

Research Note

Education and Interpretation on Public Lands: Lessons from Research and New Directions

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Abstract

Decades of research confirm that interpretation and environmental education on public lands can accomplish a wide variety of positive outcomes for participants, ranging from personal learning and growth to stewardship behaviors both on- and off-site. This research note offers a brief summary of the state-of-the-field of interpretation and environmental education research as applied to public lands. It highlights the general state of knowledge and identifies opportunities for researchers to further enhance our understanding about education on public lands to maximize benefits for visitors and managers alike. In particular, we emphasize the value of large-scale comparative studies as well as collaborative approaches to adaptive management, in which researchers support active experimentation through iterative data collection and analysis within a learning network of multiple program providers. This latter approach promotes evidenced-based learning within a larger community practice in which participants can benefit from the diverse knowledge, experiences, and data that each brings into the network.

Keywords

Communities of practice, environmental education, evaluation, evidence-based learning, interpretation

Decades of research confirm that interpretation and environmental education (EE) on public lands can accomplish a wide variety of positive outcomes for participants, ranging from personal learning and growth to stewardship behaviors both on- and off-site (e.g., Storksdieck & Falk, 2020; Thompson & Houseal, 2020). This research note draws upon the empirical literature as well as our own experiences over the past two decades-plus of studying interpretation and EE on public lands in the United States and abroad. We address two critical questions: (1) What can interpretive and educational programs achieve for public lands?; (2) What are the emerging and innovative research approaches that will help researchers expand our knowledge in this arena?

Interpretation is “a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and the meanings inherent in the resource” (NAI, 2021). Interpretive communications can include live programs, exhibits, films, and other media intended for non-captive audiences who visit an interpretive site. The North American Association for Environmental Education defines EE as “a learning process that increases people’s knowledge and awareness about the environment and its associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action” (NAAEE, 2021).

What Can Interpretive and Educational Programs Achieve for Public Lands?

Common goals of EE and interpretation include: enhancing the visitor experience, increasing visitors’ knowledge, promoting appreciation and other positive attitudes toward park resources, building or strengthening positive perceptions of the management agency, helping visitors to develop new skills, and influencing visitors’ behavioral intentions and behaviors both on- and off-site (Ardoin et al., 2018; Powell et al., 2019; Stern & Powell, 2021; Stern et al., 2014). Within public lands management agencies, EE programs are often geared toward younger audiences. As such, EE outcomes often also include addressing school-based curricula or enhancing the academic achievement of visiting school groups. Evidence suggests that each of these outcomes can be attained through high quality educational and interpretive efforts.

Systematic reviews and empirical studies reveal that high-quality EE can positively affect participants’ knowledge, awareness, motivations, self-confidence, skills development, attitudes, socioemotional learning, behavioral intentions, and behaviors (Ardoin et al., 2018; Marion & Reid, 2007; Stern et al., 2014). These programs commonly take the form of school field trips (Dale et al., 2020) or overnight experiences (Ardoin et al., 2015), though more recently, the COVID-19 pandemic has motivated many program providers to shift their modes of delivery to online offerings. A recent review suggests that online EE programs can also achieve positive outcomes for participants, including enhanced knowledge, awareness, interest in learning, critical thinking and other skills development, attitudes, self-efficacy, behavioral intentions, and behaviors (Merritt et al., in review).

Reviews and empirical studies also demonstrate that interpretive communications can provide meaningful outcomes for participants: including increased knowledge, attitude change, enjoyment, self-efficacy, behavioral intentions, and behaviors (Skibins, et. al., 2012; Stern & Powell, 2021). The most powerful positive results are typically associated with live (face-to-face) programs, though non-personal (not live) interpretation, including exhibits, podcasts, videos, and other recordings, have also been linked to positive outcomes, including enhanced knowledge, awareness, and behavioral intentions (Stern & Powell, 2021).

High-quality interpretive and educational programming also provide other benefits to parks and protected areas. Ranger-led programs have been shown to enhance public opinions of national parks and the National Park Service in the United States (Stern et al., 2011). The quality of interpretation in some national parks has been directly linked with local residents’ attitudes and behaviors of support (e.g., volunteering, donating) and opposition (e.g., violating park rules, public protests) toward neighbor-

ing national parks as well. For example, at Virgin Islands National Park, local residents often cited inadequate interpretation of relevant cultural histories as a primary source of negative attitudes and responses to the National Park (Stern, 2008). Similarly, at Great Smoky Mountains National Park, perceptions of inadequate cultural heritage preservation and interpretation were strongly linked to local distrust for park managers, which in turn was the strongest predictor of local opposition to the park (Stern, 2010). In each park, perceptions of consistency and quality of the work of park rangers contributed to more positive attitudes and responses on behalf of local residents. Perceptions of the quality of interpretive services represented a major component of these overall assessments (Stern, 2006). In each of three national parks included in the study, feelings of trust for park managers were better predictors of support, compliance with park rules, and avoiding other forms of opposition than fear of enforcement.

What Is the State of the Art and Where is the Cutting Edge of Research in These Areas?

While the range of studies of educational and interpretive efforts can include a diverse array of research questions, ranging from how to appropriately plan programs (e.g., Healy et al., 2016; White et al., 2005) to organizational influences on instructor motivation (e.g., Pratson et al., 2021), we focus on two key areas that characterize a significant portion of the published research: summative evaluation and explanatory research. Summative evaluation focuses primarily on measuring the outcomes of distinct programs to gauge their effectiveness. Explanatory research, as we conceptualize it here, focuses on what programmatic or other elements appear to be more or less responsible for varying degrees of outcomes achievement. Some refer to these latter types of studies as formative or adaptive evaluation, as they also provide evaluative information that can help to improve programming.

Summative Evaluation: Measuring Effectiveness for Program Participants

Researchers have employed a range of research designs to investigate the effectiveness of educational and interpretive efforts. The predominant methods include measuring participant outcomes using retrospective surveys (e.g., Miller et al., 2018; Miller et al., 2019; Powell et al., 2016; Taff et al., 2014) and quasi-experimental designs, which most commonly involve measuring participants' knowledge, awareness, attitudes, intentions, behaviors, and other desired end-states both before and after an educational or interpretive experiences (e.g., Beaumont, 2001; Powell & Ham, 2008; Powell et al., 2009; Stern et al. 2008; Tubb, 2003). For example, many researchers use pre/post/follow-up designs, which involve administering participant surveys before, immediately after, and again some time later following educational experiences (ranging from less than a month to over two years) to determine both the short and long-term effects of the programs (Ardoin et al., 2018).

Specific techniques for measuring outcomes vary across studies. Although participant surveys are the most commonly reported methods in much of the peer-reviewed literature (Ardoin et al., 2018; Stern et al., 2014; Stern & Powell, 2021), observational techniques are also used (e.g., Serrel, 1997). In particular, researchers have evaluated signage (e.g., Hall et al., 2010) and exhibits (e.g., Benton & Sinha, 2011) in protected areas and other sites by observing the duration and level of engagement with these educational resources. In other cases, researchers have used observational methods to observe whether specific interpretive or educational strategies can influence behaviors to minimize impacts to protected area resources (e.g., Ward & Roggenbuck, 2003).

In some cases, researchers have measured behavioral traces and resource conditions, rather than behaviors themselves as outcomes—for example, the extent of campground damage (e.g., Oliver et al., 1985) or other depreciative behaviors (e.g., Settina et al., 2020) following interpretive or educational interventions. Some researchers have also combined observational techniques with questionnaires to examine the consistency between observed and self-reported behaviors (e.g., Hockett et al., 2017).

Each of the techniques described above make use of both qualitative and quantitative data. Additional qualitative techniques include the qualitative coding of open-ended questionnaire items or other artifacts, such as video or nature journals; unstructured or semi-structured interviews; and analyzing participant drawings or photos (Ardoin et al., 2018). In some cases, methods may be co-created between researchers and subjects, enhancing the cultural responsiveness of local contextualization of any research findings (Askew et al., 2011). Each can reveal the participants' and others' perspectives of the overall influences of the evaluated programs.

Explanatory Research

Explanatory research examines how or why interpretive and educational interventions attain whatever outcomes they achieve. Explanatory research techniques also run the full spectrum from qualitative to quantitative methods. Qualitative studies often examine the nuances of a particular program or approach, commonly relying on interviews, journals, or other forms of self-report of participants, instructors or observers to provide explanations of how programs influenced participants (e.g., Ardoin et al., 2014; Britt, 2017; Macklin et al., 2010; Powell et al., 2016). In some cases, qualitative interviews have been used to solicit explanations for quantitative findings (e.g., Ward & Roggenbuck, 2003). Quasi-experimental designs have also been used to compare different programs, approaches, and techniques to identify specific interpretive or educational approaches associated with better outcomes in a particular context (e.g., Ballantyne & Packer, 2009; Littlefair & Buckley, 2008; Powell et al., 2009; Ward & Roggenbuck, 2003). For example, Ballantyne and Packer (2009) paired in-depth interviews with observational data to identify the strategies that best facilitated learning across 12 EE programs in Queensland, Australia. In both single case and comparative case study designs, such as these, the generalizability of these findings can be somewhat difficult to determine, based on the particular contexts in which the studies took place.

Large-Scale Comparative Studies

Large-scale comparative studies, which aim to identify what works best in education and interpretation across contexts (or within specific contexts), are far rarer. We conducted one such study focused on interpretive programs in national parks in the United States, designed to isolate which programmatic elements, including characteristics of the interpreter, educational practices, and contextual characteristics, were most strongly associated with three cross-cutting visitor outcomes—visitor satisfaction, enhancing visitors' experience and appreciation, and visitors' intentions to change behaviors (Powell & Stern, 2013a; Stern & Powell, 2013). To accomplish this goal, teams of researchers observed 376 live-interpretive programs in 24 units of the U.S. National Park Service, tracked the extent and quality of 56 different programmatic elements, and surveyed over 5,000 visitors immediately following interpretive programs. The results revealed a list of 15 programmatic elements with statistically significant relationships with these outcomes. These elements reflected commonly pro-

moted interpretive techniques, such as employing thematic communication, adhering to Tilden's (1957) principles, developing a holistic story arc through effective sequencing and organization, and avoiding fact-based lecturing (Powell & Stern, 2013a; Stern & Powell, 2013). The results also revealed that the behaviors and characteristics of interpreters, including their apparent degrees of confidence, passion, sincerity, charisma, and responsiveness to audiences, were also important for driving positive outcomes (Powell & Stern, 2013a; Stern & Powell, 2013). Furthermore, preliminary explorations of the data suggest that certain practices might be more or less effective in different contexts or with different audiences (Powell & Stern, 2013b).

More recently, we again used a comparative design that employed observational techniques paired with participants surveys to investigate what leads to better outcomes in EE field trip programs for adolescent youth (grades 5-8) across the U.S. (Dale et al., 2020; Lee et al., 2020; O'Hare et al., 2020). Teams of researchers observed 334 EE field trip programs provided by 90 different organizations across the U.S. to examine the linkages between positive learning outcomes, including measures of environmental literacy, place attachment, 21st century skills, social/emotional learning, and positive youth development (see Powell et al., 2019 for full description of outcome measures) and over 70 pedagogical approaches, educator attributes, and contextual characteristics. While analyses of these data are ongoing, preliminary findings suggest the importance of the quality of the relationship built between the educator/interpreter and the audience (O'Hare et al., 2020), the degree of visitors' active engagement with the content, the novelty and naturalness of the educational site (Dale et al., 2020), and the overall organization and sequencing of the program. Current and future efforts are addressing how findings might vary across different socioeconomic, curricular, ecological, political, racial, and geographic contexts (e.g., Stern et al., 2021).

There are many reasons why large-scale comparative designs with direction observations of programs are rarely replicated. These types of studies face many methodological challenges, including developing reliable and valid observational measures that are consistent among researchers; ensuring that the shared outcome measure is relevant for all programs under consideration and sensitive enough to distinguish differences between high and low quality programs (Powell et al., 2019); and logistical and resources challenges associated with recruiting, scheduling, and funding such a large effort. However, without undertaking studies of this nature, the fields of interpretation and EE largely rely on individual case studies, singular evaluations, and small-scale quasi-experimental efforts to develop their research base in support of best practices (Skibins et al., 2012; Stern et al., 2014). Such methodologies are more limited in their generalizability.

Evidence-Based Learning Networks as Communities of Practice

Building on our recent large-scale comparative studies, we are currently engaging in what we consider to be a new frontier in EE and interpretive research. Our team is currently engaged in developing communities of practice as an opportunity for iterative quasi-experimental research that can further our understanding of what works in EE and interpretation. Communities of practice are groups of people who share knowledge and expertise through ongoing interaction for the purpose of continual learning and improvement of their work associated with common goals (Wenger, 1998). We are merging this concept with the practice of adaptive management to build evidence-based learning networks of EE providers. This approach combines experimental and

comparative case study designs and is based on iterative evaluation, systematic reflection, and active experimentation.

Within these networks, organizations use a consistent outcome measure, in this case a retrospective participant survey (Powell et al., 2019), to gauge the performance of their programs. Following data collection and analysis by the research team, each organization receives a confidential summative evaluation report depicting the extent to which their organization is achieving outcomes. Organizations then come together to discuss their programs and collaboratively develop hypotheses about what programmatic elements they feel are more or less responsible for the outcomes they have achieved. These conversations are bolstered by regular (monthly) learning sessions in which research results and program examples are shared within the network. We, as the research team, have an opportunity to compare outcomes across programs of different design to formulate similar hypotheses. Following facilitated exchanges between participants in the network, each organization commits to adapting their programs in ways they believe will enhance their participants' outcomes. After these innovations are implemented, organizations undertake a second cycle of data collection. This cycle reflects a quasi-experimental design, providing empirical data about the relative effectiveness of these innovations; this is equivalent to dozens of intra-organizational experiments (30 to 40 organizations are currently participating in each of two such learning networks). These experiments provide empirical evidence about whether certain practices appear to enhance, constrain, or otherwise influence participant outcomes. As a result, new knowledge is co-created as the research team analyzes the collected data and shares which adaptations exhibited statistically significant relationships with improved outcomes measures. This approach accomplishes multiple goals simultaneously: (1) it builds capacity in program-providing organizations in data collection, the interpretation of research findings, and adaptive management; (2) it builds community between diverse organizations, enabling the wider and more rapid sharing of ideas and innovation; (3) it provides empirical data on what works in educational programming; and (4) it provides a forum for rapid dissemination of research findings to practitioners and their own networks.

Management Implications

The literature reveals that EE and interpretive services can yield a wide array of positive results for people and parks, including enhancing visitors' experiences; influencing their knowledge, awareness, attitudes, skills, feelings of self-efficacy, behavioral intentions and behaviors; and both increasing support for and limiting opposition to public lands management. Research has predominantly and traditionally focused on summative evaluations of single interpretive or education efforts that measure the efficacy of those programs on intended outcomes. We share examples of, and advocate for, more explanatory research approaches that investigate which factors (e.g., components of educational or interpretive design, characteristics of the educator/interpreter, contextual factors, audience characteristics) most powerfully influence desired outcomes. These approaches include quasi-experimental and comparative studies, particularly those that engage program providers and their audiences in the co-creation of relevant research questions, adaptive management (making revisions to programs based on research evidence and measuring their impacts) and co-learning (sharing findings and brainstorming improvements together).

Of particular interest to educational providers and researchers is the proposed use of communities of practice combined with adaptive management and participatory

evaluation approaches. This approach requires partnerships between program providers and researchers. The providers, typically park managers or educational/interpretive staff on public lands, share in engaging their stakeholders, developing research questions, collecting data from participants, interpreting findings, and revising their programs based on results. Researchers help to guide the process, design representative sampling procedures, analyze data, share and interpret results, and facilitate learning exchanges between organizations. The use of consistent measurement techniques across a network of providers allows for comparative case studies and for quasi-experimental designs to test the efficacy of different programmatic approaches. This networked approach not only enables the continual evidence-based improvement of programs by identifying what factors are related to more desired outcomes, but also enhances the capacity of program providers in evaluation research and adaptive management.

Conclusion

It has been well established that high-quality educational and interpretive efforts on public lands and elsewhere can yield positive results for people and parks. Traditional research has commonly focused on summative evaluations of individual programs that support this claim. Quasi-experimental and other forms of research examine proposed causal linkages between different approaches and visitor outcomes. Each of these approaches has yielded meaningful results in terms of both what can be accomplished and how those outcomes have been achieved in specific contexts. Only recently have large-scale comparative studies and collaborative evidence-based adaptive management approaches been attempted to examine these questions across a wide variety of contexts and program types. We urge researchers to continue to push the envelope on these fronts to ensure the continual development and improvement of interpretive and educational efforts on public lands. As efforts multiply to reach broader and more diverse audiences in meaningful ways, collaborative efforts, engaging not only researchers, but also practitioners and their intended partners and audiences, in developing meaningful research questions, may yield new frontiers and breakthroughs across the years to come.

Acknowledgments: We'd like to acknowledge the Pisces Foundation and the National Park Foundation for providing funding for creating the evidence-based learning networks described in this manuscript.

Disclosure Statement: The authors have no disclosures or competing interests to declare.

Funding: No external funding was received.

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