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Animals in Environmental Education: Assessing Individuals' Emotional Reactions to Interactions with Wildlife

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Abstract

Environmental education (EE) programs, when combined with human-wildlife interactions (HWI), can trigger emotions, an essential part of attitudes that influence pro-environmental behaviors (PEB). We used participant observation and a post-event evaluation survey to investigate emotional response to HWI among participants from marine educational programs at the University of Georgia Marine Education Center and Aquarium, Savannah, GA. We found that during HWI participants demonstrated positive (e.g., empathy) and negative emotions (e.g., frustration) with animals, including misconceptions and negative perceptions toward snakes and horseshoe crabs. In addition, outdoor exploration, contact with wildlife (direct or indirect), biofacts exhibitions and live animal presentations were the practices that most engaged participants in the programs, indicating that animals (e.g., turtles and crabs) can increase participants' interest in educational activities. By incorporating wildlife in EE practices, educators can engage individuals in activities and stimulate their emotional attachment to animals, which can encourage changes in perceptions, leading to PEBs necessary for environmental conservation.

Keywords: animal ambassadors; animals in education; environmental education; human-wildlife interactions; pro-environmental behaviors

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Introduction

The marine environment is essential to human existence as coastal ecosystems provide humans with ecological, socioeconomic and cultural benefits (Barbier, 2017). Saltmarsh ecosystems along the eastern U.S. Atlantic coast, for example, protect shorelines from erosion and floods, maintain healthy water quality, serve as a nursery and refuge habitat for many species (South Carolina Department of

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Natural Resources, 2016), and provide people with food and support recreational and tourism activities (Stedman & Dahl, 2008).

Nevertheless, salt marshes are highly threatened. Unmanaged coastal development, which consumes forests and increases the amount of impervious surface, and the introduction of invasive species are some examples of unsustainable human practices (South Carolina DNR, 2016). It is estimated that at least half of the world's salt marshes have been lost or degraded due to overdevelopment and pollution (Barbier, 2017). In the coastal watersheds of the eastern U.S., for instance, there was an estimated wetland loss of 361,000 acres between 1998 and 2004 (Stedman & Dahl, 2008), and salt marshes from Georgia have been contaminated by heavy metals from anthropogenic practices such as industrial activities (Alberts et al., 1990; Horne et al., 1999; Blanvillain et al., 2007). Anthropogenic threats posed to the salt marsh concern other ecosystems as marine ecosystems are not isolated, rather they are interconnected across an interface between land and sea (Barbier, 2017). Consequently, adverse practices result in social, economic and ecological impacts on a global scale. Therefore, a change in human knowledge, attitudes, and behavior can lead to pro-environmental behaviors (PEBs) among both the general public and land managers/developers that are imperative to promote the conservation of ecosystems that humans depend upon for food and lifestyle activities.

To facilitate PEBs, educational interventions, such as environmental education (EE), are necessary. EE is "a process that allows individuals to explore environmental issues, engage in problem-solving, and take action to improve the environment" (U.S. Environmental Protection Agency, 2018, p. 1). This process of exploration, engagement, and action towards environmental solutions is only possible with knowledge about, and concern for, the environment and its problems (Stapp et al., 1969). By providing people with knowledge and skills, it is possible to promote awareness, which can change attitudes (Gardner & Stern, 1996) and, perchance, motivate behavior toward conservation. However, to efficiently move people from awareness to action and encourage sustainable development, it is important to have a better understanding of human behavior, which can be obtained by "understanding the interrelationship of cognitive concepts such as attitudes, values, and norms with affective concepts such as mood and emotion" (Manfredo, 2008, p. 51).

Indeed, emotions influence PEBs (Steg & Vlek, 2009; Gifford, 2014) and interactions with wildlife can give rise to powerful emotional reactions in individuals (Kellert, 1996; Ballantyne et al., 2011; Jacobs, 2009). When integrated in EE activities that include captive animals can encourage emotional connections between humans and animals (Hacker & Miller, 2016). Human experiences with wildlife can evoke positive and negative emotions (Schänzel & McIntosh, 2000) that can determine human perceptions (Ballantyne & Packer, 2013), relationships, and responses to wildlife (Jacobs et al., 2012). Specifically, positive emotions can attract people to seek out wildlife (Manfredo, 2008; Jacobs, 2009), play a positive role in environmental attitudes (Berenguer, 2007; Fuhrman, 2007), and when induced for animals in natural settings, emotions can trigger responsible environmental behaviors toward wildlife (Ballantyne & Packer, 2013). When used in teaching, animal ambassadors (animals that engage with the public with the purpose of conservation) can increase peoples' attendance at environmental programs, help individuals to retain knowledge (Newberry et al., 2017), inspire individuals' empathy for animals (Fuhrman, 2007), and improve presenter's communication skills (Fuhrman & Rubenstein, 2017).

Because human-wildlife encounters induce strong emotions (Jacobs et al., 2012), animals are more likely to be remembered by individuals (Reisberg & Hertel, 2003). Remembering these experiences is important because they have the capacity to "reawaken human connection with the natural world" (Curtin & Kragh, 2014, p. 546), which is essential considering the increase in urbanization and overexploitation of natural resources. In a marine education center, these experiences may take on the form of live animal presentations and observations, which allows the public to observe animals up close and learn about the biology and ecology of marine species. Experiences where contact

with wildlife during outdoor exploration activities is promoted can even influence environmental concern and support for conservation (Dutcher et al., 2007). However, there is a need to explore the emotional outcomes of these experiences on audiences with limited exposure to the environment and the animal ambassadors used to deliver EE (Fuhrman, 2007; Newberry et al., 2017).

Our findings contribute to literature regarding EE experiences necessary to foster the public's engagement in marine conservation through marine education centers and Cooperative Extension activities, which are equally imperative to reduce anthropogenic impacts on the marine environment. Given the importance of evaluating emotions and considering the low number of studies on this topic (Manfredo, 2008; Jacobs et al., 2012; Ballantyne & Packer, 2013), especially on marine and coastal animals, the rationale for this study is justified.

This study also reflects the values of the American Association for Agricultural Education, research priority four in "promoting meaningful, engaged learning in all environments" (Roberts et al., 2016, p. 37). We sought to determine the most effective model for delivering non-formal environmental education lessons to nontraditional youth and adult audiences. Our study focused on customer satisfaction with the lessons presented, and emotional reactions to learning with animals and biofacts.

Purpose and Objectives

The purpose of the study was to evaluate individuals' emotional reactions to wildlife interactions through single exposure activities with environmental exhibits and captive animal ambassadors in a nature center-type setting. The specific objectives of the study were to:

- Describe individuals' emotional reaction to wildlife interactions in a nature center-type setting.
- Describe individuals' perceptions and misconceptions of wildlife.
- Describe individuals' interactions with the marine environment.
- Describe individuals' response to environmental education activities.
- Identify best educational practices to engage individuals with the goal of inspiring PEBs.

Theory of Planned Behavior (TPB) and Pro-Environmental Behaviors (PEBs)

Ajzen's (1991) theory of planned behavior (TPB) was developed from the theory of reasoned action (Fishbein & Ajzen, 1975) that assumed behavior is determined by intention. The TPB is focused on the individual's intention to perform a behavior, which is considered to be indicators of "how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior" (Ajzen, 1991, p. 181). The TPB presumes that the variables "attitude toward the behavior," "subjective norm," and "perceived behavioral control" are predictors of intention, which precede behaviors (Ajzen, 1991, p. 188). The first prediction of intention, attitude toward the behavior, relates to how one feels and thinks about the behavior in question. The second variable, subjective norm, refers to the support given by others to perform the behavior. Finally, the third variable, perceived behavioral control, refers to how one perceives their ability and confidence to perform the behavior, considering barriers and challenges (Ajzen, 1991).

According to Kurisu (2015), the TPB model helps in understanding the key factors for PEBs and the associations between them. PEBs are defined as "behaviors that harm the environment as little as possible" (Steg & Vlek, 2009, p. 309) or even "behaviors conducted through the motivation to conserve the environment and actually contribute to environmental conservation" (Kurisu, 2015, p. 3). These behaviors are influenced by many factors, such as individuals' ethics, beliefs, values (Gardner & Stern, 1996), environmental concerns (Bogner & Wiseman, 1999), knowledge, sociodemographic characteristics (Kurisu, 2015), and also attitudes (Steg, 2009).

Attitudes, an important component of the TPB (Ajzen, 1991), are defined as "the sum total of a [person's] inclinations and feelings, prejudice or bias, preconceived notions, ideas, fears, threats, and convictions about any specified topic" (Thurstone, 1928/1967, p. 77), and are structured into three

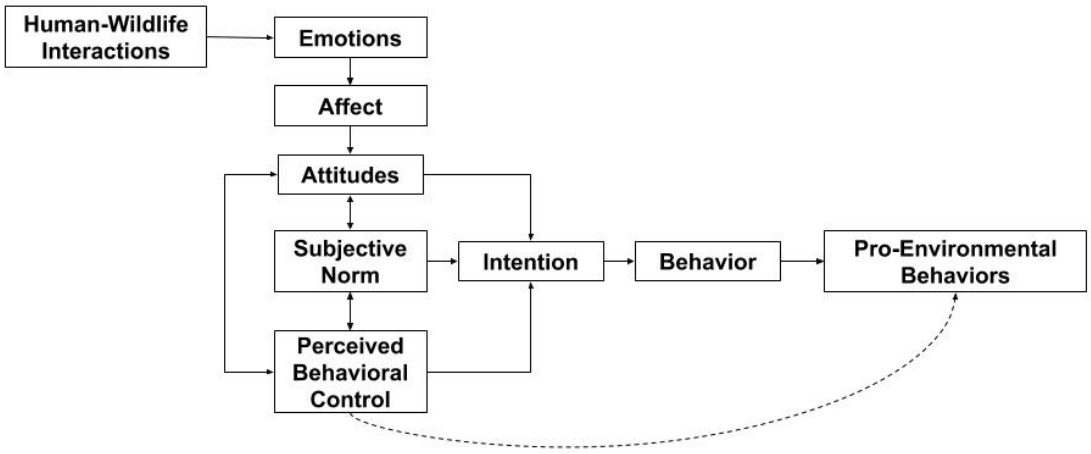
components: affect, behavior, and cognition (Triandis, 1971). In particular, the affect component is considered the most essential part of attitudes (Fishbein & Ajzen, 1975), and has a primary influence on individuals' decisions to perform PEBs (Steg & Vlek, 2009).

In general, affect refers to feeling states that humans experience (Manfredo, 2008), and emotions are an important component of it (Gifford, 2014). Emotions are known to influence PEBs as a consequence of their impact on attitudes (Ballantyne & Packer, 2013). However, the majority of behavior models tend to focus more on cognitive factors (e.g., knowledge) rather than affective factors, such as emotions (Ballantyne & Packer, 2013). Thus, considering the important role of affect, specifically emotions, in PEBs, we applied the TPB to understand the human emotions triggered by human-wildlife interactions (HWI) and how those emotions might inform likelihood to engage in PEBs.

We used the TPB as a lens to propose a model (Figure 1) to demonstrate how emotions resulting from HWI play an important role in PEBs. The inclusion of emotions in this model can provide insights to better understand HWI (Jacobs et al., 2012).

Figure 1

Model Adapted from the Theory of Planned Behavior (Ajzen, 1991)



The model illustrates how HWI trigger emotions (Ballantyne et al.,2001; Jacobs, 2009). Emotions are a component of affect (Gifford, 2014), which is the most essential part of attitudes (Fishbein & Ajzen, 1975). Attitudes affect intentions to perform a range of behaviors (Ajzen, 1991), including PEBs (Kurisu, 2015), which, positively influences overall environmental quality. In the context of the current study, this model posits that a visitor's interaction with, for example, a blue crab (*Callinectes sapidus*) at a marine education center would trigger positive emotions within participants, such as joy, and this emotion could play a positive role in attitudes leading to PEBs.

Methods

Research Approach

The study was framed methodologically from an interpretivist approach, which examines "things in their natural settings, attempting to make sense of, or interpret phenomena in terms of the meanings people bring to them." (Denzin & Lincoln, 1994, p. 3), to better understand participants' emotional response to wildlife interaction during six different marine educational experiences. To interpret the events through a sense-making process and provide a contextually rich, comprehensive description of the phenomenon of interest, we used participant observation and a post-experience satisfaction survey to collect data (Creswell & Creswell, 2017).

Context of the Study

The programs observed were offered from June 4th to July 30th, 2019, at the University of Georgia (UGA) Marine Education Center and Aquarium, Savannah, GA, which is part of the UGA Marine Extension and Georgia Sea Grant system. The summer public programs have been delivered at the UGA Marine Education Center and Aquarium since 2017.

The 2019 version of the summer public programs was composed of four educational experiences, including: (a) Toddler Touch Tanks, (b) Turtle Tuesdays, (c) Behind the Scenes, and (d) Family Field Trips to a maritime forest, marsh mucking, crabbing, and fishing. We investigated all experiences, except the fishing experience (Table 1).

Table 1

Description of the Marine Extension Public Educational Experiences at the UGA Marine Education Center and Aquarium

Experience	Description	Duration	Target audience
Family field trip: Salt marsh	Exploration of the saltmarsh environment and its organisms through hands-on activities (microscope observation and a guided walk through the salt marsh).	2 hours	Children ages 5 and above (accompanied by an adult)
Family field trip: Crabbing	Education on blue crabs during a catch-and-release crabbing lesson.	2 hours	10 years and up (accompanied by an adult)
Family field trip: Maritime forest	Guided hike with educators that include interactive games and scavenger hunts. Before looking for animals in their natural habitat, visitors interact with alligators, snakes, and turtles in the aquarium.	2 hours	Children ages 5 and up (accompanied by an adult)
Turtle Tuesdays	Introduction of the aquarium's ambassadors : diamondback terrapins, box turtles, loggerhead sea turtles, and gopher tortoises.	1 hour	General public
Toddler touch tanks	A mix of games, art, stories and animal encounters that provide a fun learning experience about the ocean.	1 hour	2 to 5 years old (accompanied by an adult)
Behind the scenes	Exploration of the aquarium and behind-the-scenes area led by staff. Highlights include seeing the food prep room and observing the seahorse feeding.	1 hour	Children ages 5 and up (accompanied by an adult)

The educational experiences, usually led by one educator and an intern, occurred once a week during June and July of 2019. Each experience had a suggested age range (from toddlers to +55) and cost (from $4 to $15). For most of the activities, individuals were able to register in advance and complete the payment online. Aquarium visitors were also invited by the program coordinator and summer intern to participate while paying for their aquarium visit.

Population and Subject Selection

The target population of this study was adults (+18 years old) who enrolled in one of the six educational experiences developed by the UGA Marine Education and Aquarium staff offered summer, 2019. Adults were chosen because they make more trustworthy subjects than children and youth (Creswell & Creswell, 2017). However, observation of individuals under the age of 18 was also

conducted simultaneously as most adult participants were escorting children to the events. The UGA institutional review board determined that the study was exempt.

Instrumentation

We collected the data using a post-experience satisfaction survey and participant observation protocol (Creswell & Creswell, 2017). We administered the survey after activities in which the majority of the participants were adults, including Behind the Scenes and Family Field Trips to a salt marsh, maritime forest, and crabbing activity as during these activities, adults (target population) participated, rather than just accompanying children as was the case for the Turtle Tuesdays and Toddler Touch Tanks experiences. The intent of the survey was to measure the overall experience and satisfaction of participants, including their intention to conserve the marine environment following participation and engage in PEBs. At the end of the activities, we invited participants (over 18 years old) to complete the survey, which was optional.

Participant Observation

We employed participant observation to capture physical behavior, gestures and behavioral responses (expression of emotion) to wildlife, which were indicated by facial movements, spoken comments, and body language (Mack et al., 2005). We completed observation notes after each educational experience based on an observation protocol designed by the University of Minnesota (Carlson et al., 2009). The protocol contained questions related to the characteristics of the environment where activities happened, description of educational activities performed, participants' behavior and engagement in activities, interactions among participants, and questions asked by the audience.

In June the lead author conducted pilot observations of participants' experiences for two weeks to analyze the dynamics of the Marine Educational Center to better understand what aspects of the events should be observed. During this time, the lead author acted as the observer, having minimal involvement in the activities and social setting being studied (Gold, 1958).

The next set of observations were made using the complete participant observation role in which the lead author was part of the setting and concealed her role (Gold, 1958). She engaged in long and direct interactions with participants with unobtrusive measures. She chose the active observer role because the she worked as the facilitator for some of the educational experiences as a summer intern, which enabled her to control the activities, talk to participants, watch their reactions up close, and observe within the boundaries of a teacher-student dynamic. Observations of the setting and participants started from the moment of participants' registration in the experiences (usually 20 minutes before the event begin), in which informal conversations took place. Observations ended as soon as participants left the setting.

Interaction was facilitated by using Georgia coastal animals (e.g., *Terrapene carolina carolina* - Eastern box turtles, *Callinectes sapidus* - blue crabs, *Limulus polyphemus* - horseshoe crabs, and *Pantherophis guttatus* - corn snakes) as teaching tools that allowing participants to see and touch the animals during the activities. Confirmability and trustworthiness was enhanced by taking detailed notes of participants' verbatim statements and conversations as well as comparing and checking observations made with other educational staff immediately following each activity.

Data Analysis

Observational Data Analysis

The observational data were analyzed following the latent content analysis method, which consisted of searching the texts for meaning and constructing themes to address the research questions (Babbie, 1992; Dunn, 2010). The handwritten notes taken after each activity were typed, cleaned, and coded according to a code book. Similar codes were grouped together and organized into themes that summarized the observations made.

Survey Data Analysis

Adult participants completed an optional satisfaction survey after the Behind the Scenes and Family Field Trips (salt marsh, maritime forest, and crabbing) activities. In total, 40 adults participated in these activities, 29 responded to the survey for a response rate of 72.5%. Descriptive statistics were used to analyze the quantitative data (mean and frequency) using Excel®. Responses from open-ended questions were coded, separated into categories and then organized into themes.

Results and Discussion

Participants and Educational Experiences Observed

The lead author observed 13 of 32 educational experiences that were offered between June and July, 2019. There were 305 participants in 13 activities. Most of the participants (approximately 87%) were white and were accompanied by family members. Most participants found out about the public programs on Facebook, online (other websites) and Email. Participants' ages ranged from 2 to 55+ years.

Individuals' Emotional Reaction to Wildlife Interactions

Positive Emotions

Participants' positive emotional reactions when interacting with animals used as ambassadors in the activities were indicated by the expression of empathy, excitement, joy, pride surprise, curiosity, and astonishment. These emotions were demonstrated by smiles, laughs, eyebrows raised, and expressions such as "wow" and "really?" when seeing animals up close and when touching them.

Participants demonstrated empathy when desiring to protect animals and ensure they would not be harmed when being touched. For example, some participants seemed empathetic when choosing to not touch crabs as they did not want to disturb and stress animals, when trying to release a fish back to the river as quickly as possible, when wondering if species would hurt each other in the aquarium's tank, and when asking if it was okay to touch turtles. Similar findings were reported by Ballantyne et al. (2011) in which some visitors were concerned about their impact on animals' wellbeing, and in Fuhrman's (2007) study in which individuals were worried about injuring animals if they touched them.

Excitement was demonstrated by children prior to seeing blue crabs and mud crabs (*Armases cinereum* and *Uca pugnax*) up close outdoors, and when seeing seahorses and freshwater turtles feeding in the aquarium. Joy was demonstrated by nearly all participants when they saw and touched turtles, and when seeing bottlenose dolphins (*Tursiops truncates)* and ospreys (*Pandion haliaetus)*, which are animals not easily seen in nature, during family field trip activities. Also, children were joyful when seeing skeleton shrimp and barnacles under the microscope, when seeing mud fiddler crabs' dance (movement to draw females' attention) and when trying to catch small crabs in the salt marsh. Pride was observed as participants caught crabs during the crabbing experience. Adults demonstrated surprise when learning specific animal facts. Adults demonstrated curiosity when asking questions about oyster toadfish (*Opsanus tau*), pipefish (*Syngnathinae*), clearnose skates' eggs (*Raja eglanteria*), and horseshoe crabs in the aquarium. Astonishment was expressed by participants (adults and children)

when seeing horseshoe crabs' underside that contained its legs, gills, and mouth; this led some children and adults to not touch them.

In summary, most participants had positive experiences when interacting with live animals. This result agrees with previous studies wherein visitors demonstrated positive emotions, such as amazement and fascination when encountering wildlife in tourism experiences (Schänzel & McIntosh, 2000). The positive interactions of humans with animals, especially with wild animals, are likely to increase visitor's satisfaction and engage participants emotionally (Kellert, 1996; Farber & Hall, 2007), which produced empathy and a desire to positively impact the animals' habitat through PEBs.

Negative Emotions

Participants' negative emotional reactions when interacting with animals were indicated by the expression of frustration, disappointment, and impatience. These emotions were related to the desire to see animals up close and interact with them, indicating that participants sought to have close interactions with animals. For instance, frustration was demonstrated by children when they could not see zooplankton under the microscope and when they could not catch a blue crab during the crabbing experience. Adults also demonstrated disappointment when unable to catch blue crabs, when not allowed to hold turtles (just touching was allowed to protect the animals), and when learning it was illegal to own a gopher tortoise (*Gopherus polyphemus*) as a pet.

Children demonstrated impatient behaviors when asked to wait five minutes before checking the crabbing net to see if they caught a crab, and adults demonstrated impatience when waiting for the sea turtle to eat its food during the Turtle Tuesdays activity. These findings are similar to previous research in which visitors demonstrated dissatisfaction when not able to get close to wildlife (Schänzel & McIntosh, 2000) as visitors' satisfaction was associated with close contact with animals, which has the potential to provide memorable experiences (Chapman, 2003; Manfredo, 2008). HWI can be facilitated by providing pre-planned teachable moments in which educators could point out animals and their biofacts (footprints, feathers, and bones) during nature walks.

Individuals' Perceptions and Misconceptions of Wildlife

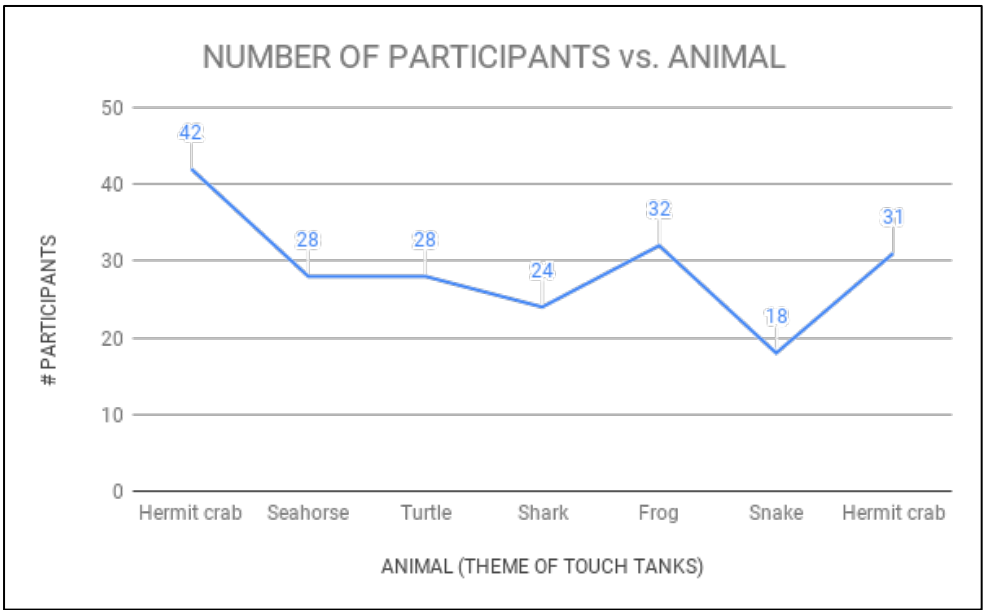
During observations, the lead author noticed that some participants had misconceptions or negative perceptions of some animals. For example, one child and two adults thought that the horseshoe crab tail was a stinger and one male adult thought that horseshoe crab's blood was used to dye clothes. Some participants avoided touching horseshoe crabs for thinking that the animal could be harmful (due to its stinger) or when thinking that its underbody looked "disgusting" (a word used by a female adult participant).

Although some participants presented misconceptions and negative perceptions of horseshoe crabs, when considering participants' reactions and curiosity, these animals received the most attention from participants. Most adults expressed surprise when listening to information about horseshoe crabs' sexual dimorphism, and blood (used to prevent contamination of bacteria in medical devices). This was confirmed when, on the survey, two adults stated that the "info about the horseshoe crabs" was surprising. The attention created by the horseshoe crabs might be due to its unique shape and its leg and tail movements, which can be slightly intimidating. In fact, Kellert (1996, p. 90) argued that individuals' attraction to animals "is often found to be greatly influenced by color, shape, movement and visibility" of the species. Participants' interest in horseshoe crabs might indicate that this animal has the potential to be a charismatic fauna; however, the negative perception of horseshoe crabs presented by some participants in this and other studies (Kwan et al., 2017) might be a barrier that can be overcome by the introduction of educational programs focusing on horseshoe crabs' ecological relevance.

Snakes were also regarded as undesirable animals by adults. This was not only noticed during conversations, or when some female adults avoided looking into the snakes' tank but it was also clearly demonstrated as the number of participants decreased during the snakes' week of the Toddler Touch Tanks activity (Figure 2).

Figure 2

Number of Participants Who Attended the Toddler Touch Tanks Program by Species June-July, 2019



There were 35 participants previously registered in the snake week of the Toddler Touch Tanks activity; however, after learning that snakes would be the animal of the week, only 18 participants attended. Indeed, a woman sent an email requesting the cancellation of her (and her children's) participation and stated, "Unfortunately, we are not into snakes. Therefore, I would like to cancel our reservations. Maybe next time." Also, during the frog week of the Toddler Touch Tank program, a female adult asked, "what is the animal theme next week?" and she reacted negatively and expressed disappointment when she learned it was snakes.

Although the number of participants in the snake week was the lowest compared to the other weeks, 70% of the children touched and interacted with the snakes during the Toddler Touch Tank experience, which may indicate that adults were avoiding snakes on behalf of their children. This negative perception of snakes is consistent with claims in previous studies that found that snakes were negatively viewed by the general public (Özel et al., 2009). Bixler et al. (1994, p. 31) argued that fears "pose barriers to enjoying and learning about wildlands." Therefore, the addition of educational programs, especially those of long-term duration, is imperative for reducing negative perceptions and fears of the environment (Emmons, 1997).

Participants' Response to Educational Experiences

Outdoor explorations, observations and contact with wildlife, live animal ambassadors, and animal biofacts exhibitions were the activities in which families demonstrated the highest level of engagement and excitement. This was demonstrated when participants listened attentively to educators, expressed excitement during interactions with animals, and fully participated in activities when expected.

Outdoor Explorations

The outdoor salt marsh exploration activity was exciting for children, especially when they interacted with mud fiddler crabs and sea snails in the saltmarsh. Indeed, a woman stated on the survey that her son "loved crab catching", and there were also multiple answers from adults on the survey stating that "crab catching" and "marsh exploration" were their favorite activities.

During the nature trail walk of the maritime forest activity, a child expressed curiosity when seeing a spider on a cabbage palm tree and a blue-tailed skink on the forest floor; he stopped to admire and observe both animals that were pointed out by the educator for a minute. When participants from this activity were asked what their favorite part was, some respondents stated, "hike and all the observations" and "the nature walk."

Including outdoor experiences was a positive experience for participants that stimulated their curiosity and appreciation for nature. Beyond that, outdoor exploration can have positive impacts on individuals' knowledge, behavior, and attitudes towards the environment (Bogner, 1998; Mittelstaedt et al., 1999; Eaton, 2000). Therefore, educators should consider providing individuals this type of experience, in which environmental conservation aspects are approached.

Furthermore, children discovered signs of animal movement when on nature hikes. For example, children were interested in deer tracks that they saw on the beach, and they wondered how big the deer were. Similarly, a child saw a bone from a dead animal in the forest and expressed excitement. He wanted to keep part of the bone but was convinced by his mother that it was not a good idea. Signs from wildlife can also garner attention from participants, providing moments of learning and connection with nature, even if the animal is not necessarily alive or present. This finding is similar to McIntosh and Wright (2017) who found that signs of wildlife (e.g., visual cues) can create meaningful experiences for participants.

Observations and Contact with Wildlife

Contact with wildlife increased visitors' satisfaction with their overall learning experiences. During the salt marsh exploration activity, participants, especially children, demonstrated excitement during the zooplankton observation under the microscope. An adult commented on the survey, "the microscope discovery was amazing." and "the microorganisms were surprising." During the crabbing activity, children and adults were excited about crabbing and they were also very engaged in the activity. Most of the participants held blue crabs and all participants properly released the crabs in the water after catching them. When asked about their favorite part, some adults provided the following answers, "Everyone caught something," "Catching the crabs in the net," and "I thoroughly enjoyed the crabbing and picking up my own crab."

Live Animal Ambassadors in Educational Presentations

Using live animals as ambassadors in the educational presentations stimulated participants' learning engagement and respectful behaviors toward the animals. During the reptile talk of the maritime forest exploration activity, participants were excited to interact with reptiles and learn more about them. Adults and children touched turtles, snakes, and alligators gently, and they enjoyed the activity. When asked about their favorite part, some respondents stated that the reptile interaction was their favorite by writing, "Seeing reptiles up close" and "The little alligators + reptiles." Likewise, in the Turtle Tuesdays experience, participants were active and excited to interact with turtles. Multiple questions about the turtles were asked, for example, turtles' age, sexual dimorphism, names, how big they can get, how long they can live, and where they came from. When allowed to touch turtles, children

were the first to come forward, followed by adults. All participants were respectful when touching the turtles and parents ensured their children were careful. Similarly, in the Toddlers Touch Tanks activity, the toddlers also positively interacted with live animals while respecting them.

Our findings agreed with the literature that teaching with wildlife can potentially increase participants' knowledge retention (Newberry et al., 2017). Contact with wildlife can foster environmental learning (Ballantyne & Packer, 2002) and concern for the environment through empathy (Fuhrman, 2007). Therefore, both practices should be introduced in educational programs when logistically and safely possible.

Animal Biofacts

Participants appeared surprised when seeing the biofacts from animals during the Behind the Scenes program. For instance, a middle-aged man said, "This is fascinating!" when seeing the shells and bones of turtles. Children and adults were taken by surprise when shown a lobster shell. This not only suggests that biofacts are good tools for teaching but may also indicate that looking at animal biofacts are interesting activities for visitors and provoke participants' emotions, even though live animals were not present. Other studies have found positive outcomes from animals' biofacts, such as animal conservation support (Swanagan, 2000), and children's recall of past animal experiences (Patrick & Tunnicliffe, 2013), which simulates affective memory. This finding may be meaningful to nature centers that do not have enough space or ideal conditions to maintain live animals in captivity for educational purposes.

Sharing Experiences with Others

Participants demonstrated a desire to share their experience with others. For instance, a man shared seeing reptiles in his backyard. He stated that he wanted to share what he learned during the maritime forest exploration program with his wife. He told his child, "You see? You're learning something new! We will tell your mom about it when we get home!". Similarly, after learning about horseshoe crabs, a boy shared information of horseshoe crabs with other children that were beside him. One child said, "They have 10 eyes and their tail is not a stinger" (which he thought it was).

On the survey, when asked how they planned on using the information learned that day, some participants stated that they would share the information learned with others, "I will tell my husband about my daughter's adventure" and "Sharing with others, inspiring living science knowledge for my kids." By sharing information learned and experiences after a nature/wildlife program may contribute to the promotion of awareness and participation in similar educational experiences, moving participants from awareness to action (Fuhrman & Rubenstein, 2017). Moreover, according to Patterson et al. (1998), reflecting on and sharing with others about intense environmental interactions can help individuals to transform these experiences into long-lasting and meaningful memories.

Intention to Perform Pro-Environmental Behaviors

Our findings indicate that attending marine educational programs encouraged participants' interest in the marine environment, and motivated future attendance at other similar educational programs. Participants were asked on the survey to what extent they agreed or disagreed using a five point Likert-type scale with the statements in Table 2. The table displays the percentage of participants who agreed or strongly agreed with the statements.

Table 2

Participant Satisfaction Results

Question	Response	Percent
This program increased my interest in the marine environment.	29	100
This program encouraged me to attend other marine education programs in the future.	29	100
This program motivated me to learn more about the marine environment and its organisms.	27	96

Indeed, a woman who attended the salt marsh exploration activity with her young son registered for and attended another public program with her son and her husband (crabbing activity) later in the summer. Similarly, several participants stated on the survey that they would "Explore more marshes," "Try crabbing (net) off of our dock," and do "Recreational crabbing." One participant stated that she would use the information learned in the program "To know more about topics to explore specifically awareness of reducing microfiber waste."

Findings also indicated that the crabbing experience encouraged participants' intention to perform sustainable crabbing. When asked on the survey how they planned to use the information gathered during the crabbing experience, participants stated, "I will begin crabbing responsibly at my home on Tybee," "I plan on getting a license so I can crab," and "Potentially practice proper and sustainable crabbing in the future."

Adults were also curious about the recreational fishing license, how to obtain a crabbing net and the type of bait that should be used to catch crabs. Although participants demonstrated an interest to perform conservation behavior, chances of achieving this behavior are diminished overtime if opportunities to perform the behavior are not given. Indeed, "the time period between an educational event and the opportunity to practice conservation behaviors is often so long that a large number of other variables have exerted their influence, undermining whatever educational residue might have existed" (Monroe, 2003, p. 120). Therefore, in order to increase conservation behaviors, Unsworth and McNeill (2017) suggested that educators should challenge these behaviors by using a self-concordance approach, which seeks to connect environmentally sustainable behaviors to one's personal goals.

Participants' Interest in the Environment

Participants reported visiting other EE centers and/or participating in other programs related to the environment. In fact, 71% (n = 21) of the participants affirmed on the survey that they had been to the UGA aquarium before, and 37% (n = 11) reported they had previously participated in public programs offered at the aquarium. Additionally, participants mentioned having participated in summer camps, fishing/crabbing activities, reptile talks, manatee observations, and visits to turtle centers and touch tank programs.

In addition to having participated in other environmental educational programs, adult participants demonstrated curiosity about animals. They wanted to know more about the species (e.g., turtles, crabs, and sea snails), their characteristics/features (e.g., life span, life cycle, distribution) and story (e.g., how the animals got in the aquarium to serve as an educational ambassador). Regarding topics that participants would like to learn more about, most of the survey responses were related to animals or activities that included animals, such as "Native birds, crabs, and turtles," "More animals to

touch," "Fish, starfish, local waterways/habitats," "The species of crabs and oysters we saw on the beach," "Plankton + microorganisms," "Marine birds," and "Crabbing, turtles."

These findings indicate that participants had a clear interest in animals, which may explain why most participants positively interacted with wildlife and demonstrated positive emotions toward animals, with the exception of snakes. Educators should consider using live animals as teaching tools as the inclusion of animal ambassadors and charismatic megafauna can improve the publics' ecological understanding and stimulate PEBs (Skibins & Powell, 2013; Newberry et al., 2017).

Conclusions and Implications

Findings suggest that outdoor exploration, contact with wildlife (direct or indirect), biofacts exhibitions, and live animal educational presentations were the practices that engaged participants and increased their interest in educational activities. Data also provided insight into participants' misconceptions and negative perceptions toward some animals (e.g., snakes and horseshoe crabs), reinforcing the need for educational programs combined with HWI to reduce fears and negative perceptions of animals (Emmons, 1997).

Observing participants' emotional reactions to wildlife reaffirmed that animals can trigger positive (e.g., excitement, joy, surprise) and negative (e.g., frustration and disappointment) emotions (as measured by facial reactions and emotional outbursts) in individuals. Emotions are important because they help individuals to remember experiences with more precision than episodes without an emotional component (Reisberg & Hertel, 2003). Moreover, remembering experiences with wildlife, especially positive ones, can lead individuals toward PEBs (Ballantyne & Packer, 2013), such as participating in volunteer projects, attendance at other educational programs, donations to environmental causes, and engagement in conservation efforts. Thus, considering that EE programs seek to encourage PEBs, one way to encourage positive behaviors is by stimulating individuals' emotional attachment to animals during educational programs. This can be done by teaching with animal ambassadors when logistically and safely possible (Newberry et al., 2017), including animal storytelling (Kincaid, 2002) in activities (especially for youth audience) to change the image of less attractive animals, and giving participants the opportunity to reflect on their HWI (McIntosh & Wright, 2017), which can be done by adding group discussions to the activities.

The results of this study also reveal that educators can enhance participants' satisfaction, engagement, learning, and emotional attachment to animals by:

- Including predetermined teachable moments during nature walks. For example, hiding an animal's remnants (e.g., feathers, bones) behind a tree and then pointing it out to participants during the activity.
- Giving all participants the chance to observe animals up close when safely possible. This could be done by dividing participants into small groups in order to facilitate observation.
- Including activities with animals that are often perceived negatively by the general public (e.g., snakes).
- Using biofacts exhibitions, and signs of wildlife (when outdoors) as teaching tools when it is not possible to use live animals.

In summary, by incorporating wildlife into EE practices, educators can stimulate emotional attachment and positive perceptions towards animals, necessary elements to foster PEBs and engagement in conservation efforts, and, consequently, reduce anthropogenic impacts on marine ecosystems.

Limitations of the Study

Although multiple data sources were used (participant observation and surveys) and detailed notes of observations were member checked with other educational staff, the results of this research are limited in transferability as there was just one researcher observing the events and her observations were limited by observational and interpretive skills and researcher bias (Creswell & Creswell, 2017). Particularly, emotions were recorded from the lead author's perspective, which might not accurately reflect the emotions experienced by participants. Moreover, observations may have focused on some individuals rather than others due to the presence of one observer. Therefore, further studies are encouraged to employ additional strategies to measure emotion-type data to increase transferability of the results. In addition, although the survey response rate was 72.5%, the study's sample size was small (29 respondents), and context-specific (marine educational center); therefore, researchers should be careful when transferring these findings to wider populations and different contexts.

Recommendations for Future Research

To better understand participants' emotions resulting from human-wildlife interactions, recommendations for future research include:

- Examining the emotions associated with animals individually, especially for animals that are seen negatively by the general public, such as snakes.
- Examining if naming animals has a positive effect on human-wildlife emotions.
- Examining how previous experiences with animals influences impactful memories made through interactions with educational animal ambassadors.

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