

iSWOOP Implementation in National Parks: Interpreters' Perspectives

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Interpreters and Scientists Working on our Parks (iSWOOP) is experimenting with a model program to build visitors' understanding of science at National Parks. The project brings together educators, scientists and National Park Service (NPS) interpreters to incorporate park-based science into formal and informal interactions with the public. iSWOOP is led by principal investigators Martha Merson from TERC, and Nicholas Hristov and Louise Allen from Winston Salem State University.

Char Associates conducted an evaluation of the four-year, NSF-funded iSWOOP project. The project brought interpreters and scientists together in multi-day professional development sessions at five national parks with the purpose of showcasing scientific research that usually goes unseen and unappreciated by park visitors. iSWOOP coordinated the development and delivery of digital libraries including animations, still photos, thermal and high-speed videos, and maps to give visual support to explanations of particular scientific studies. In interpreters' hands, visualizations were a jumping off point for observations, predictions, and speculation during ranger-led interactions with park visitors.

The iSWOOP evaluation team has been examining the benefits of and impact of iSWOOP on participating interpreters and their interpretive practice in the parks. This evaluation report presents findings from a survey study conducted with NPS interpreters from five parks participating in iSWOOP professional development (2016 - 2018). These parks were: Acadia National Park (Maine), Indiana Dunes (Indiana), Joshua Tree (California), Jean Lafitte National Historic Park and Preserve (Louisiana), and Carlsbad Caverns (New Mexico). This interpreter study is complemented by accompanying Char Associates' studies of iSWOOP scientists, park leaders, and visitors (Char, 2019a, 2019b, 2019c).

The evaluation is informed by a logic model co-developed by the iSWOOP core team and the evaluator. It outlines a set of key desired outcomes for interpreters and their practice, in which interpreters:

- 1) Feature **current scientific research** in programs and visitor interactions
- 2) Tell **stories** about **how we/scientists know what they know**
- 3) Engage visitors in **observing, speculating, and predicting based on scientists' and park-based visualizations**
- 4) Facilitate visitors in discussing **relevance of science and research to their lives**

For their visitor programming, iSWOOP parks each identified a featured scientist and topic of park-based scientific research. In Acadia, the featured science involved paleoecology and change in the plant communities over time, and changes in geology and climate since the last glacial advance. In Indiana Dunes, the featured science was in two areas: amphibian research on

breeding patterns and its serving as a possible indicator of climate change was selected for the first year of implementation; in the second year the focus was expanded to include work by geologists and biologists on decomposition chimneys in the dunes. In Joshua Tree, the research focused on its iconic Seuss-like Joshua Tree, and its pollinator, the Yucca moth and its water-sourcing fungal networks. In Jean Lafitte's Barataria Preserve, the research focused on the Prothonotary warbler and the birds' breeding and migration patterns to reveal factors driving population declines. Carlsbad Caverns, involved in an earlier pilot phase of the project, focused on iSWOOP Principal Investigators' research into population, colony dynamics and habitat of the Brazilian free-tailed bat.

The five parks were ambitious in their choice of topic – introducing new and complex ideas to both interpreters and visitors.

The evaluation work with interpreters was framed by three primary questions:

- *In what ways did iSWOOP professional development strengthen and expand interpreters' abilities and opportunities to feature and communicate science-based research in their work with the public?*
- *Which elements of iSWOOP do interpreters incorporate into programming most readily—e.g., descriptions and findings from park-based science; visual media; or inquiry-based facilitation/visitor interaction techniques?*
- *What aspects of professional development and support do interpreters deem as most important for fostering and sustaining this approach to engaging visitors in park-based science?*

Sample and Methods: The primary survey sample for the evaluation involved interpreters who participated in iSWOOP professional development in 2016, 2017 and/or 2018 from five parks (Acadia, Indiana Dunes, Joshua Tree, Jean Lafitte, and Carlsbad Caverns). iSWOOP evaluators and project staff interviewed, surveyed, and observed rangers at the five parks. Below we draw primarily on a post-implementation survey to examine the impact of iSWOOP on participating interpreters.

While iSWOOP project staff estimates that they offered professional development to over 200 park staff (i.e., interpreters, administrators, resource managers) over the four-year iSWOOP 2.0 project, the program implementation survey captures the impact of 38 interpreters at five parks. These interpreters had the opportunity to implement iSWOOP-influenced programs multiple times and were employed and available to complete surveys at the end of their park's peak season (which might or might not have coincided with rangers' seasonal employment). Ten of the 38 interpreters elected to take part in iSWOOP professional development over the course of two years, and submitted annual surveys for each year (i.e., in both 2017 and 2018.) The 38 interpreters completing surveys were out of a total of 43 interpreters who were sent surveys (88% response rate).

The most recent post-program implementation survey employed in 2018 drew largely from items that had been previously presented in 2016 and 2017 versions of the survey. The survey was designed to gather information on interpreters' professional skills and practice, and program implementation of, and feedback on, iSWOOP professional development, materials and resources. It consisted of nineteen evaluative items (five open-ended questions, five items featuring matrix rating scales, five 2-part "hybrid" questions (multiple choice or yes/no questions, plus open-ended question to comment upon one's choice), and four multiple choice questions), plus six additional items gathering demographic information on respondents.

A core set of questions featured rating scales on skill level and frequency of use concerning professional practice and different interpretive techniques pertaining to park-based science and interactive forms of engaging visitors in science. One set of questions focused on the specific science research featured in a particular park, and thus was customized for each participating park.

Quantitative data yielded from the matrix rating scale items and the multiple-choice items were analyzed using frequency distributions, given the relatively small sample size ($n = 38$). Prose responses to the open-ended questions were coded by a member of the evaluation team, using a grounded theory approach (Charmaz, 2006; Patton, 2002) using thematic categories that emerged from the comments and that were in alignment with the main features of the project, project goals and desired outcomes.

For those interpreters ($n = 10$) in two of the parks who participated in iSWOOP for two years and responded to annual surveys in both 2017 and 2018, rating scale data was used only for their first year (2017 survey), in order to capture the initial impact of iSWOOP and make that sample comparable to others who only participated in iSWOOP for one year, and to avoid "double-counting" their responses. Qualitative prose data, however, was analyzed from both years of their surveys, to capture insights gleaned from their two-year experience with iSWOOP.

General profile of interpreters: iSWOOP professional development included participants from a wide age span ranging from their early twenties to their late sixties, and at every stage of career (early-, mid-, and late). As had been noted in earlier iSWOOP evaluations (Char, 2016; Char, 2018c), many interpreters had already worked in multiple parks over the course of their careers. In the survey, interpreters were able to list up to six parks in which they had worked, and responses indicated the highly mobile and seasonal nature of the career for many interpreters. About a fourth (27%) of interpreters listed five or six parks in which they had worked, while an additional 15% indicated three or four parks in which they had already worked. A little over half (56%) had worked in only one or two parks, but roughly half of these interpreters were under 26 years old, and thus were early in their careers with the National Park Service. A number of these positions were seasonal, lasting 3-6 months at a given park, although a handful of interpreters had returned for multiple stints at a given park.

Of the interpreters' formal training, a little over a third had training in the sciences (38%), with a fourth of interpreters in either the applied sciences (e.g., natural resource management) (25%), or in the humanities (22%).

All the interpreters had used the iSWOOP materials and approaches with visitors for at least several days, with about a third (36%) having used iSWOOP for ten or more days during their past peak season.

Figure 1: Number of days implementing iSWOOP

1-2 days	3-5 days	6-9 days	10+ days
3 (8%)	10 (28%)	10 (28%)	13 (36%)

(n = 36, 5 parks)

Interpreters adapted iSWOOP materials and approaches to a variety of program formats they commonly used. The most popular format was use in an informal setting (e.g., drop-in, junior ranger station or rove) used by about three-fourths of the interpreters. Close to half the interpreters used iSWOOP in structured programs with movement (e.g., scheduled hike or tour), or in seated structured programs (e.g., projecting images in an evening program or in classroom setting).

Figure 2: Program Formats used to implement iSWOOP

Structured program w/ movement	Seated structured program	Informal Setting (drop in, junior ranger station, or rove)	Other
18 (47%)	18 (47%)	28 (74%)	8 (21%)

(n = 38, 5 parks)

Organization of Report: Evaluation findings presented in this report focuses on results from the post-implementation survey and the benefits and impact of iSWOOP professional development on interpreters. Feedback on professional development, materials and resources were reported to iSWOOP leaders and project staff and used to inform implementation and training (Char, 2018a, 2018b.) Here, we focus on the experience of interpreters and their interactions with visitors.

Findings are organized by the following eight topics:

- iSWOOP as a Valuable Experience
- Understanding of Scientific Research
- Notions on Visitor Engagement
- Interpretive Approaches Featuring Park-based Research: Capability and Frequency of Use
- Interpreters' Capacity to Increase Visitors' Scientific Understanding
- Biggest challenges to Incorporating Scientific Research
- Obstacles to Implementing iSWOOP
- Valued Sources of Professional Development Support

RESULTS

iSWOOP as Valuable Experience: 84% (31 out of 37) of interpreters reported that they had found iSWOOP a valuable experience.

Figure 3: To what degree has participating in iSWOOP been a valuable experience for you?

Not valuable/A little valuable	Somewhat valuable	Valuable/Very valuable
2 (5%)	4 (11%)	31 (84%)

(n = 37; 5 parks) (5-point scale)

Of the 35 interpreters who further described what they found most valuable about iSWOOP, a little over half cited the value of the featured scientific research and increasing their scientific knowledge. Roughly two-fifths valued the interpretive skills they gained, and the visuals, technology and/or 3D props developed to illustrate and showcase the park-based research. A fifth cited the new partnerships and relationships they had with scientists, fellow rangers, and resource managers.

Figure 4: Reasons interpreters found iSWOOP Valuable

Scientific Research/science knowledge	18 (51%)
Interpretive skills	15 (43%)
Visuals/props/technology	13 (37%)
Relationships with scientists and park staff	7 (20%)
Visitor impact	6 (17%)

(n = 35; 5 parks)

What I found valuable about participating in iSWOOP was looking at interpretation in a new way. It was exciting to have research to share with visitors...I gained an understanding of the science on a personal level, something I have never thought about before participating in this program.

Professionally, I think it is always rewarding to push yourself out of your comfort zone. Coming from a humanities major, iSWOOP definitely did this. I feel more confident talking about the science and engaging visitors in conversation. It added another tool to the toolbox of techniques I can pull from in any park that I work at.

The opportunities to use open-ended questions about scientific topics were grand. Most of my trainings in ACE (audience centered experience) techniques have centered around social topics. This was a comfortable way to practice using those same techniques to tackle science- by making the researchers and the research process as much of the story as the scientific findings.

I have worked as a field biologist for more than 20 years, and am very comfortable incorporating science into interp programs. But the ability to use Juniper's props made me see that there is a way to teach people about science while having fun, and it is always helpful when the ranger has a sense of humor and is willing to put on moth glasses.

Learning new techniques for engaging visitors, regardless of topic, including new technologies and tools, was extremely valuable, since we rarely do "interpretative" training even within the park.

Understanding of Scientific Research: A central element of iSWOOP professional development was strengthening the direct connection that interpreters had with scientists and scientific research occurring in the national parks.

83% (31 out of 37 interpreters) indicated that their understanding of scientific research taking place at their park had changed as a result of iSWOOP.

Figure 5: Understanding of park-based scientific research changed as a result of iSWOOP

Understanding of Science Changed?	Yes	No
	31 (83%)	7 (18%)

(n = 37, from 5 parks)

This occurred in several important ways. iSWOOP both increased interpreters’ awareness of the research being conducted in their parks, and led to a deeper understanding of the research featured. When describing the ways in which their understanding of scientific research had changed, 71% (17 out of 24 interpreters) cited having a greater awareness of the research being conducted in their parks. 58% (14 out of 24) further described having a deeper understanding of the research itself, and the scientific content featured. 33% (8 out of 24) spoke about appreciating the opportunity to play a more active role in the research and greater understanding of the parks’ research permits.

In Acadia, I knew research took place but I enjoyed learning the depth and I was really challenged to dig deep into the science to understand the information being presented enough to simplify it for my audience.

It's changed dramatically, especially concerning the amphibians... Before iSWOOP, I had little understanding of the research going on at Indiana Dunes. I may have heard a few things about research in the park, but nothing compared to the thorough examinations and scientist-connections that iSWOOP has ushered.

I did not know the extent of research being done on Joshua trees and the desert ecosystem in our park. I have a better understanding of who is working here and what they are working on.

[Before iSWOOP] Our park ecologist would send us spreadsheets of research permits in the park at least annually, but it didn't mean much because we weren't interacting with the researchers. Even though our ecologist would organize Research Roundups annually for at least 2-3 investigators to share their research, it was PowerPoints and not following a researcher in the field to learn about them and their work. Nudging park staff to make that connection is key.

The interpretation division here has often not had great contact with scientist outside of the NPS. I had no idea that so many research permits were issued every year and that there was a wealth of information available. I think it is amazing to be able to state a fact about the park and follow that up with why we know what we know - the research! Some of the research that we discussed goes back 20 years.

This important connection made with scientists forged through iSWOOP was also found in an earlier formative evaluation (Char, 2018a) based on short evaluation forms that interpreters filled out on the final day of iSWOOP training. In that study, close to half (54%, or 20 out of 37) cited

working with, interacting with, and speaking directly with the scientists as the most valuable aspect of the professional development sessions.

Notions of Visitor Engagement: A major focus of the iSWOOP professional development is to provide tools and resources for interpreters to actively engage visitors in observing scientific phenomena and visualizations and having them consider the relevance of science and research to their lives.

68% (25 out of 37) of interpreters reported that they looked at visitor engagement at their park differently now, compared to before their involvement with iSWOOP.

Figure 6: Look at visitor engagement differently now, compared to before iSWOOP

Look at Visitor Engagement Differently?	Yes	No
	25 (68%)	12 (32%)

(n = 37, from 5 parks)

Interpreters reported an increased focus and intentionality to incorporating science in their interactions with visitors, and expressed greater conviction that visitors could and would find science engaging. When describing how their views of visitor engagement had changed, 60% of interpreters (15 out of 25) cited a greater and more prominent science focus in their interactions with visitors, and how their deeper appreciation and knowledge of scientific research being conducted in the parks could be applied and leveraged in their visitor programs.

I loved being able to talk about Acadia's foundation through the Champlain society (science/research) and how that is continuing today. People were really excited to think of Acadia as a science lab versus just a place for recreation.

Before iSWOOP, I would usually only speak with visitors about research if they had a specific question. Now, I am more inclined to bring this topic up and expand it on my own.

Working with iSWOOP encouraged me to get to know some of the scientists and to include specifics of their research into programs. The iSWOOP team and Juniper's work has encouraged us to include science in programs but also to increase audience participation in programs. It is very satisfying to help people learn and have fun at the same time.

As recommended in SWOOP professional development, 28% (7 out of 25) described now having a more audience-centered approach in their work with the public.

Prior to iSWOOP, I feel as if research was not on my priorities list of interpretive interactions. If it was, it was limited to older studies that were finished and had concrete, finite conclusions. iSWOOP has opened up these engagements to contain an array of relevant, interesting, and ongoing research that sparks highly interactive and educational visitor engagements.

I see iSWOOP as an approach, and the park ecologist and I already have a meeting set up to decide which research project we will "iSWOOP" next. I think I had a really passive approach in the past to sharing park research (i.e., a visitor will eventually ask about it and then we'll give them a really truncated answer about the research). But now I see this as a dialogue with visitors, and welcome the extended conversations.

One interpreter described how she viewed iSWOOP and its featured scientific research as a powerful vehicle to engage visitors in considering changes in the natural world and conservation management issues at the park.

I look at visitor engagement as a way to provoke a different level of thinking. Often times visitors come to the parks and just relish at their beauty but don't think beyond what these places provide in our understanding of the natural world. The biggest thing about the research done in Acadia is it shows change. Often time we think of parks as these unimpaired places but the natural world is constantly changing, whether by its own accord or prompted by human influence. It becomes a question of how park managers are going to manage for change utilizing what we know about the past. This is something I think most visitors don't think about. I know that visitors are not exposed to the management side of things for the park service and research and iSWOOP provides a great opportunity for visitors to discover that.

Interpretive Approaches Featuring Park-based Research: Capability and Frequency of Use: Interpreters in the four parks who took part in iSWOOP professional development in 2017 and 2018 were asked to assess their level of skill and to report on the frequency with which they used a variety of interpretive approaches, pertaining to park-based science and more interactive techniques to engage visitors. Interpreters were asked to assess their frequency of using eight interpretive techniques encouraged by iSWOOP, such as the use of stories, visualizations, and focusing on science process.

The majority used techniques to give greater prominence to scientific research. Confirming park leaders’ observations, interpreters reported making scientific research prominent and interactive in visitor programs. Over half the interpreters reported that they often

- Shared stories about specific researchers and their methods
- Employed visualizations related to scientists’ questions
- Explored how we know what we know based on scientists’ research
- Facilitated visitor discussions of the relevance of park-based research to their lives and society

Techniques used with less frequency were those that involved facilitating more active involvement on the part of visitors, such as eliciting visitors’ reactions to scientists’ visualizations, and ideas about obstacles to research.

Figure 7: Park-based Science Interpretive Techniques– Frequency of Use
Which ways do you use to incorporate park-based science into interactions with visitors?

<i>Interpretive Technique</i>	<i>Used Often or Very Often</i>
<i>Sharing stories about specific researchers and their methods</i>	66%
<i>Showing visualizations related to scientists' questions and findings</i>	62%
<i>Using scientists' research questions, data collection strategies and findings to explore how we know what we know</i>	57%
<i>Positioning themselves as learners and stakeholders in scientific research</i>	54%
<i>Facilitating visitor discussions of the relevance of park-based research to their lives and to society</i>	52%

<i>Positioning visitors as learners and stakeholders in scientific research</i>	44%
<i>Using prompts or open-ended questions to elicit visitors' reactions to scientists' visualizations</i>	39%
<i>Eliciting visitors' ideas about obstacles to research</i>	28%

(n = 26-29, varied by item, from 4 parks) (5-pt scale: Not at all, Seldom, Occasionally, Often, Very often)

As three interpreters described when explaining why they found iSWOOP valuable,

Learning new interpretive techniques to incorporate scientific research topics, methods and data into interpretive programs was the most beneficial to my professional development.

I think it has opened up a new avenue for interpretation for me. Not coming from a science background, I feel more confident talking about science with the public. I also look at the images I use differently, especially on evening programs and how to leave them open for interpretation.

I think iSWOOP is a long-needed shift in interpretive thinking. I think it's effective at showing how science is important, exciting, and relevant. I think it has personally benefited me by making me a stronger interpreter. It has stressed the benefits of active listening and engaging questions- and how these lead to rewarding visitor interactions that benefit both the visitor and the interpreter...I've gained a much greater understanding of current science research being performed in the park. I have also had many skills reinforced and grown such as conversational learning, using science with narrative, and relating research back to visitors' own past experiences.

Interpreters who took part in iSWOOP professional development in 2018 were also asked to assess whether they reported any changes in their interpretive skills or practice in the months after iSWOOP training, compared with prior to iSWOOP. Four of the interpretive approaches assessed involved park-based science that were part of the iSWOOP program model.

Interpreters reported increased skills in using park-based research in their programs to foster visitors' connections to the parks. The vast majority of interpreters noted increased skills in *using park-based research to provoke visitors' emotional and intellectual engagement with park resources*, and in *basing interpretive programs on park-based scientific research*. 73% indicated increased skills in *incorporating scientists' visualizations into programs*.

Figure 8: Park-based Science and Interpreters' Choices– Capacity and Frequency of Use

<i>Skills Improved Some/A lot</i>	<i>Interpretive Technique Regarding Park-based Research</i>	<i>Use Increased Some/A lot</i>
82%	<i>Basing interpretive programs on park-based scientific research</i>	74%
91%	<i>Using park-based research to provoke visitors' emotional and intellectual engagement with park resources</i>	70%
64%	<i>Encouraging visitors to express their personal interests on the park and park-based science</i>	52%
73%	<i>Incorporating scientists' visualizations into programs.</i>	44%

(n = 23) (5-pt scale: Decreased, Stayed the same, Improved/used a little, Improved/used some, Improved/used a lot)

Interpreters factor in the needs and interests of their audience as well as the time available when incorporating park-based science into a wide range of visitor programs they are expected to lead and facilitate. Thus, being skilled in using a particular interpretive technique did not necessarily translate into that technique frequently being used. About a quarter of the interpreters reported

that they had not increased their use of programs based on park-based scientific research. Roughly half had not increased their encouragement of visitors to express personal interests in the park.

A similar pattern was found regarding interpreters’ capacity and use of more audience-centered interactions, with interpreters reporting higher increases in skill levels for various techniques compared with increased frequency of using those techniques. Roughly three fourths of interpreters reported that they had improved their skills in involving visitors in making observations and in making predictions, while closer to half reported increased use of those techniques.

Figure 9: Interpretive Techniques Encouraging Active Visitor Role: Skills and Frequency

<i>Skills Improved Some/A lot</i>	<i>Interpretive Techniques Encouraging Active Visitor Role</i>	<i>Use Increased Some/A lot</i>
77%	<i>Involving visitors in making observations</i>	61%
73%	<i>Involving visitors in making predictions</i>	48%
59%	<i>Encouraging visitors to build on each other’s ideas and perspectives</i>	30%
59%	<i>Leaving visitors questions unanswered to promote suspense or encourage further thinking</i>	45%

(n = 23) (5-pt scale: Decreased, Stayed the same, Improved/used a little, Improved/used some, Improved/used a lot)

So while interpreters felt more skilled and comfortable with the techniques that iSWOOP encourages, interpreters may have needed more coaching to make the most of opportunities to integrate park-based research and audience-centered approaches into their interactions OR have park assignments that better lend themselves to such interactions.

Interpreters’ Capacity to Increase Visitors’ Scientific Understanding: With the iSWOOP professional development focusing on a specific set of scientists and ongoing scientific research studies, another desired project outcome is that interpreters would increase their skill and capabilities to increase visitors’ understanding of specific areas of scientific information and methods pertinent to their specific park. To assess this increased capability, a set of survey rating scale items were customized for each park, to target the specific scientific research conducted by the iSWOOP scientists featured at the park and its visual library.

For example, regarding visitors’ ability to visualize natural phenomena and a complex context, items were modified for the various parks. Depending on the park, the focus concerned visualization of:

- glaciation and deglaciation (on a continental scale, a state scale, or in certain situations where the glaciation and deglaciation affect the landscape) (Acadia),
- variation (in the soundscape during breeding times in the bog or in the shape and placement of the dune in the landscape) (Indiana Dunes),
- the big picture (the factors that influence the health of Joshua trees, their reproduction and resilience)” (Joshua Tree), or

- the big picture (the factors that influence the health of wetlands and the wildlife populations they sustain)” (Jean Lafitte).

Following iSWOOP training, over half the interpreters reported that they felt skilled or very skilled in increasing visitors’ understanding and awareness in four of the six targeted “big ideas”; most of the remaining interpreters indicating that they felt at least somewhat skilled in these areas. The areas interpreters felt most skilled in were fostering visitors’ understanding of change over time, and the scientific research’s relevance, while the most challenging area was increasing visitors’ understanding of obstacles to research.

Figure 10: Interpreters’ ability to increase visitors’ understanding and awareness of different scientific areas

	Not at all/A little Skilled	Somewhat skilled	Skilled/Very skilled
Understanding of change over time (processes and variation)	4 (13%)	8 (26%)	19 (61%)
Relevance of scientific research	3 (10%)	10 (32%)	18 (58%)
Understanding of the phenomenon, species or process being studied	3 (10%)	11 (35%)	17 (55%)
Ability to visualize natural phenomena and a complex context	5 (16%)	10 (32%)	16 (52%)
Awareness of how we know what we know (methods and technology)	2 (6%)	14 (45%)	15 (48%)
Understanding of obstacles to research (n = 30)	4 (13%)	16 (53%)	10 (33%)

(n = 31 across 4 parks, unless otherwise noted)

Interpreters spoke about how both their increased knowledge of the scientific research and the visual library has helped bolster their work with visitors.

[Before iSWOOP] I didn't know anything about pollen, coring, or the data collected. I can now distill it down to what is most important for visitors. I still don't think I am an expert by any stretch of the imagination but I am more aware of the research happening in the park and the ramifications of that research.

Personally, I have found that I am more interested in learning about bird species. As an NPS professional, I have learned the importance of paying attention to the research happening in the park, outside of my division, and how this information can bring a great learning opportunity to visitors.

I believe that gaining a better understanding of the scientific research that occurs in the park has made the quality of my interpretive programs stronger. The images produced by ASAP have also added clarity in the explanation of glacial activity.

The visuals are good. They are unique and the 3D pollen and ideas can help stretch us to ask questions about what is happening in our own park.

I can now share the different tools researchers use to collect data and the importance of helping amphibians in the Indiana Dunes NP.

One interpreter even reported that she had created a new science program for visitors interacting with featured scientists, saying,

I have started another program to bring more science into the park, Science Saturdays, where visitors get to go collect samples with scientists, along with learning about the scientists’ research.

iSWOOP-trained interpreters increasing visitors’ engagement with park-based research is corroborated by another source of evaluation data. iSWOOP staff asked interpreters in 2017 and 2018 to report on iSWOOP programs they had conducted (n = 144 program entries, submitted by 37 interpreters across the five parks). In addition to collecting visitors’ questions and reactions to the visualizations used, interpreters identified one or more features of the interactions with visitors that qualified that visitor experience in their minds as an iSWOOP program or an iSWOOP-influenced interaction.

In two-thirds or more of the iSWOOP influenced programs, interpreters indicated that they:

- Talked about the questions driving park-based scientific research
- Discussed the technology scientists are using to answer questions
- Invited visitors to make observations or predictions

Figure 11: iSWOOP Features Incorporated in Interpreter Programs

iSWOOP Feature	Percentage of Programs
Talked about the questions driving park-based scientific research	85%
Talked about the technology scientists are using to answer questions	77%
Invited visitors to make observations or predictions	69%
Had a 2-way conversation about the relevance of park-based research	62%
Talked about how scientists know what they know	58%
Talked about scientists’ stories, obstacles and break-throughs	56%
Looked at scientists’ data or other visualizations to answer their questions	51%
Learned something from visitors related to research at parks	20%

(n = 144 program entries, submitted by 37 interpreters across five parks)

In over half the programs, visitors also looked at scientists’ data and other visualizations, learned about scientists’ stories and how scientists knew what they knew, and discussed the relevance of park-based research.

Biggest challenges to Incorporating Scientific Research: When asked to describe the biggest challenges to incorporating scientific research, most interpreters described ways in which they needed to make the content accessible, interesting, and relevant to their park visitor audience. Interpreters identified a number of areas they needed to consider, such as aligning particular content to the specific location in the park, or finding the appropriate program formats that would work best, given the importance of being responsive to visitors’ interests and time constraints.

Context and location are the biggest challenge. If a hike or a program is focusing on a completely different topic, or the location makes no sense to talk about frogs, it can feel forced and unauthentic.

Specifically with the prothonotary warbler, I do not want to feel like I am forcing visitors to learn about the bird if they do not want. It is easy to add this information into a guided walk, not always so easy when roving, especially if the visitor is interested in another topic.

Visitors often would like an overview in most sessions. There is still a desire, especially from educated, upper and middle class visitors in the baby-boomer generation accustomed to this model, to

expect a download of information from the ranger. I've been told "I don't want to be talking, I want to hear from you. You tell me." I'd love to get into the topic in more depth, but as far as the best setting for that, an evening program presentation seems like the best match for visitor expectations. Otherwise a less detailed description of the research on a hike seems like a better fit than trying to delve deeply into the topic.

Squeezing the science component into a finite timeframe. Also, especially with roving and informal interactions, realistically and quickly assessing how much they will understand and be interested in.

Some interpreters described the challenges posed by certain scientific fields and topics or by visitors mainly coming to the park for recreational reasons, and how the use of props and featuring of charismatic species helped mitigate some of those challenges.

The biggest challenge of incorporating science research into programs is trying to make it exciting when it does not have a cute face. Without a cute face, many visitors do not have background knowledge for plant succession and cannot visualize thousands of years ago or the geology aspect so it is building an understanding from scratch. It can be a daunting process, but one that can be exciting and challenging for visitors.

The struggle I have had the most is taking pollen or microscopic concepts that are complex and breaking them down for children or whole family audiences in a way that shows meaning. In fact, the hardest part for me was coming up with a "why does this matter to the general public?" If the audience walked away not knowing this how would it impact them- this especially challenged me with geology as well and I was never able to wrangle up a solid discussion question for my geology groups to dive into and add their ideas to.

[A challenge is] Finding an engaging topic that visitors will ask questions about and want to know more. iSWOOP has up until now focused on charismatic fauna. At Jean Lafitte, it is very likely that our next highlighted projects will be about flora, or about whole systems change, or about hydrological dynamics. I will need to spend some time brainstorming with the staff about how to find the hook... The other thing about the prothonotary warbler topic is that it is seasonal. We started in March, and the birds are about to migrate south for the year in late July. It's a nice bounded time period each year. I think that we will struggle in the future on how to give a big push on a new topic - i.e. "finding the urgency."

One challenge I've found is getting visitors at our beaches to get interested in research when they're mainly coming to swim. I think some time could be spent finding ways to hook our beach-goers more. I'm thinking that instead of roving with an iPad at say, West Beach, it may be more effective to have a couple rangers sitting at a table with iPads and other props that visitors would pass on their walk from the parking lot to the beach.

Props often make science-based research more accessible, and in this case an illustration and a video on an iPad is a good tool, but the connection to the place is heavily conceptual, not tangible. In other settings I've had the condor wing tag, a radio telemetry device for wolves, my own cloud-catching equipment to use as a hook for audiences. I'm wondering if there's a way we can make a core with them- even if it's just using the soil core equipment we use at SEA working with middle school audiences.

Six interpreters described a variety of park staffing issues, such as identifying the appropriate interpreters to be involved, and the importance of peer and administrative support. Only three

interpreters described challenges in terms of needing more information or wishing they understood the science more adequately themselves.

Obstacles to Implementing iSWOOP: When asked whether they encountered any significant obstacles to implementing iSWOOP, 21 out of 31 interpreters (68%) said they had. Describing the nature of these obstacles, interpreters (11 out of 21) most commonly described technical issues with using the iPad, with most interpreters citing the difficulty of using them outdoors due to glare on the screen. Other technical issues concerned having a digital format that was easily downloadable on different computers, connecting the computer to the projector, and needing more time to practice with the computer, and being hesitant to use it outdoors in the rain, or nervous about dropping it.

Seven of the 21 interpreters (33%) described the challenges of speaking about the scientific research, with most commenting on the difficulty of the featured scientific topic in one park not aligning well to locations and standard programs at the park (i.e., difficulty of talking about frogs and amphibian research when on the beach or in the dunes) that might require the development of a special program; additional research topics were added in the subsequent year that satisfactorily addressed this issue. Other described challenges concerned dealing with a sensitive topic such as climate change, getting the public to interact with the topic, trying to reach the featured researcher for follow-up questions, or not feeling sufficiently expert enough on the topic to answer questions from visitors.

Six of the 21 interpreters (28%) described constraints on the opportunity to develop and/or offer iSWOOP programs. Interpreters spoke about being assigned particular venues or programs for which there wasn't a good fit with the featured iSWOOP science or offered opportunities for highly interactive exchanges with the public, and not having sufficient time to develop new programs that could best take advantage of the iSWOOP research. As one interpreter commented:

Timing and focus of the rangers I think is always going to be an issue across national parks. Doing the same or more with less will often nix more engaging programming such as iSWOOP because it does take deliberation and thoughtfulness to build the images and the "program menu." And it does take time in the field away from regular "front desk/walks and talks/education program" time of a typical interpreter.

One interpreter also commented on the desire for more peer feedback and support, and recommended structured feedback either in-person or on-line.

The biggest challenge was my lack of peer feedback, team support. Some kind of structured peer feedback system for participants would be perfect (this could be accomplished online too perhaps through the new common learning portal by creating a new iSWOOP discussion group who could submit programs for review or links to programs for feedback (which would be esp helpful for remote locations like mine who cannot spare even one staff member in the schedule to do a peer audit.) It could be a requirement for participants.

Valued Sources of Professional Development Support: Interpreters were asked to rate how valuable various sources of professional development support might be for interpreters

interested in learning about iSWOOP and using iSWOOP visuals and approaches with visitors. Of the eight different options presented, interpreters expressed a clear preference for sources that enabled them to consult in-person certain professionals related to the park. Consulting *iSWOOP featured scientists* was rated as the most valuable and deemed as either valuable or very valuable by over three-fourths (80%) of the interpreters. Consulting with the park’s *resource managers* was deemed as valuable by about two-thirds (63%) of interpreters. As one interpreter commented, “Personnel in the resource division often have access to the research being conducted and can offer information about what scientists are doing and possibly access to the scientists.”

Talking with *peers on-site* was also regarded favorably by about half of the interpreters (51%), at rates somewhat higher than consulting with *supervisors* (40%). Consulting with *peers via social media* and other on-line formats was viewed as a valuable form of professional contact by less than a quarter (23%) of interpreters.

Regarding forms of professional development workshops, interpreters expressed a strong preference for *on-site iSWOOP professional development* workshops over an *online forum* or webinar. At the same time, almost a third of the interpreters (30%) valued being able to use *resources on the project website*.

Figure 12: Sources of Professional Development Support:

	Valuable/Very Valuable
Participate in on-site iSWOOP professional development workshops	58%
Participate in on-line forum or webinar (asked in 2018 only, n = 21)	19%
Talk to peers on site	51%
Consult with supervisors	40%
Use resources on the project website	30%
Consult with peers via social media or other online forum	23%
Email project leaders (asked in 2017 only, n = 16)	44%
Ask iSWOOP-featured scientists for further assistance or resources	80%
Ask resource managers at your park for further assistance or resources	63%

(n = 30-33, unless otherwise noted) (5 pt. scale: Not valuable, A little valuable, Somewhat Valuable, Valuable, Very Valuable)

Interpreters were asked to describe what it takes to move from having a positive professional development experience with iSWOOP to actually using the content and approaches with visitors (i.e., putting it into practice.) Roughly two-fifths of interpreters (9 out of 23, or 39%) indicated the importance of having engaged and supportive supervisors, as well as support from fellow interpreters, and other park professionals. About a fifth of interpreters (5 out of 23, or 22%) emphasized the importance of selecting interpreters who are motivated to learn and try out new approaches. Interpreters stressed that it was important to have supervisors give them the time to develop programs, experiment with and practice new techniques, and share practices with their fellow interpreters.

I think it really depends on the interpreter. They need to be self-motivated to incorporate this into their interpretation and the supervisors need to make sure they have a team that is willing to commit to this.

It also takes the supervisor to leave time in the schedule to have these opportunities or to schedule them and make sure the interpreters are following through. I feel this was lacking at [my park].

It takes enthusiasm and the willingness to both try and learn new things. Setting goals (e.g. I will develop three new programs using the material) would be helpful. For me, reporting to Martha [from the project core team] was a good incentive to incorporate the material into my programs, think about what worked and what didn't work, and constantly improve my programs.

When asked what actions supervisors can take to enhance interpreters' successful implementation of iSWOOP, interpreters mentioned a range of actions, including setting clear expectations that iSWOOP be a main part of a program and scheduling specific iSWOOP programming times, allowing interpreters the time necessary to develop, experiment with, and implement new techniques and the time to audit programs and collaborate with other interpreters. Others added the importance of supervisors making continuing training a priority and allowing all interpreters to take part in the training.

As one interpreter expressed,

I value the opportunity this program has given me to try new ways to engage people about scientific research. Being required to do it by my supervisor was wonderful for me- there was complete clarity on my part that time spent on this skill set was well-spent and endorsed by the leadership.

CONCLUSION

In summary, iSWOOP brought together educators, scientists and National Park Service interpreters to incorporate site-based science into formal and informal interactions with the public. The project increased direct contact between interpreters and scientists, equipping park interpreters with the skills and knowledge to facilitate conversations about park-based science in order to increase STEM learning opportunities for visitors. For many interpreters, iSWOOP was a catalyst for professional growth, stretching their skills, offering opportunities to learn from scientists, and to tell new stories.

iSWOOP enabled interpreters to showcase park-based research in several ways, by deepening their knowledge, expanding their repertoire of techniques for discussing park-based research, and by making props and visualizations available as a jumping off point for discussions.

Through iSWOOP, interpreters reported they more prominently featured science in their work with visitors, and that they leveraged their deeper appreciation and knowledge of scientific research being conducted in the parks in their visitor programs. Over half the interpreters reported that they often shared stories about specific researchers and their methods, employed visualizations related to scientists' questions, explored how we know what we know based on scientists' research, and facilitated visitor discussions of the relevance of park-based research to their lives and to society.

The biggest challenges to incorporating scientific research involves making the content accessible, interesting, and relevant to park visitor audiences. Interpreters found aligning

particular content to the specific location in the park, using props and charismatic species, and finding optimal program formats particularly successful strategies.

To take iSWOOP approaches and put them into practice, interpreters felt it was critical having engaged, supportive supervisors and peers, and developing deeper relationships with park-related scientists and resource managers. It was important that supervisors give interpreters the time to develop programs, experiment with and practice new techniques, and share practices with their fellow interpreters.

Char Associates' evaluation study of interpreters -- coupled with our accompanying studies of participating park leaders, scientists and visitors -- indicates that iSWOOP offers a promising, viable model of professional development that can increase the prominence of ongoing scientific research in visitor programs and build visitors' understanding of science at National Parks.

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