some situations, PPZA was wrapped into a bigger event, such as the kickoff for the yearlong, citywide *Science Chicago* festival or in Raleigh, where it was wrapped into an ongoing special weekend format. In some of these situations, this proved to be a highly successful strategy, where the two events seamlessly complemented one another, and the weekend turned out to be more than the sum of its parts. In other venues, however, PPZA got lost in the shuffle. Data indicated that this was due to a variety of forces working together, including host staff perceptions of and expectations for the two events, ability of the institution to put on a huge gala experience, as well as available resources dedicated to each of the respective events.

The Outreach Host Experience

During the first year, some PPZA venues included ancillary or outreach activities in the local and surrounding communities. These included events at schools, such as guest lectures at local universities and Traveler presentations to rural schools, and events presented at community organizations and partner informal education institutions, such as a Traveler speaking at a Native American cultural organization or partnering museum, and tabletop activities and Traveler presentations at the local zoo.

Data indicated that the outreach host experiences were similar to the museum host experiences — generally positive — except that sometimes outreach host experiences were not as well implemented as hoped.

> [*from a host museum staff person*] The problem is you do lose some control when you turn it over to a partner…. You have to work a little bit harder, I think, and spend more time at it to make sure that stuff happens at the other site as it would happen at your facility. [A245382]

> [*from researcher's notes*] The people at the check-in desk didn't seem to know about [PPZA] or what to do with us. [A2492]

In addition to the host museums' feeling that working with a partner institution required additional oversight, there was also evidence to suggest that some outreach host institutions felt they were not given as much direction as they needed. Even though they were given detailed checklists, some partner institution staff indicated they did not have a clear understanding of all

the things they should do to (a) set up the environment and deal with the technology needs of the Travelers and (b) adequately prepare teachers and school groups before they arrived.

> I thought that our gym would have been easy enough to use. We do have some partitions that roll down and I remember in the past we had shown the slides … on the partition … which makes a much bigger slide than the hand-screen that we were dragging around. I think that would have been a little bit better. The kids that were there could have probably seen a little bit more of those images…. The presentation was great, but it was just the logistics of how we set that up that was kind of a problem. [A29495]

> [*from researcher's notes*] [An outreach institution staff member] explained that the only prep[aration] teachers were given were to go the [outreach institution's] website because they weren't given any other info to give them. [A266492]

There was evidence that some outreach institutions perceived these PPZA opportunities as similar to other programs that came to the institution [A28492]. In some cases, that meant that the institution did not particularly value the opportunity, instead seeing it as just one more program. In other cases, it meant that PPZA fit nicely into an already existing and familiar format and that the host institution knew what to expect and how to prepare.

The Traveler Experience

One of the unanticipated findings from this evaluation was that the Travelers themselves gained in important ways from their participation in PPZA. While not a focus of this evaluation, these findings were an additional positive outcome of the POLAR-PALOOZA program.

Overall, the data indicated that the experience for most of the Travelers was extremely positive, with the largest drawback being the amount of time required. However, for the most part, this was easily offset by the strong desire to participate in PPZA and contribute in such a meaningful way to the furthering of the public understanding of science, as these Travelers stated.

> It was in every way a great experience. [A2502]

> Oh, it's fun. I wouldn't do it if it wasn't fun…. It's seeing the audiences come alive. It's having people come up to us after the presentation and say, "Oh my gosh, that was fascinating. I never knew that." You know, things like that are really fun…. I mean, it's always, you know, a hoot to hang out with scientists. So I have a good time. If it was a horrible experience, I wouldn't do it. [A25134]

The data indicated that there were numerous ways Travelers benefited from participating in PPZA. While all the Travelers were very well grounded in their own specific content, many of them were relatively unfamiliar with other Travelers' specialties, and indicated they valued learning about an area they were less knowledgeable about.

> [Participating in PPZA] has certainly helped me to understand the science of the other scientists along. You know … I don't hang out with people who study birds. But … it's just fascinating…. I know a lot more about blubber than I knew when I

> started this. So there's some content that I've learned because it's not stuff that I would read other than the fact that I'm in the room at the same time listening to this guy talk. [A2007134]

Some of the Travelers had participated in extensive outreach opportunities prior to participating in PPZA and were well versed in communicating their science to the general public and/or children in particular. For others, this was a relatively new opportunity. Regardless of their backgrounds and expertise in presenting their research to a lay audience, there were strong indications that most Travelers appreciated expanding their outreach tool kits and learning new ways to present and talk about their science. In fact, many of the Travelers we spoke with indicated that one of the challenges about participating in PPZA was trying to communicate complex ideas in an interesting and accessible way, but that this was a "good" challenge.

> [We learned] how not to use scientific jargon. How to tell it in a conversational way so that … as a viewer, you feel you're standing right beside the scientist. We're not preaching. Techniques like that they gave us advice on, and I think that has molded … our abilities to talk to the public. So yes, I've learned stuff too. [A21134]

> What I didn't anticipate about participating in the POLAR-PALOOZA was the effect that it would have on me and on creating a community of polar presenters. I think that this may turn out to be one of the most enduring influences of the program. For example, [some of the other Travelers] and I have all given similar talks on the changing Arctic in the past, but by working through this together, we learned from each other about better ways to present the message, and also about great animations (e.g. [one Traveler's] basal glacial water flow) and videos ([another Traveler's] instrument plunging down the moulin) that will help us tell the story more powerfully in the future. [B65131]

As mentioned in the quotation above, participating in PPZA also gave the Travelers access to additional resources (especially video clips and podcasts) to use later.

> And I use [the video clip]…. Every year I give talks at local schools. And that's just something I do and I've done for a long time. What's different now is that I not only have my PowerPoint, but some parts of my PowerPoint I take out and show the movie instead. So I show pieces of the movie. So it's really effective because [it's something] that kids will stay awake for. And they love it. [A202134]

Collaborative Aspects of PPZA

Collaborative projects such as PPZA are incredibly complex endeavors to orchestrate. Much of their success depends on all partners working equally hard to achieve a common goal. PPZA was an ambitious endeavor with ambitious goals, and it was clear that it was most successful at venues that embraced the collaborative working relationship. All PPZA host venues shared common challenges, and different institutions were more and less successful at dealing with those challenges. In many ways, the PPZA project as a whole faced even greater challenges, because each venue comprised a unique situation with a new cast of characters. POLAR-

PALOOZA relied on the participation of a large number of polar scientists and Arctic residents — close to 40 by the completion of the project — and partnerships with many science centers that contributed in-kind resources and recruited local outreach venues and audiences. And all of this was accomplished in 24 geographically diverse locations.

Some of the challenges faced were common to many of the venues. For example, the marketing and promotion of PPZA was difficult for most sites, as was dealing with the facility and technology limitations of many outreach venues beyond the host museums and science centers. Coordinating the Travelers' schedules so that the right people were in the right locations at the right times sometimes necessitated sophisticated and creative arrangements and was well carried out, especially given all the potential pitfalls. Printed materials, detailed checklists, and telephone support and guidance were offered to all host sites; some institutions took better advantage of these materials and opportunities than others.

While it is tempting in collaborative projects to place the responsibility for things that did not go well on aspects of the project that were out of the project's immediate control — partners did not deliver what they promised; the facility was not up to par; people failed to take advantage of the support that was offered; outreach venues dropped the ball — the fact remains that orchestrating the intricacies of the PPZA collaboration was a difficult and complex undertaking, and one that worked well in spite of its many challenges.

As with all collaborative projects, however, simply involving many players, stating expectations clearly, or making support materials available does not guarantee or even maximize the potential for success. A significant amount of research has explored the characteristics of successful collaborative projects. One study that comprehensively surveyed this research literature, analyzed the findings and identified six categories of factors that influence the effectiveness of collaborations: (a) environment — including such issues as the political and social climate within which the collaborative operates and the perception of leadership ability; (b) membership characteristics — including mutual respect and trust and the ability to compromise among the collaborating partners; (c) process and structure — including all members sharing a stake in both process and outcome, clear roles and expectations, and the ability to be flexible and adaptable; (d) communication — including frequent and open communication and establishing informal relationships; (e) purpose — including a shared vision and attainable goals; and (f) resources — including sufficient time, money, materials, and skilled leadership (Mattessich, Murray-Close, & Monsey, 2004). While analyzing the PPZA partnerships in terms of these six criteria was beyond the scope of this evaluation, these characteristics are presented here as a possible framework for examining the PPZA collaborative relationships as a whole and identifying particular strengths and also specific areas that might be improved. As with many informal science programs, the ultimate effectiveness of PPZA for audience members at each venue was — at least to some degree — a function of the effectiveness of the collaborative relationships.

CONCLUSIONS

POLAR-PALOOZA toured the United States at a time when the topic of climate change and global warming appeared relatively low on a list of Americans' concerns (Pew Research Center for the People and the Press, 2006), with the economy, war, and health care taking precedence. Nevertheless, POLAR-PALOOZA was a powerful format for engaging the public and teachers with science, while also being a rewarding and worthwhile experience for the traveling scientists.

PPZA was an ambitious and complex undertaking designed to bring what is happening at the poles as a result of global warming and climate change to public audiences across the country in an authentic, accurate, and appealing way. The PPZA model of using real scientists and Alaska natives accompanied with high definition video and audio footage proved to be an engaging and powerful format for engaging many of its audiences. The centerpiece of PPZA, the *Stories from a Changing Planet (SfaCP)* multimedia presentation, expanded adult audience members' (and some of their young charges') understanding of and interest in global warming and polar research. *SfaCP* also helped many audience members understand the subtleties and complexities of climate change and motivated some toward more concern about the rapid changes taking place at the poles and even an intention to act on what they learned. There was also evidence that direct interactions with the Travelers supported and likely extended some children's existing interest in science careers.

The specific components of PPZA that contributed most substantially to meaningful audience experiences were: dynamic scientists and Alaska natives standing in front of video footage of them working in the field, high quality video and audio, the well-choreographed and professional production values, having multiple Travelers (not just one) as co-presenters, the use of authentic artifacts, up close and personal tabletop discussions and activities (when local circumstances allowed), the 8½ x 11 "glossies" audience members could get autographed (when they were available), and the large repository of easily accessible online resources. The careful integration of all of these PPZA elements created an engaging and memorable approach to science.

An issue that arises from large-scale multimedia presentations such as PPZA is the cost-effectiveness of this approach to presenting science to the public. Does it seem to be worth all the money, time, and effort? Data from this study indicated that it clearly was worth it at many of the venues. Audience members at these venues had powerful and memorable experiences, and there were even indications that some lives were changed. People were reminded in powerful ways of things they already knew but had forgotten, and they were encouraged to care and to make a difference. Having the opportunity to interact with real scientists talking about real research and explore real artifacts and accoutrements of polar science created lasting impressions and memories for all audiences.

While PPZA was a powerful experience for most adult audience members and for some of the younger people who accompanied them, for school groups and traditionally underserved audiences at many venues, the large-scale multimedia presentation tended to be comparatively less effective. PPZA made an extensive effort to engage children and underserved audiences by

employing a comprehensive array of strategies, including having a diverse panel of Travelers, having Travelers participate in targeted media opportunities, and arranging many outreach presentations often targeted to specific underserved audiences. While these were all essential and effective strategies, the most successful venues — i.e. the *SfaCP* public presentations — tended to be attended primarily by adult, middle- to upper-class, White, and well-educated audience members.

Some of the lessons learned during the course of the project were (a) the need to adapt the length of the presentations to specific audiences, recognizing that weekend daytime audiences in science centers will inevitably include a wide range of ages (including toddlers), regardless of how the program is advertised; (b) the ability to translate scientific concepts into more popular and accessible language is a highly refined skill that varied greatly among Travelers; some will need more guidance and support than others; (c) some local partner organizations will need more support, guidance, and encouragement to allow for those aspects of PPZA which proved most effective, for example one-on-one interaction between the Travelers and the audience members at tabletops after the *SfaCP* presentations; and (d) the need to incorporate into the design of the *SfaCP* presentations — especially when the audiences include younger and/or less-motivated participants — additional audience participation opportunities, including such activities and props as rap songs, stage activities, ice cores and fossils, and plenty of time for questions and answers and face time with the Travelers.

Experiences that resonated with all children and even many adults were those that included interactive and hands-on components, such as opportunities to drill into the ice, shuffle a "penguin egg" on one's feet, put on a polar coat, plunge a hand into icy water with and without insulating blubber, or talk with and ask questions directly of a scientist. Relying exclusively — or even primarily — on the scientists-on-the-stage model limited the ability of some audience members to have memorable educational experiences. This was true for programs given at host sites as well as ancillary outreach programs. The challenge with these more interactive and hands-on opportunities is to relate the activity back to the bigger science message so that the activity does not become "empty." Trying on a big red parka for example, is important, but relating it to global warming and climate change is the real message. Feeling the insulating properties of blubber when a hand is plunged into icy water is impressive, but ensuring it is explicitly connected to the overarching idea of climate change is important.

POLAR-PALOOZA was an incredibly complex and yet well-orchestrated venture. Because of the organizers' and Travelers' solid commitment to producing, refining, and improving a high-quality product, the PPZA programming was widely praised by the host institutions, audiences, and various other participants. As a model for program development and a strategy for helping people who care about the environment and climate change become more knowledgeable about and appreciative toward these issues, POLAR-PALOOZA was a powerful, informative, and entertaining program for many of its audiences. As an experiment in informal science communication, it demonstrated the effectiveness (and some challenges) of a wide range of innovative and unique approaches to connecting with our visiting publics.

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APPENDIXES

Appendix A: Description of the POLAR-PALOOZA Program

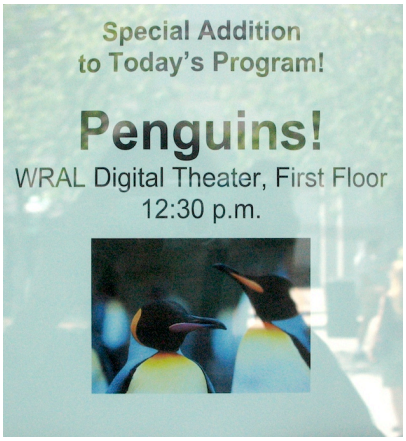
The PPZA model

At the heart of POLAR-PALOOZA was a diverse core group of about 25 research scientists and Alaska natives who made up the Travelers. These individuals were handpicked because of the polar focus of their research, their presentation skills, and their willingness to have video and audio footage of their field research and lives captured digitally on film and on tape. At each venue, a selected team of diverse Travelers (usually four to six individuals) presented the *SfaCP* program and participated in a variety of outreach events.

The individuals comprising the team of Travelers at each location varied greatly and were intentionally selected to create a diverse group encompassing male and female, scientists and Alaska natives, and representing different science disciplines, different ages, and different personalities. Whenever feasible an Alaska native was part of the team of Travelers to give a first-person account of day-to-day living among the most dramatic effects of global warming. The team at each location was a unique configuration.

Travelers usually arrived on-site individually based on their schedules. Although development of the individual Traveler's presentations began well before arriving at a venue, presentations were refined through a series of breakfast meetings, individual consultations with the producers, group rehearsals, and debrief meetings between presentations. The Travelers all participated in a group rehearsal for the *SfaCP* presentation(s) and were also assigned to different ancillary outreach activities. While the rehearsals for the large group *SfaCP* performance were usually lengthy and detailed, preparation for the outreach activities tended to take place informally on the way to a specific location.

An important characteristic of the PPZA model was a strong commitment to ongoing refinement and improvement of the Traveler's presentations. This happened on many levels: from venue to venue, as well as on-site between back-to-back public presentations. An example of this was in Raleigh, North Carolina when — in response to a large number of children at a Saturday show and anticipating a similarly young audience for Sunday — it was decided to add an additional child-centered presentation focusing on penguins. More often, it was in evidence when sections of the presentation were dropped or reformatted or better segues were developed. This constant, "on-the-fly" tweaking was integral to the PPZA model.



Diversity and serving underserved audiences were also a major focus of the PPZA project. Each team of Travelers was selected, in part, to represent the diversity of researchers working in polar regions, (when possible) including women, Alaska natives, people of color, and both young and more established researchers. One of the goals of PPZA was reaching audiences that are not

traditionally served by science and environmental programming. PPZA planners worked closely with partner institutions to reach out to the full range of their host communities, including special efforts to present PPZA programming to groups of African Americans, Latinos, Alaska natives, and other Native Americans.

The partner institutions played an indispensable role in PPZA. With support and guidance from PPZA staff and co-PI Jayne Aubele of the New Mexico Museum of Natural History & Science, partner institutions both facilitated the presentation of PPZA-developed programming and developed and presented their own International Polar Year-related programming, often before, during, and after the PPZA visit. PPZA staff provided a wide range of telephone and e-mail support and detailed checklists and templates, and in turn asked the hosts to record and report data such as audience statistics and a summary of outreach events offered. In addition to celebrating International Polar Year, some host institutions tied PPZA programming to other special events, such as the kickoff of *Science Chicago* at the Museum of Science and Industry and the opening lecture in the annual Explorer Lecture series at the Cleveland Museum of Natural History.

A core aspect of the PPZA model was a commitment to securing a diverse lineup of host and ancillary venues to include a variety of types of institutions and audiences. These included large and small institutions, science and natural history museums, zoos, universities, cultural centers, community organizations such as Rotary, and broadcast media opportunities such as radio shows. The realization of this can be seen by scanning the organizations listed in Appendix C.

***Overview of* Stories from a Changing Planet (SfaCP)**

The nucleus of the PPZA program, *SfaCP,* was typically 60-90 minutes long with four to six Travelers sitting on stools on an auditorium stage. After a brief welcome by a member of the host staff, one of the Travelers began the show with an introduction to the presentation. At this point, a brief introductory video clip began playing (http://passporttoknowledge.com/polar-palooza/pp09a.php Polar Montage).

After the introduction, the Travelers took turns talking about their research and the video footage that was projected onto the screen behind them. The high-definition video projections included scenes of polar habitats and life, along with videos of the on-stage scientists engaged in research and daily activities like cooking meals, traveling across snow and ice, and having fun on the job. These videos were interspersed with animations and static slides that highlighted and explained the concepts being discussed on stage.

In addition to the backdrop of high-quality audio and video, the Travelers usually also incorporated some authentic artifacts in their performance, for example wearing a big red polar coat, or bunny boots, or displaying a many-thousand-year-old ice core. Music, sounds, and dramatic lighting effects were also part of the show. At many venues, the presentation included one or more opportunities for the audience to participate in the program. Most often, these took the form of quizzes, where the audience guessed the identification of sounds recorded in polar regions or found out which "facts" they may have heard about the poles were actually true.

At the conclusion of the formal presentation, the moderator usually opened the floor to questions from the audience. The questions were addressed to particular Travelers or to the whole group, and the answers often led to interesting exchanges with the audience or on stage. After five or ten minutes of questions, the audience was usually invited to meet the Travelers in person, either at tables set up outside the auditorium, or when schedules or space prevented it, at the base of the stage. These informal exchanges sometimes lasted a half hour or more when the Travelers did not have to hurry off to another engagement.

PPZA at any particular venue was usually a two- to three-day event with *SfaCP* taking place one evening or during a weekend afternoon. At some venues, there was a second or even third *SfaCP* presentation. It was also not unusual to have a shorter, modified *SfaCP* presentation focused on a specific topic such as penguins and geared toward a special audience such as adults with young children.

Ancillary Programming

In addition to the *SfaCP* stage presentation that was the nucleus of the program at each venue, additional ancillary activities and presentations were an important part of PPZA. These varied greatly by venue but usually included some combination of museum-wide Family Days with tabletop demonstrations and activities, presentations to school groups, educator workshops, interviews on local television and radio shows, and presentations to local business and government leaders. See Appendix B for an example of a detailed PPZA schedule at one venue.

Following is a brief description of many of these outreach opportunities.

Programs for school groups. Programs for school groups were presented by one or more Travelers. They were conducted in a variety of venues: at schools, in host institutions' auditoriums, and on stages provided by other partner institutions, like zoos. Host institutions usually selected the schools that would be invited and the venues for the presentations, keeping in mind the project's goal of reaching out to underserved groups.

These were usually sit-down, large-group presentations. In many cases, the school presentation was a modified version of the *SfaCP* presentation; at other times, Travelers presented talks they had previously developed for other audiences, but tailored to the current audience with input from PPZA staff. There was usually an opportunity for students to ask questions of the Travelers at the end of the formal presentation. Students often had the opportunity to ask for autographs and interact one-on-one with the Travelers, either in front of the room immediately after the program or during tabletop demonstrations available separately from the main presentation.

Some of POLAR-PALOOZA's local partners recognized that reaching underserved audiences who might not typically visit science centers and natural history museums required special targeted outreach and arranged visits by sub-sets of Travelers to geographically remote locations such as a school located in a Native American community 60 miles away from the host institution. Others invited underserved schools to attend presentations in house.

Educator workshops. Educator workshops were designed to help classroom teachers and informal educators become more knowledgeable about polar science and more comfortable presenting information and activities related to polar science in their own classrooms. Most educator workshops were conducted in a classroom at the host institution. Host institutions advertised the workshops to teachers and handled registration and other local arrangements, including arranging for continuing education credits and refreshments for participants.

PPZA hired a facilitator — usually a master teacher with a strong background in science education — to coordinate the two- to three-hour workshop. The facilitator handled introductions and led the activities, and two or three Travelers gave presentations about their research in polar regions. Facilitators and PPZA staff assembled packets of printed materials, including complete descriptions of all the activities, information about the Travelers, documents linking the workshop contents to state standards, and supplemental materials about science in polar regions.

Family Days. Family Day programs were developed by host institutions as a way to better serve families and other groups with younger children (preschool through elementary grades). Some hosts also targeted homeschoolers with these programs. Family Day events usually focused on tabletop activities and demonstrations that took place in exhibit halls. Usually some tables were devoted to PPZA-developed activities and Travelers often staffed these. Tabletop activities included displays of touchable fossils from the poles, opportunities to drill into a block of ice or try on clothing worn by polar researchers, and ample opportunities to talk one-on-one with the Travelers. Other tabletop activities were developed and staffed by educators from the host institutions and included hands-on activities and crafts.

At some venues, Family Day activities took place before, during, and after the full-scale *SfaCP* presentations. At other venues, Family Day activities include shorter versions of *SfaCP,* developed and presented with families and younger audiences in mind.

Following is a brief description of examples of Family Day events at some of the venues.

> *[from a staff member]* The Reuben H. Fleet Science Center in San Diego opened its galleries on a Saturday for activities such as penguin origami and hand drilling

> into a 300 lb block of ice, mentored by the visiting scientists. The New Mexico Museum hosted homeschool families on a weekday afternoon, with activities such as "Walk like a Penguin" and a special shortened POLAR-PALOOZA show featuring two of the Travelers. On both Saturday and Sunday, the Raleigh Museum had informational booths and hands-on activities on all floors, with live animal exhibits — including an Arctic fox — on the outside mall. MSI Chicago made POLAR-PALOOZA part of the opening weekend of ScienceChicago/Life's a Lab, with events … all across the Museum. For this, Raytheon Polar Services sent both a Nansen sled and a Scott tent (with transportation funds contributed by ScienceChicago), and three of the PPZA Travelers provided "color commentary" at the *Science on a Sphere* exhibit. [A381130]

Related events. In addition to the programming described above, PPZA visits included a variety of other opportunities for the Travelers to meet and communicate with the public and/or special audiences. For instance, Travelers were interviewed on television and on the radio; participated in round-table discussions with reporters from local media outlets; spoke to business and governmental leaders at civic groups like Rotary; ate meals with donors, trustees, and museum members; presented technical research talks to university students and faculty; and gave less-technical research presentations to groups of interested adults.

Printed materials. The PPZA organizers developed two different types of handouts with additional information for audience members. An 8 ½ x 11 inch black-and-white photomontage of the Travelers was made available at some venues (intended to be used for collecting Traveler autographs). In addition, in part because of preliminary results from early formative evaluation, a color booklet was developed to answer many of the questions that audience members had about polar regions and what they could do personally about climate change and related issues. Although the evaluation's findings contributed to the development and content of the brochure, the handout was not completed in time to be included in this summative evaluation. An online version of this brochure is available at: http://passporttoknowledge.com/polar-palooza/handouts/

The PPZA Website

In addition to *SfaCP* program and the outreach activities, the POLAR-PALOOZA project included a website — http://polar-palooza.com — which is still active and houses an extensive public archive of high-definition video and audio footage of ongoing polar research. In addition, there is a *Take AIM at Climate Change* music video, podcasts, blogs, and a variety of additional resources.

One section of the site introduces the Travelers, including photos, biographical information, and quotations. Another section is aimed at educators and includes links to a wealth of resources including video clips and graphics, descriptions of the activities done during educator workshops, and a list of additional materials from other websites. During POLAR-PALOOZA's run, the website was also where audience members could go to locate information about past and upcoming venues.

Appendix B: Sample POLAR-PALOOZA Schedule

Albuquerque Three-Day Schedule

	Day 1 (October 22)	Day 2 (October 23)	Day 3 (October 24)
Early Morning	R&R	R&R	R&R
Morning	*7:30am to 11am travel* Travel & Outreach to: La Mesa E.S. (ABQ) for 4th & 5th grades, 170 students, *(presentation at 9-10am* **M.C. &C.F.** *7:30am to noon travel* L-A Jr/Sr H.S. (Casa Blanca, NM) 7th-12th grades, 370 students, *presentation at 9:30-10:30* **C.B. and J.R.M.** *7am to noon travel* Santa Fe Indian School, 10th-12th grades, 60 students, *presentation at 9:30-10:30am* **O.H. & K.L.**	*10am to 1:30pm travel &* program @ Rio Grande Zoo (5 different elementary schools, about 650 students) *demos from 11 to 12 and talk from 12 to 12:20* **C.F. and C.B.**, **M.C. and K.L.** *10:15am to 12:30 travel*& broadcast "Native America Calling" radio program *live broadcast at 11-12* **O.H. and J.R.M.**	*9:30am to 5pm travel, reception, presentation at NM Tech* **K.L and C.B.** @ noon- 1pm in MSEC 101 **J.R.M.** at 2-3pm in MSEC 101 *10:30am to 2:30pm, travel, presentation, discussions at UNM* **M.C.** @ noon at Castetter Hall (Bio) **O.H.** at noon at Hibben Center (Anth) **C.F.** @ 1-2pm at Northrop Hall (Geol)
Mid-Day	*12 (noon) to 1pm* Lunch @ IPCC *(Presentation 1-2pm)* Talk at IPCC, Nat. Am Charter School (6th&7th grade, 70 students) **O.H.**	Continue Talks at Zoo Lunch @ zoo or at Museum or wherever preferred	Continue Brown bag talks and discussions at UNM & NM Tech
Early to Mid Afternoon	*2;30-3:30pm* John Fleck interview **ALL** *3:30-4:30pm* Travel to & from KRQE-TV live Interview @ 4:10-4:20 **K.L.**	*1-2pm (@museum)* HomeSchool Fam Day **J.R.M. and O.H.** *2-2:45pm* special presentation in Dynatheater **M.C. and K.L.**	Lunch/Discussions with Faculty/students **ALL**
Late Afternoon	*3:30 to 5:45pm* for all but K.L. (*4:30 to 5:45pm*) R&R	*3-4:30* R&R, **ALL** *4:30pm to 5:45pm* Dinner, **ALL**	*2:30pm to 4pm travel* Taping of "in Focus" from 3 to 3:30pm *@ KNME* (**C.F., M.C, O.H**.)
Early-Late Evening	*6pm to 7:30pm* Rehearsal for "Stories" *Museum DynaTheater* **ALL**	*6pm* *arrive for "*Stories" Museum DynaTheater *First show 6:30-8pm,* **ALL**	*4 to 7pm (during the workshop)* Teacher Workshop for 50 teachers @ museum **M.C., J.R.M, and K.L.**. *6 to 7pm* Apple Store public appearance **J.R.M, K.L., C.B.**
Late Evening	Dinner *7:30pm* **ALL**	*Second show 8:15-9:45pm* **All**	End of visit dinner *7 to 9pm* **ALL**

Polar-Palooza Cell phone list:

Coordinators and Drivers:
Jayne Aubele:
Selena Connealy:
Tish Morris:
Carolyn Gregory:

Drivers:
Mike Sanchez.:
Linda Fey:
Wayne Adamcek:
Brian Grace:

Theater Manager: Bob Bak:
Theater tech: Dave (Eclipse):
Bio Collections (ice core): Patty Gegick Office: Hm: or

P2K
Geoffrey Haines-Stiles:
Erna Akuginow:

Travelers:

CHARLIE BENTLEY - Emeritus Professor, University of Wisconsin-Madison and Head of the U.S. Ice Coring and Drilling Services. Deepest trench in Antarctica and a peak in the Transantarctic Mountains named for him.

MICHAEL CASTELLINI –Director of the Institute of Marine Science at University of Alaska-Fairbanks. Studying harbor seal and Steller sea lion physiology and populations.

CHRISTINE FOREMAN – Assistant Research Professor, Montana State University. Studying microbial communities in the ice covered lakes of the McMurdo Dry Valleys.

ORVILLE HUNTINGTON –Alaskan Native (Athabascan) and wildlife biologist. Member of the Alaskan Native Science Commission.

KATHY LICHT – Associate Professor Indiana University-Purdue University, geologist. Studying the Antarctic ice sheet and how it has changed over time.

JACKIE RICHTER-MENGE, Civil Engineer, former Head of Snow & Ice Branch, US Army Cold Regions Research and Engineering Lab. Studying Arctic sea-ice.

Appendix C: Summary of 12 Months of PPZA Activities & Attendance by Location

[Note: Most attendance numbers (in parentheses) are estimates and not verified; they are however reasonable estimates.]

Los Angeles, CA
ASTC 2007, LA Convention Center (Conference theme: "Lights, Camera, Action: From Vision to Reality" Explore how to turn innovative visions into successful reality)
Dates: October 14 &15, 2007
Host: ASTC, California Science Center
Events: Keynote banquet presentation, and workshop
Presenters: Andy Revkin, Stephanie Pfirman, Waleed Abdalati, Darlene Lim, Alberto Behar. Workshop moderator, Jayne Aubele. Panelists: Stephanie Pfirman, Waleed Abdalati, Geoff Haines-Stiles.
Audience: Keynote/banquet presentation for 800, and next day workshop for more than 130 science center ISE gatekeepers, on the science of climate change and outreach options.

San Diego, CA
Dates: October 19-21, 2007
Host/s: Reuben H. Fleet Science Center, San Diego Museum of Natural History, Birch Aquarium at Scripps, (plus additional Balboa Park institutions participating in the Sunday events: the San Diego Museum of Man, San Diego Automotive Museum, San Diego Air and Space Museum)
Events:
Thursday October 18
"Why the Poles Matter" lunchtime presentation by Donal Manahan to San Diego Downtown Rotary (250 members of the business community)
Friday October 19
Media Briefing (midday) 10 print and radio journalists
Webcast, San Diego County Office of Education (220 middle students) also available online.
Opening Gala, Qualcomm Hall (~500)
Saturday October 20
Teacher workshop, San Diego Natural History Museum (42)
Family Science Day, Fleet Science Center (~600) and Birch Aquarium at Scripps (~300)
Trustee dinner for all PPZA staff and presenters
Sunday October 21
"Passport to the Poles" across Balboa Park
Presenters: Darlene Lim (50), Orville Huntington (10), Oded Aharonson (30)
Media appearances: Donal Manahan appearance on early morning Fox News; newspaper interviews (Orville); KPBS radio

Albuquerque, NM
Dates: October 22-24, 2007
(All of October 2007 was "POLAR-PALOOZA Month" with associated lectures from local researchers such as Phil Kyle, and a special polar exhibit at NMMNHS)

Host: New Mexico Museum of Natural History & Science, and the Indian Pueblo Cultural Center, !EXPLORA!, Maxwell Museum of Anthropology, Albuquerque Aquarium and Rio Grande Botanical Garden, Sevilleta National Wildlife Refuge, *99.5 Magic FM*
Events:
Monday October 22 (total student audiences: 550)
Santa Fe Indian School, La Mesa Elementary, Laguna-Acoma Jr./Sr. High School
Lunchtime event for Native American Charter School at the Indian Pueblo Cultural Center (60 students)
John Fleck interview
KRQE-TV live interview
Tuesday October 23
School events at the Zoo and Aquarium: attending Dolores Gonzales Elementary (whole school) & Lew Wallace Elementary (whole school.) (250)
"Native America Calling" radio show
HomeSchool Family Day at the Museum (260 family members)
Two evening performances of "Stories from a Changing Planet" (482)
Wednesday October 24th
University seminars at NM Tech (Socorro) and UNM ABQ (227)
"In Focus" taping at KNME (PBS)
Apple Store informal event
K-12 Teacher workshop (and school events) 86 educators
Presenters: Mike Castellini, Jackie Richter-Menge, Charlie Bentley, Orville Huntington, Kathy Licht, Christine Foreman

San Francisco/Berkeley/Oakland
Dates: October 26-28, 2007
Host: Lawrence Hall of Science (LHS) and UC Berkeley, Chabot Space & Science Center, NASA Ames Research Center
Events:
Thursday October 25
Evening news interview, Ch7 KABC
Friday October 26
Breakfast with LHS donors and trustees: discussion of ISE & IPY (20 gatekeepers)
2 presentations for school groups (2 x 150)
NASA Ames Research Center (250)
Saturday October 27 (Chabot)
K-12 teacher workshop (35)
2 presentations for public audiences (90 & 125)
Sunday October 28 (LHS)
Public program (150)
Special presentation for teen interns from both LHS and Chabot (25)
Presenters: Mike Castellini, Orville Huntington, Kathy Licht, Ralph Harvey, Darlene Lim

Atlanta, GA
Dates: November 11-13, 2007
Host: Fernbank Planetarium, Southern Polytechnic, Georgia State (and CEISMIC, GA Tech's K-12 Outreach Center, STEP, GA Tech's Student and Teacher Enhancement Project, GIA, GA Independent School Association, GHEA, GA Home Education Association)
Events:
Sunday November 11
Rehearsal and two public performances, Fernbank (2 x 275)
Monday November 12
Three assemblies at 3 middle schools (3 x 150)
ISE staff presentation (25)
Undergraduate/staff presentation at Southern Polytechnic (300)
Tuesday November 13
3 presentations for middle schools students (3 x 500)
Claire Parkinson brown-bag seminar at Georgia State
Taping at DeKalb County TV (local school)
"InTune2Nature" taping at WRFG
Presenters: Richard Glenn, Mike Castellini, Claire Parkinson, Darlene Lim, Marshall Shepherd

Baton Rouge, LA
Dates: November 15-17
Host: LSU Museum of Natural Science, Irene W. and C.B. Pennington Foundation, the Louisiana Department of Education
Events:
Thursday November 15
Teacher workshop (in association with LA DOE) 43
Wilbert Lecture (given by Charlie Bentley to the LSU geology department) 25
LSU departmental lectures: Biology, Jackie Grebmeier (50), LSU Museum, Richard Glenn (25), LSU Museum, Mike Castellini (110)
Friday November 16
Two student events (1,545)
Public event (719)
Saturday November 17
Antarctic Science Café and poster chat (45)
Presenters: Richard Glenn, Mike Castellini, Phil Bart, Leigh Stearns, Marshall Shepherd, Charlie Bentley, Jackie Grebmeier

McMurdo Station, Antarctica
Dates: January 2008
Host: Raytheon Morale Committee (sic)
Events: Screening of POLAR-PALOOZA videos for researchers and science support staff in the Galley (130)
Presenters: Geoff Haines-Stiles and Erna Akuginow

Washington, DC
Dates: March 13-14, 2008
Host: National Geographic Society
Events:
Thursday March 13
Student program (440)
Teacher workshop (20)
Public presentation (400)
Friday March 14
Two student programs (400 & 200)
Presenters: Mike Castellini, Andy Revkin, Jackie Richter-Menge, Richard Alley, Richard Glenn, Waleed Abdalati

Salt Lake City, UT
Dates: April 17-18, 2008
Host: Utah Museum of Natural History (University of Utah)
Events:
Wednesday April 16
Taping at DOSECC to show Julie Brigham-Grette with the "Lake E" drill
Thursday April 17
Press events at the Museum
"Radio West" interview
Rehearse at the City Library
University events/seminars: Anthropology, Sean Topkok (12), Geology and Geophysics (Kathy Licht & Julie Brigham-Grette) 16
Friday April 18
Teacher workshop, Science Charter School (46)
"Scientist in the Classroom" visit to Brigham City school (410)
Evening "Stories from a Changing Planet" presentation (280)
Saturday April 19
"Earth Day" events at the Museum (354)
Presenters: Kathy Licht, George Divoky, Atsu Muto, Sean Topkok, Julie Brigham-Grette
Audience:
Media coverage: KCPW (NPR), KUER, Fox 13, Salt Lake Tribune, KUTV weather segment, Deseret News, Utah Daily Chronicle

Norman, OK
Dates: April 21-22, 2008
Host: Sam Noble Oklahoma Museum of Natural History, University of Oklahoma, University of Oklahoma K20 Center for Educational and Community Renewal, Cox Communications
Events:
Monday April 21
Student presentation (5 local elementary schools) 347
Media luncheon (6 print and radio journalists)
Geology Department talk (Kathy Licht and Julie Brigham-Grette), 80

"Women Geoscientists at the Poles" seminar, 15
George Divoky lecture, 3
Dinner with Museum staff, etc.
Tuesday April 22
Teacher workshop (56 educators)
Evening presentation for public, followed by time for informal interaction (260, full house)
Presenters:
Kathy Licht, George Divoky, Atsu Muto, Sean Topkok, Julie Brigham-Grette
Media coverage in The Norman Transcript, The Oklahoman, The Daily Oklahoman, KGOU (NPR)

Anchorage, AK
Dates: May 4-6, 2008
Host: The Anchorage Museum of History and Art, Alaska Department of Fish and Game, The Imaginarium
Sunday May 4
Family Day at the Museum (50)
Monday May 5
Technical rehearsal
"Stories from a Changing Planet" public presentation (75)
Tuesday May 6
Student presentation for 230 "gifted" middle schoolers from the Central School of Science
Teacher workshop (10)
(Saturday May 10, follow-on workshop, without PPZA presenters.)
Events:
Presenters: Orville Huntington, Charley Bentley, Jackie Richter-Menge, Mike Castellini (with special appearance by Sean Topkok with Native dances as a warm-up.)

Fairbanks, AK
Dates: May 8-10, 2008
Host: Museum of the North, University of Alaska Fairbanks
Events:
Thursday May 8
Rotary Club presentation (65)
University lunch, "Sharing Science with the Public", GHS and PPZA presenters
Geophysical Institute seminar (Charley Bentley), 30
Teacher workshop, part 1, led by Tim McCollum, 26
Friday May 9
School visits to North Pole Middle School and Randy Smith Middle School, 220
Public presentation at West Valley High School, 319
Saturday May 10
Family Day events at the Museum, 144
End of visit dinner with UAMN staff
Presenters: Orville Huntington, Charley Bentley, Jackie Richter-Menge, Mike Castellini (with special appearance by Sean Topkok and family)

Media coverage: KUAC-FM (NPR), Fairbanks Daily Miner, KTVF-11 (NBC), KXD-13 (CBS), UAF Science Forum

Raleigh, NC
Dates: May 24-25, 2008
Host: North Carolina Museum of Natural Sciences
Events:
Saturday May 24
Two presentations both morning and afternoon (500)
Sunday May 25
Two afternoon presentations (530)
Special presentations on Penguins (Ballard and Toniolo), and The Native Alaskan Way of Life (Huntington.) 895
Presenters: Grant Ballard, Viola Toniolo, Orville Huntington, Marshall Shepherd, Darlene Lim, Bob Bindschadler, Art Howard
Audience: 6,000 total attendees to PPZA and museum events – hands-on activities relating to polar science, climate change and local connections across all floors of the museum and outside on the mall.

Cleveland, OH
Dates: Sept 12-13
Host: Cleveland Museum of Natural History, Byrd Polar Research Center
Events:
Friday September 12
"Stories from a Changing Planet" as the opening lecture in the annual Explorer Lecture series (249)
Saturday September 13
Family Day activities throughout the Museum (812)
"Stories from a Changing Planet" afternoon presentation
Presenters: Ralph Harvey, Christine Foreman, David Harwood, George Divoky
Media coverage: Cleveland Magazine, WCPN (NPR), Cleveland Plain Dealer

Chicago, IL
Dates: Sept 19-20, 2008
Host: Museum of Science and Industry, Science Chicago
Events:
Friday September 19
Student presentations (2 x 300)
Saturday September 20
Teacher workshop (40)
"Life's a Lab" events across the Museum (2,500)
PPZA presenters at the Science on a Sphere exhibit
"Stories from a Changing Planet" public presentation
Sunday September 21
"Life's a Lab" events across the Museum (1,500)

PPZA presenters at the Science on a Sphere exhibit
"Stories from a Changing Planet" public presentation
Presenters: Mike Castellini, Andy Revkin, Mary Albert, Richard Glenn, Ross Powell

SACNAS, Salt Lake City
Dates: October 9-12, 2008
Host: Society for the Advancement of Chicano and Native American Scientists, SACNAS
Events:
Thursday October 9
Keynote presentation to 1,800 attendees
Friday October 10
Teacher workshop (40)
Saturday October 11
"Community Day" Pre-college Student Institute (230)
Special presentation for local students from reservation schools
Sridhar, Mary, Christine and Orville all participated in additional presentations during the conference.
Presenters: Christine Foreman, Sridhar Anandakrishnan, Mary Albert, Orville Huntington

Richmond, VA
Dates: Oct 22-24, 2008
Host: Science Museum of Virginia
Events:
Wednesday October 22
"Lunch Break Science" with Charlie Bentley (35)
Thursday October 23
Teacher workshop (and IMAX Antarctica screening), 25
"Stories from a Changing Planet" public presentation, 59
Friday October 24
"Stories from a Changing Planet" student presentation, 258
Presenters: David Holland, George Divoky, Charlie Bentley, Jackie Richter-Menge

Appendix D: Checklist and Information for POLAR-PALOOZA Host Sites

Some Basic Parameters:

Scientists will be assigned by P2K according to their backgrounds and the activities/events that are outlined by the site; therefore, it is imperative that the schedules include specific activities, targeted audience and expectation for each venue. All communication with the scientists (travelers) will go through P2K.

P2K is responsible for travel, lodging and subsistence costs for the scientists. It is the responsibility of the site to make these arrangements and forward contact and cost information to P2K through the Polar-Palooza coordinators. However, P2K hopes that partners will try to secure local sponsors, discounts or deals for these items. Acknowledgement of such contributions on local promotional and marketing materials and signage can be offered.

PPZA has prepared a standardized promotional/publicity template for poster, fliers, rack card, etc. ALL promotional material, including press releases MUST be signed off by P2K. NSF and NASA (our funders) are very particular about size, placement & position of logos.

Accessing FTP site with templates and masters: (You must have FTP software to download)

In your browser window, type:

1) ftp://68.178.254.116
2) User: ppzam
3) Pass: SmueSum7

Go to:
Image > Master > General Art Template

General Dos and Don'ts:

Do make sure that the "Stories" public event and the teacher workshop have adequate attendance and are scheduled in adequate venues.

Do schedule adequate time for rehearsal (in the venue that will be used) and set-up for "Stories"

Do make sure that if you schedule a school audience, the travelers know the grade level and are prepared. Do make sure that if you schedule a Family Day, the travelers are prepared with props/demos/etc.

Do provide a complete schedule (for all days) for everyone associated with PPZA during the visit.

Do schedule media interviews, etc prior to the "Stories" public event so that you can get publicity for Stories.

Don't fragment your "Stories" audience by offering too many shortened versions of the full public performance to too many target audiences

Don't overschedule the Travelers. Do schedule R&R time and meal times for the Travelers during the visit.

Don't neglect to advertise the public event to your traditional audience (members, listservs, local teachers etc) and don't forget to include targeted audiences (Nature Conservancy local chapters and local eco and environmental and science groups)

Don't assume that the travelers will "know" how to reach a specific targeted audience…always have a well-defined role/task for them to do in any edu event you schedule (they will have well-defined roles already scripted for "Stories")

Host Sites should use this checklist to make sure that all of the needs of the PPZA visit are covered:

1. **Coordinating Staff members** (include name, email, institution, position) @ your institution?
   @ partner institutions?

2. **Hotel Accommodations**
   Need to accommodate the travelers with business amenities and (if needed) rooms large enough for families (some may bring spouse or families)

   ___# of rooms to be booked will vary depending upon the PPZA planned in your city
   ___Hotel name and contact info:
   ___Room Cost
   ___Payment Procedure:
   ___Reservations/date made:
   Does it have these amenities?
   ___Restaurant/room service
   ___Conferencing capability
   ___Email/internet access
   ___Transportation services

   Send contact information & costs to P2K who will secure payment

3. **Transportation to and from airport** (NOTE: P2K will rent a car/van but most of the travelers will probably arrive/leave separately)
   ___taxi?
   ___hotel shuttle?
   ___other shuttle?
   ___pickup by host site staff member?
   ___Send information & costs to P2K or you may be told to contact the travelers directly

4. **General Information to be sent to P2K prior to visit**

___SEND Hotel and transportation information & costs to P2K

___SEND Master Schedule for entire visit sent to P2K

___SEND Marketing time line including list of radio, TV, media contacts as well as in-house marketing planned (i.e. newsletters, fliers, web site etc.)

___NOTE: all marketing Materials must be reviewed and pre-approved by P2K. All printed/published materials should have all national logos (NSF, NASA, P2K, PPZA, IPY) and all local partner logos and local sponsor logos.

___SEND information on venue, audience number, and sound/lighting for public event

___SEND information on teacher workshop venue, audience number

___SEND Summary of local transportation details and needs for all venues

5. **Main Event – *Stories from a Changing Planet***

Auditorium-style science extravaganza with scientists, video, artifacts, ice core

CheckList (to make sure that the planned venue is adequate):

___Auditorium or theater?
___Location
___Capacity
___Date/Time of event
___Reception prior/post?
___Tables for hands-on one-to-one with audience post event?
___One/two tech person on site to handle sound, video, lighting
___ Screen & projector systems; size of screen - specs to P2K
___wireless lapel-style microphones for all travelers (and possibly for M.C.)
___local celebrity/politician/etc to deliver the ice core during the performance
___local host site M.C. (Director? Assoc. Director? Public Information Mgr?)
___Seating
___Ticketing (how will tickets be distributed? Price (you can sell them for a modest but reasonable amount in order to recoup costs? Reservations?…this is critical so that you know in advance how many are coming)
___Sponsors/Donors…don't forget to put their logos on everything.
___Three hour set-up built into schedule
___Three hour rehearsal built into schedule
___Projected attendance (important number… at least 300-500 recommended audience)
___Stage needs:
individual high stools for all travelers
Small table for props

___Secure storage for props pre & post event
___ Freezer/refrigeration for Ice Core (traveling in Igloo-type cooler)
OUTSIDE dimensions of the shipping container is approx. 15 inches (") x 15" x 15", a standard 4-walled Thermosafe container.
Inside will be the core, piece (about 20 cms in length and almost a full round - a slice has been removed, with lots of bubbles.) plus freezer bags, one set which can be cooled in a regular freezer (refrigerator ice box), the others needing dry ice, or the kind of ice cream freezer (reaching -36!)

6. **Teacher Workshop**
A 3-4 hour session will be presented by a PPZA Educator/Instructor. This workshop is designed for middle school science teachers, but open to other grade levels co-facilitated by educator and scientist (35-50 attendees recommended)

CheckList:
___Date/Times: (Need for Educator travel dates)
___Number of attendees projected
___Location
___Partner/sponsor (if any):
___Power point, projector, slide available
___Tables for activities (recommend 5 teachers per table)
___Ice & water available for activities
___Credit hours or certificates for teachers (P2k to provide certificates by request of host)
___Where to ship prior resources/handouts prior to event
___Staff to assemble packets (choice of site how to handle dissemination)

7. **Other Venues** (Please note: keep these events to a minimum. We are encouraging focusing on the main event and making certain travelers have enough R&R time)

CheckList:
___How many outreach events. List:
___Events with Partners (if any): List:
___Details/logistics
___Locations:
___Times/duration:
___Format:
___Anticipated number of attendees
___Transportation requirements

- **K-12 Outreach Events (schools, assemblies, other venues)**
For all outreach: Recommend Two travelers per event for outreach plus local driver
Recommend include Middle and High school audiences where possible

Include other partner sites?

CheckList:
___Transportation needs for scientists
___Please specify presentation format, i.e., classroom talk or school assembly
___Assignments for scientists
___Number of participants expected
___Date/time/map to location/logistics of travel to locations
___Assigned local host drivers
___Please supply as much information about school as possible so scientists can customize their presentations

- **Targeted Educational Events** (Family Days, Home-school Fam Days, Donor/Member Receptions, On-site educational programming)

CheckList:
___Assignments for travelers (specific role or task or demo should be assigned to each)
___Number of participants expected
___Transportation if needed
___Assigned local host driver(s) if needed
___Date/time/logistics

- **University Presentation Events**

Opportunities to present seminar, lecture, department colloquia or discussions with colleagues faculty/grad students/etc.

CheckList:
___Assignment for travelers
___University/college audiences (Depts.? Symposiums?)
___Number of participants expected
___Assigned local host driver(s)
___Date/time/map to locations/logistics of travel to locations

P2K will provide to HOST SITE:

1. Re: technical requirements (video-audio) for different venues
   Will respond and work with sites when local specifications given

2. Marketing Package to include:
   P2K has prepared digital templates for marketing and promotional materials including poster, banner, flier, brochure, rack card, and buttons that can be customized with partner names, dates, locations; press kit with press release and scientists bios
   ___Press kit with press release and scientists bios

___Radio spot
___Video spot for on-air and in-house promotion and publicity
___Other:

3. Will notify:
   Which travelers are coming
   Which would be best suited for school outreach/short presentations
   What are the basic requirements information they need in advance for preparation
   What are standard items they will bring? (i.e. artifacts, video, slides)
   What days (book rooms for 10)

4. Teacher Workshop Agenda with examples of activities, resources
   Which scientists assigned to Teacher Workshop

5. List of Props to be sent prior to event

6. Materials/handouts for workshops sent prior to event

7. Will provide certificates (Teacher Workshops) when requested

8. Will secure hotel rooms with payment when reservations, contact information and costs forwarded to P2K

Appendix E: POLAR-PALOOZA Evaluation Plan

Selinda Research Associates, Inc.
June 16, 2007

Description of the Project

POLAR-PALOOZA (PPZA) is an International Polar Year education and outreach project funded by NSF and NASA and managed by Geoff Haines-Stiles Productions, Inc (GHSP). The *Stories from a Changing Planet* (*SfaCP*) national tour component will be the primary focus of the evaluation which will be conducted by Selinda Research Associates, Inc. (SRA). The tour will make 2 to 3-day visits to approximately 25 venues (science center/natural history museum communities) from Fall 2007 through Fall 2008. Each visit will include: a) large-scale public programs on polar and Earth system science at informal science institutions; b) a range of parallel events and activities such as museum staff training workshops, media interviews, in-school programming, teacher training, and presentations for business and community leaders.

Description of Audiences

The project has identified six primary audiences:

1. Adults who participate in public programs
This audience includes adults who have heard about the program and acquired tickets (either paid and/or free) to attend. This may include museum members, but will also include the general public who has heard about the program from marketing materials, including radio, TV, print, etc.

2. Children who participate in public programs with their families
This audience includes younger members of the general public who are at the public program with their families. Most of the people who fall into this category are between approximately 4 or 5 years old and into the teenage years.

3. Formal educators
This audience includes K-12 teachers (and at some venues, college faculty) who attend special educator workshops. We expect that the major focus of the evaluation will be on middle school science teachers (especially those who teach Earth science).

4. Informal educators
This audience includes docents and volunteers, science center staff, and other informal science staff from nearby aquaria, botanical gardens, zoos, etc. They will participate in workshops and a variety of other formal and informal interactions with PPZA research scientists and staff.

5. Students who participate through school programs
This audience includes K-12 students (primarily middle-school) and may also include college students at some locations. This audience will include many students from underserved populations.

6. Decision makers
This audience includes members of city hall, the city council, rotary club, the media, etc., who will attend special programs arranged for these groups.

Description of What Will be Evaluated

The evaluation will focus on the overall effectiveness of *Stories from a Changing Planet* programming presented at the series of host venues. This programming will focus on the large-scale public

program held at at least one informal science institution/venue, in addition to selected supplementary activities such as workshops for teachers, workshops and other activities for informal educators, school programs and demonstrations at informal science institutions, and presentations for business and community leaders.

The PPZA website and the individual video clips captured in Polar Regions and distributed through the web and elsewhere will not be evaluated, except to the extent they contribute to the experiences of participants in *SfaCP*.

Evaluation Team

The core evaluation team consists of Deborah Perry, Eric Gyllenhaal, and Geoff Haines-Stiles, with input from the rest of the PPZA project team. As project manager for the evaluation, **Deborah Perry** will oversee the study, manage the timeline and budget, and ensure SRA's work is of high quality. As lead evaluation researcher, **Eric Gyllenhaal** will guide the evaluation process, including conducting literature reviews, developing all the data collection instruments and protocols, and collecting and analyzing data. He will also be responsible for the write up and sharing of the evaluation results. Additional SRA researchers may be brought in as appropriate for data collection and analysis. As client, **Geoff Haines-Stiles** will consult on and review the evaluation plans and review preliminary findings and draft reports, giving appropriate feedback and input in a timely fashion. **Erna Akuginow** will also be a member of the core evaluation team and will serve as the go to person for all logistical and budget/invoice issues. In addition, she will oversee the distribution and collecting of all written surveys.

Communications and Relationship

SRA is committed to a collaborative relationship with clients where expertise, information, and concerns are shared, and decisions are jointly made. The evaluation project team will meet by phone weekly, on Thursday afternoons from 1:30/2:30pm – 2:30/3:30pm central/eastern during project planning and then at least monthly thereafter. SRA will submit written summaries of these phone meetings. Phone meetings will include the presentation and discussion of preliminary findings after each site visit. The client may invite other POLAR-PALOOZA staff members to sit in on these phone meetings as appropriate.

Research Question and Topical Framework

The overall research question is:

> *In what ways and to what extent is SfaCP contribution to audiences' understandings of and excitement about polar science? How can what we learn about their experiences help inform the ongoing program development?*

Based on this research question, SRA and the client will work collaboratively to develop a detailed topical framework to guide the data collection. A topical framework is a list of all the topics or issues to be explored during the evaluation.

Methodology

There is often confusion between research *methods* and *methodology* (Harding, 1987). In this study, we will refer to *methods* as the specific techniques used to collect data. These can include a range of

strategies such as interviews, surveys, and observations, and are described below. *Methodology* on the other hand, refers to the underlying structure or framework within which a study is conducted.

> *A **methodology** is a theory and analysis of how research does or should proceed; it includes accounts of how "the general structure of theory finds its application in particular scientific disciplines." (Harding, 1987, p.3)*

For this evaluation study, we will use a naturalistic methodology (Lincoln & Guba, 1985). Naturalistic inquiry uses a rigorous and systematic approach for collecting and analyzing data in real-life settings, as opposed to setting up laboratory–style experiments in which particular hypotheses are tested. The goal of naturalistic methodology is to provide a holistic understanding of visitors' experiences from a variety of perspectives.

Naturalistic inquiry is grounded in the belief that a situation or phenomenon may be experienced in different ways by different participants. Its aim is to examine the range of these experiences in order to more fully understand and articulate their meaning for participants. Naturalistic inquiry is based on the assumption that if we can understand our environment—or the particular phenomenon under investigation—in as complete a way as possible, we will be able to make better judgments about what applies in another situation.

> *Naturalistic Evaluation takes a broad, holistic view of the program, exhibit or institution being studied, is more interpretative than judgmental, and requires participation from a wide range of people who are to be served by the study effort....Thus, Naturalistic Evaluation is directed toward a search for meaning.*
>
> *And it is this search for meaning that distinguishes Naturalistic Evaluation from other field oriented evaluation strategies....The purpose is to uncover the multiple realities and multiple perspectives that exist and are provoked as people experience the museum environment—it reveals the configuration of meaning that emerges when different people are exposed to a common stimulus. (Wolf & Tymitz, 1979, p. 2-3)*

This qualitative approach to visitor research is particularly useful in informal science environments because these institutions have diverse visitors with a wide range of knowledge, experiences, and interests. Unlike quantitative methodologies, which tend to look for an *average* experience, naturalistic inquiry aims to describe the breadth and depth of visitor experiences and understandings. As such, it is a powerful tool for museums, especially those institutions concerned with reaching multiple audiences.

Selection of Respondents

Although most people are more familiar with random sampling, in this study we will primarily use *purposive sampling* to select respondents (Miles & Huberman, 1994). Purposive sampling is a technique where each respondent is selected based on the results of previous data sets. As data are gathered and preliminary analysis is conducted, new questions and areas of interest emerge. Respondents are selected purposively to illuminate different types of visitor experiences. This ensures that data is gathered from a variety of program participants (see above *Description of Audiences*) with a maximum

range of experiences as they relate to the content of the program. K-12 students may be purposively selected for observation, but will not be interviewed unless their parent's permission is secured.

In accordance with standards for rigorous naturalistic methodology, we will use a smaller sample size than one would typically find in many positivistic methodologies. While in some research paradigms this is cause for concern, it is one of naturalistic methodology's strengths. By studying fewer cases in more depth, we will develop a more complete and meaningful understanding of the visitor experience than would be possible by collecting less information from a larger number of respondents.

In some situations (i.e. the formal educator workshops) respondents will be invited to complete a survey (see *Methods* section below). In this case all workshop participants will be invited to contribute to the evaluation. Although an attempt will be made to include responses from everyone, respondents will ultimately be self-selected.

Selection of Venues for Site Visits

We will also use purposive sampling to select which sites to visit. Our goal will be to visit five sites that will enable us to maximize resources and variability, while also enabling us to best answer the topical framework questions. Two site visits will take place during 2007, and three site visits during 2008. Although this list may change, an initial line-up may look like the following:

San Diego is the first POLAR-PALOOZA venue, and is comprised of three different informal science institutions. **Albuquerque** is in the desert, a land locked site, and one which hosted MARSA-PALOOZA. It also has a large Native American population. **Chicago** is local (to Selinda) and represents a cooperative venture between two very different institutions that will host POLAR-PALOOZA, a small planetarium and a large science museum. **Alaska** is another possible site, with two separate locations, one in Anchorage, and the other in Fairbanks. These locations are just a few degrees south of Arctic Circle and so would be good to include, but they will also be the most expensive to visit.

The final selection of sites will take place collaboratively between SRA and GHSP, and will evolve over the course of the project depending on the needs of the project and the available resources.

Design of Study

As described above, SRA will conduct five site visits during the two-year project. Although each site visit will be unique, the general approach will be as follows:

1. Observe at least one large-scale presentation at each venue. (If there is more than one large-scale presentation/venue, we will observe as many additional ones as possible.)
2. Immediately following each presentation, conduct as many depth interviews with audience members as possible. (This won't be very many because people will disperse and/or have other commitments.)
3. Collaboratively and purposively select additional *SfaCP* programs to be observed, with an eye towards gathering the broadest range of responses from as many different target audiences as possible.
4. Immediately follow all observations with as many depth interviews as possible (again limited in number).

5. Make sure that at all formal educator workshops, a short written survey is distributed and collected.
6. When possible, we will also purposively select Travelers and conduct face-to-face depth interviews with them.
7. When possible, additional respondents will be recruited to participate in a follow-up phone interview.

Data Collection Methods

Four data collection strategies will be employed:

Unobtrusive observations. When conducting unobtrusive observations, the researchers will blend in with the audience. During these observations, we will look for four types of engagements, although it's important to keep in mind that these four types of engagements are not—and are not meant to be—mutually exclusive.

Physical engagements are all the physical things audience members do. While we will be looking for the variety of identified intended engagements, we will also note all the additional ways (both positive and negative) that participants engage.

Intellectual engagements are all the ways in which audience members engage in cognitive and intellectual ways. Intellectual engagements include the ways respondents think about, process, and make meaning of their experiences. Intellectual engagements might include a respondent being thoughtful and reflective, or it could include expressions of frustration or confusion.

Social engagements are the ways in which audience members engage with each other or with host museum and PPZA staff within the context of the program. Social engagement includes verbal exchanges as well as body language. We will pay special attention to the extent to which and ways in which audience members engage socially with each other and with the Travelers, paying particular attention to active meaning-making.

Emotional engagements are all the ways that audience members engage emotionally while participating in the programs. We will pay special attention to evidence of (for example) surprise, and satisfaction. Research indicates that the emotional content of experiences is an important aspect of how visitors remember, reflect on, and process their visits (Anderson, 2004).

Face-to-face depth interviews. Depth interviews are open-ended and free-flowing. With the respondent's permission, depth interviews will be tape recorded and later transcribed for analysis and report-writing purposes. The researcher will have a list of questions to guide the conversation, but not all questions will be asked of all respondents. Additional questions that are not on the interview protocol will likely be asked depending on the issues and topics that emerge during the conversation.

Phone depth interviews. When possible, additional follow-up depth interviews will be conducted by telephone with selected respondents.

Written survey. A short written survey will be developed and will be handed out to all participants in all of the PPZA workshops for formal educators, regardless whether or not a researcher observed the session.

Data Analysis

Data analysis will be on-going throughout the project using a modified inductive constant comparison approach whereby each unit of data is continually compared with all previous units of data. This strategy will ensure that findings can be reported in a timely manner so that the evaluation may inform the ongoing development process.

Immediately after each data collection session is completed, the researcher will write a debrief of the observation or interview, reflecting on the process, the data collected, and doing a preliminary comparison of the results to previous results. Plans will then be made for the next data collection session.

Survey data will be analyzed and reported using basic percentages-of-responses, and—in accordance with standards for naturalistic inquiry—the findings will be integrated with the results from the qualitative observations and interviews. The primary purpose of the survey data will be to triangulate the qualitative data.

Deliverables

The primary deliverable will be a written **final report** that describes participant experiences and the effectiveness of the overall *SfaCP* program. The final report will describe the background, methodology, and methods used in the study; detail the results; and draw conclusions about the effectiveness of the program. As with most naturalistic studies it will be primarily narrative in style, and will include some limited statistics summarizing the survey results in an appendix. A draft of the final report will be submitted to GHSP for their review and feedback before it is finalized.

In addition to the final report, SRA will develop a detailed **evaluation plan** with accompanying topical framework; periodic **meeting summaries** that will summarize all the issues discussed including findings and recommendations when these are available; and a written **interim mini-report** presenting preliminary findings and recommendations from the first two site visits and prepared in time to plan for the next round of *SfaCP*.

Timeline

- **January-September, 2007: Planning and Preparation**. Develop evaluation plan, topical framework, and data collection/analysis protocols. Also, develop bibliography and associated documents.
- **October-November, 2007: First Round of Data Collection and Analysis**. SRA will make two site visits to PPZA venues to collect data. SRA will analyze data and make preliminary oral reports to the team via phone meetings after each site visit.
- **December 2007-February 2008: Interim Mini-Report**. SRA will submit the first draft by December 15, and the client will review this draft by December 31. The final version of this report will be submitted by February 28, 2008.
- **February-April 2008**: **Planning for Second Round of Data Collection**. SRA will work with GHSP to refine the topical framework and develop protocols for the next round of data collection.
- **April-November, 2008: Second Round of Data Collection and Analysis**. SRA will make three more site visits to PPZA venues to collect data. SRA will analyze data and make preliminary oral reports to the team via phone meetings after each site visit.

- **December 2008-March 2009: Final Report**. SRA will submit the first draft by January 31, 2009, and the client will review this draft by February 15, 2009. The final version of this report will be submitted by March 31, 2009.

Operating Budget

The operating budget for this project is comprised of 68 people days of SRA time and approximately $15,000 in expenses (primarily travel, transcription of interviews, miscellaneous office expenses, and editing of the final report).

This budget allows for four 3.5-day out-of-town site visits, three of them with one researcher and one with two researchers. In addition, two researchers will be on-site for 3.5 days for the Chicago venue. This is a total of 24.5 people days of on-site data collection with an additional 3 people days for follow-up phone interviews. This is a total of 27.5 people days of data collection, and an accompanying 27.5 days for data analysis and write-up. The breakout of people days is described in more detail in the attached appendix A.

Logistics

Logistics will be determined in collaboration with the client and host institutions and will include issues such as host institutions providing access to the museum and respondents, a quiet area to type up interview notes, tokens of appreciation for respondents, etc.

Ethical Treatment of Respondents

SRA, PPZA staff, and NSF are committed to the ethical treatment of respondents. We will adhere to standard professional practices for conducting research in settings of informal learning, and will ensure that the disruption of visitors' experiences is kept to a minimum. Because this is an evaluation study and not research, and because there will be minimal risk to respondents, we will not go through an IRB/Human Subjects review.

Dissemination of Reports

The final report will be posted on the SRA website and will be submitted to informalscience.org for inclusion in the database of summative evaluation reports. GHSP and SRA will work together to identify additional ways to disseminate the findings.

Project Closure

After the evaluation study is completed we will have a project closure meeting to reflect on the evaluation project and discuss lessons learned.

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Appendix F: POLAR-PALOOZA Topical Framework

10/10/08

Research Question: In what ways and to what extent is the PPZA tour contributing to audience members' understandings of and excitement about polar science? What can we learn about the nature of audience members' experiences that will help inform the ongoing development of the PPZA tour?

Big Idea: The changes occurring today at the Poles reflect the health of our planet and indicate (predict/foreshadow/augur/prefigure) important changes that will be happening in your region and community.

I. DESCRIPTION OF PROGRAM

1. Venues and Institutions
    a. Which venues did PPZA travel to?
    b. How many institutions were involved?
    c. Which institutions participated?
    d. What did the program spaces look and feel like at each site?
2. Components Offered
    a. What were the different types of components?
    b. How many of each type of component were offered at each venue?
    c. In what ways and to what extent were each of the various components targeted for the six major audiences?
3. Stories from a Changing Planet
    a. How many of these presentations were at each venue?
    b. How long did the presentations last?
    c. How were they scheduled and paced?
    d. What did they look like?
4. The Schedule of Programs
    a. What was the schedule of programs at each venue?
    b. How did the schedule of programs vary at each site?
5. Presenters
    a. Who were the presenters and where did they come from?
    b. What were their various backgrounds and experiences?
    c. In what ways and to what extent was this a diverse group?
6. PPZA staff
    a. Who were the PPZA staff and where did they come from?
    b. What were their various backgrounds and experiences?
    c. In what ways and to what extent was this a diverse group?

II. THE PARTICIPANT EXPERIENCE

1. Audience Participation
    a. How many individuals participated in each component at each venue?

b. How many individuals "flocked the stage" at the end of each *SfaCP* presentation?
c. How many individuals stayed after the *SfaCP* presentation to engage with the scientists at the tables?

2. Audience Engagement
    a. In what ways and to what extent were the audience members engaged with POLAR-PALOOZA?
    b. What was the nature of the audience's physical engagements?
        i. Did folks tend to stay through the entire SfaCP presentation, or did they leave early?
        ii. Did visitors tend to hang around afterwards and ask the scientists questions?
        iii. Did they tend to participate in the table top discussions?
    c. What was the nature of the audience's emotional engagements?
        i. In what ways and to what extent did visitors experience feelings of awe, excitement, inspiration, sadness, frustration, hopelessness, renewal, etc.?
        ii. How did visitors appear to connect with the messages?
    d. What was the nature of the audience's social engagements?
        i. In what ways did they raise interesting questions, discuss and debate, work together to construct meaningful understandings?
        ii. To what extent were there missed teaching moments and aborted conversations?
    e. What was the nature of the audience's intellectual engagements?
        i. In what ways were visitors actively thinking, pondering, wondering, comparing and contrasting, hypothesizing? Or were their experiences more intellectually passive?
        ii. What questions were stimulated for visitors?

3. Audience Understandings
    a. In what ways and to what extent did visitors expand and make richer their understandings of polar research, global warming, and climate change?
    b. In what ways and to what extent do visitors make personal connections to the content?
    c. How do they see and understand the changes happening at the poles affecting them in their local communities?
    d. How has visitors' understandings about and perceptions of scientific research and/or a career in science been influenced?
    e. In what ways and to what extent was visitors' curiosity stimulated?
    f. How did visitors describe what they found out that they didn't know before?

4. Audience Motivations
    a. In what ways and to what extent did the program engage participants socially, stimulate curiosity, help people feel more confident and comfortable about their understanding of science, challenge visitors in meaningful ways, help them feel in charge of their own learning, and help visitors feel playful?

III. THE TRAVELER EXPERIENCE

1. What was the nature of Travelers' experiences?

2. What was the nature of the relationship between them and the PPZA staff? What kind of guidance and support did they receive and what did they wish they receive?
3. In what ways and to what extent were Travelers influenced because of their participation in this program?
4. What contribution did POLAR-PALOOZA make to their professional development?
5. What worked smoothly for the Travelers and what did they find more difficult and/or challenging?

IV. THE HOST EXPERIENCE

1. What was the nature of the host experience?
2. What was the nature of the relationship between them and the PPZA staff? What kind of guidance and support did they receive and what did they wish they receive?
3. In what ways and to what extent was the host institution influenced because of their participation in this program?
4. What contributions did PPZA make to the museum and its operation?
5. What worked smoothly for the host institutions and what did they find more difficult and/or challenging?

V. DESIGN OF PROGRAM

1. The Developers
    a. Who were the PPZA staff and Travelers involved in developing the programs?
    b. What role did each play?
2. The Development Process
    a. What was the process used for the development of each component of PPZA ?
    b. In what ways and to what extent were the components modified based on experience and input from the host institutions and other sources?
    c. How was the Big Idea used?
3. The SfaCP Program
    a. In what ways and to what extent was this a well-designed product?
    b. In what ways and to what extent was the program designed to engage participants socially, stimulate curiosity, help people feel more confident and comfortable about their understanding of science, challenge visitors in meaningful ways, help them feel in charge of their own learning, and help visitors feel playful?
    c. What worked particularly well?
    d. What did not work as well?
4. The Ancillary Components
    a. In what ways and to what extent did the various components of the PPZA program work together? What was their relationship?

Appendix G: POLAR-PALOOZA Intended Outcomes & Engagements by Audience

Selinda Research Associates
August 30, 2007

Following is a brief overview of the primary audiences for the POLAR-PALOOZA evaluation project, with accompanying intended *outcomes* and *engagements* for each. *Outcomes* are all the ways in which we expect participants to be changed as a result of their participation. E*ngagements* are all the ways we expect participants to engage with the programs and the presenters (physically, emotionally, socially, and intellectually). Specifying intended outcomes and engagements at the beginning of a project serves two purposes: (a) it helps the evaluation team develop appropriate instruments and criteria against which to assess and understand visitors' experiences; and (b) it helps the project team (including the presenters) deliberately design programs to engage participants in the intended ways, and to elicit the desired outcomes.

One of the challenges of the POLAR-PALOOZA project is that it will be serving multiple audiences with a variety of intended outcomes and engagements. This document briefly describes each of the primary audiences and articulates the intended outcomes and engagements that are specific to each audience.

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1. Adults who participate in public programs

This audience includes adults who have heard about the program and acquired tickets (either paid and/or free) to attend. This may include museum members, but will also include the general public who has heard about the program from marketing materials, including radio, TV, print, etc.

Outcomes:
Adults who participate in pubic programs will:

- develop a greater understanding of, interest in, and appreciation for the poles
- make a personal connection between how the conditions at the Poles affect conditions where they live
- develop a greater understanding of, interest in, and excitement for polar research and what it's like to be a scientist working at the Poles

Engagements:
Adults who participate in public programs will:

- listen raptly and pay attention to the presentation (physical engagement)
- follow their children to the front of the room after the presentation, and encourage them to touch the artifacts (physical engagement)
- ask questions, debate, and discuss among themselves, and with the research scientists, and help their children engage with the research scientists (social engagement)
- become both excited by what they are experiencing and concerned about the messages they are hearing (emotional engagement)
- make connections between polar regions and global conditions, including global warming and their own personal lives (intellectual engagement)

2. Children who participate in public programs with their families

This audience includes younger members of the general public who are at the public program with their families. Most of the people who fall into this category are between approximately 4 or 5 years old and into the teenage years.

Outcomes:

Young public program audience members will:

- develop a greater understanding of, interest in, and appreciation for the Poles
- make a personal connection between how the conditions at the Poles affect conditions where they live
- develop a greater understanding of, interest in, and excitement for polar research and what it's like to be a scientist working at the Poles
- will develop a greater interest in pursuing science as a career

Engagements:

Young public program audience members will:

- listen raptly and pay attention to the presentation (physical engagement)
- imagine that they too could become polar researchers (intellectual engagement)
- become both excited by what they are experiencing and concerned about the messages they are hearing (emotional engagement)
- relate what they are experiencing to their own personal lives (intellectual engagement)
- lead their parents forward to the front of the room/auditorium and touch the artifacts (physical engagement)
- ask interesting questions of their visiting companions and of the research scientists, and engage in discussion and debate (social engagement)

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3. Formal educators

This audience includes K-12 teachers (and at some venues, college faculty) who attend special educator workshops. We expect that the major focus of the evaluation will be on middle school science teachers (especially those who teach Earth science).

Outcomes:

Formal educators will:

- develop a greater understanding of, interest in, and appreciation for the Poles
- make a personal connection between how the conditions at the Poles affect conditions where they and their students live
- develop a greater understanding of, interest in, and excitement for polar research and what it's like to be a scientist working at the Poles
- become aware of and familiar with IPY resources and activities they can use with their students
- recognize how IPY and polar-related activities connect to content found in their regular course of instruction and to national and state standards and guidelines
- develop an intention to conduct IPY activities with their students

Engagements:
Formal educators will:

- listen raptly and pay attention to the presentation (physical engagement)
- ask interesting questions, debate, and discuss with the research scientists and amongst themselves (social engagement)
- become excited about talking with and engaging with research scientists (emotional engagement)
- become both excited by what they are experiencing and concerned about the messages they are hearing (emotional engagement)
- apply what they are learning about to what and how they teach, including the standards that are most important in their districts (intellectual engagement)

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4. Informal educators

This audience includes docents and volunteers, science center staff, and other informal science staff from nearby aquaria, botanical gardens, zoos, etc. They will participate in workshops and a variety of other formal and informal interactions with PPZA research scientists and staff.

Outcomes:
Informal educators will:

- develop a greater understanding of, interest in, and appreciation for the Poles
- become aware of and familiar with IPY resources they can incorporate into their interactions with the public
- develop an intention to incorporate IPY information, content, and anecdotes as part of their interactions with the public

Engagements:
Informal educators will:

- listen raptly and pay attention to the presentation (physical engagement)
- discuss and ask relevant questions about both the IPY content and presentation methods with the research scientists and amongst themselves (social engagement)
- relate what they are learning about to the design of their own visitor programs (intellectual engagement)
- become excited about what they are learning and how they might use it (emotional engagement)

5. Students who participate through school programs

This audience includes K-12 students (primarily middle-school) and may also include college students at some locations. This audience will include many students from underserved populations.

Outcomes:
Students will:

- develop a greater understanding of, interest in, and appreciation for the Poles
- make a personal connection between how the conditions at the Poles affect conditions where they live
- develop a greater understanding of, interest in, and excitement for polar research and what it's like to be a scientist working at the Poles
- become aware of the great diversity of people who participate in polar research

Engagements:
Students will:

- listen raptly and pay attention to the presentation (physical engagement)
- imagine that they too could become polar researchers (intellectual engagement)
- become both excited by what they are experiencing and concerned about the messages they are hearing (emotional engagement)
- relate what they are experiencing to their own personal lives (intellectual engagement)
- request permission to go to the front of the room and/or participate in additional informal opportunities after the main program (physical engagement)
- ask interesting questions of their teachers and chaperones and with the research scientists when possible (social engagement)

6. Decision makers

This audience includes members of city hall, the city council, rotary club, the media, etc., who will attend special programs arranged for these groups.

Outcomes:
Decision-makers will:
In addition to overall objectives for POLAR-PALOOZA, decision makers will appreciate that the conditions at the Poles affect conditions where their constituents live.

- develop a greater understanding of, interest in, and appreciation for the Poles
- make a personal connection between how the conditions at the Poles affect conditions where they and their constituents live

Engagements:
Intended engagements for decision-makers will not be identified in this document because their participation will vary greatly depending on the specific venue/format.

Appendix H: Sources of Data

List of Major Events Observed

date	venue	researchers	type of session	type of location	primary/ancillary site
10/19/07	SD	EG	Community Roundtable Media Event	museum	ancillary
10/19/07	SD	EG	School Group presentation & webcast	school district	ancillary
10/19/07	SD	EG	*SfaCP* presentation	museum	primary
10/20/07	SD	EG	Teacher Workshop	museum	primary
10/20/07	SD	EG	*Family Science* Day	museum	primary
10/21/07	SD	EG	*Passport to the Poles* talks	museums	ancillary
10/22/07	ABQ	EG	School Group presentation	school	ancillary
10/22/07	ABQ	EG; MW	School Group presentation	cultural center	ancillary
10/23/07	ABQ	EG; MW; DP	PolarDays	zoo	ancillary
10/23/07	ABQ	EG; MW; DP	School Group presentation	zoo	ancillary
10/23/07	ABQ	EG; MW	*HomeSchoolers* Family Day	museum	primary
10/23/07	ABQ	EG; MW	modified *SfaCP* presentation	museum	primary
10/23/07	ABQ	EG; MW; DP	*SfaCP* presentations (2 back-to-back)	museum	primary
10/24/07	ABQ	MW; DP	Lectures (2 back-to-back)	university	ancillary
10/24/07	ABQ	EG; MW; DP	Teacher Workshop	museum	primary
5/24/08	Raleigh	BP; DP	*POLAR-PALOOZA* Day	museum	primary
5/24-25	Raleigh	BP; DP	*SfaCP* presentations (4 total)	museum	primary
5/24-25	Raleigh	BP; DP	modified *SfaCP* presentations (3 total)	museum	primary
9/19/08	Chicago	EG; DP	School Group presentation	museum	primary
9/20/08	Chicago	EG; BP; DP	*ScienceChicago* Day	museum	primary
9/20/08	Chicago	EG; BP; DP	*SfaCP* presentation	museum	primary
9/20/08	Chicago	EG	Teacher Workshop	museum	primary

Detailed List of Sources of Data

Date	Researcher	Type of Respondent	Format	Type	Venue	Paper Trail
10/19/07	eg	public	sfacp	Obs/Int	SD	debrief
10/19/07	eg	public	sfacp	Obs/Int	SD	debrief
10/19/07	eg	public	sfacp	Obs/Int	SD	debrief
10/19/07	eg	staff	b-t-s	Obs/Int	SD	site visit summary
10/19/07	eg	the media; staff	media event	Obs	SD	site visit summary
10/19/07	eg	school children	school group presentation	Obs	SD	site visit summary
10/19/07	eg	staff	b-t-s	Obs/Int	SD	site visit summary
10/19/07	eg	staff	sfacp	Obs	SD	site visit summary
10/19/07	eg	public	sfacp	Obs	SD	site visit summary
10/20/07	eg	teachers	teacher workshop	Obs	SD	site visit summary
10/20/07	eg	staff	teacher workshop	document review	SD	emails; site visit summary
10/20/07	eg	public	table-tops & activities	Obs	SD	site visit summary
10/21/07	eg	public	table-tops & activities	Obs	SD	site visit summary
10/21/07	eg	all	all	Obs/Int	SD	site visit summary
10/22/07	eg	staff	b-t-s	Obs	ABQ	site visit summary
10/22/07	eg	teachers	school group presentation	Obs/Int	ABQ	debrief
10/22/07	eg	staff	b-t-s	Obs	ABQ	site visit summary
10/22/07	eg	school children	school group presentation	Obs	ABQ	site visit summary
10/22/07	mw	school children	school group presentation	Obs	ABQ	site visit summary
10/22/07	eg	teachers	school group presentation	Int	ABQ	site visit summary
10/22/07	eg	staff	b-t-s	Obs	ABQ	site visit summary
10/22/07	eg	staff	b-t-s	Obs	ABQ	site visit summary
10/22/07	dp	public	b-t-s	Int	ABQ	debrief
10/23/07	dp	staff	b-t-s	Obs	ABQ	debrief
10/23/07	dp	staff	b-t-s	Obs	ABQ	debrief
10/23/07	dp	public	table-tops & activities	Obs	ABQ	debrief
10/23/07	dp	public	school group presentation	Obs	ABQ	debrief
10/23/07	dp	staff	b-t-s; table-tops & activities	Obs	ABQ	debrief
10/23/07	eg	teachers; school children	school group presentation	Obs	ABQ	site visit summary
10/23/07	eg	public; homeschoolers	table-tops & activities	Obs	ABQ	site visit summary
10/23/07	eg	public	table-tops & activities	Int	ABQ	site visit summary
10/23/07	mw	staff; school children	b-t-s; school group presentation	Obs	ABQ	site visit summary
10/23/07	mw	public; homeschoolers	table-tops & activities	Obs	ABQ	site visit summary
10/23/07	mw	public; homeschoolers	modified sfacp	Obs	ABQ	site visit summary
10/23/07	mw	public	sfacp	Obs	ABQ	site visit summary
10/23/07	dp	public	sfacp	Obs	ABQ	debrief
10/23/07	eg	public	sfacp	Obs	ABQ	site visit summary
10/23/07	eg	public	sfacp	Obs/Int	ABQ	site visit summary
10/24/07	eg	staff	teacher workshop	Int	ABQ	site visit summary
10/24/07	dp	university students	university talk	Obs	ABQ	debrief
10/24/07	dp	university students	university talk	Int	ABQ	debrief
10/24/07	dp	university students	university talk	Obs	ABQ	debrief
10/24/07	mw	university students	university talk	Obs	ABQ	site visit summary
10/24/07	mw	university students	university talk	Int	ABQ	site visit summary
10/24/07	mw	university students	university talk	Obs	ABQ	site visit summary
10/24/07	mw	teachers	teacher workshop	Obs	ABQ	site visit summary
10/24/07	eg	teachers	teacher workshop	Obs	ABQ	site visit summary
10/24/07	dp	teachers	teacher workshop	Obs	ABQ	debrief
10/24/07	eg	all	all	debrief	ABQ	site visit summary
10/26/07	mw	all	all	debrief	ABQ	site visit summary
10/31/07	dp;eg;mw	all	all	debrief	SD&ABQ	debrief
11/2/07	eg	all	all	debrief	SD&ABQ	site visit summary
10/31/07	dp;eg;mw	all	all	debrief	SD&ABQ	debrief
11/8/07	dp;eg;mw	all	all	debrief	SD&ABQ	group debrief & transcript
2/15/08	dp	staff	all	Int	ABQ	debrief; transcripts; docs
2/25/08	eg	staff ; teachers	b-t-s; school group presentation	Int	BR	debrief
2/26/08	eg	staff; teachers	b-t-s; school group presentation	Int	Atlanta	debrief

Date	Researcher	Type of Respondent	Format	Type	Venue	Paper Trail
3/5/08	eg	teachers	school group presentation	Int	ABQ	debrief; transcript
3/12/08	eg	teachers	school group presentation	Int	Atlanta	debrief
4/26/08	dp	public; teachers	sfacp	Int	SLC	transcript; notes
5/24/08	bp	public	table-tops & activities	Obs/Int	Raleigh	debrief
5/24/08	bp	public	table-tops & activities	Int	Raleigh	debrief
5/24/08	bp	staff	b-t-s	Int	Raleigh	debrief
5/24/08	bp	public	table-tops & activities	Obs	Raleigh	debrief
5/24/08	bp	public	table-tops & activities	Obs	Raleigh	debrief
5/24/08	dp	public	table-tops & activities	Obs	Raleigh	debrief
5/24/08	dp	public	sfacp	Obs	Raleigh	debrief
5/24/08	bp	public	modified sfacp	Int	Raleigh	debrief
5/24/08	dp	public	modified sfacp	Obs	Raleigh	rough notes
5/24/08	dp	public	sfacp	Obs	Raleigh	rough notes
5/24/08	dp	staff	b-t-s; table-tops & activities	Int	Raleigh	debrief
5/25/08	dp	public	modified sfacp	Obs	Raleigh	rough notes
5/25/08	dp	public	sfacp	Obs	Raleigh	rough notes
5/25/08	dp	public	sfacp	Obs/Int	Raleigh	debrief
5/25/08	dp	public	sfacp	Obs	Raleigh	rough notes
5/25/08	dp	all	all	Obs/Int	Raleigh	rough notes
6/18/08	eg	public	sfacp	Int	Raleigh	email
8/10/08	bp	all	all	debrief	Raleigh	rough notes
8/10/08	dp	all	all	debrief	Raleigh	rough notes
9/18/08	eg	public	sfacp	Int	Chicago	debrief
9/19/08	eg	staff	b-t-s	Obs	Chicago	debrief
9/19/08	eg	school children	school group presentation	Obs	Chicago	debrief
9/19/08	eg	school children	school group presentation	Obs	Chicago	debrief
9/19/08	eg	school children	school group presentation	Obs	Chicago	debrief
9/19/08	eg	staff	b-t-s	Obs	Chicago	debrief
9/19/08	eg	public	b-t-s	Obs	Chicago	debrief
9/19/08	eg	public	all	Obs	Chicago	debrief
9/19/08	dp	public; school children	all	Obs	Chicago	rough notes
9/19/08	dp	staff	b-t-s	Obs	Chicago	rough notes
9/20/08	bp	public	sfacp	Int	Chicago	debrief
9/20/08	bp	public	sfacp	Int	Chicago	debrief
9/20/08	eg	staff; public	table-tops & activities	Obs	Chicago	debrief
9/20/08	eg	public	table-tops & activities	Obs	Chicago	debrief
9/20/08	eg	public	sfacp	Obs	Chicago	debrief
9/20/08	eg	public	sfacp	Obs	Chicago	debrief
9/20/08	eg	teachers	teacher workshop	Obs	Chicago	debrief
9/20/08	eg	public	sfacp	Obs/Int	Chicago	debrief; transcripts
9/20/08	dp	public	sfacp	Obs	Chicago	rough notes
9/20/08	dp	public	b-t-s	Int	Chicago	rough notes; transcript
9/20/08	dp	public	table-tops & activities	Obs	Chicago	rough notes
9/20/08	eg	all	all	Obs	Chicago	debrief
9/22/08	eg	public	sfacp	Obs/Int	Chicago	debrief; transcripts
9/23/08	eg	public	sfacp	Obs/Int	Chicago	debrief; transcripts
9/26/08	eg	public	sfacp	Obs/Int	Chicago	debrief; transcripts
9/26/08	dp	public	sfacp	Int	Chicago	rough notes; transcript
9/30/08	dp	public	sfacp	Int	Chicago	rough notes; debrief
10/2/08	bp	public	sfacp	Obs/Int	Chicago	debrief
10/2/08	bp	public	sfacp	Obs/Int	Chicago	debrief
10/2/08	dp	public	sfacp	Obs/Int	Chicago	rough notes
11/20/08	dp	staff	all	Int	all	debrief; transcript
many	--	all	all	document review	all	emails
many	--	all	all	document review	all	post-program site summaries
many	--	all	all	document review	all	pr materials, websites, handouts, photos, etc.

Appendix I: Teacher Survey Form

Selinda Research Associates, Inc. CITY: _____

POLAR-PALOOZA TEACHER SURVEY

This survey will help us plan future workshops for teachers. Thank you!

1. How useful were the various aspects of the workshop to you? Please rate them on a scale of 1 (not very useful) to 5 (very useful)? (circle answer)

	Not Very Useful				Very Useful
Presentation by workshop leader	1	2	3	4	5
Audiovisual parts of the presentation	1	2	3	4	5
Online access to video segments	1	2	3	4	5
Doing hands-on activities during workshop	1	2	3	4	5
Meeting and working with the scientists	1	2	3	4	5
Information relating activities to state standards	1	2	3	4	5
Finding connections between poles and my curriculum	1	2	3	4	5
Take-home packet with activities and extensions	1	2	3	4	5

2. How much do you <u>currently</u> teach about Polar Regions in your classroom? (Please check one.)
   - _____ Not at all
   - _____ I mention the poles but don't teach much about them
   - _____ Moderate amount of instruction – I teach about them during a class session or two
   - _____ Considerable amount of instruction – they are important to a major teaching unit
   - _____ Very large amount of instruction – they are at the core of a major teaching unit

3. Given what you learned in today's workshop, how will your teaching about Polar Regions change? (Check one or more.)
   - _____ I do not plan to make any changes.
   - _____ I will teach more about the poles, including one or more of the following:
     - _____ I will teach about the poles in addition to what I am currently teaching.
     - _____ I will use polar topics discussed today to enhance my regular teaching.
     - _____ I will adapt one or more of the workshop activities for my own teaching.
     - _____ I plan to make the Polar Regions the core of a major teaching unit.
     - _____ Other (please describe):

4. Please complete this sentence: Before this workshop, I never realized that….

5. How important will the following themes be to your own teaching? (Please circle answer.)

	Not Very Important				Very Important
The poles were once very different than they are today.	1	2	3	4	5
The poles are a critical part of the Earth system.	1	2	3	4	5
The poles are rapidly changing right now.	1	2	3	4	5
Polar animals may become extinct within the next century.	1	2	3	4	5
The poles connect to where I and my students live.	1	2	3	4	5

6. What was the best part of the workshop for you, and why? (Use other side of paper if necessary)

7. What aspect of the workshop most needs improvement, and why? (Use other side if necessary)

8. What percentage of students in your classroom are eligible for free/reduced fee lunch? (circle answer)
   < 10% 10-25% 26-50% 51-75% >75%

9. Please circle level(s) you teach: PreK K 1 2 3 4 5 6 7 8 9 10 11 12 College
   Informal Educator Homeschooler

10. Please circle the subject(s) you teach: Self-contained Classroom/Almost All Subjects
    Earth Science Biology Ecology Environmental Science General Science
    Other: _____

Please hand in your completed survey as you leave. Thanks for your help!

Appendix J: Summary of Teacher Survey Data

NOTE: All percentages are rounded to the nearest whole number.			TOTALS	
N =			260	
1. How useful were the various aspects of the workshop to you?				
Presentation by workshop leader	1		0	0%
	2		0	0%
	3		7	3%
	4		28	12%
	5		223	85%
Audiovisual parts of the presentation	1		0	0%
	2		1	0%
	3		6	2%
	4		30	12%
	5		220	86%
Online access to video segments	1		1	0%
	2		2	1%
	3		12	6%
	4		35	14%
	5		194	79%
Doing hands-on activities during workshop	1		2	1%
	2		5	2%
	3		8	3%
	4		37	14%
	5		207	80%
Meeting and working with the scientists	1		0	0%
	2		4	2%
	3		4	1%
	4		36	16%
	5		213	81%
Information relating activities to state standards	1		2	1%
	2		5	3%
	3		39.5	14%
	4		47	20%
	5		159.5	62%

(continued on next page)

Finding connections between poles and my curriculum	1		2	1%
	2		1	1%
	3		14	5%
	4		60.5	25%
	5		177.5	68%
Take-home packet with activities and extensions	1		0	0%
	2		1	0%
	3		3	2%
	4		25	11%
	5		227	87%
2. How much do you currently teach about Polar Regions in your classroom?				
Not at all			44	20%
I mention the poles but don't teach much about them			85	33%
Moderate amount of instruction			84.83	34%
Considerable amount of instruction			34.83	12%
Very large amount of instruction			3.33	1%
3. Given what you learned in today's workshop, how will your teaching about Polar Regions change? (Check one or more.)				
I do not plan to make any changes.			3	1%
I will teach more about the poles…[or at least checked something…]:			237	87%
I will teach about the poles in addition to what I am currently teaching.			86	34%
I will use polar topics discussed today to enhance my regular teaching.			137	53%
I will adapt one or more of the workshop activities for my own teaching.			162	61%
I plan to make the Polar Regions the core of a major teaching unit.			53	19%
Other.			19	7%
5. How important will the following themes be to your own teaching?				
The poles were once very different than they are today.	*1*		0	0%
	2		6	2%
	3		28	11%
	4		79	29%
	5		141	58%
The poles are a critical part of the Earth system.	*1*		0	0%
	2		0	0%
	3		7	3%
	4		40	17%
	5		205	81%

(continued on next page)

The poles are rapidly changing right now.	*1*		0	0%
	2		1	0%
	3		7	3%
	4		53	20%
	5		190	77%
Polar animals may become extinct within the next century.	*1*		1	0%
	2		0	0%
	3		14	6%
	4		53	21%
	5		184	73%
The poles connect to where I and my students live.	*1*		0	0%
	2		5	2%
	3		13	6%
	4		52	21%
	5		181	71%
8A. How many miles did you travel to get to here?				
	< 10 mi.		47	49%
	10-25 mi.		31	32%
	25-100 mi.		14	14%
	100-200 mi.		3	3%
	> 200 mi.		2	2%
8B. What percentage of students in you classroom are eligible for free/reduced lunch?				
	< 10%		26	15%
	10-25%		21	14%
	26-50%		23	14%
	51-75%		32	21%
	> 75%		42	36%

(continued on next page)

9. Please circle level(s) you teach:				
	Pre-K		3	1%
	K		15	6%
	1		26	9%
	2		23	8%
	3		34	12%
	4		37	13%
	5		49	18%
	6		47	18%
	7		69	25%
	8		72	26%
	9		57	23%
	10		49	22%
	11		47	22%
	12		43	20%
	College		9	4%
	Informal		15	6%
	Homeschool		4	1%
10. Please circle the subject(s) you teach				
	Self-contained		58	21%
	All Subjects		59	21%
	Earth Science		91	33%
	Biology		71	29%
	Ecology		36	14%
	Envir. Science		48	19%
	Genl. Science		72	27%
	Other:		40	13%

(end of survey)