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Sharing a World of Resources: Incorporating Science Content in Effective Interpretation

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Incorporating science content into the presentation of resource issues to the public is essential for effective interpretation. Science professionals are eager to share their work; interpreters are equally eager to learn about relevant science. Yet, interpreting science and resource issues remains a challenge. Professional development for interpreters is critical to effectively address this challenge. Here, we describe a proven model for integrating science into interpretation: the National Park Service (NPS)–NASA Earth to Sky Institutes. These institutes resulted in the creation of a variety of products using science in dynamic interpretation at many national parks. We highlight the methodology of the Earth to Sky Institutes, and share strategies—of successful training including authentic work time, opportunity for reflection, and the creation of a resource-rich learning environment.

The Earth to Sky NASA Explorer Institutes constituted one of several professional development projects funded in 2004 by NASA's Division of Informal Education. Earth to Sky Institutes were unique in forging an exciting new partnership between NASA's space and earth science disciplines, and(NPS interpretation. For the first time, NASA scientists and education specialists worked in true collaboration with NPS interpretation trainers. The team wove NASA's rich content with proven NPS interpretation professional development methodology and research-based adult education techniques to create effective professional development opportunities for rangers.

Participants explored cutting-edge science through interactive presentations by NASA scientists and education specialists, facilitated by experienced NPS interpreters. Five major themes–night sky, comparative planetology, astrobiology, sun-earth connection/space weather, and earth systems science–provided participants with stimulating and important information that they readily incorporated into new interpretive programs, slide shows, written material, Junior Ranger activities, and educational programming. The institutes were quite successful: over 50 NPS units were represented, and each participant developed an action plan to use the new information in their interpretive work. Through these creative and engaging efforts, NASA science is now being included in many compelling stories about our Nation's natural and cultural heritage.

The structure of these successful institutes can serve as a useful model for effective professional development in interpretation, especially with respect to incorporation of new science content (as occurs, for example, during seasonal training).

The goals of the institutes were two-fold: (1) design and implement workshops that respond to park interpreters' needs for professional development; and (2) more actively

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engage NPS in the use of NASA science content.

Our objectives were to provide opportunities for participants to:

- Broaden exposure to and heighten interest in NASA science;
- Develop further knowledge of and ability to apply the interpretive process model (IPM);
- Enhance NPS familiarity with NASA content (astrobiology, comparative planetology, earth systems science, the night sky, and the sun and space weather);
- Learn how to access NASA's people, programs, and products;
- Apply NASA content to a written product or an interpretive program—create an action plan;
- Network and learn with and from a community of colleagues; and
- Increase understanding and appreciation of interpretation among NASA science and education/outreach staff.

Institute design

To help ensure success, leaders from the intended audience, namely NPS interpreters, were fully involved, from the inception of the institutes' design through implementation, assessment, and strategic planning for sustainability.

The Earth to Sky Institutes began with a planning workshop held at Goddard Space Flight Center (GSFC). NPS interpreter facilitators and experienced interpreters, together with the entire project design team, principal investigators, and selected NASA education and science staff, refined content and structure for the institutes. During this planning workshop, project leadership and interpreter facilitators noted strong similarities in purpose between the two agencies, as exemplified by their respective mission statements:

NASA mission: To understand and *protect* our home planet, *inspire the next generation* of explorers, explore the Universe and search for life, and *engage the public* in shaping and sharing the experience of exploration and discovery.

NPS mission: *Preserve* unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education and *inspiration of this and future generations.*

The knowledge that all involved had a commonality of purpose helped unify the team, and strengthened the planning and professional development effort.

Using information gathered at the planning workshop, two institutes were structured to include: (1) learning about and practicing multiple modes of collaboration, (2) science sessions, (3) tours of NASA, and (4) significant time to work in small groups led by NPS facilitators. Daily feedback and overall program evaluation were to be provided by an external evaluation team.

Prior to each of the institutes, NPS interpreter facilitators and NASA science presenters were briefed on the project with the to encourage pre-Institute communication between the two agencies. Our goal was for iterative discussions between presenters and experienced interpreters, so presenters could gauge the needs of their audience, and NPS facilitators could provide timely and useful feedback on Earth and space science presentations.

During the institutes, interpreters had numerous opportunities to connect with NASA

scientists, engineers, and technologists. Participants met formally and informally with NASA personnel in a variety of settings, including large groups, small groups, and one-on-one. Formal sessions were designed for small audiences of eight to ten people with ample time for facilitated discussions. These were followed with large amounts of time for facilitated work on developing interpretive products. Several scientists and technologists (some of whom were presenters during the Institutes) also attended ranger presentations on the methodology of interpretation.

The methodology used by the Park Service to develop interpretive products (IPM) coincidentally parallels the professional development methodology used by Earth to Sky design team advisors, WestEd. WestEd's methodology, the authentic task approach (ATA), is based on extensive research in adult learning. Both methods first define the task to be accomplished, and through a series of activities, culminate in the execution of the task. Key features of the ATA include guided facilitation, protected work time, a resource-rich environment, and continuous reflection.

Best practices for effective professional development

The Earth to Sky Institutes used a training architecture that provided facilitated, authentic work time, and allowed participants to process and reflect upon new content, ultimately leading to the development of 50 action plans. In "Designing Professional Meetings and Conferences in Education: Planning, Implementation and Evaluation," Susan Mundry, and co-authors outline established principles that foster effective workshops. These principles, together with a strong evaluation component, formed the underpinning of the Earth to Sky workshops. Below is a list of those principles, illustrated with examples of how the principle was manifest during each institute. Commitment to these principles helps create workshops that promote change or growth, reach clear outcomes, and help people develop new relationships.

1. Establish and share clear outcomes.

- State goals and objectives of workshop up front.
- Give everyone an agenda that provides a sense of structure and rhythm for the experience.
- Provide opportunities for participants to know where they are within the process—recap activities, overview of next steps.

2. Design activities to engage all participants.

- Teach/use collaboration tools (e.g., norms of collaboration—Garmston and Wellman 1999).
- Recognize the importance of shared interest—allow opportunities to highlight shared values, and to share their motivation for being in the training.
- Provide a catalyst for participants to get to know one another (otherwise it may not happen on its own). This also encourages free exchanges of ideas during the training process.
- Create a balance between structured and unstructured time.

- Provide an opportunity for a little fun—silliness with a purpose (awards, icebreakers, etc).
- Provide ample opportunities for informal, unstructured interactions between participants and between participants and speakers.
- Provide for varied learning styles (lecture, facilitated interaction, group work, one on one conversations, "share-a-thon," dedicated individual work time, were all used in Earth to Sky).

3. Model effective learning processes and environments: Make sure participants are learning by being engaged in the process (model good interpretive technique if you are teaching interpretation).

- Try to build some consistency into the structure of each day (research supports this concept).
- Allow choice (do not always assign group memberships, allow learners to choose topics of greatest interest if at all possible).
- Give breaks!
- Move from the most familiar to the least familiar throughout course of workshop.
- Have groups build some cohesiveness and achieve some success (perhaps with somewhat familiar content) before attempting a big task or before learning and applying weighty content.
- Pay attention to the physical space. Setting is important (familiar locations or new, cramped room versus spaciousness, urban or rural, lighting, layout of space). Orient people to physical space and let them know their physical needs will be met: breaks; lunch; where is the bathroom, pencil sharpener, socket for laptop, coffee, etc.

4. Establish clear roles.

- Describe who is involved in the workshop/task (in Earth to Sky: education and outreach specialist, scientist, facilitator, evaluator, participants).
- Clarify the task (in Earth to Sky it was to learn and create a plan for an interpretation product using new knowledge).
- Remind participants of their responsibility for achieving the task as appropriate/needed.

5. Have participants take responsibility for reaching the stated outcomes.

- Earth to Sky facilitator/coaching structure (facilitators also were participants, and their coaching helped participants to stay focused and on task).
- Part of the requirement for acceptance to the course was a commitment to use materials and content presented during the workshop.
- Set realistic and honest expectations (e.g., do not surprise people at the end by suddenly collecting or reporting their work!).

6. Connect with participant's own work and thinking.

- Provide a context for the content to be delivered (for Earth to Sky, it was science context

and interpretation context—provide participants with a contextual understanding of where the content fits).

- Ask yourself, how will the content apply to participants' jobs?
- In Earth to Sky we taught the IPM before the science, so people could begin to relate how the science would fit into the process of creating interpretive products.
- In Earth to Sky, facilitated discussions for each science presentation provided an opportunity for participants to make the connection between the content and their own work (creating interpretive products).

7. Provide opportunities for continued learning and maintaining relationships after the event.

- Through use of technology maintain contacts (follow up e-mails, calls, updates; website creation).
- Availability of leaders and scientists after event was emphasized in Earth to Sky.
- Make use of the mentoring/coaching/"auditing" processes at home park or site.

8. Encourage participants to share what they have learned with others outside the event.

- Participants were asked to do so as part of initial screening process.
- Participants created and conducted training for peers at their parks/regions.
- Action plans and follow-ups were posted on the workshop website.

9. Ensure adequate time for authentic work activity (as close as possible to the participants' "real world" task).

- Stick with the 40/60 rule (40% content, 60% to reflect upon and use the content to accomplish the task—challenging to do!).
- Ensure dedicated, structured time to work together on identified task.
- Provide a resource-rich environment (experts, in-print resources, electronic resources, example interpretive techniques, etc.).

10. Provide ample time for reflecting on the information and experiences.

- Include reflection time for participants throughout the workshop (use journals and pauses to write/think in sessions).
- End-of-day assessment/reflection time for participants (a chance to breathe! journal time).

11. Meaningful evaluation! (Note that providing reflection time increases likelihood of worthwhile responses during evaluation.)

- Use the application process as tool for pre-assessment; use e-mail or online access to administer pre-assessment tool.
- Use a pre-and post-assessment chart (create a simple scale for level of expertise in subject matter and have participants self-rate prior to and at end of sessions or workshop).
- Use focus groups to provide feedback at points during the workshop (this formative

evaluation helps catch items one might not otherwise, in order to make needed changes which help ensure success).

- End-of-day debrief for workshop organizer team (this provided insights we would not have otherwise received).

Results

As a result of the institutes, interpreters internalized new NASA science content and incorporated it into their own practice. Their plans show a high level of application of learning, as well as reaching the synthesis level of Bloom's (1956) taxonomy of learning. Participants learned about aspects of NASA's science that relate directly to their own parks and to the interests of the park visitors, greatly increased their ability to access NASA resources, and incorporated these resources into their own practice. Presenters made strong connections with interpreters, expressing interest in continuing the collaborative work with the NPS, and meaningful professional relationships between and among NASA and NPS staff were established and expanded. Finally, high interest was developed among NASA scientists, Education and outreach personnel, and management, to learn more about the NPS interpretive method for use in their own professional work.

NPS interpreters are now integrating NASA science at parks throughout the country. For example, "Never Summer, Ever Summer," an interpretive program at Rocky Mountain National Park, incorporating climate change, dynamics of our Sun, and changes in the landscape over time; "Night Watch/Sky Watch: The Universe through the Lens of Science and the Native American Perspective," an interpretive talk; "Hydrothermal Vents: Life in Extreme Environments on Earth and Beyond," an interpretive talk; development of a Junior Space Ranger activity booklet and accompanying badge at Delaware Water Gap National Recreation Area; and, from follow-up activities, a "Climate Change in Parks" brochure and display have been developed for use NPS-wide.

Conclusion

It is evident that the methodology used in the Earth to Sky Institutes made is possible for NPS interpreters to readily absorb and use the new material presented to them. NASA exploration and science programs offer substantial benefits to NPS interpreters who in turn, inform and inspire park visitors about our place in the natural world and the universe. NPS interpreters and NASA scientists are gaining new perspectives and creating products that use relevant science and imagery to support dynamic interpretation in the national park setting.

> Thank you! This was a tremendously successful course.... There is no question that my programs and the written material I create for students and teachers will be greatly enriched.
>
> — Earth to Sky participant

> ... a fantastic workshop. I am honored to have participated in such a well-organized and inspirational event. It has broadly expanded my interpretive mind.
>
> — Earth to Sky participant

References

Bloom, B.S. 1956. *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain*. New York: David McKay Co.

Garmston, R.J., and B.M. Wellman. 1999. *The Adaptive School: A Sourcebook for Developing Collaborative Groups.* Norwood, Mass.: Christopher Gordon.

Mundry, S., E. Britton, S.A. Raizen, and S. Loucks-Horsley. 2000. *Designing Professional Meetings and Conferences in Education: Planning, Implementation and Evaluation.* Thousand Oaks, Calif.: Corwin Press.