Animal Behavior and Cognition
ABC 2021, 8(4):558-575
DOI: https://doi.org/10.26451/abc.08.04.08.2021

The Impact of Ambassador Animal Facilitated Programs on Visitor Curiosity and Connections: A Mixed-Methods Study

Shelley J. Rank[1,*], Su-Jen Roberts[1], and Katherine Manion[2]

[1]Bronx Zoo, Wildlife Conservation Society
[2]Independent Consultant

*Corresponding author (Email: srank@wcs.org)

Orcid IDs: SJR https://orcid.org/0000-0003-2097-1165, S-J Roberts https://orcid.org/0000-0002-3119-2063

Citation – Rank, S. J., Roberts, S-J., & Manion, K. (2021). The impact of ambassador animal facilitated programs on visitor curiosity and connections: A mixed-methods study. *Animal Behavior and Cognition, 8*(*4*), 558-575. https://doi.org/10.26451/abc.08.04.08.2021

Abstract – Many zoos and aquariums offer opportunities for visitors to have up-close encounters with ambassador animals; however, the impacts of these experiences on visitors' connections to animals are not well documented. We used observations and family interviews in a sequential mixed-methods research study to explore how animal ambassador programs impact participants. We found that the type of ambassador animal did not affect the number of questions or comments made by participants during programs, suggesting broad interest in animals. Programs in which facilitators prompted participants with questions were especially successful at eliciting questions and guiding the topics of those questions, fueling deeper curiosity. Interviewees described themselves as "animal people" and self-reported practicing conservation behaviors, suggesting that their animal affiliative and pro-environmental identities could be leveraged to discuss conservation issues and encourage solutions-based behaviors. Lastly, opportunities to meet ambassador animals increased participants' feelings of connecting to animals, building on previous research and corroborating findings. Programs should consider how to further build on these positive learning and affective outcomes by capitalizing on opportunities to provide deep insights into conservation issues and actions related to the ambassador animals.

Keywords – Ambassador animals, Visitor research, Conservation, Connections, Curiosity

Many zoos and aquariums offer opportunities for people to have up-close encounters with ambassador animals. Ambassador animals are animals that are trained to interact with the public to support education and conservation goals, such as increasing visitors' learning, excitement, and personal connections to animals (AZA, 2011). Ambassador animal experiences come in many different forms, with common opportunities including feeding domestic animals, touching marine invertebrates at touch pools, meeting an animal and its caregiver, interacting with an animal in a structured classroom-based program, or viewing a show with free-flight birds. Some zoos and aquariums provide more immersive experiences, such as swimming with sharks. Ambassador animal experiences are popular with visitors and it is not surprising that close to 90% of North American institutions associated with the World Association of Zoos and Aquariums offer some kind of ambassador animal experience (D'Cruze et al., 2019).

Zoo and aquarium staff are frequently present during animal ambassador experiences to answer questions, provide information, and monitor the animals' well-being (D'Cruze et al., 2019; Kreger & Mench, 1995). Staff engagement with visitors and animals varies depending on the type of ambassador

animal experience and may include helping visitors make observations using visual thinking strategies (Genovesi, 2011) or showing visitors how to touch animals safely (Kopczak et al., 2015). There are a variety of ways that ambassador animal experiences are facilitated by interpreters, most of these interpretive methods are not well described or understood in relation to ambassador animals (Spooner et al., 2021). Interpretive strategies are better understood in relation to visitor engagement at National Parks (Lewis, 1991), and public behavior around health care and science communication (Sundin et al., 2018).

Despite substantial research on zoo and aquarium visitors (e.g., Falk & Adelman, 2003; Falk et al., 2007; Visscher et al., 2009) and live interpretation at zoos and aquariums (Powell & Stern, 2013; Stern & Powell, 2013; Stern et al., 2013), relatively little published research has focused on the impacts of facilitated ambassador animal experiences on participating visitors. The ambassador animal research community has started to investigate the impact of these types of programs on different aspects of visitor outcomes, specifically, learning, perceptions of animals, and conservation intentions (Genovesi, 2011; Manion, 2013; Newberry et al., 2017; Povey, 2002; Povey & Rios, 2002; Schueler & Newberry, 2019). We describe some of these studies below.

Knowledge about Animals

Studies have found that visitors learn and remember more fact-based animal information from an up-close facilitated encounter with an ambassador animal than from an exhibit visit alone. For example, adults participating in dolphin interaction programs at five different US institutions learned and retained more fact-based information about dolphins than the control group of adults who viewed dolphin exhibits only (Miller et al., 2013). Similarly, participants who met a penguin and facilitator in a barrier-free setting recalled more fact-based information about penguins compared to zoo visitors who visited the exhibit only, interacted with an interpreter and touched penguin biofacts (e.g., feathers), or listened to a live narration during a penguin feeding (Manion, 2013). In another study, zoo visitors who encountered ambassador ravens or radiated tortoises (*Astrochelys radiata*) outside their exhibit with a facilitator, could recall facts about those animals more accurately than could visitors who only viewed these animals in their exhibits (Povey, 2002).

While facilitation by an animal expert is a key part of these learning experiences, there is little research on the aspects of facilitation that may contribute to these improved learning outcomes. Visscher et al. (2009) studied cognitive outcomes from three different training presentations at a rhino exhibit (i.e., not an animal ambassador encounter). Fifth-grade students either (a) observed a rhino participating in a training session, (b) heard a brief fact-based presentation about animal training then watched a rhino training session, or (c) interacted with a trainer who explained training, invited students to ask questions, and demonstrated training using a student as a model animal. They found that participants learned more about rhinos from the presentation that used multiple interpretive elements rather than the presentation that shared facts only, suggesting that the facilitation approach may also play an important role in ambassador animal experiences.

Knowledge acquisition and retention is often used as an indicator of learning, but the National Research Council notes that informal science institutions, like zoos and aquariums, should also aim to generate "excitement, interest, and motivation to learn" about science (National Research Council, 2009, p.4). In other words, it is important for zoos and aquariums to promote curiosity in visitors because curiosity inclines people to learn and to ask more questions, potentially leading to sustained interest and pursuit (National Research Council, 2009). However, there are no known studies about how ambassador animal encounters encourage curiosity about wildlife and the environment.

Connecting with Animals

Visitors to zoos and aquariums have described experiences in which they connect with animals and researchers have explored how these experiences impact affective outcomes like appreciation, caring, and respect for animals (Clayton et al., 2009; Luebke, 2018; Luebke & Matiasek, 2013; Luebke et al.,

2016). Whereas most of these studies focus on animals in their exhibits, some key aspects may transfer to animal ambassador encounters. For example, Clayton et al. (2009) found that interacting with zoo animals outside of the ambassador animal context positively impacted visitors' sense of connection with the animals. Others have found that the activity of animals at exhibits and close proximity can contribute to positive affective responses by zoo visitors, such as respect, wonder, and sense of connection (Howell et al., 2019; Luebke et al., 2016). Zoos and aquariums often apply this research in exhibit design by prioritizing opportunities to make the visitors feel like they are close to exhibit animals (Chin et al., 2017). The importance of proximity in increasing feelings of connection suggests that ambassador animal programs have an opportunity to foster these feelings because they provide visitors with an opportunity to be close to animals in a barrier-free environment.

Perceptions of Animals

Meeting an ambassador animal up close may be particularly important for increasing positive perceptions of stereotypically aversive species, such as reptiles (Kreger & Mench, 1995) or terrestrial invertebrates (Pitt & Schockley, 2014). Indeed, even non-elective ambassador animal experiences - experiences that happen without participants' choice (e.g., children on a school field trip) - may improve attitudes towards animals like snakes. For example, children who saw a facilitator handle a live snake had more positive attitudes toward snakes than children who did not observe a snake being handled (Morgan & Gramann, 1989). In contrast, a school-based hands-on program did not change students' perceptions of terrestrial woodlice (Fančovičová & Prokop, 2018), suggesting that pre-existing attitudes and beliefs may also play a role in achieving positive attitude changes (e.g., Ajzen, 1991).

Conservation Intention and Action

The focus on visitors' affective outcomes is important because of the relationship between positive affective responses, such as empathy, and conservation action (Cialdini et al., 1997; Gifford & Sussman, 2012; Skibins & Powell, 2013; Young et al., 2018). However, research directly connecting zoo and aquarium visits to conservation behavior has historically been limited because of attrition in longitudinal data collection, reliance on self-reporting, and difficulty tracking visitor behavior. The few published studies that exist have found mixed results. One longitudinal study of dolphin interaction programs showed that the programs had a longer lasting impact on participants' intention to practice environmental behaviors than did dolphin shows (Miller et al., 2013). Contrary to expectations, visitors who attended a narrated penguin feeding at an exhibit were more likely to take a Seafood Watch pocket guide – a wallet-sized handout explaining sustainable seafood choices – than those who participated in a facilitated barrier-free ambassador penguin experience (Manion, 2013).

Intent to take conservation action may be easier to foster for charismatic species than for invertebrates, fish, amphibians, and reptiles (Batt, 2009; Kellert, 1984; Knight, 2008; Liordos et al., 2017; Litchfield et al., 2018; Schlegel & Rupf, 2010). However, there is some evidence that up-close tactile experiences may be particularly important for non-charismatic species. In two different studies, handling reptiles and amphibians in the field increased children's desire to protect herpetofauna (Ballouard et al., 2012; Reynolds et al., 2018). There is some contention whether a live animal is necessary to garner conservation intention as McLeod and Rawson (2019) demonstrated in the case of a stick insect and related biofacts.

Current Study

Despite the value of ambassador animal experiences for increasing visitors' engagement, knowledge, and conservation intentions, few research studies have explored how the context of animal ambassador experiences can impact visitors. Our study used observations and interviews with families to

understand how aspects of the experience, including specific factors like type of animal and facilitation approach, affected participants' curiosity, connections, and conservation intentions. While ensuring good welfare of the ambassador animals is a top priority for programs, welfare research was not part of this study.

Method

Programs

We studied animal ambassador programs at the Bronx Zoo, one of five New York City-based wildlife parks run by the Wildlife Conservation Society. The Bronx Zoo is a 265-acre urban park, visited by almost two million people each year and offers a variety of animal ambassador programs that allow visitors to get close to animals with the support of a zoo facilitator. The facilitators are staff members trained to handle animals for public programs; half of the programs were led by facilitators whose primary role is animal caregiver (n = 4) and the other half of programs were led by facilitators whose primary role is educator (n = 4). All eight staff members were trained in animal handling and conservation education techniques and approved by a supervisor to facilitate these programs. We studied 20 fee-based programs for families and adults that took place in informal classroom settings. Half the programs were facilitated through a storytelling approach, which included a narrative with an introduction, middle, and closing; the other half were facilitated through an inquiry approach, prompting visitors to engage in conversation by posing questions. During all programs, the animals were either held by a facilitator, perched on an object, or were roaming freely, and visitors could touch at least one of the animals they met.

Instruments and Data Collection

We used a sequential mixed-methods approach, conducting observations of participants during ambassador animal programs and then qualitative family interviews after their experience. We approached the phenomenological study taking both a scientific approach using a priori codes for our observations (post-positivist) and a reflective open-ended approach in our interviews (constructivist). Phenomenological studies aim to understand the essence of an experience, that is "'what' the individuals have experienced and 'how' they have experienced it" (Creswell & Poth, 2018, p. 75); here the experience is an ambassador animal program in a classroom setting at the Bronx Zoo. We completed preliminary observations of three ambassador animal programs to identify common themes in visitor remarks, during which two researchers observed the same program to confirm inter-rater reliability (see Analysis section below). One of those researchers conducted all subsequent coding for observations.

During observations, we recorded the number of participants in the program, number of adults and children, the species of animal encountered, and the length of time that animal was present. We took written records of participants' verbal remarks while animal ambassadors were present, recording if a remark was spontaneous or prompted by the facilitator. We focused on the whole room, except when facilitators held the animal for participants to see up close or touch; when this happened, we focused on remarks made by the individuals closest to the facilitator, excluding those that were farthest away. We did not record information about the facilitators, the animals' behaviors, or how the animals were handled (i.e., in hand, on a perch, etc.), as that was outside the scope of this study.

We used stratified randomized purposeful sampling (Onwuegbuzie & Collins, 2007) to recruit participants for the family interviews, ensuring that most interviews included multi-generational family groups with children, a demographic that makes up the majority of zoo visitors (AZA, 2019). For information about our recruitment and consent procedures please see the Ethical Statement. After the program observations, we conducted 15- to 20-minute interviews with each recruited family. Family interviews helped researchers learn through conversation what participants were thinking and feeling

during the programs and how those experiences connected to their daily lives. The interview protocol asked three major questions, but the open-ended nature of participant responses allowed the researcher to ask additional questions to conduct the interview as a conversation. The three major questions we asked were:

1. Connections: What was the most memorable part of the encounter?
2. Curiosity: Do you want to learn anything else?
3. Conservation: Did you hear about the issues that animals face in the wild? Are those issues relevant to you? How?

After participating in the family interview, participants received a $20 voucher to use at any of the Bronx Zoo's gift shops or restaurants. They were not told prior to the interview that they would receive this incentive.

Participants and Context

We observed 454 people who participated in 20 programs (*M* group size = 22.7, median = 17.4, range = 5 to 48). Most programs had twice as many adults as children. Participants met 12 species of animals during the 20 programs (Table 1); each program included one to three species, with a total of 35 animal encounter periods across the 20 programs. We define a single encounter as the period in which a single species of animal was viewable to the participants. An encounter could include multiple individuals of the same species (e.g., three penguins). Multiple animals of the same species were present during 10 of the 35 encounters.

We interviewed 16 families from the 20 observed programs, ranging in size from two to five individuals, including children. We used the recommended number of interviews for phenomenological and grounded theory studies to determine the number of family interviews to conduct (Creswell & Poth, 2018; Onwuegbuzie & Collins, 2007). Fourteen of the 16 families included parents with children, where the most frequent configuration was two adults and one child (Table 2). Participants included zoo members as well as non-members. Thirteen groups lived in the New York City metro area and three groups were tourists. Ten of the 16 families mentioned that they had participated in similar animal ambassador programs at the Bronx Zoo or other places in the past.

Analysis

A phenomenological study like this is concerned with capturing an experience and then identifying what is significant to the participants. In this study, we set out to explore the experience of visitors that participated in ambassador animal experiences at the Bronx Zoo. This is beneficial because it allowed us to reflect on our current practices at the Bronx Zoo. Few studies in the ambassador animal literature have used this type of approach (Spooner et al., 2021). Our methods for the observation and interviews could be applied at other similar institutions to describe the experiences that visitors have with ambassador animals. We did not control for species of ambassador animals, did not capture the type of handling used towards ambassador animals, or the behavior of the animal, unless participants mentioned one of these things and the verbal remarks were captured during the observation or the family interview.

Table 1

Program and Encounter Summary

Program ID	Facilitation Style	Group Size	Enc. ID	Time Period	Taxa	Kn/Su	Spontaneous Remarks
1	Inquiry	33	1	0:09	Reptile	Su	14
			2	0:07	Mammal	Su	6
2	Inquiry	32	3	0:09	Mammal	Su	6
3	Inquiry	8	4	0:11	Bird	Su	7
			5	0:13	Reptile	Su	7
			6	0:09	Mammal	Su	6
4	Inquiry	31	7	0:06	Reptile	Su	5
			8	0:07	Mammal	Su	6
5	Inquiry	46	9	0:07	Bird	Su	5
			10	0:10	Reptile	Su	20
			11	0:13	Mammal	Su	18
6	Inquiry	43	12	0:09	Bird	Su	9
			13	0:11	Reptile	Su	20
			14	0:11	Mammal	Su	18
7	Inquiry	43	15	0:08	Bird	Su	10
			16	0:07	Reptile	Su	9
			17	0:10	Mammal	Su	14
8	Inquiry	21	18	0:07	Bird	Su	13
			19	0:06	Reptile	Su	2
9	Inquiry	39	20	0:12	Reptile	Su	13
10	Inquiry	48	21	0:12	Reptile	Su	15
11	Storytelling	8	22	0:08	Reptile	Su	7
			23	0:09	Bird	Su	11
12	Storytelling	11	24	0:14	Bird	Kn	8
13	Storytelling	12	25	0:21	Mammal	Kn	19
14	Storytelling	11	26	0:16	Bird	Kn	20
15	Storytelling	9	27	0:13	Bird	Kn	29
16	Storytelling	5	28	0:06	Reptile	Su	8
			29	0:06	Bird	Su	16
17	Storytelling	17	30	0:03	Mammal	Su	7
			31	0:22	Mammal	Kn	17
18	Storytelling	11	32	0:24	Mammal	Kn	19
19	Storytelling	18	33	0:04	Mammal	Su	1
			34	0:19	Mammal	Kn	15
20	Storytelling	8	35	0:14	Bird	Kn	32

Note: Enc. ID = Encounter Identification; Kn/Su = Known or Surprise Animal, Kn = Known, Su = Surprise; Birds included: Black-bellied whistling duck, eastern screech owl, emu, and Magellanic penguin; Mammals included: Armadillo, Fennec fox, and two-toed sloth; Reptiles included: American alligator, ball python, dab lizard, eastern box turtle, and white-throated monitor.

Observation Data

During pilot observations, the researchers took notes and then open-coded the elements for themes, resulting in an initial topic codebook. Two researchers coded their observations of three co-observed programs to further refine the topic codebook and check for consistent coding. All three observations had between 70% and 90% coding agreement between researchers. A single researcher coded all observations using the agreed-upon topic codebook (Table 3) and coded the spontaneous remarks as either questions or comments. Remarks could be coded as multiple topics (i.e., not mutually exclusive), but this occurred in less than 7% of remarks.

Most results are descriptive because of our small sample size (i.e., 20 observations, 35 encounters), but we used JASP version 0.9.1, an open-source project with structural support from the University of Amsterdam, to conduct statistical analyses (JASP Team, 2019). We conducted an

ANCOVA comparing the two facilitation styles. We also used ANCOVAs to see if there were differences between the types of ambassador animals present (mammals, birds, and reptiles) and the frequency of question-asking. We used omega squared (ω^2) to measure effect size because of the small sample sizes and multiple variables being examined (Fritz et al., 2012).

Table 2

Configuration of Interview Groups by Age Category and Family Generations

Configuration	*n*	Generations
2 Adults + 1 Child	5	2
1 Adult + 2 Children	2	2
2 Adults	2	1
1 Adult + 1 Child	1	2
1 Adult + 1 Teen	1	2
1 Adult + 2 Teens	1	2
2 Adults + 2 Teens + 1 Child	1	2
2 Adults + 3 Young Children*	1	2
3 Adults + 2 Children	1	3
3 Adults + 1 Teen + 1 Child	1	3
Total Interview Groups	16	

Note. Generations help describe the group dynamic, three generations represent at least one grandparent, one parent, and one child, two generations represent at least one parent and one child, and one generation denotes an adult couple. * denotes that these children were under 5 years old and contributed minimally to the conversation.

Table 3

Topics Coded During Observations and Their Descriptions

Topic	Description
Animal Care	Remark about how animals are cared for at the Bronx Zoo or other facilities (e.g., "how are you holding him?"); keeper-animal interactions and relationships (e.g., "can they hurt you?"); or what animals are at the Zoo (e.g., "how many penguins do you have here?")
Conservation & Research	Remark about field conservation and research (e.g., "your scientists . . .", "you work in policy . . ."), breeding programs, or animal welfare research.
Individual Animal	Remark about the individual animal, including temperament, likes/ dislikes, demeanor, and how the animal came to the Zoo.
Natural History	Remark about the animal species, including habitat, diet, taxonomy, and general ecology (e.g., predators, camouflage).
Personal References	Remark that relates something about the animal to the participant or their personal experience (e.g., "that's like me" or "I like turtles"); or about touching animals.
Talking to or "for" Animals	Talking to the animals (e.g., "you are so cute!") or for the animals (e.g., "give me more food!").
Other	A remark other than the codes described above, such as thanking the facilitator, or asking how many animals will be met.

Interview Data

After we transcribed audio recordings of interviews, a single researcher used open-coding to qualitatively code the interviews (Creswell & Poth, 2018; Punch, 2014). Blending aspects of grounded theory, a qualitative research approach that is used to generate theories about an experience (Creswell & Poth, 2018), and phenomenology, we examined open-codes in relation to each other to see how themes interacted and participants made meaning out of these experiences (Creswell & Poth, 2018; Punch, 2014). The interview coder reviewed both a priori and emergent codes during the analysis process with another researcher to ensure the interpretation was appropriate (Creswell & Poth, 2018).

Results

Overview

We recorded a total of 539 remarks made by program participants during the 35 encounters. Participants' remarks were either prompted (n = 122, 23%) - i.e., in response to something the facilitator asked - or spontaneous (n = 417, 77%) - i.e., not in direct response to a facilitator's question. Overall, most remarks were spontaneous, which were further analyzed and divided into questions and comments (Table 4), where almost two-thirds were questions.

Table 4

Frequency of Spontaneous Questions and Comments, Including Description and Examples

Type	Description	*n* (%)	Example
Question	A remark that requested an answer, usually directed towards the facilitator	259 (62%)	"How do they whistle with their mouth closed?"
Comment	A remark that did not warrant a facilitator response	158 (38%)	"[Their] coloring is appropriate for sand"
Total		417	

The themes that arose during the interviews (Table 5) were consistent with the topics coded from the observations (Table 3). This allowed us to further explore those themes with participants and make stronger connections between the data sources.

Curiosity About Animals

During eight of the 20 programs, participants met a known animal - i.e., an animal that they were expecting to meet because of the program's title, such as "Penguin Connection." During the other 12 programs, participants met a surprise animal - in these cases, participants did not know what animals they would be meeting in advance of the program. As noted earlier, most spontaneous remarks were questions. There was no significant difference in the number of questions asked during encounters with known (n = 8, M = 9.50, SD = 4.66) versus surprise animals (n = 27, M = 6.78, SD = 4.46) after correcting for the length of the encounter (F (1, 32) = 1.25, p = .271). We corrected for length of encounter because there was a significant positive correlation between the encounter duration and the number of questions asked (r (33) = .45, p < .007).

Table 5

Major Themes Coded from Interviews, Including Examples and Their Frequency

Interview Codes	*n*	Example Statement
[Curiosity about] Natural History	9	"I think I'd like to see what [ball pythons] look like when they turn into a ball."
[Curiosity about] Animal Care	1	"I was curious about when the other child asked whether or not [the ball python] was born here."
[Connections to] Individual Animal	4	"[I didn't realize] that birds have personality. That all animals can have real personalities."
[Connections through] Personal References	15	"All of [our] senses are aroused, therefore it's a unique experience."
[Personal Relevance to] Conservation (Actions & Sustainability)	9	"We try to recycle. We try to be aware of what's going on in the environment in animal habitats."
[Program Relevance to] Conservation (Issues)	8	"I didn't know penguins were affected [by plastic], I just knew turtles were. But that makes sense because they are aquatic."

Additionally, there was no significant difference between the number of questions asked during encounters with birds (n = 11, M = 7.27, SD = 4.27), mammals (n = 13, M = 7.00, SD = 4.10), or reptiles (n = 11, M = 8.00, SD = 5.71) after correcting for the length of the encounter (F (2, 31) = 0.96, p = .39). During interviews, all families made comments about how their familiarity with the animal affected their interest (i.e., curiosity) such as one adult who declined to touch an eastern box turtle saying they "had touched a lot of turtles." Conversely, some self-declared animal "experts" were eager to meet and touch the animals they knew a lot about. In response to the question "do you want to learn about anything else [about these animals]" during the interviews, nine out of 16 families mentioned something else they wanted to learn about the animals' natural histories or their care at the zoo. For example, an adult we interviewed with their grandchild, wanted to learn more about armadillo family structure after meeting an armadillo ambassador; they wondered if "[armadillos] live in a group, what happens when their babies are bigger, [and] do they stay in the group?"

Relevance to Conservation

During interviews, 14 of 16 families shared that they actively pursued their interest in animals during their leisure time. Six families incorporated it into daily activities, such as watching nature shows and reading books about animals. Nine families shared that they had participated in other animal ambassador experiences and three families spoke about traveling to see animals in the wild. Fifteen of the families described themselves as "animal people" or "animal lovers."

Thirteen of 16 families shared that they heard about conservation issues during their ambassador animal experience, however only eight of these occurrences was when the ambassador animal was present during the program, the other five were when ambassador animals were not with participants (i.e., parts of the program when participants were not with ambassador animals). When we asked families about conservation and how it relates to them, participants most frequently named the behaviors they do to protect wildlife (9 families), such as recycle (5 families) and avoiding single use plastics (5 families). Seven families also used their prior knowledge and experience to talk about more complicated topics within wildlife conservation. During an interview, a family described how hearing about how deforestation affected box turtles reminded them of the area where they live. They described how large parts of the forest have been cut down and new buildings have gone up, and how sometimes bears

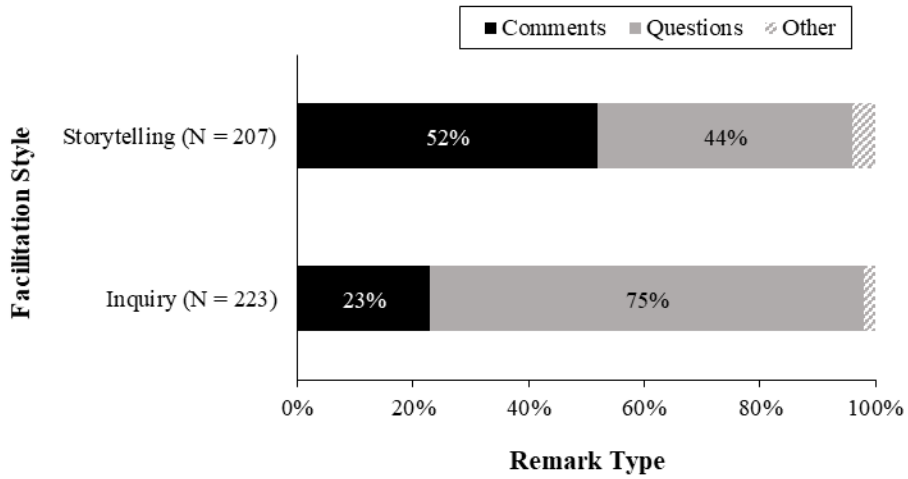
ventured into their neighborhood for trash, acknowledging that cutting down the forests have left the bears and other animals with less suitable habitat. Similarly, another family that met a ball python drew from their previous knowledge about snakes, including how pythons in Florida are invasive and causing problems within the ecosystem.

Facilitating Curiosity

Program facilitators used one of two different strategies to engage program participants. In half of the observed programs, facilitators asked participants questions throughout the program, a facilitation style that we refer to as 'inquiry.' During the other half of programs, facilitators tended to use a more narrative or storytelling style, often sharing stories about the individual animals. During inquiry-style programs, 75% of spontaneous remarks were questions, compared to 44% in storytelling style programs (Figure 1). This difference was significant, even after controlling for length of the encounter (F (1, 32) = 4.98, p = .033, and ω^2 = .08), where there was a medium to large effect of facilitation style on how participants engaged with the facilitator's style.

Figure 1

Percentage of Spontaneous Comments and Questions by Facilitation Style



During inquiry-style programs, participants responded (n = 91, 81%) to the facilitator's questions, by sharing an observation about the animal or previous knowledge about the animal's natural history. Most participant questions focused on natural history (n = 93, 56%) or the individual animal (n = 58, 35%) in inquiry style programs. Questions from participants in storytelling style programs were more varied, touching on a variety of topics including natural history, the individual animal, animal care, and personal references (Table 6).

Connecting with Animals

Seven of the 16 families interviewed shared that one of the main motivations for participating in an animal ambassador program is getting to have a special experience, often for a special occasion like a birthday. This was particularly true for the families who participated in animal ambassador programs where they knew what animals they would meet prior (six of the seven families). During observations, 16% of comments were positive such as proclaiming, "I love penguins!" or making general appreciative statements like "pretty cool" (n = 26). One child who was quiet during the program expressed her awe

and wonder during the interview by describing how much more she appreciates penguins after being up close with them, saying that penguins "are like a whole other level of just being a bird!".

Most spontaneous remarks made by participants in the storytelling programs had to do with personal references, the individual animal, and talking to or for the animal (65%); as compared with 42% of the spontaneous remarks in programs facilitated through inquiry. Participants' comments during the programs most frequently emphasized connections with the animals through personal references (n = 67, 42%), such as describing how they would behave similarly. For example, an adult in a storytelling program observed an emu being scratched by a facilitator, saying, "If you keep scratching me like that, I'd fall asleep too." Participants in both programs also made remarks about the individual animal (n = 47, 30%) where many of these comments were anthropomorphic, such as exclaiming "they are jealous of each other" when two penguins appeared to squabble over attention from a facilitator. In 10% of comments (n = 16), participants spoke to the animal or assumed the identity of the animal. For example, when participants watched a two-toed sloth start to descend her perch after learning that sloths climb down to the forest floor once a week to defecate, one participant exclaimed "I've waited all week for this!"

Table 6

Frequency of Question Topics by Facilitation Style

Question Topic	Inquiry (N = 167)	Storytelling (N = 92)	Example
Natural History	56%	40%	"Where are they native to?"
Individual Animal	35%	25%	"Does he have friends?"
Animal Care	11%	22%	"How long does it take to train them?"
Personal References	3%	14%	"How fast can we run?"
Talking to the Animals	0%	5%	"What are you doing looking at me?"
Conservation & Research	1%	2%	"Are you all partnered with any penguin research groups?"
Other	2%	1%	"Do they enjoy being upside down?"

Note. Some questions were coded as more than one topic, so percentages sum to more than 100%.

Fourteen of the 16 families described meeting the animals as cool, unique, and novel. Those positive feelings were often attributed to how physically close they were to the animal (12 families), if they got to touch the animal (13 families), and their up-close observations of animal behavior (9 families). One adult interview participant elaborated on why proximity was so important, saying that "all the senses are aroused, you touch the animal, you hear it, you smell it . . . therefore it's a unique experience." However, being physically close to an animal was not the only reason participants felt these experiences were unique, and three families noted that hearing stories from the facilitators helped them see the animals as individuals. A teen shared their surprise "that birds have personality. That all animals have personalities. You see it in dogs and cats. But in wild animals, [they] didn't think [that was the case]."

Discussion

The goals of ambassador animal programs are strongly linked to the mission of zoos and aquariums to foster public appreciation for wildlife (AZA, 2011). The goals of ambassador animal experiences are to educate visitors, connect visitors to animals in meaningful ways, and to inspire people to protect wildlife. While our research was exploratory in design, we purposefully asked participants in the interviews about how the program influenced their curiosity, their feelings of connections to wildlife, and how conservation is relevant to them, so we can better understand how aspects of these programs impact participants and ultimately refine these programs to maximize our impact.

Facilitation Technique

There were significant differences between the remarks participants made during encounters that used inquiry and programs that used storytelling, even when we controlled for length of encounter which increased the overall number of remarks. This study was aimed at examining the range of experiences with ambassador animals offered to visitors at the Bronx Zoo in an authentic way, and as such we did not control for the facilitator. Though we acknowledge that having multiple program facilitators may have affected the results, we believe these differences were likely minimal because differences between facilitation type were consistent. We also acknowledge that inquiry facilitated programs included more participants than storytelling programs, and while we captured group size, we did not record how many people in the group actually spoke.

Overall, both facilitation techniques were successful in fostering visitors' curiosity about animals and making connections with wildlife. During programs, inquiry facilitated programs were particularly effective in encouraging curiosity as illustrated by the abundance of questions asked by participants. Questions helped facilitators know what concepts participants already knew about the animals, but the facilitator's questions also seemed to guide participants' question topics. Thus, using an inquiry style of facilitation can potentially guide participant curiosity about specific targeted topics, or diving deeper into particular topics of interest. This approach may be particularly useful when thinking about how zoos and aquariums communicate to the public about expected content, such as an increasing transparency around animal care and engaging participants in solutions to protect wildlife (Ballantyne & Packer, 2016; Rank et al., 2018).

Ambassador animal experiences helped participants connect to animals on an individual level and for some participants, this connection seemed to extend to other animals. These connections were frequently seen and heard during the programs facilitated through storytelling, where the majority of remarks helped close the gap between participant and ambassador animal. Some of these differences may be explained by the size of the group participating in the ambassador animal program, where smaller group sizes may have led to a sense of a more personal experience. Storytelling encouraged conversations about a broader range of topics that reflected participants' specific curiosities and interests. Facilitators gained insight into these interests through the questions asked, which enabled them to personalize the encounter. Personalizing stories may be a particularly powerful tool for programs that aim to encourage a holistic interest in wildlife, especially when stories resonate with the audience in ways that they identify with the characters in the story (Kent, 2015, p. 483); with ambassador animal experiences the "characters" seemed to be the animal ambassadors but could have also potentially been the facilitator. However, storytelling may also leverage participants' environmental identity or identity as an "animal lover" to encourage new conservation-related behaviors or allow participants to reflect on their own practices.

During interviews, participants shared their thoughts about the experiences, letting us know that both programs were successful in fostering curiosity and creating connections with wildlife, even if those outcomes were not visible from the observations. These results suggest that different facilitation styles may be able to be leveraged to achieve different program outcomes. Additionally, through interviews we

learned that conservation was already relevant to participants, but neither type of facilitation style was appropriately leveraged to further engage participants in conservation.

General Curiosity

We did not observe any significant differences in the ways that participants asked questions about known (i.e., a species participants knew they would meet during the program) or surprise (i.e., a species participants did not know they would meet during the program) animals, or different types of animals during programs, despite previous research findings that suggest charismatic animals garner more intent to practice conservation behaviors (Batt, 2009; Kellert, 1984; Knight, 2008; Liordos et al., 2017; Litchfield et al., 2018; Schlegel & Rupf, 2010). A similar rate of question-asking across animals suggests that participants have a broad curiosity that was not tied to a particular species or group. This finding also begins to address one of the priority visitor research questions for AZA's Ambassador Animal Scientific Advisory Group; "does the type of animal presented make a difference in the outcomes of the experience?" (Association of Zoos and Aquariums, n.d.).

Conservation Relevance

Interviewed participants shared that they actively pursued their interest in animals during their leisure time and described themselves as "animal people" suggesting that these participants may be more knowledgeable than the general public about animals and that their interest in animals is a strong part of their identity. While participants rarely discussed conservation with facilitators during the programs (Table 4), during interviews we found that nine families engaged more deeply with the researchers about the relevance of ecological and conservation issues to them, suggesting that participants may also have a strong sense of environmental identity (Clayton & Opotow, 2003). However, only three of eight families connected a conservation issue to a solution that they heard about during their ambassador animal experience, suggesting that the ambassador animal programs alone may not increase these connections between a conservation issue and their recommended solution, rather conservation-based outcomes must have more intentional planning. As environmental identity is a strong predictor for environmental behaviors (van der Werff et al., 2013; Whitmarsh & O'Neill, 2010), there may be opportunities to leverage prior knowledge, experience, and self-identity during programs with ambassador animals to engage more deeply about complicated topics such as conservation or ecology, especially for fee-based programs similar to this study.

Connecting with Animals

During our study, program participants indicated engagement with the animals in a number of ways. They spoke about feeling closer to the animals that they met, shared their appreciation of the animals, attributed emotional states or thoughts to the animals, and physically interacted with some of the animals. These sentiments are not unique to participants at the Bronx Zoo, as Melbourne Zoo visitors describe connecting with zoo animals in similar ways (Howell et al., 2019). For participants that attributed human mental states to the ambassador animals, these attributions seem to help people connect to the animals in meaningful ways (Young et al., 2018).

Some participants indicated that they felt greater appreciation for the species as a whole, but it is unclear how those sentiments transfer to wild counterparts, how those sentiments can best be leveraged during programs for specific outcomes, and how long these positive feelings last. Remarks such as "[penguins] are like a whole other level of just being a bird!" highlighted participants' appreciation for animals after their experience. We learned that families were excited about the ambassador animal experience from our interviews and these experiences facilitated opportunities for adults and children to make positive emotional connections with the animals. Other work has demonstrated that positive

emotional states can affect people's willingness to perform prosocial behaviors in a variety of scenarios, such as at work (George, 1991) or in public spaces (Guéguen & Stefan, 2016). Animal ambassador facilitators may be able to leverage their audiences' positive moods to encourage altruistic actions that participants can take to help wildlife.

Areas of Future Research

There are still many key areas of ambassador animal research that deserve exploration. Familiarity with the animals and different classes of animals did not seem to impact engagement of our participants, however, other studies suggest that people have different sentiments towards various taxa (Batt, 2009; Bjerke & Ostdahl, 2004; Borgi & Cirulli, 2015; Colléony et al., 2017). Further exploration with a population who has a broader range of pre-existing interest in animals (e.g., during a community event outside a zoo) could provide insight into the impact of ambassador animals encounters for those who are not necessarily animal enthusiasts. In particular, some 'aversive' taxa, such as snakes, are commonly employed as ambassador animals, but few studies have explored the relationship among attitudes towards an aversive species, interaction with that species, and types of environmental behaviors that impact those species (e.g., Blevins, 2018). More importantly, few, if any studies examine the long-term persistence of positive changes in attitudes or environmental behaviors towards aversive species.

The role of inquiry in guiding participants' question topics should be explored further with an experimental design. For example, observations can be conducted on programs where natural history inquiry frames one program type, and conservation inquiry frames another set of programs. Using the same method we used - to record observations and then code remarks - we can learn if participants' questions follow the topic set by the facilitators. Using conservation as an inquiry frame will allow facilitators to explore the potential for engaging participants in complex conservation solutions. If facilitators can first assess audience familiarity with a topic and use that existing knowledge to focus the conversation, facilitators may be able to help audiences think more deeply about that topic.

We also suggest further exploration of side conversations during observations. Observational data was typically collected by one data collector, as such we did not attempt to capture side conversations, especially in larger groups. Recent studies suggest that side conversations during programs might have offered additional information on how families talk with each other about ambassador animals (Kisiel et al., 2012) and more complex science content, such as ecosystem functions (Kopczak et al., 2015). Side conversations likely also serve other purposes such as supporting meaning-making (Clayton et al., 2009). Ambassador animal experiences are memorable and unique, exploring how these experiences impact participants as part of a continuum of experiences contextualizes these experiences in life-long learning and in a social context. Ambassador animal experiences may help inform and shape participants' attitudes about animals, zoos, and conservation, as well as shape their environmental identity.

Similarly, we suggest further studying the connections that people develop with animals during ambassador animal experiences. Our participants described their ambassador animal experiences in similar ways to visitors at an Australian zoo who felt they connected with animals (Howell et al., 2019), suggesting broad applicability of the importance of proximity, interaction, attribution, and appreciation of these animals in feeling connected to them. Participants may experience connections with animals through different mechanisms, but those experiences can make people feel either positively or negatively about the experience (Myers et al., 2004). We believe that understanding the mechanisms through which these valences are produced can help us understand and influence environmental attitudes, identity, and behavior.

In conclusion, in this study of ambassador animal programs at the Bronx Zoo, facilitation style influenced participant curiosity and both program styles increased feelings of connection to ambassador animals. In particular, facilitators who prompted participants with questions about the ambassador animals were especially successful in sparking curiosity about the ambassador animals' natural and individual histories, while programs that were facilitated through a narrative fostered broader curiosity from participants. These two facilitation styles also offered opportunities for participants to feel connected

with the ambassador animals, giving participants a unique opportunity to gain insight and appreciation for species and individuals. We suggest that programs should leverage participants' enthusiasm for meeting ambassador animals and their strong environmental identities to prompt deeper conservation about conservation.

Ethics Statement

The Wildlife Conservation Society's IRB (Registration #: IORG0006735, IRB00008076; FWA: FWA00016913) approved all protocols and instruments under a full review, verifying compliance with research practices to protect human subjects. A third party notified all program participants via email that a researcher would be observing the program they were attending. If registrants did not want to be observed, they were asked to opt out via an email response. The third party also recruited a family group using a stratified random sampling method, where the group encompassed at least two people where at least one individual was a minor and one their guardian, unless there were no minors in the group. These registrants were asked via email if they were interested and willing to participate in a 15- to 20-minute long conversation about their experience. Participating guardians gave verbal consent for themselves and their children and children gave verbal assent to participate in the study prior to starting the conversation.

Acknowledgements

We have no known conflict of interest to disclose. This research was funded through a challenge grant through a partnership with experiment.com, the Association of Zoos and Aquariums, and Zoo Biology. We would like to thank Bronx Zoo staff from the animal care department, business services department, and the education department for facilitating positive and meaningful experiences with our visitors every day.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211.

Association of Zoos and Aquariums (2011, June). *Ambassador Animal Policy*. https://www.aza.org/aza-ambassador-animal-policy

Association of Zoos and Aquariums (2019). *Visitor Demographics*. https://www.aza.org/partnerships-visitor-demographics

Association of Zoos and Aquariums (n.d.). *Ambassador Animal Scientific Advisory Group*. Retrieved July 16, 2021, from https://www.aza.org/ambassador-animal-scientific-advisory-group?locale=en

Ballantyne, R., & Packer, J. (2016). Visitor perceptions of the conservation education role of zoos and aquarium: Implications for the provision of learning experiences. *Visitor Studies, 19(*2) 193-210.

Ballouard, J-M., Provost, G., Barre, D., & Bonnet, X. (2012). Influence of a field trip on the attitude of schoolchildren toward unpopular organisms: An experience with snakes. *Journal of Herpetology, 46*(3), 423-428.

Batt, S. (2009). Human attitudes towards animals in relation to species similarity to humans: A multivariate approach. *Bioscience Horizons, 2*(2), 180-190.

Bjerke, T., & Ostdahl, T. (2004). Animal related attitudes and activities in an urban environment. *Anthrozoos, 17*(2), 109-129.

Blevins, S. L. (2018). *Comparing university entomology outreach events while examining public views of arthropods and pesticides* [unpublished Master's thesis]. Virginia Polytechnic Institute and State University.

Borgi, M., & Cirulli, F. (2015). Attitudes toward animals among kindergarten children: Species preferences. *Anthrozoos, 28*(1), 45-59.

Chin, S., Hezel, S., Honda, K., & Edmunds, S. (2017). Designing to foster connection and inspire action. *Exhibition: A Journal of Exhibition Theory & Practice for Museum Professionals*, *Spring*, 32-41.

Cialdini, R. B., Brown, S. L., Lewis, B. P., Luce, C., & Neuberg, S. L. (1997). Reinterpreting the empathy-altruism relationship: When one into one equals oneness. *Journal of Personality and Social Psychology, 73*(3), 481-494.

Clayton, S., Fraser, J. & Saunders, C. (2009). Zoo experiences: Conversations, connections, and concern for animals. *Zoo Biology, 28*(5), 377-397.

Clayton, S. & Opotow, S. (2003). *Identity and the natural environment: The psychological significance of nature*. MIT Press.

Colléony, A., Clayton, S., Couvet, D., Saint Jalme, M., & Prévot, A.-C. (2017). Human preferences for species conservation: Animal charisma trumps endangered status. *Biological Conservation, 206*, 263-269.

Creswell, J. W. & Poth, C. N. (2018). *Qualitative inquiry & research design: Choosing among five approaches* (4th ed.). Sage Publications, Inc.

D'Cruze, N., Khan, S., Carder, G., Megson, D., Coulthard, E., Norrey, J., & Groves, G. (2019). A global review of animal–visitor interactions in modern zoos and aquariums and their implications for wild animal welfare. *Animals, 9*(6), 332.

Falk, J. H., & Adelman, L. M. (2003). Investigating the impact of prior knowledge and interest on aquarium visitor learning. *Journal of Research in Science Teaching, 40*(2), 163-176.

Falk, J. H., Reinhard, E. M., Vernon, C., Bronnenkant, K., Heimlich, J., & Deans, N. L. (2007). *Why zoos & aquariums matter: Assessing the impact of a visit to a zoo or aquarium*. Association of Zoos Aquariums.

Fančovičová, J., & Prokop, P. (2018). Effects of hands-on activities on conservation, disgust, and knowledge of woodlice. *Eurasia Journal of Mathematics, Science, and Technology Education, 14*(3), 721-729.

Fritz, C. O., Morris, P. E., & Richler, J. J. (2012). Effect size estimates: Current use, calculation, and interpretation. *Journal of Experimental Psychology, 141*(1), 2-18.

Genovesi, J. S. (2011). *An exploratory study of a new educational method using live animals and visual thinking strategies for natural science teaching in museums* [unpublished Doctoral dissertation]. Drexel University.

George, J. M. (1991). State or trait: Effects of positive mood on prosocial behaviors at work. *Journal of Applied Psychology, 76*(2), 299-307.

Gifford, R., & Sussman, R. (2012). Environmental attitudes. In S. D. Clayton (Ed.), *The Oxford handbook of environmental and conservation psychology* (p.99). Oxford University Press.

Guéguen, N., & Stefan, J. (2016). "Green altruism": Short immersion in natural green environmental and helping behavior. *Environment and Behavior, 48*(2), 324-342.

Howell, T. J., McLeod, E. M., & Coleman, G. J. (2019). When zoo visitors "connect" with a zoo animal, what does that mean? *Zoo Biology, 38*(6), 461-470.

JASP Team (2019). JASP (Version 0.11.1)[Computer software] https://jasp-stats.org/

Kellert, S. R. (1984). American attitudes toward and knowledge of animals: An update. In M. W. Fox & L. D. Mickley (Eds.), *Advances in animal welfare science 1984/85* (pp. 177-213). The Humane Society of the United States.

Kent, M. L. (2015). The power of storytelling public relations: Introducing the 20 master plots. *Public Relations Review, 41*, 480-489.

Kisiel, J., Rowe, S., Vartabedian, M. A., & Kopczak, C. (2012). Evidence for family engagement in scientific reasoning at interactive animal exhibits. *Science Education, 96*(6), 1047–1070.

Knight, A. J. (2008). "Bats, snakes, and spiders, Oh my!" How aesthetic and negativistic attitudes and other concepts predict support for species protection. *Journal of Environmental Psychology, 28*(1), 94-103.

Kopczak, C., Kisiel, J., & Rowe, S. (2015). Families talking about ecology at touch tanks. *Environmental Education Research, 21*(1), 129-144.

Kreger, M. D., & Mench, J. A. (1995). Visitor-animal interactions at the zoo. *Anthrozoos, 8*(3), 143-158.

Lewis, W. J. (1991). *Interpreting for park visitors*. Eastern Acorn Press.

Liordos, V., Kontsiotis, V. J., Anastasiadou, M., & Karavasias, E. (2017). Effects of attitudes and demography on public support for endangered species protection. *Science of the Total Environment, 595*, 25-34.

Litchfield, C. A., Lowry, C., & Dorrian, J. (2018). Recycling 115,369 mobile phones for gorilla conservation over a six-year period (2009-2014) at Zoos Victoria: A case study of 'points of influence' and mobile phone donations. *PLoS ONE, 13*(12), e0206890.

Luebke, J. F. (2018). Zoo exhibit experiences and visitors' affective reactions: A preliminary study. *Curator, 61*(2), 345-352.

Luebke, J. F., & Matiasek, J. (2013). An exploratory study of zoo visitors' exhibit experiences and reactions. *Zoo Biology, 32*, 407 – 416.

Luebke, J. F., Watters, J.V., Packer, J., Miller, L. J., & Powell, D. M. (2016). Zoo visitors' affective responses to observing animal behaviors. *Visitor Studies, 19*(1), 60-76.

Manion, K. (2013). *The effect of different learning experiences with African penguins (Spheniscus demersus) on zoo visitor knowledge, attitude, and behavior* [Unpublished master's thesis]. George Mason University.

McLeod, E., & Rawson, S. (2019) Lord Howe Island stick insect encounters: Does anyone care? *International Zoo Educators Association Journal, 55*,44-49.

Miller, L. J., Zeigler-Hill, V., Mellen, K., Koeppel, J., Greer, T., & Kuczaj, S. (2013). Dolphin shows and interaction programs: Benefits for conservation education? *Zoo Biology, 32*, 45-53.

Morgan, J. M., & Gramann, J. H. (1989). Predicting effectiveness of wildlife education programs: A study of students' attitudes and knowledge toward snakes. *Wildlife Society Bulletin, 17*(4), 501-509.

Myers Jr., O. E., Saunders, C. D., & Birjulin, A. A. (2004). Emotional dimensions of watching zoo animals: An experience sampling study building on insights from psychology. *Curator, 47*(3), 299-321.

National Research Council (2009). *Learning science in informal environments: People, places, and pursuits* (P. Bell, B. Lewenstein, A. W. Shouse, & M. A. Feder (Eds.)). The National Academies Press.

Newberry, M., Fuhrman, N., & Morgan, A. (2017). Naming "animal ambassadors" in an educational presentation: Effects on learner knowledge retention. *Applied Environmental Education and Communication, 16*(4), 223-233.

Onwuegbuzie, A. J., & Collins, K. M. T. (2007). A typology of mixed methods sampling designs in social science research. *The Qualitative Report, 12*(2), 281-316.

Pitt, D. B., & Shockley, M. (2014). Don't fear the creeper: Do entomology outreach events influence how the public perceives and values insects and arachnids? *American Entomologist, 60*(2), 97-100.

Povey, K. D. (2002). Close encounters: The benefits of using education program animals. In *Proceedings of the Association of Zoos and Aquariums Annual Conference* (pp. 117-121). Association of Zoos and Aquariums.

Povey, K. D., & Rios, J. (2002). Using interpretive animals to deliver affective messages in zoos. *Journal of Interpretation Research, 7(2)*, 19-28.

Powell, R. B., & Stern, M. J. (2013). Is it the program or the interpreter? Modeling the influence of program characteristics and interpreter attributes on visitor outcomes. *Journal of Interpretation Research, 18*, 45-60.

Punch, K. F. (2014). *Introduction to social research quantitative and qualitative approaches*. Sage Publications Ltd.

Rank, S. J., Voiklis, J., Gupta, R., Fraser, J. R., & Flinner, K. (2018, June 7-9). Understanding organizational trust of zoos and aquariums. In K. P. Hunt, D. M. Wald, M. Dahlstrom, & S. Qu (Chairs), *Understanding the role of trust and credibility in science communication* [Symposium]. Iowa State University 6th Summer Symposium on Science Communication, Ames, IA, United States.

Reynolds, B. R., Salamander, T., & Wilson, T.P. (2018) A walk in the woods: Changing student attitudes towards amphibians and reptiles. *Creative Education, 9*(2), 182-191.

Schlegal, J., & Rupf, R. (2010). Attitudes towards potential animal flagship species in nature conservation: A survey among students of different educational institutions. *Journal for Nature Conservation, 18*(4), 278-290.

Schueler, D. S., & Newberry, M. G. III (2019). Animal ambassador interpretation techniques and its impact on connectedness to nature, *Applied Environmental Education & Communication, 19*(2), 259-273.

Skibins J., & Powell, R. (2013). Conservation caring: Measuring the influence of zoo visitors' connection to wildlife on pro-conservation behaviors. *Zoo Biology, 32*(5), 528-540.

Spooner, S. L., Farnsworth, M. J., Ward, S. J., & Whitehouse-Tedd, K. M. (2021). Conservation education: Are zoo animals effective ambassadors and is there any cost to their welfare? *Journal of Zoological and Botanical Gardens, 2*, 41-65.

Stern, M. J., & Powell, R. B. (2013). What leads to better visitor outcomes in live interpretation? *Journal of Interpretation Research, 18*, 9-43.

Stern, M. J., Powell, R. B., McLean, K. D., Martin, E., Thomsen, J. M., & Mutchler, B. A. (2013). The difference between good enough and great: Bringing interpretive best practices to life. *Journal of Interpretation Research, 18*, 79-100.

Sundin, A., Andersson, K., & Watt, R. (2018). Rethinking communication: Integrating storytelling for increased stakeholder engagement in environmental evidence synthesis. *Environmental Evidence, 7*, (6)

van der Werff, E., Steg, L., & Keizer, K. (2013). The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behavior. *Journal of Environmental Psychology, 34*, 55-63.

Visscher, N. C. Snider, R., & Vander Stoep, G. (2009). Comparative analysis of knowledge gain between interpretive and fact-only presentations at an animal training session: An exploratory study. *Zoo Biology, 28*(5), 488-495.

Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviors. *Journal of Environmental Psychology, 30*, 305-314.

Young, A., Khalil, K. A. & Wharton, J. (2018). Empathy for animals: A review of the literature. *Curator, 61*(2), 327-343.