Bringing the Planetarium to Earth

Summative Evaluation of the Worldviews Network Project

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Executive Summary

Background

The Worldviews Network is comprised of institutions trying to create an innovative approach for engaging the public with topics of human-induced global change. The project's approach sought to 1) leverage the power of immersive environments within informal science institutions (ISIs), such as planetariums and portable domes, by 2) incorporating visualizations of scientific data sets about relevant social-ecological issues as they relate to "planetary boundaries," framed by 3) a systems-based narrative approach that incorporated cosmic, global, and local perspectives on the issues. The project sought to produce a set of products, programs, and actions:

- Creation of Digital Assets (Visualizations and Storyboards)

- Professional Development Program for Informal Science Educators (PD)

- Production of Bioregional Community Dialogue (BCD) Events at each ISI

- Engage Scientific and Community Organizations for Future Action

Summative evaluation was designed to address four overarching questions about the process, outcomes, and generalizable lessons from the three-year experimentation with this model:

1. To what extent were short- and medium-term outcomes achieved with each of the target audiences: ISI professionals, advisors, and members of the public?

2. In what ways did the Worldviews Network process, approach, and model work well to support ISI professionals and public audiences in achieving these goals? In what areas could the model be further strengthened?

3. How have the processes, strategies, and approaches promoted by the Worldviews Network been sustained within institutions after the project?

4. How did contextual factors at each ISI site relate to or influence implementation, outcomes, and sustained change?

Summative evaluation used a multiple-case study approach. This methodology allowed the collection of both qualitative and quantitative data from a variety of stakeholders connected to each ISI in the Network. The analysis allowed for findings at two levels: 1) a portrait of the nuanced process and outcomes within each Network site, and 2) a cross-case analysis of all eight sites, which results in generalizable conclusions about the outcomes and efficacy of the Worldviews model as a whole. Methods used included interviews (with Leadership, staff at ISIs, and advisors), web surveys (of staff at ISI and advisors), questionnaires at events, event observations, and project management document analysis.

Overview of Worldviews Event Development Process

Looking across the eight ISI cases within the Worldviews Network, a generalized process for the project emerged, which is important context for understanding the findings of the study:

1. **Leadership Kicks-Off Production Process with the ISI.**
   a. ISI Defines the Topic.
   b. Leadership and ISI Begin the Story Outline, using the "cosmic-global-local" story framework and models from prior Network storyboards.

     c.   Leadership and ISI Identify Potential Advisors or Sources

2. **The Team Involves Outside Advisors to help:**
    a. Shape the Story
    b. Provide Story Information, Fact-checking, or Background
    c. Provide Data for Visualizations

3. **ISI Takes Responsibility & Leadership Identifies and Fills Gaps to Create Final Result**:
    a. Event Logistics
    b. Content (when content advisors were difficult to identify/involve)
    c. Technical Troubleshooting
    d. ISI Staff Coordination/Point-Person Role

4. **The BCD Event:** Dome presentation (data visualizations with live narration based on the script/storyboard); one to three presenters. After the presentation, some events had Q&A sessions, some held discussion groups, and some did not have formal audience interaction.
    a. Audiences – Some events focused on specifically invited stakeholder groups (while also being open to some interested members of the public). Other events were primarily open to the public, with a list of community stakeholders receiving specific invitations (but the majority of the audience was general public).
    b. Presenters – Usually ISI staff gave part or all of the presentation. In a number of cases, members of the Leadership Team co-presented with the ISI rep.
    c. Dialogue – Seven events included post-presentation dialogue/discussion sessions.

Key Findings

Audience Outcomes

- **Learning Ecological Content:** 93% of audience survey respondents reported they learned something new at the BCD Event. Most reported learning about key ecological concepts– either general facts, changes occurring over time, or the expansive scale of ecological systems. Another main area was audiences' understanding of human interactions with natural systems.

- **Main Takeaways of Understanding, Visualizing, and Perspective:** In a closed-ended item to measure individuals' three primary thematic connections with the presentations, four items were the most pervasive takeaway messages, each of which relates to important project goals. These results differ quite substantially from those collected from Science On a Sphere® (SOS) Network sites in previous evaluation:
    o Thinking about the complex interrelations in Earth systems (41%)
    o Visualizing certain concepts of time and scale (35%)
    o Learning or being reminded how the Earth is always changing and evolving (28%)
    o Feeling a sense of how small the Earth is compared to the greater universe (27%)

- **Evidence of Feeling Responsibility:** In this same question, the two statements that were most frequently ranked as the #1 takeaway by audiences were *thinking about complex interrelations in Earth systems* (15%) and *feeling a need to take better care of the Earth* (13%). Those who selected the latter item tended to experience that message very strongly. Again, these results different from prior results of visitors to SOS programming, indicating some distinct impact of the Worldviews Network model.

- **Influence of the Dome on Reaction:** More than three-fourths of respondents (79%) reported the dome changed the way they understand the material; these focused mainly on the visual aspect of the environment in "giving perspective" or that it helped to see the visuals.

- **Mixed Emotional Reactions:** In the last four events, visitors reported how the show made them feel, and reactions indicated substantial diversity in reactions. While some connected to positive messages of hope for change, others were affected by feelings of concern and the overwhelming scale of problems, while still others focused on the neutral feeling of having learned more about an issue.

- **Like the Visuals and the Speakers:** Of the 86% of visitors who indicated what they liked about the presentations the visuals/images were most mentioned, followed by the quality of the presenters. **Suggested Improvements** were made by 60% of respondents, focused on specific improvements for a particular show. Audiences were most concerned about content that could have been added or clarified, how visual images could be improved, and technical glitches that occurred. These suggest areas for future productions to focus energy on polishing in advance of a public event.

ISI Partner Outcomes

- **Collaboration:** The most common ISI outcome, mentioned by five of the eight ISI sites, was engaging and developing new collaborations with outside institutions or partners – community advisors and the Leadership Team. Two sites indicated that cross-departmental collaboration was a significant outcome, which was notable for departmentally "siloed" institutions.

- **Technological, Content, and Pedagogical Learning:** Staff from seven ISIs reported significant gains across all technological, pedagogical, and content knowledge and skill areas. The greatest reported gains were in technological knowledge/skills. The areas of content and pedagogical knowledge were where ISI staff had the highest levels of *prior* preparedness; but slight gains were still shown. Staff interviews indicated that technological skills and learning the content of the social-ecological themes were the most notable learning.

- **Institutional Buy-In:** Seven of the eight sites reported at least one area of impact on the institution since their engagement in Worldviews, with the most common being some degree of buy-in to the ideas behind Worldviews Network. Over time, many sites identified some degree of institutional or departmental commitment to telling these types of stories in the dome.

- **Reuse and Repurposing of Products or Approach:** Five sites have already repurposed the visualizations, datasets, or storylines created through Worldviews. This has included using the materials for internal professional development; use with classrooms, teachers, or students; and use for new audiences or venues. Two sites emphasized a continued focus on the approach, creating new stories and products beyond those initially created.

- **Commitment to Ongoing Relationships:** About half of the sites reported they have worked with an advisor/attendee from a BCD Event since the event, and could describe outside relationships that have been maintained or developed as a result of the project. No ISI reported they had yet engaged community partners in a new project, but four reported plans to do so.

Cross-Case Patterns and Themes

- The underlying concept of Worldviews was ambitious and innovative, as it created and tested a new model for programming. The sites that were engaged in the first year were on a steep learning curve, in which their experimentation, testing, and reflection on what worked and

what could improve was necessary to develop tools and approaches that operationalized the vision of Worldviews Network into a defined process.

- When BCD Events were primarily framed as events for the general public, with a number of expert stakeholders also specifically invited, there was some evidence that these two audience-types responded differently to the content. While experts felt the show was easy to understand, and sometimes wanted greater depth presented, non-experts sometimes felt elements were "over their heads." This presents a challenge for events seeking to meet the needs of both types of audiences simultaneously, rather than focusing on one or the other at the outset.

- Each instance of experimenting with post-show dialogue provided positive experiences for attendees and did actively engage audiences and presenters. The content of those dialogues varied, pointing to a few key lessons for creating more successful dialogue sessions: 1) Having enough "expert" or knowledgeable attendees in the room to sustain dialogue (those with more non-experts tended to fall more toward Q&A); 2) having an experienced facilitator with skills to initiate and support this format; and 3) ensuring the facilitator is comfortable with the purpose of the solution-oriented, design-process dialogue in the Worldviews model.

- The incoming resources, strengths, and assets of an ISI partner affected their implementation approach. Each site worked from a set of institutional constraints and opportunities, building on strengths and receiving project support to compensate for weaknesses and to build new skills. For instance, large ISI sites could leverage robust planetarium facilities, technical knowledge, and programming models; but they generally had to face barriers of often-siloed departments and staff when seeking internal collaboration. Smaller ISIs, in contrast, tended to be more used to internal collaboration, but were more likely to face a lack of resources, tools, or staff capacity to make vision a reality. In both cases, the barriers were overcome, but strategy had to adapt to strengths and weaknesses.

Recommendations for Future Network Sites

- The TPACK (Technological-Pedagogical-Content Knowledge) framework is a useful organizing device for understanding incoming strengths and supporting Worldviews Network sites in development. Looking forward, new sites would be advised to engage in a self-assessment of individual competencies along this framework, as well as institutional priorities and assets that can be leveraged. Resources are available to support this on the Worldviews.net website.

- For future sites working independently, pedagogical skills around creating and facilitating true dialogue with an audience should be an area of development and training. Facilitation of dialogue is a specialized skill-set, which is not often the core focus of the work of many types of ISI professionals, even those who are educators, who approach this type of project.

- In what ways can the Worldviews Network approach be adapted to non-dome settings? For a broader reach, some current Network sites have already pushed on the need to apply the techniques to flat-screen environments. The Network may want to advise future sites on trade-offs of the two formats and any critical decision-points to consider if both formats are an option.

- Patience is a virtue for advocates of this approach. At most of the sites in the Network, there were one or two advocates of the approach, who were willing to invest a lot of their own time and passion to go with the experiment and seek to bring others on-board through the experience. In those cases where institutional-level interest has mounted, there was generally some strategic alignment of the program with a larger institutional goal (such as the program's ability to promote internal research achievements or provide a unique, marketable product for educational outreach).