Getting Started with iSWOOP

A Reference

Acknowledgments

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To You

Welcome to iSWOOP, *Interpreters and Scientists Working on Our Parks*, an approach to science communication and professional development where rangers, education researchers, and scientists collaborate to advance the public's engagement with park-based science.

Whether curious about iSWOOP or already committed, read on

In concert with NPS resource managers, interpreterrs, educators, and administrators, iSWOOP has:

- Expanded STEM learning opportunities in several national parks;
- Created a model for making science prominent in audience-centered experiences that works at parks of different sizes and types;
- Published findings and has made tools and strategies available for wider use.

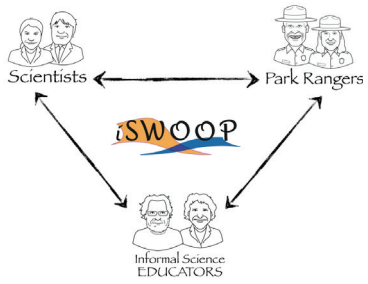
Wondering if your park can benefit from iSWOOP?

Use this guide to find:

- the distinctions between what iSWOOP is and is NOT;
- a checklist to help you determine if iSWOOP could work at your park;
- suggestions for getting buy-in from leadership and front-line interpretive staff;
- templates and links to help you get started.

On Your Own or Adopting iSWOOP Division-wide?	
Flying solo	Skim this guide, join the iSWOOP group on the CLP to start the online course, use the participant guide on iswoopparks.com/about/resources
Getting a division on board	Keep reading for strategic next steps Find helpful articles and resources online: iswoopparks.com/about/resources and iswoopparks.com/about/reports

iSWOOP Overview and Project Goals



Funded by the National Science Foundation, iSWOOP featured scientists and informal science educators have helped park units take up such challenges as 1) improving the scientific literacy of visitors, 2) fostering a national stewardship ethic (NPS Science in the 21st Century, 2009), and 3) offering interactive experiences based on current scholarship (The Park Service Call to Action, 2011).

iSWOOP advances STEM (science, technology, engineering, and math) learning among national park visitors. By featuring the scientific scholarship happening behind the scenes, interpreters reveal the significance of the resource and the science research underway on park lands. **iSWOOP programs and informal interactions led by interpretive rangers give visitors an opportunity to see aspects of the park that are not usually visible and to discuss the relevance of park-based research.**

The iSWOOP model on p. 4 lists the components and expected outcomes for visitors.

Interpreters plan and deliver formal and informal interpretive programs, incorporating these central elements of iSWOOP:

- Facilitating interactions that feature opportunities for visitors to **observe, predict, and speculate;**
- Making research prominent through **stories** about research, scientists, and technology innovations;
- Making research prominent through the use of a **visual library**, a collection of still images, video, and other visualizations, artifacts, and props.

iSWOOP addresses the disconnect that NPS interpreters often feel between themselves and the research underway behind the scenes. iSWOOP helps interpreters do their jobs with excitement and confidence.

The project has developed a model that can be adapted for parks of different sizes, types, and visitors. iSWOOP has learned much from: Acadia, Carlsbad Caverns, Indiana Dunes, and Joshua Tree National Parks, as well as Jean Lafitte National Historic Park and Preserve.

For an overview

- Watch one or more of the videos on iswoopparks.com/project/about for the project premise
- Watch "iSWOOP in Action" (a 6-minute video) on iswoopparks.com/about/benefits-to-visitors/ to get a taste of the elements in the iSWOOP approach
- Read about the professional development approach, in Allen et al. 2018, *Beyond the Brown Bag: Designing Effective Professional Development for Informal Educators* on iswoopparks.com/about/reports

Questions to Answer—Before you iSWOOP	
Do interpretive rangers conduct roves or formal programs like patio talks?	___Yes ___No
If not, can the schedule shift to include programming (including roves) to allow for longer interactions?	___Absolutely ___Not really
Do interpreters use techniques to involve visitors in sharing observations, predictions, and speculations with each other?	___Of course ___Need to check
If not, are staff motivated to shift interpretive practice to interactive exchanges about scientists' methods and findings?	___Absolutely ___Not really
Are visitors curious about wildlife or the landscape, flooding, fires, recent discoveries? What questions do they pose?	___Of course ___Unsure
Is there active science research on topics visitors tend to ask about?	___Absolutely ___Need to check

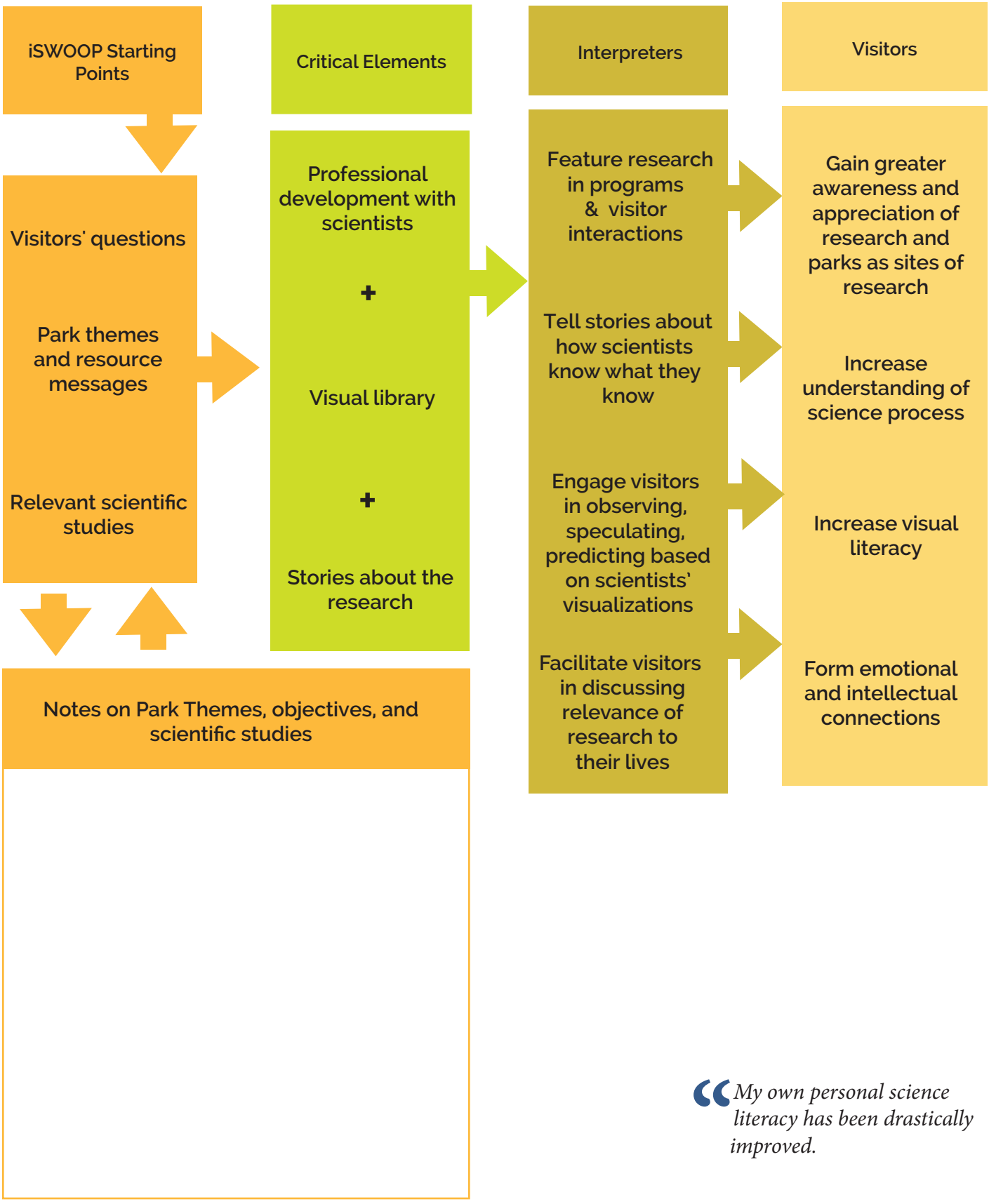
Getting Ready for iSWOOP

Most likely you answered yes or absolutely to the questions above. iSWOOP is meant for you! And it's meant to be flexible. Depending on scientists' availability, the range of existing visualizations, and staffing and the schedule, you may need more or less time to get iSWOOP rolling.

Is your park one that could do iSWOOP? Nearly every park could take an iSWOOP approach to interpreting science for the public, but it will take a slightly different form at every park. If you don't know off the top of your head, make a plan to ask colleagues and supervisees for input on the following:

To Research	PLAN OF ACTION Person to ask & When	Notes
What scientific research is underway?		
What science research is exciting to resource managers?		
What questions do visitors ask?		
Where are substantive conversations with visitors occurring?		
Which interpreters on staff will be keen to showcase science research?		
Which resource managers are familiar with active research? Who will lend support?		
When can the schedule accommodate staff training?		

The iSWOOP Model: Components and Outcomes



"My own personal science literacy has been drastically improved.

iSWOOPparks.com • © 2020

What iSWOOP Is and Is NOT

Parks get at science in many ways, through waysides, newspaper articles, social media posts, talks and walks, and even apps that help visitors identify species or contribute data to a study. How does iSWOOP distinguish itself from the science-based interpretation currently happening in parks? Below are some of the ways we see iSWOOP as different.

iSWOOP Is ...	iSWOOP Is Not ...
Personal and an interactive: part of the public's park experience	Primarily waysides, social media, exhibits, or print media to showcase park-based science
Audience-centered, two-way conversations that allow time for visitors to engage with each others' ideas	An informative presentation with a chance for questions at its conclusion,
A way to talk about science as a process that starts from questions, involves revision, and has the potential to matter to all of us	A way to remind visitors that science is largely a collection of facts about how the world works
Stories about the researchers and their struggles; why they are studying what they are studying	Interesting facts offered in an engaging way
A window into how scientists use technology and innovative methods, revealing how we know what we know.	Factual information shared without attention to who figured it out and how
Visualizations, purposely incomplete at times, are a starting point for inquiry and discussions of relevance	Self-explanatory images. Photos that primarily illustrate a concept
Programs, formal and informal, that invite visitors to predict, observe, and speculate.	A replacement for the strategies and know-how interpreters possess already
Comfortable with silence and reflection	Pre-scripted and pre-determined
Possible because interpreters and scientists are in contact formally and informally, in the field and in the classroom	Minimal or limited contact between interpreters and scientists, such as a 1 hour bag-lunch without follow up

"It helped me put some energy back into my programs and approach them a different way. Oftentimes the default for our programs is to do all the talking. This helped me step back from that.

Moving Ahead Strategically

To get started, build interest and buy-in among your colleagues in your division and other divisions. Use pages from this guide to explain the project. You will know best in what order to approach people and what details will make a difference to them.

Generate interest

- ☐ Introduce iSWOOP and explain how it is different from current practice (see p. 5)
  - ✓ Show one or more of the 3-minute videos available on iswoopparks.com

Build Support among Leadership

- ☐ Talk with park leaders about iSWOOP, its goals (see pp. 2-3) and benefits (Findings, pp. 7-8)
  - ✓ Be clear on what iSWOOP is and is not, how it differs from science-based programming you already do. See p. 9 for talking points
  - ✓ Explain that few costs will be incurred (see p. 16)

Build Excitement among Interpreters

- ☐ Talk with interpreters about the fit with 21st century interpretation
  - ✓ Talk through trade-offs and concerns (see p. 9)

Talk with Resource Managers

- ☐ Explore options for the science focus
- ☐ Ask for their help contacting scientists
  - ✓ Customize the sample letter or send out an RFP (see Appendix for both)

Select a Scientist and Gather Visuals

- ☐ Interview, select, and confirm with your choice of scientist
- ☐ Start a visual library
  - ✓ Consider the suggested content (see p. 15)
  - ✓ Apply iSWOOP's visual principles (suggested references on p. 14)
  - ✓ Identify staff or others with visual design skills to assist

Find the entry points that work for you and your colleagues.

- 3-minute videos explain the premise of the project
- For evaluation findings, see iSWOOP Implementation in National Parks on iswoopparks.com/about/reports
- Read through sample iSWOOP programs to get an idea for how iSWOOP looks in practice iswoopparks.com/about/resources (Developing an iSWOOP Program)

Making a Case Based on Findings from iSWOOP Parks

iSWOOP began offering professional development at Carlsbad Caverns in 2014. Since then, iSWOOP project leaders have led professional development at four more parks with more than 100 park rangers participating. What has changed as a result of iSWOOP collaborations? Ten park leaders provided feedback on the impact iSWOOP had on interpreters at their park. Thirty-nine interpreters gave feedback by completing surveys after using iSWOOP approaches and resources mulitiple times. Thirty-three of those trained provided feedback about their interactions with visitors on specific occasions. iSWOOP's external evaluator compiled the findings. Highlights from Char Associates' reports follow.

> *"Hearing about research from the people doing it, meeting them, and talking to them brings the science to life in a way that is impossible when reading a peer-reviewed article. People don't talk the way articles are written.*

iSWOOP increased interpreters' confidence conveying park-based research.

All ten park leaders reported that iSWOOP had medium or high impact on supervisees' and co-workers' confidence conveying park-based research. Interpreters concurred—84%, 31 out of 37 of interpreters reported they valued opportunities to:

- → increase their scientific knowledge and access to relevant research;
- → form new partnerships and relationships with scientists, peers, and resource managers;
- → use visuals, technology, and props developed to illustrate and showcase the park-based research; and
- → gain interpretive skills.

More than 50% of interpreters (n=38) said they used certain techniques often or very often. These included:

- → sharing stories about specific researchers and their methods (66%);
- → using scientists' research questions, data collection strategies, and findings to explore how we know what we know (52%); and
- → showing visualizations related to scientists' questions and findings (62%).

62%, 23 of 37, agreed that the training had given them new skills with which to engage visitors in observing, examining, speculating, and predicting based on scientists' visualizations.

82%, 18 out of 22, interpreters reported greater skills in basing interpretive programs on park-based scientific research.

Read more in:

- *To Be More Inquisitive in the Natural World* (2015) and
- *iSWOOP Implementation in National Parks* (2020)

Both are available at iswoopparks.com/about/reports/

Track Record

5 Parks & 5 visual libraries

12 Featured scientists & their stories

105 hours of PD

121 Feedback forms

35 Observations

15 New outreach partners

iSWOOP affected interpreters' skills and practice.

Following iSWOOP professional development sessions, interpreters reported that they had improved in their ability to:

- make sense of scientists' visualizations: 11 out of 14; 79%
- explain areas of scientific bat research being conducted at CAVE: 79%
- generate excitement about park-based research: 71%

> *My own personal science literacy has been drastically improved. How are we to be good residents of this planet if we barely understand it and our impact?*

Just about half of the sessions observed (14 sessions; 54%) used a range of interactive techniques.

Visitors Comments on "What was New?" after iSWOOP Interactions 48% stated they learned about how scientists work (aka, the process of doing science)

- 44% stated they learned how scientists use technology to conduct their work.
- 25% stated they became aware of the fact that scientific work is being done at parks.
- 21% stated they learned more about bats. *n* = 73 visitors at Carlsbad Caverns

> *Most of them [the visitors] thought that seeing scientist's work presented this way was different. It was not a presentation of facts so much as an opportunity to see things they weren't expecting to.*

The idea that researchers are working at national parks made an impression.

> *... One lady ... she didn't even know the park was being used for research.*

Making Emotional and Intellectual Connections with Visitors

One of the main components of an iSWOOP program is to engage visitors—meaning to invite them to observe, predict and speculate, to connect their park experiences to their interests and prior knowledge. Particularly when visitors ask a direct question, it is helpful to have questions and stories in mind and props or visuals in hand, in order to move the conversation beyond a delivery of facts.

Acadia National Park, Summer 2016

Rangers reported on the science that was engaging, surprising, and valuable to their visitors.

Visitors appreciated the perspective that they had their own set of valuable knowledge (understanding of science principles) and that they could begin to look at the landscape and piece stories or questions together.

Many never thought about pollen grains looking different from each other, or being species specific.

People like to feel connected to current research in the park.

Talking with Interpreters

In iSWOOP's experience, interpreters welcome direct contact with researchers and especially value hands-on opportunities to learn about relevant research. Many also embrace the opportunity to work on their craft.

Points to highlight

When talking with interpreters, stress that:

- *iSWOOP is meant to make park rangers' jobs more interesting.*
- *iSWOOP is much the same as interpretive practice:* starts with a high-interest story the public is curious to hear more about, touches on the site's big messages; relates to the landscape visitors are immersed in; and uses interpretive techniques like stories and images.
- *iSWOOP aligns with 21st century standards for interpretation.*
- iSWOOP programs are different in that they convey stories about researchers, reveal applications for technolog, and invite visitors to consider the relevance of park-based research.

> *"The methods we have been encouraged to use in our iSWOOP programs are the future of NPS interpretation …*
>
> —Interpreter, Carlsbad Caverns

> *"iSWOOP gives me a chance to get into researchers' lives and to see their stories.*

Common Questions and Responses

Does doing iSWOOP programs mean giving up other popular programming?

Not necessarily. Each park needs to think about where the best time and place is for interactions about park-based research. Interpreters could develop a 15-minute patio talk which could then be incorporated into a hike, daylong program for a group, or used as a basis for roving.

Formal programs are not the only way to showcase park-based research.

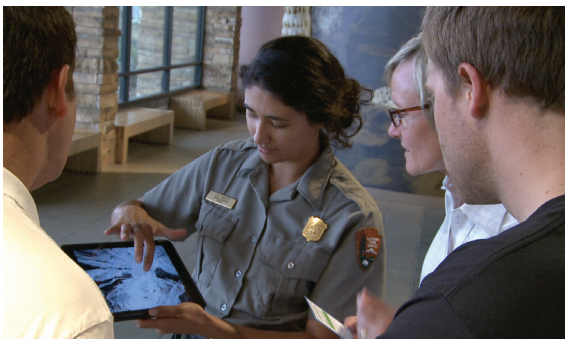
- At Carlsbad Caverns, roving near the passage to the bat roost made sense as a place for interpreters to talk with visitors about research on bats.
- At Acadia, junior ranger stations were an opportunity to have conversations with family groups.
- At Joshua Tree, an interpreter asked evening program participants and his visitor center contacts about their experiences collecting data on plants and wildlife. Then he described Juniper Harrower's study of Joshua trees. Her research on Joshua trees is a catalyst for discussions with visitors about how the park might change in the future.

For inspiration and examples, see

- iSWOOP Program Examples and
- iSWOOP FAQ for Melinda McFarland's reflections

Both are available under *Developing an iSWOOP Program*, iswoopparks.com/about/resources

What if visitors did not come to the park to learn science?



Parks offer opportunities for recharging, recreating, reconnecting with family and friends. A visitors' plan may or may not include learning. Nevertheless, we advocate that opportunities to learn about and react to park-based research be offered to as many visitors as possible. Persistent gaps in achievement across race and class have long-term implications. Interpreters are in a position to nurture science, technology, engineering, and math-related interests. Rather than offering stories of park-based research solely to those who ask or appear interested, if the invitation is open to all, families or individuals can opt out. Forcing or inflicting interpretation is not expected.

Is using an iPad required?

Some parks have adopted iPads and Keynote for presentations. Yes, interpreters will likely need time for hands-on practice with new devices. iSWOOP encourages a period of experimentation and reflection. Do new tools lead to conversations which are substantive, to visitors posing sophisticated questions and similar benefits? What seem to be the disadvantages? Overall, is a switch to new technology worth it?

What will be different? Interpreters have always used science research.

iSWOOP includes:

- ✓ Connecting scientific research and parks as outdoor labs in visitors' minds (see 'Changing the Story,' https://vimeo.com/356579699)
- ✓ Creating opportunities for visitors to talk about the role for science in park management (see 'iSWOOP in Action,' iswoopparks.com/about/benefits-to-visitors)
- ✓ How scientists figure things out, successfully and unsuccessfully (see 'Tasting the Ice Age,' where Jacquelyn Gill talks about all the things that can go wrong on a coring expedition, iswoopparks.com/parkslocations/acadia-national-park)
- ✓ What motivates scientists (see Juniper Harrower's short videos and interviews, iswoopparks.com/parkslocations/joshua-tree-national-park/ and https://artistsandclimatechange.com/2018/09/19/bringing-together-art-and-science-to-save-joshua-trees)

Is the park truly supportive of these efforts?

Be clear about expectations. Will the division commit to time for ongoing professional development? To planning time for interpreters developing new programs? To time for peers to exchange ideas on questioning, storytelling, and techniques to elicit discussions about relevance? Will coaches and supervisors be looking for certain program elements? Make sure the expectations and commitment are transparent.

iSWOOP's strengths align with the standard elements of interpretation, which include revealing the resource; provoking an emotional or intellectual reaction; and forging connections, which involves establishing relevance. Read about roving with a tablet in more depth:

- Roving with a Digital, Visual Library (2015), https://www.interpnet.com/NAI/nai/_publications/JIR_v21n1_Merson.aspx or iswoopparks.com/about/reports

Identifying Scientists to Participate

To talk about park-based researcher credibly, interpreters need to acquire stories and an understanding of the science. Resource managers often will have a good working knowledge of possible "featured scientists". The pool for scientists can include four types of scientists:

1) Currently and actively conducting research in the park, but employed elsewhere
2) Currently and actively conducting research in the park, works at the park, employed by NPS (e.g., on resource management)
3) Currently and actively conducting research in the park, does not work at the park on a daily basis, however, is employed by NPS or a sister organization (e.g., Fish and Wildlife or Forestry Service or NPS' Inventory & Monitoring team)
4) Active researcher on topics with relevance to the park, but not employed at the park and does not hold an active research permit

Bob Brodman, Indiana Dunes' scientist, is Type #1.

Jacquelyn Gill, Acadia's featured scientist, is Type #4.

Figure out who should be in on the decision for selecting a scientist. Establish criteria. Recognizing that you probably will not find a person who meets all of the criteria, you and others should establish criteria and prioritize them. Suggestions for criteria include:

- Research interests are close to visitors' interests and/or the interpretive division's plan or a resource management topic of concern
- Personifies or embodies a good story (the research questions are suspenseful), applies technology in innovative ways, etc.
- Has characteristics that will help audiences expand their idea of who a scientist is
- Is someone whose work can use the visibility
- Researcher is interested in participating in iSWOOP. With or without funding, (See next page for more on expectations.)
- Will be responsive (e.g., via email and phone)
- Embraces the iSWOOP mission with enthusiasm, is pleasant to work with, keen to work on outreach

You may create a short list of candidates and set up times to talk with each one or send out an application (see sample, p. A-3) and then reach out to the candidates who look most suitable.

Juniper Harrower, one of Joshua Tree's featured scientists, was keen to share ideas for props. Her presentation on art/science outreach is on iswoopparks.com/about/reports. Credit: Hristov

Finding a Featured Scientist
A promising fit

Selecting a Scientist

At Indiana Dunes, staff from interpretation and resource management considered featuring bat research, as the iSWOOP pilot did. The majority of people don't visit at night or encounter bats. The monitoring project underway is also very simple, and we were looking for a more complex story.

One project leaped out when we consulted the NPS Research Permit and Reporting System (RPRS)—"Amphibian Response to Climate Change." The selection team was excited about improving our ability to interpret climate changes. We thought that people might relate in positive ways to amphibians, and might take action to slow climate change if they understood negative impacts on amphibians. Dr. Brodman's data are analyzed in association with satellite data from USGS. We thought some people would be interested in the use of the satellite technology .

The fit seemed promising, especially when we factored in how passionate Dr. Brodman is about helping people understand his work.

Wendy Smith
Great Lakes Regional Learning Center,
Education Coordinator

For more, see

- Shaping Outreach and Education Collaborations with National Park Interpreters (Scientists' Outreach Preferences) and
- iSWOOP Implementation in National Parks, pages 33-39 on scientists' perspectives.

Both documents are available on iswoopparks.com/about/reports/

Talking with Scientists

Scientists asked for clear communication about expectations. Check the iSWOOP RFP or use this list as a starting point for conversations.

Goal: Park rangers and you together build public understanding of your research and the role of parks as outdoor laboratories. In park rangers' hands, your science becomes part of the park visitor experience.

As an iSWOOP Featured Scientist, you will ...

- Present on study questions, methods and findings on park-related research;
- Present the back story, including all the aspects of research that will never make it into print: personal reasons for the research, early failures, emotional moments of break-throughs, fieldwork regrets or catastrophes;;
- Be available for follow up questions by email
- Give feedback on rangers' re-packaging of information on the research;
- Attend periodic refreshers (annual meetings with new and returning staff);
- Dedicate at least half a day per year to authentic fieldwork with rangers;
- Make slides available for use with the public;
- Modify graphs, figures (e.g., simplify labels, remove titles, builds sequences to illustrate predicted and documented outcomes or to show interrelationships of species), take photos of fieldwork in process and share with the park;
- Bring students or interns into the mix, providing diverse voices to represent the science.

Finding a Featured Scientist
Why not issue an RFP?

Resource manager Julie Whitbeck and Lead Interpreter Aleutia Scott, Staff at Jean Lafitte National Historic Park (JELA) decided to issue a request for proposals (RFP) that called for a scientist with an interest in outreach and a story to tell. They sent the RFP to all of their recently permitted researchers and received several applications.

Rising sea levels and salt water intrusion are on the minds of scientists and resource managers. However, Katie Percy, Avian Biologist for Audubon Louisiana, was selected as the first iSWOOP-featured scientist. Katie Percy studies the Prothonotary Warbler (PROW), a bright yellow songbird. Louisiana supports a hefty 25% of the world's breeding population, but PROW populations have declined every year over the last 50 years. Percy installs nest boxes and bands birds. She's part of a team of researchers who track the birds' flight paths, breeding success, and choice of wintertime habitat.

Interpreters have used visitors' interest in the birds and their nest boxes as an entry point into conversations about changing habitat.

Visitors *were really intrigued by the nest boxes ... Many visitors learned about banding and geolocators, which were new to them.* Visitors were very receptive to these three questions:

1) What is migration, and where do you think PROW go from here?

2) If you were a researcher, how would you igure out exactly where they are going?

3) Why do the birds use these boxes, why are they designed like this?

One parent/daughter pair and a few other kids were very interested in PROW decline and the graphs and geolocator maps were very useful.

—Emmé Elliott, Jean Lafitte NHPP

Percy (right) hopes that a better understanding of the birds' travel between breeding grounds in LA and wintering grounds in Colombia will reveal factors that are driving population declines.

Compiling Visualizations

iSWOOP has increased the attention to the design and use of visual media for interpretation in formal and informal interactions. Though not new, the approach that iSWOOP has promoted rests on the idea that a shared visual experience is a jumping off point for two-way conversations, observation, prediction, speculation.

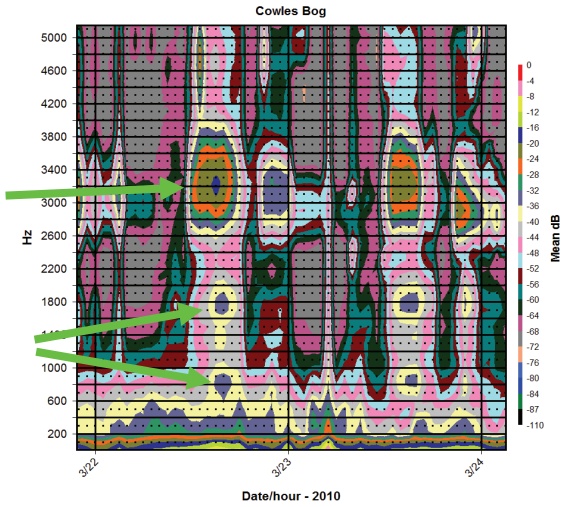
iSWOOP uses the term visual library, to talk about a collection of visualizations related to a scientific study or lines of study from a particular scientist or group. The metaphor of "library" is important. You are selective when you go to a library. No expectation that you will use it all.

The style for Visually Assisted Interpretation, distilled design principles.

This is how we see the role of visualizations ...

ViA stands in contrast to traditional signs and infographics, which provide all the necessary information. ViA material purposefully leaves room for an interpreter to steer the conversation and cultivate a meaningful learning experience in response to conditions of a given moment. The visual point of departure relies on the facilitator or storyteller to craft a story or learning experience that is further enriched by visitors' questions, past experiences, and reactions. ViA content is deliberately minimal.

→ 73% of interpreters reported that through iSWOOP their skills had improved in incorporating scientists' visualizations into programs, and 44% said their use of scientist visualizations had increased. 52% reported now being skilled in increasing visitors' ability to visualize natural phenomena and a complex context.



Spectrographs make sounds easier to analyze.

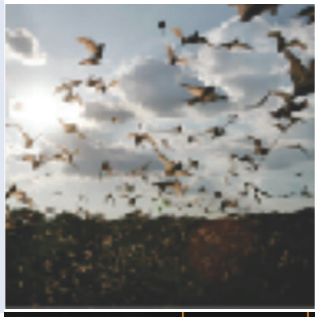
> *I think it has opened up a new avenue for interpretation for me. Not coming from a science background, I feel more confident talking about science with the public. I also look at the images I use differently, especially on evening programs and how to leave them open for interpretation.*

Read more about visual design for STEM learning in park settings in:

- "Talking Visuals in a Digital Age," Legacy Magazine Sept/Oct. 2019 and
- Designing for Broad Understanding, Integrative and Comparative Biology, 2018,

The articles are also available on iswoopparks.com/about/reports

Visual Library Contents

TYPE	PURPOSE	EXAMPLE	MEDIA
High-resolution images of the resource	Make aspects of the resource visible; inspire stewardship	Bottomland hardwood forest	
High-resolution images of the research instrument	Visual reference for scientists' tools; illustrate an innovation	Low-tech artificial nest boxes	
Visual of the researcher in action	Illustrate the science process; put a human face to scientific research	Field assistant removing a bird from the net	
Visual of human interaction with the resource	Model how to handle the resource; get across scale	A migratory songbird whose weight is equal to a car key	
Visual that documents the focus of study	Illustrate what was investigated	Emergence of 1,000s of bats from roost	
Video or audio of the phenomenon	Help viewers imagine themselves in the scene	Group dynamics in a dense flight formation	
Image that precedes a graph or visualization	Show the progress of data analysis; what the instruments pick up that is then analyzed	Anyalysis of bat emergence with computer vision	
Graphs, spectographs, or visualization	Show the data and other results of the research activity; illustrate evidence	Each colorful trail shows the trajectory of a bat	
Tutorial visual that demonstrates the technology	Scaffold understanding by showing technology in use with familiar objects	Thermal image of candle and icepack	
Juxtaposition of any kind	Help viewers imagine themselves in the scene	Hot flame versus ice pack	

What Does Implementing iSWOOP Cost?

iSWOOP does not have to cost a lot. You have what you need, if your park has interpreters and science.

Possible costs: If you have funds, consider these options ...

- Defray the cost of housing or transportation for the researcher
- Pay overtime for interpreters to attend sessions with the scientists (on lieu days or after regular shifts)
- Purchase display options such as tablets, a large screen, banner for visual media (see below)
- Ask scientists and resource managers where you can buy new or used instruments for visitors to handle, other props

Visual Media: A visual library is a critical resource for interpreting park-based studies. Compiling relevant maps, photos, animations, video clips, sketches, diagrams, graphs, etc. should not cost money, but if you have funding, you could pay for:

- ☐ a photographer or videographer to capture researchers at work and professionally edit interview footage of the featured scientist
- ☐ copyright fees for the use of others' maps or video
- ☐ production of new figures (the scientist might be able to pay a student); graphic design assistance
- ☐ high quality prints enlarged and printed as banners
- ☐ 3-D models (of pollen or the landscape to show how the topography has changed)
- ☐ rack cards or buttons or temporary signs as a catalyst for conversation (Ask me about Dr. Bob. Ask me about frogs)

So What's Next?

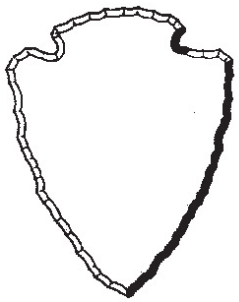
Have you noticed how important, non-urgent items drop to the bottom of the to-do list? Science communication is one of the items that can get lost in every day demands. Because it cuts across divisions, because it is complex and requires thought and planning, because it's so embedded in many aspects of interpretation, it seems overwhelming to start making changes. It becomes all too easy to leave it for another day. Don't drop it! If you give it a little energy, you might find that it has a self-sustaining momentum and that it returns rewards equal to or far greater than the effort you put in.

Here are some steps you might want to take.

- ☐ Start conversations with others in your division;
- ☐ Make notes about themes and objectives that can be amplified with park-based science;
- ☐ Schedule a time in your calendar for reading and watching. Check out the participant packet, videos, and reports online.
- ☐ Read through the RFP and sample email in the Appendix as a starting point for recruiting a scientist;
- ☐ **Reach Out!**

Appendix

Sample Email



Greetings from [park],

This year the interpretive division is making a concerted effort to highlight more of the park-based research happening out of sight of visitors. As someone with relevant research, I hope you will work with us to bring aspects of your research to the public's attention. The iSWOOP project, *Interpreters and Scientists Working on Our Parks,* with support from the National Science Foundation, has been encouraging and facilitating these kinds of partnerships. You can read more about the project at iSWOOPparks.com/about.

The park rangers in the interpretive division talk with visitors about the natural and cultural resources of the park. We want to inspire people not only to care for the park, and their own neighborhoods, but to come back to the park to solve the many remaining questions that we have about our natural world.

We would like to talk about your research in programs and interactions with park visitors. Of course I want to make sure that I represent the science accurately and tell the story of the research in a way that is meaningful and memorable to park visitors. Thus I am writing with a few requests.

> Do you have a powerpoint designed for an interested audience that is not highly trained in your field? Are there images you could share that interpreters can use with the public helps bring science to life (e.g., slides from labwork, video clips, thermal images, still images of instruments, sequences of images that show your workflow, graphs, tables, or charts or visualizations based on them for ease in communicating with others about your findings, etc.)?
>
> Could you (or perhaps the university communications office) supply a summary of your research that we could review in addition to more technical reports?
>
> Do you have plans to do research in the park in the coming months? If so, could some of my staff shadow or assist? Could we schedule 20-30 minutes for staff to hear how you got started on this line of research and what the main struggles have been?

Thanks so much for considering this request.

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Sample Application: Recruiting a Scientist Partner

Request for Proposals for Interpreters and Scientists Working on Our Parks (iSWOOP)

Applications Due [Date] at [Time and Time Zone]

Scientist Partners Sought: [Name of Park] seeks applications from scientists with natural resource research interests for its iSWOOP program. iSWOOP seeks to build capacity among park interpreters in understanding and communicating science to the general public. It offers scientists the opportunity to develop or improve science communication skills via a partnership with communication and visualization experts and park interpretive staff. We especially encourage applications from investigators with ongoing studies in the park. Direct questions to: Contact [Name, email address, and phone number].

Target Dates

- In-person or phone meetings for top candidates, [specified weeks or months]
- Final candidate(s) will be chosen [specified weeks] and all applicants notified by [date].

Selection Process: A committee comprised of representatives from [Park Name] interpretive and resource management divisions will review the applications. The top candidates will be selected based on their fit with park priorities for science content/messaging.

Program Goals, Outcomes, Expectations of Scientists, and Timeline

iSWOOP stands for Interpreters and Scientists Working On Our Parks. See iswoopparks.com for more.

Project Goals

This project is meant to advance STEM (science, technology, engineering, and math) learning among national park visitors. iSWOOP brings together educators, scientists, and National Park Service (NPS) interpreters to create a model that brings visitors into the loop on the science research underway on park lands. iSWOOP ranger-led programs and informal interactions led by interpretive rangers will give visitors an opportunity to see aspects of the park that are not usually visible. The program model [ATTACH, see p. 3 in this guide, designate location in the application] shows project components and expected outcomes. This project is funded by the National Science Foundation.

iSWOOP is successful when interpreters:

- Showcase science happening in national parks
- Increase visitors' science literacy
- Increase visitors' visual literacy

The iSWOOP project was funded to develop models for parks of different sizes, types, and visitation. We expect to experiment, revisw, and refine as we go.

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Expected Outcomes

- Increase interpreters' knowledge of and increase their strategies for communicating about research,
- Increase interpreters' repertoire of strategies for explaining scientists' visual data, and
- Increase public understanding of how we know what we know.

The Role for Scientists

Bringing scientists into direct contact with interpreters for extended interactions in seminar style settings and in hands-on work in the field helps interpreters tell research-focused stories that generate enthusiasm for science.

As an iSWOOP Featured Scientist, you will do some if not all of these ...

- Provide guest lectures to park rangers and make slides available for use with the public
- Present on study questions, methods and findings on park-related research
- Present the back story, including all the aspects of research that will never make it into print: personal reasons for the research, early failures, emotional moments of break-throughs, fieldwork regrets or catastrophes
- Be available for follow up questions by email
- Give feedback on rangers' re-packaging of information on the research
- Attend periodic refreshers (annual meetings with new and returning staff)
- Dedicate at least half a day per year to authentic fieldwork with rangers
- Modify graphs, figures (e.g., simplify labels, remove titles, builds sequences to illustrate predicted and documented outcomes or to show interrelationships of species), take photos of fieldwork in process and share with the park)
- Bring students or interns into the mix, providing diverse voices to represent the science

We recognize that iSWOOP is asking more of scientists than the typical one-hour presentation with Q & A. On the other hand, scientists can benefit:

- Gaining help with data collection or analysis from interpreters
- Increasing the visibility of research to public audiences at the park and beyond
- Enjoying the opportunity to experiment with innovative teaching methods

Program Requirements

- Participate in planning and leading professional development for 10-20 interpreters during a workshop spanning two-to-five days (classroom and field-based sessions)
- Contribute data representations, still images, video, and other visual media for park interpreters' and project use (website, blog, video products). Revise and refine as needed.
- Support interpreters as needed by responding to questions about your science

Timeline

The timeline below provides a guide to how implemenation may unfold from the scientist's perspective. The timeline can be reconfigured to deal with the interpreters' and scientists' availability, peak visitation, furloughs, the fieldwork season, etc.

	Year 1			Year 2				Year 3		
Phase	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer
1	X									
2	X	X	X							
3				X	X			X	X	
4						X	X		X	X
5							X	X		X

Phase 1— A scientist is selected and timeline set which will fit the research program and participant availability.

Phase 2—Development of a visual library. The featured scientist and park staff co-develop a set of visualizations for park rangers to hook interest and spark two-way conversations with the public. The set includes images from past presentations, publications, field work and data representations from various stages of analysis.

Phase 3—Scientists and park staff co-lead professional development for interpreters. Scientists give feedback on interpreters' draft program outlines and respond to follow up queries, supporting the park in showcasing current research.

Phase 4—Interpreters engage visitors in conversations about park-based science. They share their outlines and visitors' questions and reactions with scientists and peers.

Phase 5— Scientists consult on or contribute to revisions of the visual library after its use with visitors. Scientists hear feedback from visitors on the questions and reactions that have surfaced.

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APPLICATION

In addition to filling out the application below, please list of up to five products that are closely aligned to the work you propose bringing into the iSWOOP model. The word counts are meant as guidelines, not limits.

1) What attracts you to iSWOOP? Why are you considering taking the time to be part of it? 150 words
2) Describe a situation where you presented your research to the public or an audience of professionals outside your field. What was your hook? (200 words)
3) What story about your research investigations is important to tell? Why? (200 words)
4) Given the opportunity to present to park rangers who will pass on details about your research to the public, what messages about science, science process, or who does it are important to you to convey? (150 words)
5) Given the nature of your research, could you imagine a half day of fieldwork for 8-15 interpreters? What would the work entail? In what ways would it be an authentic, enriching experience for interpreters? (200 words)
6) If you will be relying on students to assist, describe their roles and how you and they will interact with interpreters in the field. (150 words)
7) How important is it to you to build public understanding of your research? Do you blog, tweet, present to the public frequently? How much exposure has your work had (e.g., via radio or tv, social media, park events, other)? What are your preferred ways to communicate about your work? (max. 300 words)

Budget [If Applicable]

If applicable: Funds [are/are not] available to defray costs associated with providing professional development and ongoing support to the park's interpretive and education rangers. Expenses related to travel, supplies, equipment, and student assistants will be considered for reimbursement. Some funds should support collaborative development of visual media for the visual library and costs supporting the scientist's participation in and facilitation of interpreter training:

Each grantee can request up to [$ amount]. Please provide a budget that details the following: costs associated with travel to in-park professional development for interpreters, supplies for field work, stipends for students to assist with data representations or field work set up.

Category/Line Item	Amount requested	Justification
Visualization development		
Stipends for students		
Supplies & Equipment		
Travel (mileage, lodging)		
Other		
Total		

iSWOOP Foundational Competencies for NPS Interpreters

Based on The Foundations of 21st Century Interpretation

Evolving Interpretive Theory and Relevant and Essential Ideas

- Uses park-based (or site-relevant) research to provoke emotional and intellectual engagement with resource meanings and relevances (sparking or fueling visitors' interests)
- In active and engaging ways, uses scientists' research questions and findings to explore how we know what we know, as well as other relevant and essential ideas and/or values
- Asks questions which help audiences consider both personal relevance and broader needs of society

Knowledge of Audience and Community & Embracing Multiple Engagement Strategies

- Actively engages participants and solicits open expression of their unique perspective
- Invites audience to express observations, speculations and predictions
- Balances the amount of "broadcast" and "listening" time intentionally to facilitate visitor engagement and expression of knowledge
- Continuously adapts and employs different modes of communication in response to evolving audience input, reaction, and self-expression
- Responds to audience input in intentional ways, allowing experience to evolve based on audience motivation
- Encourages audience members to build on each others' ideas and perspectives

Knowledge of On-Site Resources, Research and Current Context

- Incorporates current scholarship, giving the research a frame or context related to the meanings of the resource and engages visitors in learning about science research
- Shares details or broad purpose of the scientific research being conducted at the park (e.g., research questions, methods, findings, future research agendas from park-based research)
- Positions self and audience as learners and stakeholders in research, its questions, challenges, innovations and applications
- Incorporates scientists' graphs, descriptions or demonstrations of instruments, and visualizations into programs
- Explains/fields questions to help visitors make sense of scientists' visualizations

The Mather Center for Interpretive Development intends to update these annually. See http://idp.eppley.org/sites/default/files/Foundations%20of%20Interpretation-Version%202016-NPS-IDP-with%20cover%20%281%29.pdf

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Target Audiences for iSWOOP

Research on museum visitors' motivations has yielded categories that can be a useful way to think about park visitors as well (Falk, 2012). The types of visitors most likely benefit from iSWOOP include:

Explorers: Visitors who are curiosity-driven. They expect to find something that will grab their attention and fuel their learning. At parks, these folks eat it all up. They read signs, listen to audio-guides, sign up for tours.

Facilitators: Visitors who are socially motivated. Their visit is focused on enabling the experience and learning of others in their group. Rangers see this when adults push their kids forward and position themselves in the background.

Professional/Hobbyists: Visitors who feel a close tie between the resource and their professional or personal passions. Their visits are typically motivated by a desire to satisfy a specific objective.

Experience seekers: Visitors who are motivated to visit because they perceive the park as an important destination. Their satisfaction primarily derives from the mere fact of having 'been there and done that'. iSWOOP can work for this type of person too because their agenda isn't too fixed. They're ready to make the most of the opportunities available.

The types of visitors who are less likely to participate actively and to enjoy an interactive experience are:

Rechargers: Visitors who are primarily seeking to have a contemplative, spiritual and/or restorative experience. They see the park as a refuge, crave time alone or seek a confirmation of their religious beliefs.

Experience seekers or Explorers with a Plan: Sometimes explorers and experience seekers have a plan. They are fixated on a geoquest or a physical challenge like a bouldering expedition and may not pause for science learning opportunities.

http://slks.dk/fileadmin/user_upload/dokumenter/KS/institutioner/museer/Indsatsomraader/Brugerundersoegelse/Artikler/John_Falk_Understanding_museum_visitors__motivations_and_learning.pdf.

Research Underpinning iSWOOPs Professional Development Approach

iSWOOP asks interpreters to incorporate content, techniques and approaches to increase visitors' scientific and visual literacy. Effectively handling new content matter, new techniques, and new devices (if tablets are part of the initiative) warrants a serious commitment to professional development. During approximately 18 hours of classroom- and field-based professional development (PD), interpreters delve into:

1) Scientific field work and studies by the featured researcher
2) The interactive use of visualizations (using questioning techniques)
3) The power of story-telling to communicate science
4) Beliefs about science and science process

> "Without sustained, critical and reflective professional development, ... educators ... often revert to conceptualizations of knowledge and pedagogy they themselves experienced in their own learning, ... usually in schools" — Bevan & Xanthousdaki (2008).

Maximizing impact. Studies show that educators may stall before actually implementing new innovations or new practices. Researchers have identified eight levels of how people enact or defer enacting change from non-use and preparation, to routine use and refinement (Hord, Rutherford, Huling-Austin & Hall, 1987, p.55).

Consensus in the professional development literature emphasizes the importance of educators engaging in science investigations, experiencing the same approaches that they will adopt with learners (Bevan & Xanthousdaki, 2008). Such experiences set new habits and behaviors in place. PD sets interpreters up to draw *less* upon the familiar techniques associated with K-12 settings and *more* on techniques that foster learning in an informal setting.

Bolstering Confidence. Without investing in serious efforts to equip interpreters to handle new content and techniques, we risk undermining interpreters' confidence, as well as their authority, competence, and credibility in the eyes of the public. Stern and Powell (2013) analyzed 376 interpretive programs in 24 units of the U.S. National Park Service. They found 15 characteristics of interpreters, including confidence, that were strongly correlated with positive visitor outcomes. iSWOOP interpreters spend time learning about researchers' methods, questions, instrumentation, findings, prior work and planned studies so that interpreters can credibly and confidently represent the research, field questions, and generate enthusiasm for park-based research.

Attention to Craft. Participating interpreters experiment with questions and other strategies to invite visitor interaction. The intent is to create memorable science learning experiences. Researchers have found that learning experiences in informal settings promote the development of rich episodic memories, which can subsequently be leveraged for learning in new informal settings…." (McClain and Zimmerman (2016).

Interactive use of visualizations. During PD, interpreters experiment with interfaces and using display devices during interactions with visitors. They become smoother at managing images (on tablets) while directing a conversation, which takes time (Garibay & Ostfeld, 2013). They also gain experience using visual media in three ways: as a hook, as an illustration, and as a jumping off point for inquiry-oriented, two-way or multi-directional communication. During PD, participants pay close attention to

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the purposes of their questions. Interpreters will elicit predictions, observations, and speculations, core skills that distinguish experts and novices (Eberbach & Crowley, 2013).

Choosing imagery to highlight park-based science. Hristov et al (2018) explain principles for choosing visualizations that lend themselves to interpretive conversations.

Attention to families as learning units. Influenced by research in museums and parks, iSWOOP recommends techniques and approaches that support group learning. Family groups often come to new informal settings with relevant prior knowledge and experiences that they can build on (McClain and Zimmerman, 2016). Children and adults offer different interest areas or expertise for dialogic negotiation. Picking up these cues when there are cultural or language differences is vital but not trivial (Ash, 2013). Furthermore, there is an art to inviting family groups to use their inquiry skills in dialogue to explore matters of importance (Ash, 2013) and to shaping roles for learners and authority figures within the group (Pattison & Dierking, 2013).

During iSWOOP professional development interpreters practiced moving between the resource and scientists' visualizations, questions, and findings.

Marshalling storytelling techniques to advance science engagement is relatively new. Recent research underscores the impact of stories of scientists' struggles on students' motivation and performance in science class (Lin-Siegler, Ahn, Chen, Fang, & Luna-Lucero, 2016). Using Randy Olson's paradigms, participants in iSWOOP PD draft programs that build on archetypal conflicts.

Messaging about science. Participants reflect on their own beliefs about science and examine the messages being conveyed to public audiences. The predominant message about science in most people's education is that science is the compilation of facts about how the world works. While this is not false, it is a narrow view that eclipses the role of questions, revision, innovations to support solving puzzles, collaboration, how we know what we know, and who has a stake in the process and findings. Stuart Firestein's text *Ignorance: How It Drives Science* (2012) makes two points that are critical to communicating science in park settings: 1) much more is not known than is known about how the world works; and 2) regardless of training or academic background, any one of us can have an interesting conversation about the questions that drive scientific inquiry. These ideas are critical to inspiring youth and adults to participate in, follow, pursue careers in, and support park-based science.

Conclusion. iSWOOP seeks to support adoption. With intensive PD, interpreters move from understanding and experiencing new ideas to crafting and implementing programs. After iSWOOP PD, interpreters are ready to incorporate approaches into programs. When educators are expected to adopt new practices that stand in stark contrast to how they have learned science and math themselves, it is incumbent on leaders and supervisors to offer professional development support them. New props, techniques, and approaches to visitor interaction require time to practice. Without a commitment to professional development during which they increase their understanding, comfort with new devices and techniques, interpreters may lose confidence in themselves and credibility in the eyes of visitors.

To Do Before Professional Development Begins

Preview Excerpted from
The iSWOOP Professional Development Guide for Facilitators

Planning Logistics. Allow about two months in advance of Session 1 to:

- ☐ Recruit and select participating interpreters (may include partner organizations, staff from nearby parks, volunteers. See suggestions for an application);
- ☐ Establish times and place(s) for sessions;
- ☐ Choose readings and review them. Send participants the details for the sessions sent including what to wear, what to bring, start time, and what to read. See sample email in Appendix;
- ☐ Confer with martha_merson@terc.edu for additional support.

Planning with the featured scientist

Schedule professional development sessions in consultation with the featured scientist. Request at least two classroom presentations as well as time in the field. Three, six-hour sessions scheduled over three days is a good start (this includes time for the scientist to present, to lead field work, for interpreters to raise questions, plan an interpretive interaction and practice it.

Make sure to discuss:

- ☐ A hands-on activity or challenge that functions as an entry to the research presentation
- ☐ Field work logistics, and
- ☐ The scientist's presentation(s) which should include:
  - ✓ a back story on finding this topic, focusing on this species or phenomenon
  - ✓ false starts, missteps, mistakes
  - ✓ obstacles overcome
  - ✓ research questions, methods, and findings
- ☐ A plan for how to promote the collaboration. For example, invite the social media point person at the park to observe the professional development sessions, field work, or to talk with interpreters who participate in it.

Agree on and disseminate the agenda.

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Troubleshooting

Under Construction

Send Martha your questions and concerns!

What can go wrong

What to do about it

.

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