THE IMPACT OF ZOO LIVE ANIMAL PRESENTATIONS ON STUDENTS' PROPENSITY TO ENGAGE IN CONSERVATION BEHAVIORS

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ABSTRACT

Zoos frequently deploy outreach programs, often called “Zoomobiles,” to schools; these programs incorporate zoo resources, such as natural artifacts and live animals, in order to teach standardized content and in hopes of inspiring students to protect the environment. Educational research at zoos is relatively rare, and research on their outreach programs is non-existent. This leaves zoos vulnerable to criticisms as they have little to no evidence that their strategies support their missions, which target conservation outcomes. This study seeks to shed light on this gap by analyzing the impact that live animals have on offsite program participants’ interests in animals and subsequent conservation outcomes. The theoretical lens is derived from the field of Conservation Psychology, which believes personal connections with nature serve as the motivational component to engagement with conservation efforts. Using pre, post, and delayed surveys combined with Zoomobile presentation observations, I analyzed the roles of sensory experiences in students’ (N=197) development of animal interest and conservation behaviors. Results suggest that touching even one animal during presentations has a significant impact on conservation intents and sustainment of those intents. Although results on interest outcomes are conflicting, this study points to ways this kind of research can make significant contributions to zoo learning outcomes. Other significant variables, such as emotional predispositions and animal-related excitement, are discussed in light of future research directions.

Dedication

To my husband, John, who gave me the nudges I needed to think outside the box,
the unwavering support to pursue my dream, and the two precious boys
who help me see the world anew.

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I have heard more than one colleague mention that she feels the same way about her dissertation as she would a child. I have also learned over the past few years that it really does 'take a village to raise a child.' In my case, it also takes a village to produce a dissertation.

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CHAPTER 1

INTRODUCTION

Zoos[1] regularly provide educational programs that give children firsthand encounters with unique or exotic animals. The goals of these programs are often aimed at supporting conservation awareness and engagement – but very little research exists to back these efforts. This is, in part, because the conservation education initiatives of zoos are such a recent phenomenon that few studies – particularly longitudinal – have been completed. In addition, the field of conservation psychology has only recently emerged (Ogden & Heimlich, 2009; Saunders, 2003). As Saunders (2003) depicts, the aims of conservation psychology (CP) research is to identify strategies that help move individuals or groups toward more eco-friendly behaviors. Zoo missions have only evolved to have conservation education themes within the past few decades; 98% of these institutions wish to further evaluate mission fulfillment and 50% have not yet accomplished any such work (Luebke & Grajal, 2011). This study addresses the research gap by analyzing the roles that live animal experiences play in student interests and behavioral outcomes. The objective of the study is to shed light on informal practices that may readily complement school efforts to stimulate science orientation and conservation learning.

[1] Hereafter, the word zoos will represent all animal-focused informal learning centers.

Background

Zoos as Informal Learning Environments

Zoos aim to meet goals in the areas of conservation, research, education and recreation (Churchman, 1987). Both zoos and aquariums support over 143 million visitors a year in the U.S. alone and 700 million visitors worldwide (Falk, Reinhard, Vernon, Bronnenkant, Deans, & Heimlich, 2007; Gusset & Dick, 2011). Many of these visitors are school children, some of whom are seeing these animals for the first time. Zoo-based learning experiences range from repeat visit camps to single field trips. Schools commonly take field trips or invite zoos into their classrooms for new learning experiences. These weight-bearing decisions require extra financial, logistical, timing considerations.

Generally, school educators plan zoo trips to complement school curriculum and provide meaningful learning opportunities although the demonstrable benefits from these experiences have yet to be clearly defined (Kisiel, 2007). The main focus of previous research is on cognitive gains as opposed to attitude or behavior change, and the majority of empirical research centers on field trips. With formal education systems driving this research, the findings from these studies often depict standards-related results. Meanwhile, informal educators at zoos are keenly interested in higher learning tiers such as motivational and behavioral outcomes in order to achieve their missions, which are oriented toward catalyzing conservation action.

Research-based practices are desired, but especially hard to achieve in zoo settings (Luebke & Grajal, 2011). Because the zoos themselves lack the financial capital, human resources, and research expertise to conduct academic studies, the probable merits and mission-fulfillment of these facilities are ambiguous at best. There is a small pocket of evidence to suggest that opportunities to touch and interact with artifacts and media at zoo exhibits improve both content and affective learning (Lindemann-Mathies & Kamer, 2005; Weiler & Smith, 2009). However, critics of zoos contend that there is no compelling evidence nor sound research to suggest zoos promote attitudinal or behavioral change, or if they do promote such changes they are redundant in this media-rich world (Margodt, 2000; Marino, Lilienfield, Malamud, Nobis, & Broglio, 2010). Such stances leave zoos vulnerable until further, more rigorously designed studies are conducted to demonstrate relationships between zoo experiences and affective learning and/or behavioral change.

Given this lack of clear evidence from zoo learning outcomes, why do zoos have animal presentations? There are two answers. First, animal programs consistently sell to schools and funding agencies. Given that revenue is a practical concern for zoos, animal presentations and shows will continue despite the lack of research-based evidence supporting the practice. Second, program administrators and managers believe these programs do have a positive educational impact on participants, thereby helping them to accomplish their missions.

The public is also able to access zoo experiences beyond zoo grounds. Starting in the 1980s, dozens of zoos' education departments mirrored the museum field by adding outreach programs to their offerings (Wood & Churchman, 1988). Often dubbed Zoo-to-You or Zoomobile, these programs bring artifacts, learning kits, and zoo animals into public venues for educational and entertaining presentations. In the 1980s, not one of the twenty-six surveyed programs was self-sustaining, meaning that that zoo and grant funding supplemented expenses (Wood & Churchman, 1988). Nonetheless, these practices grew, and they continue today out of a desire to reach more diverse audiences and support zoo missions. These programs contain common threads and strategies despite there being relatively little discourse between institutions. A bulk of offsite programming is conducted in school classrooms and auditoriums, which has catalyzed the addition of state and national learning standards into zoo programs.

Study Phenomenon: KCZ's "Journey to Survival" Program

Much like many zoos around the country, the Kansas City Zoo (KCZ) has multiple offsite programs geared to different grades and content standards. The KCZs "Journey to Survival" (J2S) presentation has explicit objectives that are linked directly to the zoo's mission statement: "To conserve and provide experiences with wildlife in order to entertain and educate our audiences and to instill a lifelong respect for nature." Programming subtext is often to promote 'greener' behaviors. Specifically, by the end of the J2S presentation, students should be able to identify four natural events or human behaviors that lead to endangerment and describe at least two actions that they can take to assist with the continued survival of remaining species (Kansas City Zoo Education Department, 2013).

In order to make their programs accessible to local teachers, KCZ has done as most zoos in the country have done: their school programs frequently list state or national standards which are coincidentally addressed by the content. The following example demonstrates the relationship between schools and zoos. J2S addresses, amongst others standards, Missouri science Strand 4 (Missouri Department of Education, 2013).

> **Big Idea 1, Concept D, Grade 6:** The diversity of species within an ecosystem is affected by change in the environment, which can be caused by other organisms or outside processes.
>
> a. Describe beneficial and harmful activities of organisms, including humans (eg., deforestation, overpopulation, water and air pollution, global warming, restorations of natural environments, river bank/coastal stabilization, recycling, channelization, reintroduction of species, depletion of resources), and explain how these activities affect organisms within an ecosystem
> b. Predict the impact (beneficial or harmful) of a natural environment change (e.g., forest fire, flood, volcanic eruption, avalanche) on the organisms of an ecosystem
> c. Describe possible solutions to potentially harmful environmental changes within an ecosystem.

J2S derives its name from the program strategy, for which presenters escort students on an imaginary trip around the globe, one continent at a time (the full curriculum can be found in Appendix A). Using this theme and their collection of international species, Zoo educators demonstrate the impacts of deforestation, introduction of invasive species, and depletion of natural resources. Clearly, these topics are direct links to Missouri Science Strand 4.1.D.6.a. During J2S, presenters highlight deforestation and loss of diversity in the Amazon Rainforest as a key topic that directly impacts the Amazon Parrot often used in the program. By illustrating Amazon deforestation as a result of aluminum ore mining, the presenter makes the benefits of recycling tangible to students. Similar elaborations permit presenters to highlight key conservation species at the zoo – such as the Black Rhino – as well as bring relevancy to the zoo’s behavioral program objectives. Notably, zoo staff additionally encourage the audience to ‘tell at least one friend about the things they’ve learned’ during the presentation.

By zoo standards, an effective outreach program is one that marries school curriculum with related zoo behavioral objectives. In this case, it requires that students understand the consequences of human actions in the natural world as well as increases their knowledge and skills to take countermeasures related to these matters.

Zoo Outreach

Despite Wood and Churchman’s (1988) claims that these types of programs have the potential to accomplish zoo goals, very little academic research exists on zoo outreach. The few studies on zoo outreach demonstrate that live animals (and specific qualities they possess) improve student attitude, effort and creativity in classroom environments (Reames & Rajecki, 1988; Training, Wilson, Wickless, & Brooks, 2005). The need for studies such as this one is further propelled by the paucity of research in the more than three decades of zoo outreach programming.

As evidenced by both the KCZs and the Phoenix Zoo’s outreach programs, educational outlets (such as Zoomobiles), which rely on animals as part of the pedagogy, are also a focal point for government and privatized grant support. These funding agencies support the roles that zoos play for education despite the lack of evidence, but they are beginning to mandate proof of grant-funded program success. Regardless of the existing research, informal education institutions and participang teachers insist there is convincing evidence for the use of animals in educational programming (Ogden &

Heimlich, 2009). Many who work in these environments even propose that the learning which takes place within zoos is more attitudinal than cognitive (Swanagan, 2000).

The added value of the most controversial zoo experience – touching animals – remains a mystery. Zoo staff would certainly like to believe that their work goes beyond expanding content knowledge of their participants, and animal presentations owe a great deal of their existence to the hope of moving audiences toward more environmentally sound behaviors (Ballantyne, Packer, Hughes, & Dierking, 2007; Tilbury, 1995). The idea is that by having personal contact with an animal, participants are more compelled to support species' existence.

This study seeks to answer questions into how a single outreach program with live animals impacts students' interests, intents and engagement with conservation actions. Personal experiences with zoo animals help to bridge student engagement with target behaviors by promoting care for animals and nature. The field of Conservation Pyschology helps to explain this process because it theorizes that affinity *or care* for nature serves as a gateway to promoting conservation behaviors.

Theoretical Lens

Conservation psychology theorists contend that connections with nature predict protective behaviors, and research validates this point. As CP is a new field, and the existing literature demonstrates personal experiences in nature as a key to conservation action, a review of outdoor experiential learning research is also warranted. Finally a tool often used in CP, known as the Elaboration Likelihood Model (ELM), helps tie together experiential learning, emotional and social factors of behavior (Petty & Cacioppo, 1986).

Conservation Psychology

Conservation psychology is an emerging field with sound justification for its need. According to Saunders (2003), CP research "explores how to cause the kinds of changes that lessen the impact of human behavior on the natural environment" by "experimenting with different approaches to realize… desired outcomes" (p 141). It acts as an overarching umbrella for subfields such as conservation biology, human ecology and environmental education. Allowing for the inclusion of theoretical, applied and evaluative research, CP addresses both care for and behaviors toward nature (Saunders, 2003). This merging of emotion with action in the pursuit of conservation is a great deal of the push behind the new field, and the academic link between caring for nature and conservation behaviors is truly at an early stage (Kals, Schumacher, & Montada, 1999; Schultz & Zelezny, 2003). This study takes a leap in explicitly addressing animal experiences as a subset of nature experiences.

Conservation psychology supporters have roots in dozens of professions, with one of the more prominent backgrounds being environmental education. Members attending the Tbilisi Intergovernmental Conference for Environmental Education, which is often referenced in CP literature, determined that the key purposes driving the need for environmental education include environmental awareness, sensitivity to nature, attitude development, conservation skills and active participation (Hungerford & Volk, 1990).

During the 1990s, environmental researchers emphasized activators (e.g. learning) alongside planned consequences in order to promote behavior change; for example, researchers discovered that participation in a conservation program increases when personal action was more visible within a community and was perceived as being a social norm (Bator & Cialdini, 2000). However, researchers caution that environmental educators should appeal to attitude change as opposed to social norms because the effects are demonstrated to be more lasting (Bator & Cialdini, 2000). As an alternative to the narrow scope of early conservation research, today's efforts incorporate a much wider range of methodologies. Environmental agencies have progressed beyond simple peer pressure as a means for catalyzing change (Geller, 1995). As a result, practitioners suggest that modern education programs seeking to spark conservation behaviors need to prime subjects' knowledge *and* feelings through a variety of means in order to bring about targeted behaviors (Hungerford & Volk, 1990).

A current focus of CP research is the notion of environmental sensitivity, which is defined as a basic understanding of the environment and associated environmental problems (Hungerford & Volk, 1990). This sensitivity is theorized as a major entry-level variable in developing pro-environmental behaviors (Hungerford & Volk, 1990). As a result, *how* environmental sensitivity develops, has become a particular focus in some strands of research. Personal experiences with nature demonstrate the most promise in developing environmentally friendly behaviors (Finger, 1994; Kals, Schumacher, & Montada, 1999; Tanner, 1980). For example, Finger (1994) discovered that environmental experiences are more important than environmental values in predicting protective behaviors. Another study found that 40% of the variance in participants' emotional affinity toward nature is explained by their current and past time spent in nature (Kals, Schumacher, & Montada, 1999). Furthermore, "significant life experience" research indicates that time spent in nature is a significant childhood theme for those who regularly engage in wild space preservation as an adult (Chawla, 2006; Tanner, 1980).

This work revealed that these conservationists typically had teachers or parents supporting these activities in youth.

Retroactive studies such as these do little to validate current efforts in conservation education because they are both individually constructed reflections of past experiences and they do not translate easily into methodologies that can promote more immediate changes in interests, attitudes or behaviors. Nonetheless, the majority of research indicates the childhood experiences play a major role in developing an appreciation for nature and predisposition to protect it. Given what some have identified as a nature-deficit in youth, there might be reason for the growing concern about how much exposure children have with wild places and natural elements (Louv, 2006). In calls for further research, Tanner (1980) expressed the need for schools to provide regular student exposure to outdoor spaces and nature.

Experiential Learning with Animals

The majority of environmental sensitivity research focuses on experiences in outdoor spaces such as nature preserves or local parks. Some studies also explore the impact of natural elements, such as trees and waterfalls, in man-made environments. Little applied or evaluative research exists to explicitly link experiences with animals, in unnatural settings or synthetic surroundings, to environmental sensitivity or CP. This is especially striking in light of Rabb and Saunders' (2005) call for zoos and aquariums to become centers of caring as part of their purpose and survival.

This lack of CP research on animals as a form of nature or natural experience warrants a brief review of experiential learning with animals. In particular, theories of how relationships with animals develop prove useful. Animal presentations, as a form of experiential, sensory-based learning, are specifically built to nurture factual, tactile and emotional learning experiences in order to change behaviors and foster *protection*. Rousseau (1979) explicitly suggests that early childhood exposure to and experience with animals helps to form healthy relationships with them. This supposition is supported by research revealing that children indeed progress through developmental phases of interest in animals starting in early childhood with emotional concern, leading to cognitive awareness in the preteen years, and then finalizing with ethical considerations as young adults (Kellert, 1985). Of particular pertinence from these studies is the value of touch experiences, which help elementary-aged students progress through knowledge acquisition and form emotional bonds that eventually allow students to consider animal ethics (Kidd, Kidd, & Zasloff, 1995).

Zoos as a center of caring. Because a sense of connection to the natural resource is most highly correlated with caring, zoos may indeed serve as appropriate venues for building connections, and therefore, environmental sensitivity (Clayton, Fraser, & Saunders, 2009). Researchers have demonstrated that animals have innate levels of emotional appeal to humans (Myers, Jr., Saunders, & Birjulin, 2004; Vining, 2003). The level of emotional response mediates the extent to which people connect with nature, and this, in turn, regulates how people care for the natural world. For example, US zoo visitors seem to experience more powerful emotions when they are in the presence of gorillas than most other animals, and these experiences served as a "bridge," or connecting force, to the natural world (Myers, Jr., Saunders, & Birjulin, 2004). Some zoo visitors describe transcendent experiences with zoo animals (Vining, 2003). These moments might promote connections to wildlife, which Skibins and Powell (2013) determined act as strong predictors for caring and species-specific conservation behaviors.

From the existing CP theories and research, it seems that effective environmental education develops both knowledge about, and affinity for nature, which then stimulates personal action. By promoting care for nature, many researchers hope to see behavioral outcomes (Hungerford & Volk, 1990; Saunders, 2003). While there are a variety of strategies to observe or measure these desired outcomes, again, many studies have been retroactive in nature. Chapter 2 contains further discussion on more experimental studies and the tools used in current CP research.

The Role of Emotion in Behavior

Bandura (1974) emphasized that learning theories, which omit student's internal factors such as emotion, cannot fully explain the learning experience. In social learning theories, behaviors and their precursor internal regulators play an equally important role in the learning process as the information being presented, and thus, must be considered alongside external environmental factors. This 'reciprocal determinism' between one's self and the environment co-regulate the evolving events and ultimately, the cognitive, affective, attitudinal and behavioral outcomes (Bandura, 1978). For example, Bandura and colleagues discovered that both physiological arousal and self-efficacy for controlling emotions had a direct impact on the attitudinal and behavioral shifts of participants working to overcome fear of snakes (Bandura, Adams, & Beyer, 1977). This suggests that learning techniques that acknowledge cognitive and physiological components simultaneously can alter attitudes and behaviors. It also revealed that first-person experiences of seeing humans interact with live animals were more profound than simple cognitive coaching. This would support what Matthews (2004) more recently suggests: affect is derived from cognition *and* emotion. This illustrates the need to consider emotional predispositions and responses to animals in addition to the type of interaction students may have with them during the zoo presentation. The following model helps to conceptualize just how both internal and external factors impact attitude and behavior.

Elaboration Likelihood Model

The Education Likelihood Model (ELM) theorizes two routes to modifying behaviors (Petty & Cacioppo, 1986)**.** The first path, or central route, requires more individual effort by the facilitator because it demands finding personal connections with participants and ultimately, modification of or integration into the learner's belief system. The central route to behavior change, not surprisingly, has more enduring outcomes than the following alternative. Peripheral routes to behavior change depend on environmental influences such as social norms and source credibility to alter behaviors (Brown , Ham, & Hughes, 2010). For example, if a homeowner believes most neighbors participate in a recycling program and believes his non-participation is being noticed, the homeowner may be more motivated to recycle.

There is compelling evidence that ELM-based communication for environmental behaviors is an effective strategy. This was demonstrated by a 400% increase in conservation fund giving by tourists visiting the Galapagos Islands after a theory-based approach to promoting behavior change was developed (Powell & Ham, 2008). This study's application of the ELM has a clear relevance and connection to zoo missions, which have conservation end-states.

Researchers have concentrated on particular individual and social features to determine how these elements factor into the ELM. For example, personal relevance is supportive of central route processing and seems to have a more lasting impact on behavioral outcomes than other peripheral factors (Bas, 2012; Lackey, 2003). Other research has demonstrated that proximity to conservation sites, another relevancy factor, is a significant determinant in engaging in deliberate conservation behaviors (Trewhella, et al., 2005). Consistent with Bandura (1974), an additional vein of research indicates that emotion during an experience impacts intent to change behavior. Physiological arousal led to an increased likelihood of participants' intent to behave (Howard, 2000). Similarly, increased respect and wonder increased desire to save certain species (Meyers, Saunders, & Birijulin, 2004). Higher emotional connection with a subject also leads to higher intent to behave in connected ways (Hughes, 2013). Some of these studies are not explicitly linked to CP, but they directly correlate with the research of conservation behavior change.

In light of the importance of relevancy and emotional factors to ELM-based behavior change techniques, there is a growing concern in the conservation education community with regards to the next generations' connections to natural spaces. Some have dubbed this problem the 'extinction of experience' with nature (Pyle, 1993). The concern, specifically, is in the difficulty of convincing populations to preserve resources with which they have little to no contact.

Demonstration of Need

With primary and middle school years serving as an opportunity to instill caring beliefs and values, this research studies an intervention on the growing deficit in nature experiences. Zoomobile live animal programs provide an opportunity for youth to connect with nature. CP provides us with the theoretical grounding to understand how these connections may impact engagement with conservation behaviors. Personal sensory experiences provide a mechanism through which students may come to care for animals.

CP provides us with the needed measurement tool– caring - to assess how live animals and social settings might impact student behaviors after participating in a zoo presentation. As the education community increasingly emphasizes self-directed learning experiences, we are seeing a proliferation of informal learning environments and programs around the world (Next Generation Science Standards, 2014). Utilizing the metrics of formal education and the lens of psychological learning, there has never been a better time to assess the practices of informal learning environments.

Foreground

The previous sections have outlined the background of zoo outreach and have grounded this study in CP theory. This research is further justified by placing it in the larger context of informal education research, acknowledging my own motivation for the work, and outlining its impact on education and conservation research.

Status of Informal Learning Research

The National Science Foundation (NSF, 2012) defines informal learning as education that takes place outside of the classroom. Informal education systems are of growing interest to researchers, who are beginning to recognize the role that non-school based activities and their accessibility play in interest, motivation, career development, and academic performance (Bartels, Saavedra, & Dyne, 2001; Borun, 1983). Informal learning environments host a myriad of individually-centered learning experiences that support the human inclination to make meaning out of sensory input (Brooks & Brooks, 1993). Informal learning environments such as zoos emphasize hands-on, authentic learning experiences in social settings.

A high percentage of informal learning research targets ongoing afterschool, weekend or summer programs in a particular subject area – such as math or science. These include rocketry clubs with inherent engineering content, summer "zoo keeper for a week" programs riddled with biology, and sleep away math camps designed to make math more fun (Azevedo, 2011; Kruse & Card, 2004). Programs with longer durations are more popular research targets possibly because they offer greater opportunity for traditional longitudinal study designs than typical Zoomobile-style programs might readily support.

This leaves educators with little knowledge of the impact of singular informal experiences despite the prevailing belief that learning and attitude changes occur in these settings. That which is known about singular informal education experiences is sufficiently reviewed by DeWitt and Storksdiek (2010), who conducted a literature review of field trip studies. Their research demonstrated that some class trips can lead to cognitive and affective change. More specifically, they found that field trips are effective enhancements for classroom learning when proper preparation, social contexts, experience management, and review lessons are given adequate consideration. Nonetheless, the lack of research into zoo, park, and museum learning beyond field trips is a particularly striking irony in light of the hundreds of parks and institutions whose main purpose is to promote “greener” or more conservation-oriented behaviors.

Today, many informal educators seek to inspire visitors who want to help protect a resource. These protective behaviors, ideally, manifest in personal behaviors with animals or the environment (Ham, 2013). Desired outcomes range from park cleanups to class fundraisers for a wetland preserve (Ham, 2004; Powell & Ham, 2008). The previously discussed Galapagos Island ecotourism study, which resulted in 400% more financial contribution to preservation fund, is a prime example of how CP and the ELM inform practitioners and move their efforts toward more significant behavioral outcomes.

Personal Experience

With a background in zoo and aquarium education, I have worked with and trained hundreds of staff and volunteers in order to build toward these conservation-education goals. Many of their sentiments are reflected here in this project. Yet, as I have attempted to research effective methods for animal education over the years, I have not found one guide nor resource to inform live animal interpretation, let alone one that was founded on empirical investigation or evidence-based practice. Similarly, many educators in the field of environmental education are driven primarily off a combination of personal experience and intuition despite over a century of field program history (Mills, 1920; Tilden, 1957).

With increasing pressure on zoos and aquariums from animal rights organizations and documentaries such as *The Cove* (2009) and *Blackfish* (2013), zoos are more prudently seeking opportunities to understand, enhance and justify their practices and visitor outcomes (Stevens, Pesmen, & Psihoyos, 2009). In an era of accountability, both in classrooms and zoo management, it is increasingly vital to research informal animal science education to help lay the foundation for many future studies into the merits of informal programs. I also conduct this research cognizant of my bias in favor of zoo education programs, and I proceed mindful of this inclination. Ultimately, the findings of this study help inform for the use of animals in education because it investigates whether animal presentation can lead to affinity for animals and conservation actions.

Research Questions:

Using a foundation in CP, which theorizes that personal experience with nature develops caring and shapes behaviors, I will scrutinize the impact that live animal interactions have on student attitudes and behavior. Since the use of animals is strictly regulated by the Association of Zoos and Aquariums (AZA) as well as zoo missions and protocols, this research also considers possible mediating and control factors within such presentations. With these considerations, this study explores the following research questions:

1) How does the type of interaction (sight versus sight with touch) with live zoo animals influence student interests and behaviors as measured by survey self-reports of attitude and behavior?
2) How do emotional predispositions and emotional responses, including interest, to live animals impact student caring and behavior as measured by survey self-reports of attitude and behavior?
3) How enduring are conservation behaviors which result from live animal presentations, as measured by student reports of behavioral intents and actual engagement with conservation behaviors?

Significance

Implications for informal animal education programs. Few zoo program evaluations are conducted with education-based theoretical foundations or empirical design. As a novel academic study of animal conservation programming, this research will serve as a foundation for further dialogue on zoos in relationship to CP. Efforts such as this could help to substantiate the use of animals for achieving zoo missions.

The key outcome of this study is in exploring mission fulfillment. By assessing behavioral intent and resulting conservation actions of a particular subset of zoo audiences, this study will address outcomes that zoos intend to promote but have not yet studied. With over $350 million spent annually on conservation initiatives by zoos, it is vital to understand how these investments are impacting public perceptions (Gusset & Dick, 2011). However, these results may have implications to animals used for educational purposes outside of zoos as well. Nature centers, wildlife parks, and even schools may benefit from this research by validating what some have suggested: live animals should be incorporated into their collection and classrooms. For example, "NSTA supports including live animals as part of instruction in the K-12 science classroom because observing and working with animals firsthand can spark students' interest in science as well as a general respect for life while reinforcing key concepts as outlined in the *NSES*" (NSTA Board of Directors, 2012). Yet, little has been done to study animal impacts on learning, and animal presence in classrooms is minimal.

This type of research answers the growing cry for more education theory in interpretive education practices and research in order to help the field move forward (Farmer & Knapp, 2008). The findings help to form the basis for animal pedagogy and selection guidelines. The latter point is illustrated by a study that revealed visitors to a tropical zoo respond no differently to exotic animals over native species, which greatly influences finances and conservation themes of zoos (Mendes da Silva & Carodo da Silva, 2007). These factors could increase the availability and effectiveness of animals used for presentations by informing program animal selection or perhaps reducing the burden placed on other key species.

Broader impacts. Dwindling student interest in science, technology, engineering and mathematic (STEM) in the United States over the past few decades has been well documented (Braund & Reiss, 2006; NRC, 1996). Both government and private sectors have faced this issue with growing concern as they try to address the shortage of qualified, competitive and diverse candidates for STEM related programs at universities and to meet the demand of the job market. Some critics of science education in the

United States have identified many formal education practices that conceivably extinguish natural curiosity in science classrooms, making students opposed to caring about science (Carlone, 2003; Havasy, 2001)

However, formal and informal education both play a role in encouraging interest in science (Bulunuz & Jarrett, 2010). Krapp and Prenzel's (2011) synthesis of research reveals that the manner in which classroom science is taught indeed influences student interest development. Yet, to date, there is little empirical research into how informal learning environments may support interest, career pathways, or care for science fields (Holmes, 2011). The research of Dabney et al. (2011) indicates that activities outside of school, middle school interest in science and math and gender are three of the key factors associated with college freshman pursuit of STEM career pathways. With the billions of dollars invested each year into U.S. informal science education facilities by visitors, schools, benefactors, institutions, and government agencies, educators have even more reason to research and capitalize on the most effective practices at such science centers (Fuller, 2011). Accordingly, this study has links to both formal and informal instructional designers and findings should be disseminated in both fields to help bridge the divide between these two systems.

Specifically, findings from this study help enlighten practices used nationwide for environmental science topics as it indicates the ability of animal presentations to influence attitudes and behaviors. More generally, this study promotes and justifies zoo experiences and field trips for teachers, administrators and district planners. Furthermore, it provides an example of a practice that generates desirable student outcomes such as science interest, attitudes and engagement.

Summary

Ultimately, this work aspires to deepen the foundation of zoological education, but its outcomes have additional extensions. It provides insights into attitudinal and behavioral transformation and speaks to the potential power of unique nature experiences. These lessons help guide future studies aimed at developing interest and supporting behavior change, in both formal and informal education systems.

CHAPTER 2

LITERATURE REVIEW

The founder of modern natural resource educational guides (called interpreters), Freeman Tilden, believed that individual perceptions through hands-on, sensory-based experiences provide opportunity for deep, authentic learning: "Beauty perceived by the organs of sense often needs no interpretation; nature's handiwork readily interprets itself" (Craig, 2008). This concept serves as the foundation for this study. Live animals lend themselves to personal sensory experiences through sight, sound, smell and touch. Other research suggests that personal experiences with nature pave the road for developing care for the natural world (Kals, Schumacher, & Montada, 1999). Animal presentations may serve as a form of nature experience and have the potential to develop caring or shift interests. The following literature review seeks to elaborate on the relationship between emotional connections to nature and engagement in conservation behaviors.

With widespread implementation of animal programming, it is important to understand just how living creatures impact learning outcomes such as interest and behaviors. Animal-touch presentations are a manifestation of constructivist theories, but the separate acts of discussing, seeing, and touching these animals have not been investigated to determine how these actions influence participants. This study explores the role of sensory experiences in the human development of links to animals thereby investigating how such experiences impact student conservation behaviors.

Scant literature exists on teaching and learning through animal-centered pedagogies. As a result, this chapter draws upon several fields of study in order to expound upon the various influential factors. To help frame the research, this chapter begins with a brief review of the existing Conservation Psychology (CP) literature on human-nature relationships as well as a review of relevant behavior change research. The present study is then grounded in experiential learning research, a strategy-rich theory borne of Constructivism. Finally, the literature on sensory-based learning is reviewed in the context of its connection to human-animal relationships.

Human Relationships with the Natural World

Biophilia

In 1964, Fromm defined biophilia as "the love of life or living systems." Two decades later, researchers made a leap in claiming that biophilia is an "inherent affinity of humans for the living" (Kellert & Wilson, 1983; Wilson, 1984). Around the same time, Orr (1989) compared the current generation to previous generations and identified an emerging gap in human-nature connectedness. As a result, he proposed reacquainting children with nature through school programming that would regularly expose students to natural places and animals. He felt this would rekindle biophilia in progressive societies. In the long run, the claim of a biological basis (associated with genetic fitness) for biophilia may have stretched the theory beyond acceptance (Kellert, 1997). In the years that followed, research revealed only weak evidence for any genetic predisposition of humans to caring for nature (Kellert, 2009).

Another problem with the biophilia theory is that it is underdeveloped and vague (Joye, 2011). This may be one of the reasons the concept is rarely accepted in peer-reviewed journals (Simaika & Samways, 2010). Nonetheless, a variety of studies surround the concept of biophilia; most center on outdoor space, prolonged exposure to natural elements, or focus on policy (e.g. Delavari-Edalat & Abdi, 2010; Preheim, 2001). The research provides consistent evidence that humans find personal fulfillment and enjoyment in natural spaces over manmade areas (Delavari-Edalat & Abdi, 2010).

In education, the growing disconnects between youth and nature is the push behind environmental studies (Burgess, 2010). To date, most biophilia research centers solely on exposure to natural places and occasionally to natural elements, such as plants or pets in the home. No explicit links exist between animal education programs and biophilia. Given the underdefined nature of this concept, other literature is necessary to better understand the phenomenon of caring for animals.

Human-Animal Relationships

Research indicates a general interest phenomenon with human-animal relationships. Whether it is as a pet in the home or exotic wildlife on the plains of Africa, humans frequently seek out animals. Shipman (2011) contends that primal forces drive this connection. Similarly, zoo interpreters would suggest there is something naturally appealing about live animals, which help to focus audience attention towards the subject and content being presented. Research generally supports this. For example, Allen (2002) discovered that live animals spark richer learning experiences than static exhibits with the same species and topic because, in part, of the discourse they elicit.

Research in and out of zoos documents the appeal and power of live animals. Some zoo studies reveal that visitors take interest in animals based on size, popularity, taxonomy, proximity, charisma and flagship statuses (Fuhrman & Ladewig, 2008;Ward, Mosberger, Kistler, & Fischer, 1998). Live animal exhibit experiences are able to redirect visitor predispositions and stimulate enjoyment and introspection (Luebke & Matiasek, 2013). Multiple studies have demonstrated the ability of live animal shows to improve conservation attitudes, and animal show themes - when effectively presented - have good retention (Heinrich & Birney, 1992; Yerke & Burns, 1991). Positive findings in animal experiences are not limited to just zoos, however. Research demonstrates the merits of both wild and captive animal learning opportunities as both have produced desired learning outcomes (Packer & Ballantyne, 2012).

Theories that animals not only appeal to audiences, but that they can lead to affective and behavioral changes may not be so surprising when one considers that humans often react emotionally to animal experiences (Ballantyne, Packer, Hughes, & Dierking, 2007; Orams, 1996). Studies show that the type of emotional response in onlookers varies by animal traits such as level of human-likeness, endangerment status, and infancy (Gates & Ellis, 1999; Orams, 1996; Woods, 2000). While these studies range in human demographics such as age and interest, some of the research particularly targets developmental phases of animal-interest in children, which is particularly relevant for this school-based study.

Animal-Interest Development

Children's relationships with animals develop through phases that mirror Piaget's (1977) developmental phases. Children progress through three stages in their animal-understanding: beginning with knowledge seeking, transitioning through building emotional ties, and finally arriving at ethical considerations (Kidd & Kidd, 1996). Children between the ages of three and seven highly value touch experiences while they begin to gain a general understanding of and develop emotions toward animals (Kidd, Kidd, & Zasloff, 1995). When students reach more advanced states of reasoning and emotional awareness at ages seven to nine, they are able to process and, therefore, contemplate live animal experiences more deeply using multiple perspectives, including basic animal welfare considerations in addition to their own animal interests. One study with this age demonstrated that exotic animals stimulated students to write longer and more creative works than commonplace species in the classroom (Wilson, Trainin, Laughridge, Brooks, & Wickless, 2011). Between ages nine and twelve, most students are able to empathize with animals and begin to consider perspectives about conservation matters addressed in presentations (Kidd & Kidd, 1996). By middle school, students reach this final stage and should be able to address ethical issues with animals such as captivity as well as be able to predict and problem-solve other worldwide conservation issues. With research questions addressing conservation behaviors, it is important to study a student population that can process ethical concerns.

It is also worth noting that demographic differences in both biological science interest level and attitudes towards animals are well documented in children (Baram-Tsabari, Sethi, Bry, & Yarden, 2006; DeWitt, et al., 2013; Prokop & Tunnicliffe, 2008; Reid, 2003). While parent's attitudes towards science play a significant role in students' science orientations, science attitudes are also associated with ethnicity, socio-economics, and gender (DeWitt et al., 2013). These three factors are also linked to differences in attitudes toward animals (Kellert, 1985). These differences are important because they play a role in career development; thus, understanding how these differences develop helps practitioners and researchers understand how to mitigate diversity gaps in these critical fields.

Research indicates that girls' attitudes towards science diminish with age and that, generally, females are more attracted to biological or social science pursuits while males are more prevalent in physical or mechanical science fields (Baram-Tsabari, Sethi, Bry, & Yarden, 2006; Reid, 2003). This trend continues in occupational pursuits as females are more likely to major in biology and subsequently obtain biological science positions than any of the other scientific disciplines (Miller, Blessing, & Schwartz, 2006). Human and animal-specific interests may drive the higher percentage of females in biological studies than towards other science fields (Hanson, Schaub, & Baker, 1996).

Girls take particular interest in animal communication and social connections, which translates to college program interest. Synthesis of the existing literature suggests that in early developmental phases, boys take more interest in learning about animals from an ego-centric perspective (Jones, Howe, & Rua, 2000; Uitto, Juuti, Lavonen, & Meisalo, 2006). As children progress through learning phases. however, girls become more attracted to animals on emotional and ethical levels which then translates to college program interest (Jones, Howe, & Rua, 2000; Tamir & Shcurr, 1997). Additional research is needed to help better understand differences in development of animal relationships by gender as well as other currently underexplored demographics.

Persuasion Research

Journey to Survival (J2S), which served as the foundation of this study, has objectives targeting attitude and behavior change. As a result, it is important to consider findings related to behavior persuasion and, principally, conservation persuasion. Provoking actual behavior change is the aim of Conservation Psychology, which provides us with several studies of effective persuasion strategies. Generally speaking, behavior persuasion is defined as an attempt to sway personal behaviors in one direction as a result of educational, informational or entertaining techniques. Conservation persuasion tends to focus on motivating communities of people toward desired conservationist behaviors.

Compared to other related fields such as conservation biology, conservation psychology draws heavily upon social psychology research and techniques in order to enhance outcomes such as attitudes and behaviors. Reid's (2006) review of social psychology illustrates the difficulty in accurately measuring attitudes and behaviors by depicting these two variables as fluctuating combinations of knowledge, affect, environments and behaviors in those environments. For example, someone may have the underlying attitude that recycling is a worthwhile effort, but may actually vary in overt recycling behavior based upon environmental influences such as awareness of local recycling guidelines, proximity to recycling bins or perceived peer pressures. Thus, accurately depicting a subject's underlying attitudes or behavioral engagement is not a straightforward undertaking.

As early as the 1960's the relationship between attitude and overt behavior came into question. Most assume that they are explicitly linked, but the relationship between these two phenomena is regulated by other factors such as habits, social norms and personality traits (Ajzen & Fishbein, 1973; Hughes, Ham & Brown, 2009). While much of the research from this era assumed a weak relationship between attitude and behavior, Ajzen and Fishbein's (1977) comprehensive review of over 140 studies demonstrated that attitudes can serve as proxies for behavior when the object and behavior explicitly correspond to one another. Furthermore, they emphasized the importance of attitude interventions, or persuasive strategies, that specifically align with related behavioral goals. Ham (2012) argues that studies failing to demonstrate desired behavioral outcomes occur when the behavior was not effectively and explicitly linked to the attitudes that presenters were trying to promote through programming.

It is important to acknowledge that the research into behavior change seems to focus on two routes. Specifically, researchers have focused on either attitude-shaping information or environmentally regulating cues (Ajzen & Fishbein, 1977; Ham, 2013; Iozzi, 1989). For example, one might be motivated to participate in a local recycling program by learning about the cost-benefit to their community (changing attitude) or someone could be prompted to recycle when he realizes he is the only one in his neighborhood who does not recycle (social environmental persuasion). The overlap between these factors and the Elaboration Likelihood Model are striking.

Values and affect, or emotions, are also pivotal in shaping behavior. Several decades of research illustrate behavior is regulated by three mechanisms: beliefs about action consequences, beliefs about norms and expectations, and beliefs about control over the behavior itself (Ajzen, 1991). These regulators act – it seems – upon affect and attitudes towards a subject. Thus, behavior change requires a shift in either beliefs about personal actions and norms or a shift in emotion towards the subject. As behavior correlates most closely with affect towards certain objects or ideals, it stands to reason that aims to alter attitudes through affect may have the most potential to change behavior (Iozzi, 1989). As previously discussed in Chapter 1, CP research reveals the same point:

the most potent predictor of environmentally protective behavior is emotional affinity for that resource (Kals, Schumacher, & Montada, 1999).

These findings have led researchers to create scales that measure environmental attitudes, interests and behavioral propensities. Leeming, O'Dwyer, and Bracken (1995) developed a Children's Environmental Attitudes and Social Knowledge Scale (CHEAKS) to measure student dispositions to environmental science and activities. Similarly, Prokop and Tunnicliffe (2008) developed animal attitude questionnaires in order to better understand sources of students predispositions to certain classifications of animals.

Experiential Learning

Kolb developed the Experiential Learning Theory, which was founded on work from Piaget (1964, 1972), Dewey (1934) and other Constructivist fathers. In this theory, he highlights that "knowledge is created through the transformation of experience" (Kolb, 1984, p. 41). Experiential learning is deeply grounded in Constructivism as it capitalizes on the belief that students make the most meaning out of personal experiences, which are catered toward specific concepts that register or conflict with existing beliefs (Slavich & Zimbardo, 2012). Furthermore, experiential learning allows for historical, social and cultural contexts to drive the learning process, all of which are key components of constructivist education (Vygotsky, 1978). Thus, opportunities for learners to directly interact with the learning topic, such as an animal, and to have a choice in how they engage with the subject, such as asking questions or sharing stories with their peers, serve as a form of experiential learning under the Constructivist umbrella.

Experiential learning theory further emphasizes that some learners prefer to observe and others actively engage, but both learner-types make meaning out of these experiences by restructuring and grasping the event (Kolb & Kolb, 2005). In this process, the experience has potential to change knowledge, beliefs, attitudes, and even shape behaviors.

The following sections document some of the findings of experiential learning studies in both formal and informal learning contexts. Most of the CP literature on emotional affinity for nature is based on experiential learning strategies. Used broadly, experiential learning may be as simple as immersing oneself in emotional imagery or as complex as grappling with a personal behavior modification after experiencing a presentation on illegal animal trafficking. Results from studies in learning science, field experiences, informal learning environments and animal-related education are considered.

Formal Education Studies on Experiential Learning.

There are three key elements reported in experiential learning research from formal contexts: memory, emotion, and physiology. The following section briefly summarizes key literature from experiential learning that relates to my study.

Memory. Actively engaging in the learning process aids in recall of the learning event itself (Furman & Sibthorp, 2013). Occupational therapy has explored hands-on learning strategies with a range of learners for some time, and research has shown that recalling content and even processes are greater when learning disabled participants engaged directly in the learning activity (Hartman, Miller, & Nelson, 2000). In another study, sixth graders who embarked on an outdoor field trips most commonly recalled the most hands-on portions of their trip (Nadelson & Jordan, 2012). Similarly, primary students who actively participate in a lengthy process, which in this case involved constructing a model volcano, recall more steps from that process than those who simply watch a demonstration (Hartman, Miller, & Nelson, 2000). These studies of experiential learning and memory indicate that active engagement in the learning experience produces more effective recall, but they do not capture the mechanisms for how the memories are stored or activated.

Emotion and physiology. Learning within formal education systems is often assessed by the ability to recall content or apply basic procedures, such as those measured on standardized tests. However, research demonstrates that emotions play into even simple content recall on such assessments because emotions activate and stimulate our brain and thereby support the recall process (Jensen, 1998). Researchers suggest that effective science teaching actively utilizes student and teacher emotions (Zembylas, 2004). Student readiness to recall experiential learning is due to the emotional and physical engagement of learners during the experience (Howden, 2012). Therefore, experiential learning has the potential to teach more lasting lessons than non-interactive education.

Deep change requires emotional involvement partly because of the role emotions play in evaluation of situations, objects and beliefs (Eynde, De Corte, & Verschaffel, 2006). For example, the work of Berry, Schmied, and Schrock (2008) demonstrated that emotional pictures of 1960's activism lead students to have better performance on tests covering issues from that era compared to more sterile images of the same topic. They further concluded that the emotions inherent to the selected images help to arouse a deeper search for meaning in their subjects. Dirkx (2001) shares how "the process of meaning-making… is essentially imaginative and extrarational" and emotions elicit a much deeper personal search for meaning than purely rational attempts at education (p 64).

However, emotional and physical connections to subjects do not always lead to accurate learning outcomes. The work of Prokop and Tunnicliffe (2008) helps to illustrate the difference between the roles of cognition and emotion in learning. They studied the difference in student fears of bats and spiders; in doing so, they realized that personal experiences with spiders elicited negative emotions and, therefore, created more misconceptions about spiders than students have about bats because the students typically lack personal encounters with the latter. Sources of fear toward these two animals were derived differently and, consequently, impacted student conviction of knowledge and attitudes towards these creatures differently. In other words, personal experiences and socio-cultural factors, such as public perceptions and folklore, both play a different mediating role in knowledge, attitudes and beliefs.

Further research shows that there is a positive correlation between cardiac rate and cognitive activity (Cacioppo & Petty, 1979). This is especially applicable in this dissertation study, which may present students with animals that might elicit fearful or excited reactions. As a result, it is important to provide some control for the variability of emotional and physiological statuses of students during the presentations. For the zoo presentations, both the educator and the audience become social forces that influence learning. A presenter calmly handling a hissing cockroach while students touch one-by-one has a different emotional response and physiological message than a group of students flinching as they try to individually pick up a cockroach with less guidance.

Experiential Learning at Informal Learning Environments

Informal learning environments are social in nature. This increases the complexity of research findings, but some trends are fairly clear. Unique experiences, such as those provided by a zoo, are often accompanied by a chain reaction of social factors that both regulate behaviors through perceived social norms and stimulate efforts to integrate knowledge into existing systems (Balling & Falk, 1982; Falk, Martin, & Balling, 1978; Orion & Hofstein, 1991). A typical field trip experience not only exposes students to potentially novel physiological environments, but students are left to negotiate their own behaviors amidst more fluid interactions amongst peers, museum staff, and other visitors. Factors such as peer behaviors, derived perceptions of norms, and familiarity with content may all impact the learning process. As such, informal education researchers suggest that contextual and social forces such as these be considered alongside interpersonal variables in order to appreciate just how understanding develops (Brody, Tomkiewicz, & Graves, 2000; Falk & Dierking, 2000). This is difficult to do, however, and few studies have isolated these variables, such as content novelty, peer perceptions or individual perception of control, in order to empirically investigate best interpretive practices for environmental education (Stern, Powell, & Hill, 2013). One that has attempted to do so discovered that presenter qualities such as charisma, sincerity, passion, and confidence make the most positive impact on visitor experiences (Stern & Powell, 2013). This study also found that a subjective measure of presentation quality significantly predicted audience outcomes.

The foci of informal education research, however, vary by content, affect, attitude and behavioral learning outcomes. Ham (2013) reminded us that some interpretive educators seek to educate, while others aim to provoke, and this is an important distinction in research and review of interpretive practices. Ham (2013) explicitly links content learning to semantic, or factual, learning processes and attitudes to episodic, or experiential, learning. The following sections elaborate upon the findings of studies on these various outcomes.

Content or declarative knowledge. The most abundant source of content knowledge studies in experiential learning comes from field trip research. Review of informal learning experiences provides general indications of cognitive gain (Anderson & Lucas, 1997; Bamberger & Tal, 2006; DeWitt & Storksdiek, 2008; Orion & Hofstein, 1994; Tuckey, 1992). However, some studies present scattered and conflicting results. Although rare, longitudinal studies from field trips demonstrate that content knowledge continues to change for several weeks as students' discursive behaviors and interests continue to shape their understanding (Randler, 2009). A zoo camp confirmed significant gains in student knowledge immediately following the camp while delayed follow-up indicated a great loss of self-reported knowledge two months after the program (Kruse & Card, 2004). This is in opposition to a study that demonstrated students making unanticipated content gains in the nine weeks following a zoo field trip (Randler, Baumgartner, Eisele, & Kienzle, 2010). In the previous study, students' content knowledge is shown to expand in the weeks following field experiences, while in Kruse and Card's (2004) research, student's perceive their content knowledge to decrease. This discrepancy might be a result of the self-reports being subject to self-efficacies but more research is needed to understand how content knowledge is shaped by field trip experiences and their aftermath. In light of these mixed findings, it is helpful to remember that these field trip experiences may provide different levels of provocation versus education.

Other research into field experiences demonstrates that while content memorization and therefore, test performance, may be low in students, oftentimes, connection-making can be quite high (Bucy, 2005; Tarleton, Ward, & Howarth, 2006). These connections can serve as links between points of content knowledge, such as how systems are inter-related, but they can also serve as direct links between learners and the content itself, allowing content to be perceived as more personally relevant. Cognitive studies are abundant, but many of these studies also reference attitudinal shifts as an observed or anecdotal outcome. In fact, after completing their seminal literature review of over 100 field trip studies, DeWitt and Storksdiek (2008) contend that zoos are not better content learning venues than classrooms, but that they are better at experiential learning lessons such as those appealing to the affective domain.

Affect, attitude and persuasion. Many informal learning environments are designed to teach, while others aim to entertain or provoke (Ham, 2013). The latter two purposes speak more to experiential learning than teaching does because these approaches provide more opportunity for emotion, personal connections and reflection – all ingredients of persuasion. Provocative experiential learning changes attitudes and even helps to shape identities, such as with Jewish students taking a trip to Polish concentration camps (Romi & Lev, 2002).

Informal learning environments have the ability to provoke interest from a wide range of audiences. From pre-kindergarten students visiting an Australian park system to pre-service teachers in Central Park, learners undergo significant attitude changes and awareness of the resource being explored (Gambino, Davis, & Rowntree, 2009; Warketin, 2011). By interacting with a forest environment and an endangered species character (a human dressed as an Australian Bilbi), young children developed awareness and care for preserving the animal and its environment (Gambino, Davis, & Rowntree, 2009). For the pre-service teachers visiting Central Park as part of their professional development, participants' perceptions of the park, it's purpose, and their relationship to it evolved drastically as a result of a simple nature-journaling exercise which required them to sit in nature, observe their surroundings, and record their observations in pairs; many of the participants changed their long-term behaviors with the park by choosing to continue the nature-journaling practice in the park (Warketin, 2011). Furthermore, the layers of self-pursued interpretive media, such as attending keeper talks, interacting with volunteers, and observing actors, results in increased conservation indicators over a single exhibit walkthrough experience (Weiler & Smith, 2009). The freedom to flow through learning environments helps to alter visitor moods and intentions while sparking enjoyable and reflective moments (Luebke & Matiasek, 2013). Furthermore, the use of live animals in interpretive presentations has positively influenced public beliefs about conservation and stewardship (Swanagan, 2000; Yerke & Burns, 1991). A common finding of studies involving informal learning environments is that they provide personal experiences, often accompanied by enjoyment, with the subject matter.

What is particularly illuminating is that studies of more provocative interpretive lessons have demonstrated that having greater personal relevance may actual increase attitude changes meanwhile decreasing content recall (Cacioppo & Petty, 1989). This is important to recognize because it illustrates a teeter-totter between attitude and declarative knowledge, and it may suggest that zoos will face difficulty in trying to demonstrate increased content knowledge gains while trying to fulfill their own missions of promoting conservation behaviors. This presents a potential problem to organizations seeking to cater toward public schools, which receive support or funding based on standards-based content pursuits.

Linking Experiences to Persuasion

Realistically, many factors have been shown to influence the persuasiveness of an experience. Some of these are individual internal characteristics such as values and relevance while others are traits of the discourse such as strength of reasoning, repetition of theme, use of rhetorical questions and perceived expertise of the presenter (Cacioppo & Petty, 1989; Petty & Cacioppo, 1979; Petty, Cacioppo, & Goldman, 1981). Surprisingly, Petty and Cacioppo (1989) also discovered that, in one case study, weak persuasive messaging led to more content recall than did strong messaging, and content recall was completely unrelated to attitude outcomes.

In the 1950’s, pioneer work by Cohen and colleagues explored how people varied in their need for cognitive engagement (Cohen, Stotland, & Wolfe, 1955)**.** These researchers discovered that some people seek out opportunities to engage in effortful thinking. Cacioppo, Petty and Morris (1983) extended this work to demonstrate that people with high need for cognition are more greatly persuaded by strong arguments, while those with low need for cognition show no difference in persuasion based on argument strength. Argument strength may be an important factor for zoo presenters that aim to persuade students to engage in more conservation behaviors. Admittedly, most of the work by Cacioppo and Petty is with adult populations and, therefore, it remains ambiguous as to when some youth develop similar needs for deep cognitive engagement to be persuaded.

Nonetheless, in order to change behaviors, attitudes must change first. Persuasion to act in a certain way can be enduring or fleeting; the duration depends on how well the matter aligns with personal attitudes (Cialdini, Petty, & Cacioppo, 1981). Mirroring Petty and Cacioppo's (1979) peripheral and central routes of persuasion, Ham (2013) has identified two paths to successful behavior changing interpretation: the normative path using social pressures to cause short-term change and the reasoned action path which requires deeper values assessment and leads to long-term change. Interpretive presentations, then, may have the power to temporarily alter behaviors when they align mildly with circumstantial beliefs, but perhaps they are more powerful when they help to shape attitudes. Whether it is through modifying social belief systems, forging personal connections or creating emotional bonds, those who seek to spark conservation behaviors must embed learning in meaningful experiences.

Behavior

Ham (2013) contends that soundly designed interpretive presentations have demonstrated their ability to lead to short-term behavior change, but long-term change has yet to be demonstrated in part due to a lack of research and in part due to non-rigorous research design. This section draws upon conservation education research in order to demonstrate what is known about behavior change through interpretation.

For more than three decades, many zoos have experimented with strategies to bring about positive change for the environment. Helping people to see how their actions contribute to problems half a world away is not the only challenge wildlife interpreters face. The 1980s and 1990s were characterized by harsh and overwhelming messages forecasting doom if immediate action was not taken. Statements such as “80,000 acres of rainforest disappear each day” and “50,000 species go extinct each year” began to fall on mostly deaf ears as zoo patrons became overwhelmed or displeased with the messaging (EarthTalk, 2009). Similar efforts to solicit donations to counteract hunger in Africa discovered that potential donors feel capable of supporting an individual but do not contribute to a cause when presented with staggering figures on hunger (Vedantam, 2014). Subsequently, many conservation emphases of zoos were downplayed. More recent efforts to interpret conservation messages are positive in order to lead to protective behaviors for national parks, historic monuments, species and individuals (Ham, 2012).Today, zoos try to support change with varying devotion; some place small signs at key habitats while others produce conservation puppet theater performances.

Many fields within CP are striving to identify the key mixture of strategies to promote conservation behaviors. “Working with cognitive scientists and experts in linguistics and anthropology, a coalition of aquariums set out in 2008 to develop a pattern that would intrigue rather than daunt or depress the average visitor" (Kaufman, 2012). The National Science Foundation alone has invested more $6.5 million dollars in seven years into developing and training effective global warming massaging at zoos and aquariums around the country. The results of these studies are eagerly anticipated as they too will shed light on mechanisms of change. In the meantime, more research is needed to analyze the various avenues through which zoos hope to shape behaviors of their patrons.

A study by the Philadelphia Zoo revealed that out of all of its resources, such as signs, exhibits and collections, quality of staff made the most difference for visitors' motives to engage in conservation initiatives (Wagner, Chessler, York, & Raynor, 2009). The strength of human-human persuasion likely lies in the ability of an interpreter to personally cater conversation to visitor interests while driving the discussion towards particularly relevant conservation issues. Zoo personnel may also be seen as some level of expert, thus lending credibility or urgency to statements.

As Bamberg (2003) suggests, critics who doubt that environmental concern influences environmental behaviors are misled because most research has measured very general beliefs against very specific behaviors. Bamberg demonstrated that students could be influenced to behave through two pathways. Students with high specific environmental concern were more likely to behave correspondingly when an expert demonstrated individual control over the behavior, while those with low environmental concern were most heavily influenced to behave "green" by perceptions of social norms. Furthermore, visitors who perceive themselves as having positive connections with zoo animals also tend to be more readily open to conservation initiatives (Clayton, Fraser, & Saunders, 2009).

Sensory-Based Learning

Sensory-based learning should be viewed as a subset of experiential learning. It requires that the learner be involved in the learning experience through multiple senses, and generally speaking, researchers typically make touch a pivotal aspect of this line of research. In his essay, "The Ederly Schoolma'am," Tilden explicitly links the senses to interpretive techniques: "Interpretation addressed to special populations at times means that special sensory-based interpretive techniques or programs become necessary in order to help visitors connect with resources" (Craig, 2007). Proponents of sensory-based approaches claim that it provides more primal cognition to arouse motivation and interest as well as providing learners with tangible experiences to recall (Auer, 2006). Touching, seeing and hearing live animals have better potential to trigger emotion and episodic memory processes than passive learning strategies that rely on discussion or reading about them. Because literature on the impact of individual sensory experiences is sparse, the following section is a compilation of findings from studies of sensory-focus research followed by individual sensory interventions.

Capitalizing on sensory-based references impacts factual learning in a zoo setting. For example, black rhino training presentations that were interpreted with personal references and metaphors emphasizing the five senses led fifth graders to have greater content recall than presentations that were solely factual in nature (Visscher, Snider, & Stoep, 2009). The treatment, which drew heavily upon Freeman Tilden's (1957) interpretive principles and is endorsed by the National Association of Interpretation, engaged the audience through multiple opportunities to directly participate as well as absorb presentation content through multiple senses.

Another growing vein in education has researchers experimenting with virtual worlds, as a form of experiential learning, full of visual, auditory and even kinesthetic stimuli (Branson & Thomson, 2013; Ketelhut, Nelson, Clarke, & Dede, 2010; Llobera, Blom, & Slater, 2013). Similar to field trips, however, virtual environments present the challenge of singling out the contribution of each sense to the whole learning experience. Further research has begun to isolate the impact of adding single sensory-based additions, such as sight or sound into effective learning design. The findings begin to illustrate how holistic experiential learning strategies can enhance learning.

Sight. From virtual reality to field experiences and even imaginative exploration, personal experiences with visual medium heighten the learning process. The nature of authentic learning makes it difficult to differentiate the role of one sense from another, but a few researchers have succeeded in doing so. In an art-museum-based study, Lankford (2002) discovered that taking time to fully immerse oneself visually in a piece of art while trying to construct its meaning leads to heightened cognitive, affective, perceptual and empathetic visitor outcomes. In studying learning animations of biological functions, researchers identified that simple visual cues, when paired with reflective explanation, improved learning in their subjects over non-cued animations (De Koning , Tabbers, Rikers, & Paas, 2011). Researchers believed this finding was a result of reducing the burden placed on working memory load within a visually stimulating environment. In both of these studies, prompting learners to focus on a specific visual aspect of the learning experience meanwhile reflecting upon its meaning enhanced the desired learning outcomes.

Sound. One of the oft-overlooked senses in formal education programs is sound, but informal contexts are playing with this factor to enhance learning. Something as simple as adding read-aloud narratives to virtual character conversation windows led students to better overall performance; such accommodations allow for different learning styles to be involved as well as make the learning experience more accessible to learners of different needs and varying aptitudes (Shelton, 2013). Similarly, audio commentaries provide students with enhanced hands-on learning of complex science subject (Heard, Divall, & Johnson, 2000). Another study used environmental audio (i.e. sounds of stream water) to enhance the intricacies of an online map. The researchers propose this addition further promoted spatial learning in the virtual environment (Siekierska et al., 2003). In the field, ambient sound devices acted as a tool of provocation by promoting students' explorative behaviors and inquiry dialogue as they advanced through a woodland lesson (Randell, Price, Rogers, Harris, & Fitzpatrick, 2004). Sound, in these studies, enhanced the intake of information as well as aroused greater interest in the subject.

Smell. Olfaction has a slightly different place in education than some other senses, perhaps in part because of the challenge of manufacturing unique smells. However, smells become important in our memory and even social frameworks as they can elicit thoughts, ideas and emotions on their own (Low, 2013). Although not yet researched, there are likely links to sense of smell and immersion in an experience; the growth of 4D movie theaters with scent-production abilities may be testament to this.

Touch. Hands-on learning is a widely used term often used to indicate one of two things: experiential learning on the whole or truly touch-centric forms of kinesthetic learning (Rosenstein, Sweeney, & Gupta, 2012). This section focuses on the latter definition, requiring physical contact with the learning objects or environment.

Studies into hands-on lessons in the classroom abound, and they illustrate a variety of outcomes, including that students develop better understanding, greater interest in the subject, longer retention of the information, and even more engagement with the discipline (Bilgin, 2006; Grisham, 1997; Johnston & McAllister, 2008; Jurisevic, Vrtacnik, Kwiatkowski, & Gros, 2012). For example, the ability to physically manipulate light through a hands-on spectronomy lesson in a physics classroom not only significantly improved student knowledge of the topic, but students also perceived the content more positively (Jurisevic, Vrtacnik, Kwiatkowski, & Gros, 2012). Findings from formal lessons are mirrored in informal contexts.

In zoos specifically, researchers found that hands-on lessons produced greater content retention than guided tours; researchers speculated the ability to remember actions aided in affixing long-term knowledge (Randler, Kummer, & Wilhelm, 2012). Another study demonstrated that interaction with objects and interpreters at a touch-table promotes higher learning tiers and longer retention of exhibit-related information than merely visiting the exhibit itself (Lindemann-Matthies & Kamer, 2005). When targeting three to seven year old audiences, incorporating opportunities to touch animals garnered more student interest than seeing the animals (Kidd, Kidd, & Zasloff, 1995). In overcoming fifth-grade student fears and misconceptions, Morgan and Gramann (1989) discovered that the ability to touch snakes was far more effective at producing positive attitudes than simply just seeing them. Similar research has shown students having physical contact with animals has demonstrated the ability to overcome sensations such as fear and disgust (Randler, Eberhard, & Prokop, 2012). The common theme in hands-on, touch-based learning is in emotional connections helping to forge attitude and behavior change.

Summary

Research demonstrates that behavior changes are more effectively promoted when experiences tie into local social norms, demonstrate individual ability to engage in behavior, have clear consequences, and are specifically targeted (Ham, 2012). When a presentation keys into these values, educators can hope to see some level of behavior change. Live animal presentations, providing students with a social, experiential learning opportunity, have the potential to elicit emotional reactions such as caring – which may ultimately enhance protective behavioral outcomes. Existing literature indicates a variety of factors that may mediate the sensory-based learning experience. These include animal predispositions, concurrent emotional responses, species being presented, presentation quality, and persuasive routes. Research should consider these factors in addition to the type of sensory experiences students may have with the animal. A variety of literature also supports CP theory of caring for a resource as leading to protective behaviors; Conservation Psychology studies demonstrate the centrality of attitudes – as in caring and subject interest – in regulating behavior outcomes. Only by controlling for student backgrounds, animal differences, emotional responses, and messaging discrepancies can we hope to identify the specific role that live animals play in promoting conservation behavior change.

CHAPTER 3

RESEARCH DESIGN AND METHODS

As widespread as live animal programs are, prior to this study, there has been no evidence that they promote behavior change. This means that not only are presenters left guessing if these programs lead to conservation behaviors, but we know nothing of how the use of animals potentially aides or impedes engagement with conservation behaviors over similar presentations without live animals. It is in the scope of this research to evaluate if behavioral learning objectives are generally achieved. However, because it would adversely impact the zoo and its audience to alter paid-program expectations and directly experiment with adding or removing the “star” attraction from Zoomobile presentations, the research direction dictated other methods of investigation that get at *how* live animals may impact behavioral changes. With the inability to directly manipulate the level to which students interact with animals as well as the species presented during each presentation, the study was subject to the constraints of collecting data from presentations as they occur and then running analyses as correlations allow.

Overall, the data included in this study controlled for variables that form a basis of comparison between animal and presentation factors. For example, level of interaction with the animals, familiarity with species, quantity of animals presented, presentation fidelity and student emotional responses were collected in order to control for elements that may either directly or indirectly impact behavior change. The following research questions and hypotheses guided this research.

Research Questions

1) How does the type of interaction (sight versus sight with touch) with live zoo animals influence student interest and behaviors as measured by survey self-reports of attitude and behavior?

    - *Informed by Conservation Psychology theory and research, I hypothesize that touching live animals leads to greater levels of animal-interest and behavior change than seeing alone.*

2) How do emotional predispositions and emotional responses, including interest, to live animals impact student caring and behavior as measured by survey self-reports of attitude and behavior?

    - *Using the ELM, I hypothesize that emotional predispositions and reactions to animals significantly impact students' level of caring and level of engagement with conservation behaviors.*

3) How enduring are conservation behaviors, which result from live animal presentations, as measured by student reports of behavioral intents and actual engagement with conservation behaviors?

    - *Using the ELM, I hypothesize that touch experiences promote more enduring conservation behaviors because touch elicits more interest from students.*

Collaboration with the Kansas City Zoo

Located to the southeast of downtown Kansas City, the Kansas City Zoo (KCZ) is situated in the historic Swope Park area, which with over 1,800 acres, is one of the largest city parks in the United States. First opened in 1909, the Zoo has celebrated its centennial and seen many transitions through the years. With 202 rolling acres and over 1,000 animals, KCZ has hosted an average of over 630,000 visitors in the past five years (D. Ryder, personal communication, December 10, 2013). Currently, KCZ is a private, non-profit organization. Accredited by the Association of Zoos and Aquariums, the KCZ's six-element master plan requires enhancing connections between guests and animals (The Kansas City Zoo, 2013).

Thanks to a regional grant, everyday KCZ visitors and schools had more access to the zoo in 2013 and 2014. Residents of neighboring Jackson and Clay Counties in Missouri were provided with multiple opportunities each year to experience the zoo without having to pay admission, and schools in these counties had access to Zoomobile presentations at no cost.

The Education Department

With a staff of 15 full-time annual and 10 part-time employees, the Education Department offers a myriad of educational opportunities including live animal shows, keeper chats, birthday parties, summer camps, overnights, local TV segments, offsite "Zoomobile" programs, teacher resource books and online learning games. With these programs, the Zoomobile reached a total of 17,230 participants in 2011, 21,489 participants in 2012 and a striking 98,786 participants in 2013 due to the grant funding (D. Ryder, personal communication, December 10, 2013). Most presentations and programs, including J2S, in the KCZ Education Department have a set curriculum and associated animal collection used for on-site and off-site presentations. These presentations are aimed to fulfill the zoo's mission and vision for 2020, extending content to include opportunities for visitors to learn behaviors that promote a healthier environment and conservation efforts.

Zoomobile

The majority of zoo animal research addresses animal experiences that take place on zoo grounds; however, zoo outreach programs present a unique opportunity to target specific audiences and control for more factors than everyday impromptu animal encounters onsite. The level of control and ability for repeated access directed this research toward school groups.

While the zoo mission itself does not explicitly state its role in fostering conservation behaviors in its patrons, a great deal of the education department's programming states objectives which include specific "green" behavioral outcomes. Each presentation is geared toward a grade-range, with most presentations having appropriate target audience ranging in three to four grade levels. Staff works with teachers in order to select the most age and content-appropriate lesson for the given audiences.

"Journey to Survival" program. The J2S program (see Appendix A for the full program Curriculum guide) is targeted specifically towards students in grades four through seven. Lasting 45-50 minutes, the programs' objectives are to promote students' abilities to:

- Define the terms such as endangered, threatened, and extinct,
- Identify four causes that lead to extinction, and
- Describe at least two actions that can support animal survival.

Each presentation has at least one staff member plus another docent or staff member to help students learn from the materials provided by the zoo. Using posters, biofacts (tangible biological artifacts such as pelts or ivory), Q & A sessions, physical interaction, game-like activities and live animals, the presenters surround students with learning experiences as they direct attention from one sub-lesson to another. The zoo historically presents this program between twenty and fifty times a year

The continuous themes of "Journey to Survival" are that natural and human factors impact animal survival and animals around the globe grow and adapt in order to best survive their environment. By *journeying* across the globe, one continent at a time, presenters key students into the plight of some key animals with conservation messages of importance to the zoo. They also link human behaviors to causes and solutions of these plights. The presentation nears conclusion with local and endangered domestic animals followed by a short discussion on the value of diversity. The presenter reviews key behaviors to wrap up, and it there is time remaining, the presenter assesses student learning by asking the students questions relating to the theme and objectives.

The guidelines (Appendix A) contain a great deal of content with which presenters can draw upon to build the presentation. Depending upon the mix of presenters, the behavior of the audience, the ideas generated during the presentation and even animal behaviors, content varies from one presentation to the next. This variation generally accounts for only about a 10% difference in overall content. Each presentation covers at least three of twelve targeted behaviors that students can engage in as they support conservation efforts. In order to account for significant variations, however, these factors are controlled through fidelity measures outlined later in the chapter.

Presentation staff. There are a handful of presenters that conducted Journey to Survival with schools. These presenters have varying experience in teaching zoo programs, ranging from one month to five years. To help control for presenter differences, the presenter(s) in each program were documented in order to determine if presenter-specific significant differences occurred.

Animal collection. Each presentation included three live animals, representing the themes outlined in the J2S curriculum (see Table 1). Staff conducts the same presentation for multiple groups at the participating schools, but presenters sometimes vary which animals are viewed and touched because there are limitations on the frequency each animal is used for a presentation.

Table 1.

Studied Journey to Survival animal ambassadors and tangibility

Content Theme	Touchable	Non-Touchable
Australian	Blue-tongued skink Bearded dragon	Lorikeet Marine toad
Amazon	Rainbow boa	Amazon parrot
U.S. Domestic	Chicken Rabbit Chinchilla	

Two levels of animal presence occurred during the presentation: live animal touching and live viewing, without touch. Students had the opportunity to touch animals, depending on the species and individual as well as student behaviors that may impact animal welfare. During some presentations, presenters were unable or selected not to allow students to touch some animals that fall into the “touchable” category. This occurred due to a number of reasons including time constraints, perceived audience maturity level, and classroom logistical constraints.

Live animal use occurs during the presentation as each sub-lesson's specific content was summarized. Thus, students are presented with content and activities, and live-animal moments are interspersed through the full length of the presentation. Animal welfare is always the utmost priority in KCZ programs, and therefore, the availability of animals – and even their use – varies by individual rotation, presentation topic, husbandry considerations (i.e. shedding or feeding), training schedules, behavior fluctuations and occasionally special requests. Furthermore, on-site variables such as animal comfort, audience control and presentation logistics continue to regulate the student-animal interactions.

Due to these presentation variations, species and the types of interactions were documented to help isolate the impact of the independent variable (touch) on the outcome variables. To illustrate, during one presentation, the Zoomobile brought a bearded dragon, a rainbow boa, and a chicken into the classroom. The presenter allowed students to touch all three animals. Additionally, the domesticated chicken was quite "talkative" because it layed an egg in its travel container before being presented. The research controls for these and other unique occurrences by inspecting these presentations for anomalous outcomes. A presentation observation form (Appendix C) was used to document the administration of each program.

Research Subjects

Because the program content is geared for grades four through seven, a fairly large range of ages participated in this study. Furthermore, due to an unanticipated shortage in bookings of this program, zoo personnel expanded their target audience in order to fulfill the participant population needs of the research within the research window. A combination of factors was attributed as being responsible for the low frequency of J2S bookings. These factors include a changeover of the webhost and website layout for the Kansas City Zoo, the loss of description on the website of this specific program, and the challenging transition from phone booking to online automated booking of programs. During the winter and spring of 2014, the KZC education program booking system was backed up due to this transition, and schools recruited to participate with this study had trouble booking their presentations. As a result, a more diverse (in terms of grade level, school affiliation, and presentation grouping) participant base than anticipated contributed in this study.

While it would have been ideal to have one presentation per class, some teachers combined classes into one presentation. This was the case for a special needs instructor who combined four classes into one presentation as well as a high school instructor that gathered seniors and eighth-graders from multiple classes into one presentation. Additionally, three full-time afterschool programs for urban students grades three through five participated and are referred to as a classes for simplicity. Afterschool programs had fewer than ten participants each, and most are not included in analysis because grades 4 and under were excluded due to validity concerns. Thus, a total of 21 classes from seven different schools participated. These classes provided a total of 197 participants that were believed to be reliable enough for analyses. See Table 2 for further participant details.

Table 2.

Participant summary

Sample Item	Details	Number
Schools		7
Teachers		9
Classes		21
Grades	(5,6,7,8,12)	5
Participants		197
Ethnicities	African American	41
	Caucasian	95
	Asian	5
	Hispanic	23
	Multi-racial	18
	Other	4
	Missing	8
Gender	Male	72
	Female	115
	Missing	9
English Language Preferred		184
Visited a zoo within the past year		167

Recruitment

Subjects were identified through existing booking requests and through personal recruitment. Schools within the targeted age range and who had left a message with the education program booking line were contacted and invited to participate in this study. Additionally, I contacted all the regional science curriculum coordinators in the surrounding counties to discuss J2S and the research. If interested, contacts were sent an informational flyer on behalf of the researcher and a letter on behalf of the zoo to further explain participation requirements (see Appendix B for school recruitment forms). All schools and afterschool groups that booked the J2S program between February and May 2014 were included in the study.

Compensation. Student and teacher participants did not receive any compensation for participation in this study.

Methods

Timeline

Participants were recruited between January and April 2014. Once identified as participants, subjects completed the consent process anywhere from six weeks to two days prior to the first survey implementation. Pre-surveys (Survey 1) were targeted one week prior to the zoo presentation. However, last minute changes, school assemblies, end-of-course exams, and rotating block schedules resulted in survey administration occurring from ten days to one day prior to the presentation. Because the presentation itself fills one class period, post surveys were administered during the first class period following the presentation. As a result, the first post survey (Survey 2) was administered one to two days following the presentation. While it was most desirable to administer the delayed post-survey (Survey 3) at more than four weeks following the presentation, the actual final survey dates fell between two and five weeks following the presentation due to the end of the school year (see Figure 1 for timeline illustration).

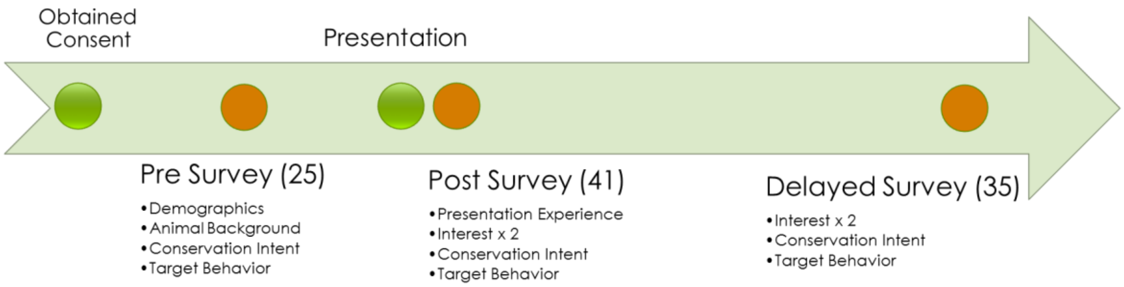


Figure 1. *Study implementation timeline*

Note: Numbers in parentheses indicate the quantity of items on each survey

Thus, students took three study-related surveys over the course of approximately between three and five weeks. I administered the surveys, which consistently lasted between 10 and 20 minutes, by reading each question aloud.

Animal Presentation

In order to be as unobtrusive as possible, I observed the natural flow of the animal presentations without interfering in the content or sequence of the presentation events. With two schools left in the study, I discussed the animals used in study-related presentations with the department supervisor, who then suggested certain animals be used for the following presentations in order to provide a diverse, but more controlled data set of animal encounters.

While this research does not manipulate the presentation itself, its flow is documented here to provide important details that may vary in style from one zoo to the next. Zoomobile presentations are 45 – 50 minutes long. Depending on their age and classroom logistics, students sat in rows on the floor, in pods of desks or in a U-shaped configuration at desks in a science classroom. The afterschool program, which represents a total of seven included study participants, and the special needs classrooms, representing an additional 22 participants, visited the zoo for this presentation, which was held in a zoo classroom. The presenter and the animals were always on the same level as the students, meaning no stages were used for presentation. A range of education animals including reptiles, amphibians, mammals and/or birds were present, but hidden in zoo travel containers under cloth until they were discussed. Presenters established points around the room, usually in all four directions surrounding the class, from which to present each continent and animal from J2s. After a region was introduced, the presenter revealed the animal and illustrated different content points with the animal's morphology. For example, when presenting the Amazon parrot, one presenter discussed the parrot's bright coloration and how it is a desirable trait in the animal smuggling industry. Animals and content were revealed one- by- one throughout the length of the presentation. If the animal is a "touchable" animal, students have the opportunity to briefly investigate the animal closely and stroke the animal one, two or three times as the presenter walks through the audience. In one presentation at a school with four presentations in a day, one class touched two of the animals on the way out the door because the presentation was running long. This was the only anomaly in when the animals were accessible to students.

Data sources

Data for the study were collected from the public school records, the zoo booking data, presentation observation, and from the students themselves. School demographics including socioeconomic status (SES) indicators, using free or reduced lunch as a proxy, student composition factors and proximity to the zoo were collected. Group factors are accounted for on three levels: school, grade and presentation. The zoo booking process provides grade information and history with zoo activities. The remaining information was collected through presentation observation and survey data.

Presentation observation. Hickey (1997) suggests that classroom observations coupled with student self-reports paint a reliable picture of situational learning and motivation. I directly observed each presentation in order to document (Appendix C) animals used, sight and touch experiences, behavioral content variations, overall presentation effectiveness and other experience anomalies.

One particular measure on the observation form was included due to a study that revealed that when observers gave a subject "quality" score to National Park interpretive presentations, the scores were highly correlated with audience perceptions (Stern, Powell, McLean, Martin, Thomsen, & Mutchler, 2013). For this reason, this study included the same measure, with the same criteria. This "quality" score was derived from two elements: my individual perception of the level of quality and the audiences' apparent reaction to the presentation. Additionally, the study included two "Presentation Fidelity" measures. Both were recorded as percent fulfillment of the program guidelines; the first is directed at the overall nineteen content points of the presentation, and the second is aimed at the thirteen suggested conservation behaviors students can engage in to support animal conservation. These measures provide the opportunity to control for differences in content adherence between individual presentations. Combining reliable presentation observations with student self-reports also helped to ensure student surveys accurately represent specific animals and interactions.

In order to establish reliability of the measures being used, another evaluator observed four of the eleven presentations and inter-rater reliabilities (IRRs) were calculated. For the content measures, observers had a 92% agreement rate. The IRR for the suggested conservation measures was 94%. Disagreements stemmed from whether items glazed over in wrap-up could be considered as components of the presentation as well as over the definition of “conserving energy.” Both reviewers agreed that these issues should be treated more liberally and thus, any mention warranted a score and any form of energy, including electricity, gas, water, and solar power were considered. Additionally, the Quality measure had an IRR of 90%.

Surveys. Survey instruments were designed to allow for analysis between viewing and touch experiences with the same group as well as across presentations and schools. As a result, surveys contain some blank spaces that require filling in (e.g. “I saw these animals today”). I directly facilitated survey implementation in each classroom by managing consented participation, walking the participants through filling in animal variables, and by reading each survey question aloud. By reading each survey item for the students, I hoped to alleviate both the burden of survey lengths as well as possible reading comprehension challenges. I collected surveys immediately upon completion. Below, the surveys are outlined and in the instrument section, the details of each instrument are described.

Survey 1, (Appendix D) the pre-survey, was administered the week prior to the zoo presentation. It contains the following four sections: demographics, animal background, the Children's Environmental Attitudes and Social Knowledge Scale (CHEAKS), Verbal Commitment to conservation (Leeming, O'Dwyer, & Bracken, 1995), and finally participation in five targeted behaviors from J2S. As Ham (2012) shares, one of the biggest mistakes that interpreters make in trying to persuade their audience is in assuming that they are like us. In better understanding characteristics of those we address, we can better understand how to teach and inspire them. Thus, these 25 questions are designed to help better understand the student audience and their predispositions.

Survey 2 (Appendix E), the first of two post-surveys, was administered immediately following the presentation for the on-sight presentation with one school and within 2 school-days for all other presentations. Survey 2 includes a total of 41 questions including animal presentation experience, two versions (to be explained below) of the modified Wildlife Attitudes survey, CHEAKs verbal commitment, and the targeted behaviors. Appearing only in this survey due to its ability to capture student reactions, the animal presentation experience section asked students to rate their excitement level for each animal on a scale of one to ten, share their feelings about touching those animals, if they were afraid of any of the animals, if they refused to touch any animals, and about what they remember the most from the presentation. These items were included due to the literature indicating emotional and physiological states influence the learning process (Bandura, 1974; Fraser & Brandt, 2013). The animal presentation experience items were created specifically for this study in order to provide more control for potentially mediating factors. The modified Wildlife Attitudes survey existed in each student survey in two different forms, representing either animals that were touched versus animals that were only seen. Thus, many students completed two versions of the same construct to account for animals touched versus seen. Being the longest survey with 43 items, the first post-survey required students to fill in presentation animals specific to their experience.

Survey 3 (Appendix F), the delayed post-survey, was completed by students anywhere from two to five weeks following the presentation. Students were, once again, asked to complete both versions of the modified Wildlife Attitudes, animal-connectedness, CHEAKS, and target-behaviors sections. Survey 3 had a total of 35 questions.

Instruments. Survey content was derived from previous research implications related to the research questions as well as two validated instruments. The survey sections are listed in the sequence that students were introduced to them.

Demographics. While it is not a main component of this study, students were asked for their age, self-identified gender, ethnicity, and language preference during the first survey. These data, as well as school characteristics such as SES and distance to the zoo are analyzed and controlled when appropriate.

Background factors. In order control for student pre-dispositions to the animal experience, the pre-survey included questions regarding history of zoo visits, pets in the home, free-time invested in learning about animals each week, and emotional predisposition to groupings of animals (i.e. reptiles like snakes and lizards, birds like parrots and lorikeets) they might see during the presentation. Emotional predispositions to animals were arranged by animal classification as well as separated animals to gain the opportunity to differentiate between potentially “scary” reptiles and more neutral reptiles. Students were able to select from two fear-related responses (nervous and afraid) and two joy-related responses (happy and excited), allowing for the data to be categorized into fear or pleasure predispositions for analysis in addition to more specific responses when further mining of research question two was necessary. .

Internal Factors. The literature from Chapter 2 indicates that emotions such as fear, disgust and wonder impact student receptivity to learning (Cacioppo & Petty, 1979; Morgan & Gramann, 1989; Prokop & Tunnicliffe, 2008; Randler, Eberhard, & Prokop, 2012). As a result, Survey 2 included several questions aimed at capturing potential differences between student reactions. For example, students were asked what animals they touched, if they refused to touch anything, and to circle any emotions they experienced in reaction to the live animals.

Targeted behavior construct. Ajzen and Fishbein (1973) suggest that self-reports of intentions more closely align with actual behavior when they are behavior-specific, and directly precede the opportunity to act. Thus, it was thought that using validated survey instruments may pigeon-hole a study into negative results if they do not link directly to program objectives. In order to address this concern, I incorporated a sample of five items from the possible thirteen suggested behaviors contained in the presentation guidelines. They were selected because they were behaviors that are readily accessible in school environments. Items mirrored the more established "Intent to Behave" survey explained later in this section. This instrument uses the same 5-point, Likert-scale responses as the following constructs which ranged from "Strongly Disagree" to "Strongly Agree." However, the presentations were inconsistent with which behaviors were routinely suggested, thus making this construct less useful than originally intended. Any of the targeted five behaviors were only suggested 44% of the time during zoo presentations. This is further demonstrated by the low consistency between student responses; should this portion of the survey accurately represent a construct for the presentation content, it would have a high internal consistency and reliability (ICR) score. However, the attempt to establish a Cronbach's alpha on these few questions yielded an unacceptable score of 0.33, which is well below the minimal cutoff (Nunally, 1978). As a result, this measure is treated more as an indicator of presentation goal achievement as opposed to general behavior change is with the "Intent to Behave" construct described shortly. Additionally, a variable called Survey Target Behavior Fidelity was created to help explain a possible source of variation in results. Surprisingly, analysis showed that this covariate did not appear to be related to target behavior outcomes in any way.

Wildlife Attitudes or Caring. Because conservation psychology indicates that affinity for resources is the best indicator of specific conservation behaviors, this study used Prokop and Tunnicliffe's (2008) Wildlife Attitudes scale as a measure of student care for and interest in animals based on their differing level of interaction with them. This served to illustrate the difference between sight-only and touch experiences. The original survey construct, called Ecoscientistic, was comprised of 12 items, several of which were not able to be modified enough to apply to this study. The remaining nine items were modified to better fit the research by generally referring to animal students "see" or "touch" as opposed to specific animals such as bats and spiders. For example, the statement "*I would like to read a book about Bats/spider*" was replaced by the item "*I would like to read a book about the animals I saw/I touched.*" In cases when spider and bat-specific behaviors were referenced, the behavior was replaced with a generic statement about observation; "*I would like to watch bats during the night using a* *binocular with night vision*" was changed to "*I would like to watch the natural behaviors of the animals I saw/I touched.* As evidenced by the sample questions provided, these items are referenced as attitudes, but they more specifically indicate interest or care for a creature.

Students chose from five, Likert-scale response items ranging from "Strongly Agree" to "Strongly Disagree." Originally, the Ecoscientistic section had Cronbach's alphas of 0.87 and 0.89 for the two forms of the questionnaire. With the level of modifications involved in this study, Cronbach's alphas were once again calculated to see if these adjustments and the item reduction changed instrument reliability. Due to the two versions of the modification, the surveys were renamed for this study to Sight Attitude Questionnaire (SAQ) and the Touch Attitude Survey (TAQ). The internal credibility and reliability scores for these two versions of the original construct were 0.85 and 0.87, respectively. These levels surpass the minimum 0.80 cutoff goal of applied research (Carmines & Zeller, 1979; Lance, Butts, & Michels, 2006; Nunally, 1978). The potential to do comparative analysis of animal-conservation behaviors from touch and no touch experiences is particularly useful to this study, and having each student within a class respond to the impact of sight versus touch, potential class-to-class differences were eliminated that could flaw the outcome data.

CHEAKS construct. Leeming, O'Dwyer and Bracken (1995) developed an "Intent to Behave" section in CHEAKS. These twelve questions target student attitudes, specifically behavioral willingness to engage in animal, pollution, water, energy and general conservation initiatives. For clarity within this study, this construct has been renamed Intent to Behave, and it also uses the same five-point Likert scale as the previous constructs. The original survey of grades six and seven, had a Cronbach's alpha ranging from 0.88 - 0.90. Test-retest values ranged from 0.52 – 0.72. In this study, Cronbach's alpha was calculated at .708. While this is lower than desired for research, it still meets the minimum cutoff proposed by Nunally (1978) for early research aiming for at least "modest" reliability. Sample questions include:

- *I would give $15 of my own money to help protect wild animals.*
- *To save energy, I would be willing to use dimmer lights.*

Structure. *Because they were narrated while students read along, survey items within each construct were identically sequenced on each student survey. Narration was intended to postpone question fatigue by reducing the strain on student processing. The attitude and behavior constructs were sequenced to follow the data priority: 1) engagement in targeted behaviors, 2) SAQ and TAQ and 3) verbal commitment to general conservation behaviors. Survey questions were given in positive and negative phrasing, with negative statements being reverse coded before analysis (see Appendix G for the Survey Codebook).*

Summary of Variable Data

Given the exploratory nature of this study, a wide array of demographic and animal-related factors were considered as possible controls. Table 3 outlines the non-manipulated variables documented in this study. A total of 15 demographic factors (D), four control factors (C), and seven animal-related factors (RQ2) were collected on top of the primary treatment of Touch experience (RQ1).

Data Analysis

The first research question stated: How does the type of interaction (sight versus sight with touch) with live zoo animals influence student interest and behaviors? In order to control for covariates, I initially ran Pearson product-moment correlations and one-way ANOVAs, as appropriate, with the student demographics, school factors and presentation fidelity measures. All 15 demographic and historic variables, separate from animal-related variables contained in RQ2, had no significant impact on behavioral intents. To address RQ1, I conducted repeated measures ANOVAs for the general conservation behavioral outcome variable and animal-interest factors.

Table 3.

Collected variables summary

	Variable Name	Data Type	Description	Class	Effect
1	School	N	Self-explanatory.	D	T1
2	Teacher	N		D	
3	Class	N		D	
4	Ethnicity	N	Originally collected individually, but treated as White/non-White in analysis due to significance.	D	
5	Language	N	Defined as a students preferred language for test-taking.	D	
6	Zoo Visits	O	Ranging from never been to a zoo (0) to frequent the zoo many times each year (4).	D	
7	Afterschool Program	N	Dichotomous for whether the subject came from an afterschool program presentation.	D	
8	Special Needs	N	Dichotomous measure of the group of students participating from a special needs classroom.	D	
9	Gender	N	Dichotomous measure of gender.	D	
10	SES	I	Percentage of students on free or reduced lunch at the school.	D	
11	Pet	N	Dichotomous indicator of whether a student has a pet or not.	D	
12	Grade	I	Self-explanatory.	D	

(CONTINUED)

13	Age	I	Self-explanatory. Excluded from analysis due to Grade variable.	D	
14	Pet Species	I	Quantity of different species at home as pets.	D	
15	Animal Freetime	I	Measure of freetime, in hours, a student spends researching animals in books, online and on TV each week.	RQ2	
16	Distance to Zoo	I	Distance, in street traveled miles, from the school to the zoo.	D	
17	EmoPred	O/I	A composite score of students ratings of their fearful (1) to joyful (4) predispositions to animals.	RQ2	
18	Animal Knowledge	O/I	A composite score of a student's familiarity with the three species represented.	RQ2	
19	Touch Emotion	O/I	A single response of a student's fearful (1) to joyful (4) reaction to touching the specific animals touched.	RQ2	T2
20	Afraid	N	Dichotomous measure of if a student was afraid of any of the presentation animals.	RQ2	
21	Refuse Touch	N	Dichotomous measure of if a student refused to touch any of the touch-possible presentation animals.	RQ2	
22	Refuse Which	N	Which animal a student refused to touch.	RQ2	
23	PresContFidel	I	A score representing what percentage of the 19 content points were discussed during each presentation.	C	
24	PresBehFidel	I	A score representing what percentage of the 13 possible content behaviors were discussed during the presentation.	C	
25	PresQualFidel	I	A subjective score of the quality of presentation based on the presenters observations of the program and student reactions.	C	
26	TargetBehFidel	I	A score representing what percentage of the 5 measured target behaviors contained on the surveys were mentioned during the presentation.	C	
27	Excitement	I	A composite score of a student's reactions to all three animals seen during the presentation.	RQ2	
28	Touch	I/N	How many/whether students touched any animals.	RQ1	

Note: Data Type: N = Nominal, O = Ordinal, I = Interval; "Class" refers to variable relationships – D = demographic, C = control; RQ1/2 = research question driven; Effect = time point at which the variable is active, T1 = before presentation, T2 = after presentation

While it was originally intended that quantity of touch be the primary independent variable explored, manipulation of analyses were more straightforward and findings were much clearer using a touch versus no-touch comparison. I hypothesized that touching live animals leads to greater levels of interest and behavior change than seeing alone, and I expected to find that students who touched animals would have greater engagement in both conservation behavior measures than counterparts with fewer or no touch experiences. I also expected to find that their interests in animals touched would be greater than in animals only seen.

The second research question explored: How do emotional predispositions and emotional responses to live animals impact student interest and behavior? Because I hypothesized that positive changes in emotional predispositions to animals make a significant impact on student level of caring and engagement with conservation behaviors, I discovered that, of seven possible variables, the following significantly correlated with at least one behavior measure: animal freetime, emotional predisposition, animal excitement, zoo visits and animal knowledge. These variables were included in the repeated measures ANOVAs for interest and behavior outcomes as covariates.

Research question 3 asked: How enduring are conservation behaviors, which result from live animal presentations? With time as the main focus of RQ3, the same analyses from RQ2 were used, but this time with data from T1, T2 and T3. I hypothesized that touch experiences would promote more enduring conservation behaviors than sight-only experiences because they elicit more student interest and caring. Additionally, target behaviors were incorporated into analyses at this stage. Because target behavior measures were actively phrased (unlike behavioral intents), it was determined that the only appropriate analysis would occur over a greater period of time that allowed behavior changes to occur after the presentation. Thus, target behaviors were analyzed only for RQ3. The variables teacher, gender and white correlated with targeted behavioral outcomes, and therefore, the latter two were included in analysis as covariates. The variable teacher, although significantly correlated with target behaviors, was excluded from analysis for two reasons. First, it is difficult to incorporate nominal variables with this many levels into repeated measure analyses of variance. Second, there were enough participating teachers and enough diversity within teachers' classes experiences that the exclusion of this variable does not impact the results. A one-way ANOVA of change in Target Behavior scores from T1 to T3 on teacher showed a non-significant effect of teacher with a small effect size ($F(7,154) = .719$, $p = .656$, $\eta^2_p = .032$).

CHAPTER 4

RESULTS

Recall that this study sought to answer three distinct research questions attending to the impact of the type of student interaction with the animals (RQ1), investigating the role of emotional predispositions and responses to the animals (RQ2), and assessing the role of time in sustainment of desired outcomes (RQ3). Table 4 outlines the analyses documented in this chapter.

Table 4.

Analyses overview

Research Question	IV	DV	Time
RQ1 Touch	Any Animals Touched	General Behavior	T1, T2
	All or No touch	SAQ v TAQ	T2
	Quantity of Animals Touched (1,2)	Interest	T2
RQ2 Emotion	Same analysis as RQ 1 – WITH EMOTIONAL and ANIMAL-RELATED FACTORS		
RQ3 Time	Any Animals Touched	General Behavior	T1, T2, T3
	Any Animals Touched	Target Behavior	T1, T2, T3
	All or No Touch	SAQ v TAQ	T2, T3
	Quantity of Animals Touched (1,2)	Interest	T2, T3

It is worth noting the absence of the DV target behavior from analyses in RQ1 and RQ2. Because items on the target behaviors construct are actively phrased, analysis of T1 to T3 changes was deemed more appropriate and this analysis was saved for RQ3.

The three main outcome variables used for analysis are general behavioral outcomes based on intent to behave with conservation behaviors, targeted behaviors based on conservation actions specifically promoted during the presentation, and interest in live animals seen or touched during the presentation. Analysis of the potential factors was performed using Pearson correlations for every dichotomous or interval variable with each of the dependent variables (DVs). One-way ANOVAs were used to analyze the remaining nominal variables for correlation with the DVs. Table 5 illustrates the variables that are significantly correlated with outcome variables.

Table 5.

Significant correlates for use in analysis

DV	Demographic Factors		Emotion or Animal Factors	
General Behaviors			Emotional Pred** Animal Freetime* Touch Emotion** Animal Excitement***	N = 186, r = .209, p =.004 N = 184, r = .125, p=.046 N=120, r =.222, p=.015 N = 176, r = .291, p<.001
Target Behaviors	Grade** Ethnicity** ~~Teacher*~~ Zoo Visits**	N = 188, r =-.192, p =.004 N=185, r =.205, p =.005 F (7,179) = 2.154, p =.040 N = 187, r = .198, p = .007	Animal Freetime* Animal Knowledge**	N = 184, r = .149, p=.022 N = 178, r = .205, p=.006
Interest (SAQ, TAQ)	Gender***	N = 77, r = -.392, p<.001	Emotional Pred** Afraid** Animal Freetime** Animal Excitement***	N = 77, r =.336, p=.003 N = 74, r -.394, p = .001 N = 77, r =.284, p=.006 N = 79, r = .597, p < .001

Note: These correlations are based off the DV at the time indicated in Table Y below.
* p is significant at the .05 level, ** p is significant at the .01 level, *** p is significant at the .001 level

Several factors of significance (contained in Table 6) were transformed in support the analyses which follow. Ethnicity, when found significant, was converted into a dichotomous variable representing whether a student classifies as white so that it can be smoothly integrated into analysis. Finally, the emotional predisposition and response variables, while originally nominal, can also be viewed as being on a scale from fearful to joyful dispositions to animals. When treated this way, they were included as scale factors in analysis.

Table 6.

Summary of potentially significant model factors

Variable Name	Data Type	Description	Effect
Ethnicity/White	N	Originally collected individually, but treated as White/non-White in analysis due to significance.	T1
Zoo Visits	O/I	Ranging from never been to a zoo (0) to frequent the zoo many times each year (4).	
Gender	N	Dichotomous measure of gender.	
Grade	I	Self-explanatory.	
Animal Freetime	I	Measure of free-time, in hours, a student spends researching animals in books, online and on TV each week.	
EmoPred	O/I	A composite score of students ratings of their fearful (1) to joyful (4) predispositions to animals.	
Animal Knowledge	O/I	A composite score of a student's familiarity with the three species represented.	
Touch Emotion	O/I	A single response of a student's fearful (1) to joyful (4) reaction to touching the specific animals touched.	T2
Afraid	N	Dichotomous measure of if a student was afraid of any of the presentation animals.	
Excitement	I	A composite score of a student's reactions to all three animals seen during the presentation.	
Touch	I/N	How many/whether students touched any animals.	

Note: N – Nominal, O – ordinal, I – interval data measures.

General Outcomes

As previously mentioned in Chapter 3, 197 students are included in this study because they have data for at least two time points and because 5th grade was selected as the low-end cutoff for grade. Of these, 14 students had an unknown number of touch experiences due to an incomplete or missing Survey 2. A total of 49 students did not touch any animals, and 134 touched at least one animal. Further descriptive summaries are contained within each analysis.

Findings

Question 1: The Impact of Touch Experiences

To address RQ1, data from the pre-survey (T1) and post survey (T2) were used to evaluate the impact of touch experiences on student behavioral intents and interests in animals. During initial exploration, graphical representations of the data appeared to show a difference in scores based on the quantity of animals touched (ranging from 0 to 3). During further analysis, however, the findings demonstrated varying levels of significance. Additionally, the quantities of touch experiences were not consistently divided, and it was decided that the more parsimonious model, using a dichotomous (0,1) scale for whether or not students touched an animal was more appropriate. Thus, I present the results for the dichotomous touch variable when addressing behavioral outcomes.

General conservation behavioral intent. The first behavior-related variable measured intent to engage in general conservation behaviors such as reducing water usage, recycling and riding the bus. As documented in Table 5 above, not one of 15 demographic variables significantly correlated with general conservation behavioral intent outcomes. Because the starting means of T1 behaviors were determined to be equivalent, it was appropriate to use the T1 variable as a repeated measure as opposed to covariate in the analysis. Thus, a repeated measures two-way mixed ANOVA of the general behavioral intents at T1 and T2 using the between subjects variable of any touch was conducted. Results showed Levene's Tests were not violated (F=.357, p>.05; F=.865, p>.05) and the analysis continued.

Table 7.

Descriptives of general behavioral intents with no touch and some touch

DV	No Touch			Some Touch		
	N	Mean	SD	N	Mean	SD
General Behavior 1	48	3.627	.555	121	3.643	.536
General Behavior 2	48	3.460	.661	121	3.661	.555

Table 8.

Repeated measures ANOVA of general behavioral intents on any touch

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
Touch	.811	1	.811	1.523	.219	.009
Error	88.935	167	.533			
Within Subjects						
Time	.385	1	.385	3.669	.057	.021
Time x Touch	.586	1	.586	5.592*	.019	.032
Error	17.503	167	.105			

* p is significant at the .05 level

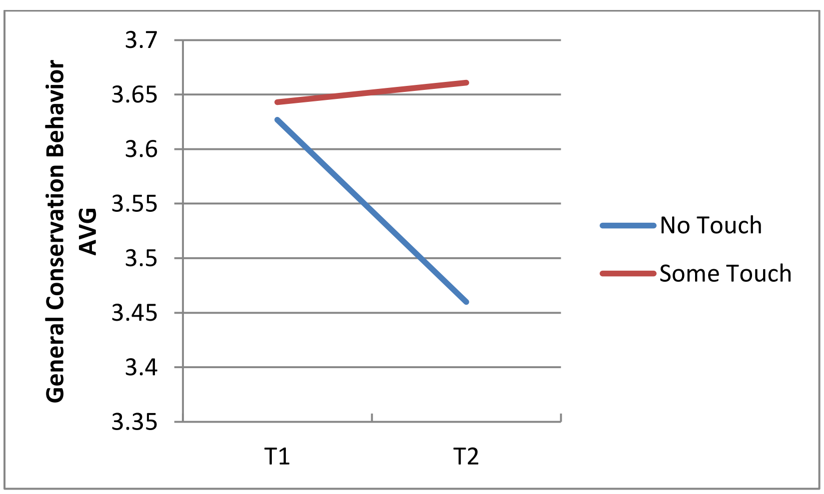


Figure 2. *Interaction of touch with time for general conservation behavioral intents*

The interaction Time x Touch was statistically significant with a small to medium effect size. No other main or interaction effects were significant. Students who did not touch an animal had a markedly lower general behavior score at T2 while students who touched animals maintained their general behavior scores.

Interest in animals. The surveys included measures of student interest in animals they saw versus ones they touched. Interest indicators included desire to read a book about the animal(s) or watch them in the wild. Two forms of the animal touch factor were analyzed at T2: one using students who had SAQ and TAQ scores and students who had only SAQ scores against students with only TAQ scores. Recall that gender was the only demographic variable significantly correlated with interest outcomes and was thus used as a between-subjects factor in the analysis of variance pertaining to animal-interest outcomes.

Students who had responses for both the sight (SAQ) and touch (TAQ) questionnaires, because they touched either one or two of the three animals, were used to compare scores against one another. A repeated measures two-way mixed ANOVA using SAQ and TAQ on gender did not violated Levene's Test ($F=.002$, $p>.05$; $F=.154$, $p>.05$).

Table 9.

Descriptives for SAQ and TAQ scores

DV	Gender	Sight			Touch		
		N	Mean	SD	N	Mean	SD
Interest 2	Male	29	3.550	.802	29	3.680	.720
	Female	64	3.615	.743	64	3.799	.669
	Total	93	3.595	.758	93	3.762	.684

Table 10.

Repeated measures ANOVA of SAQ and TAQ on touch

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
Gender	.339	1	.339	.395	.531	.004
Error	78.174	91	.859			
Within Subjects						
Touch	.984	1	.984	5.148*	.026	.054
Touch x Gender	.029	1	.029	.154	.695	.002
Error	17.385	91	.191			

* p is significant at the .05 level

The results showed a main effect of touching animals on the outcome. No other effects were observed.

Testing for the difference between student scores of those who touched all the animals versus those who only saw all of the animals required creating a new variable, referred to as Interest, which combined separate SAQ and TAQ scores into one measure with each student having only one response variable. This was accomplished by merging the students with only touch or only sight response scores into a new data column. A two-way ANOVA was conducted using interest as the dependent variable with gender as a between-subjects factor, and the results are in the tables below. Levene's test of the homogeneity of variances was not violated (F=.150, p>.05).

Table 11.

Descriptives of interest 2 by touch and no touch

DV	Gender	No Animal Touched			All Animals Touched		
		N	Mean	SD	N	Mean	SD
Interest 2	Male	32	4.055	.672	7	4.238	.557
	Female	15	3.444	.642	23	3.599	.676
	Total	47	3.860	.716	30	3.748	.697

Table 12.

Two-way ANOVA of interest 2 on touch with gender

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
Touch	.400	1	.400	.921	.340	.993
Gender	5.498	1	5.498	12.667**	.001	.999
AllTouch x Gender	.003	1	.003	.006	.937	.000
Error	31.685	73	.434			

** p is significant at the .001 level

Contrary to the t-test findings of students who touched one or two animals, the analysis of these 77 students demonstrated no significant difference between animal-interest scores after touching all animals or touching no animals. However, gender was statistically significant with female students having higher scores.

Question 2: The Role of Emotions in Mediating the Outcomes

Because RQ 2 is concerned with the impact that emotions play in shaping interests and behaviors, and because the literature suggests that interest in and care for a resource best predict engagement in conservation behaviors, analysis for this question took on two directions. The first series of analyses continued with the same procedures in RQ1 while adding in the significantly correlated emotional covariates. The second route of analysis evaluated whether conservation behavior intents (because intents can change in the short-term) changed based on level of animal-interest, regardless of a student's experience with touch or no touch.

General conservation behavioral intent. Both predispositions to animals and reactions to the live animals used in the presentation were considered as potential covariates. Of the nine variables, the four that were significantly correlated with behavioral intents were emotional predisposition, animal freetime, touch response emotion, and animal response excitement. Touch emotion complicates this analysis because it inherently eliminates all cases of no-touch from analysis and is therefore eliminated from the covariates. As with RQ1, changes in general behavioral intent, when accounting for animal-related factors, were evaluated alongside the dichotomous version of the touch variable. The ANOVA did not violate Levene's test ($F=.346$, $p>.05$; $F=1.668$, $p>.05$). Results demonstrated significant main effects of time and excitement as well as the interaction between time and touch. See Figure 2 from RQ1 to see a graphical representation of the latter interaction.

Table 13.

Descriptives of general behavioral intents on touch with animal-related covariates

DV	No Touch			Some Touch		
	N	Mean	SD	N	Mean	SD
General Behavior 1	48	3.627	.555	121	3.655	.522
General Behavior 2	48	3.460	.665	121	3.666	.540

Table 14.

Repeated measures ANOVA of general behavioral intents on touch with animal-related covariates

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
EmoPred[A]	1.357	1	1.357	2.872	.092	.018
Freetime[A]	.120	1	.120	.255	.614	.002
Excitement[A]	3.156	1	3.156	6.677*	.011	.041
Touch	.685	1	.685	1.450	.230	.009
Error	74.209	157	.473			
Within Subjects						
Time	.682	1	.682	6.512*	.012	.040
Time x EmoPred[A]	.230	1	.230	2.198	.140	.014
Time x Freetime[A]	.077	1	.077	.736	.392	.005
Time x Excitement[A]	.132	1	.132	1.261	.263	.008
Time x Touch	.491	1	.491	4.687*	.032	.029
Error	16.444	157	.105			

* p is significant at the .05 level; [A] indicates animal-background-related factor

Exploring excitement. To explore the statistically significant excitement factor, which was a composite score of student enthusiasm in relationship to all three presentation animals, individual student scores for each species were analyzed. This was done in order to determine if species-specific patterns might skew the findings. Species mean excitement scores varied, and no apparent trends in overall excitement with animal classifications appeared (See Figure 3). For example, chinchillas and rabbits scored high, but chickens scored low. Bearded dragons, which are fairly commonplace, scored higher than blue-tongue skinks, which are more exotic.

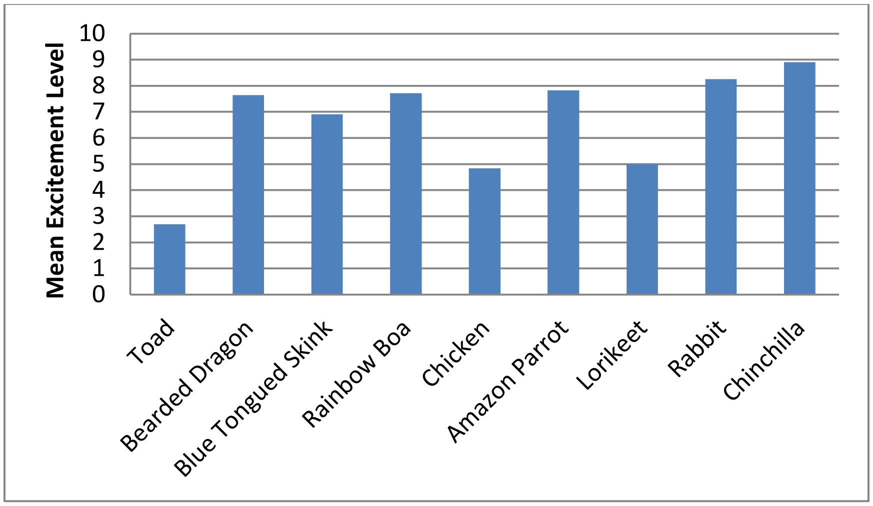


Figure 3. *Student excitement level by animal*

Mean scores for each species were then run through an independent samples t-test to see if a species touch-status related to excitement level, and this produced insignificant findings. This means that some touch animals elicited high excitement levels, and some elicited low, and the same is true for non-touch animals. Reliability is further aided by the variety of experiences in which some students touched rabbits and snakes, while others did not.

Additionally, animal excitement scores were analyzed with gender as a factor using a series of two-way ANOVAs. Three species had statistically significant scores between genders. Rainbow boas, $F(1,113) = 12.196$, $p = .001$, and blue-tongue skink, $F(1,70)=4.708$, $p<.01$, scores were negatively associated with being female, while rabbit, $F(1,93)=7.234$, $p<.01$, scores were positively associated with being female.

Interest in animals. Using the same techniques as before, four suitable animal-related variables were determined to be significantly correlated with animal-interest scores at T2 in addition to the unusable touch emotion score. When including emotional predisposition, fear, freetime, and excitement in a repeated measures ANOVA of SAQ2 versus TAQ2 on touch and gender, Levene's test violated the assumption of the homogeneity of variances (F=.728, p>.05;F=2.882, p=.041). Because Levene's test is "more robust in the face of non-normality" such as this case, this degree of violation was overlooked (Garson, 2012). There was no significant interaction between test variables. Animal Excitement, however, had a statistically significant, large main effect (see Table 16).

Table 15.

Descriptives of SAQ and TAQ scores on quantity of touch with animal-related covariates.

DV	Gender	1 Animal Touched			2 Animals Touched		
		N	Mean	SD	N	Mean	SD
SAQ 2	Male	4	3.444	.642	23	3.563	.871
	Female	7	3.571	.330	52	3.646	.744
	Total	11	3.525	.439	75	3.621	.781
TAQ 2	Male	4	3.555	.272	23	3.693	.793
	Female	7	3.634	.367	52	3.854	.657
	Total	11	3.605	.312	75	3.805	.700

Table 16.

Repeated measures ANOVA of SAQ and TAQ on quantity of touch with animal-related covariates

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
EmoPred [A]	.212	1	.212	.326	.569	.004
Afraid [A]	.058	1	.058	.090	.765	.001
Freetime [A]	2.181	1	2.181	3.358	.071	.041
Excitement [A]	10.861	1	10.861	16.721***	.000	.177
QuantTouch	.274	1	.274	.422	.518	.005
Gender	.115	1	.115	.177	.675	.002
QuantTouch x Gender	.369	1	.369	.568	.453	.007
Error	50.663	78	.650			
Within Subjects						
Touch	.407	1	.407	2.025	.159	.025
Touch x EmoPred [A]	.726	1	.726	3.612	.061	.044
Touch x Afraid [A]	.003	1	.003	.015	.902	.000
Touch x Freetime [A]	.000	1	.000	.001	.981	.000
Touch x Excitement [A]	.001	1	.001	.006	.937	.000
Touch x QuantTouch	.029	1	.029	.145	.704	.002
Touch x Gender	.015	1	.015	.075	.786	.001
Touch x QuantTouch x Gender	.022	1	.022	.110	.741	.001
Error	15.677	78	.201			

*** p is significant at the .001 level; [A] indicates animal-background-related factor

Further analysis of animal interests was evaluated using the Interest measure generated earlier for students who touched all or no animals. A two-way ANOVA was conducted with interest as the dependent variable with gender, any touch, and the four emotional variables as factors. Levene's test of the homogeneity of variances was not violated ($F=1.016$, $p>.05$). The main effects excitement, touch and gender were all significant (see Table 18).

Table 17.

Descriptives for interest 2 with animal-related covariates

DV	Gender	No Animals Touched			All Animals Touched		
		N	Mean	SD	N	Mean	SD
Interest 2	Male	30	4.033	.681	6	4.315	.568
	Female	13	3.359	.624	22	3.591	.690
	Total	43	3.829	.728	28	3.745	.722

Table 18.

Two-way ANOVA of interest 2 on touch with gender and animal-related covariates.

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
EmoPred [A]	.297	1	.297	.947	.334	.015
Afraid [A]	.198	1	.198	.633	.429	.010
Freetime [A]	.845	1	.845	2.700	.105	.041
Excitement	4.437	1	4.437	14.176***	.000	.184
AllTouch	.359	1	.359	14.539*	.013	.752
Gender	1.839	1	1.839	40.261***	.000	.709
AllTouch x Gender	.012	1	.012	.037	.848	.001
Error	19.718	63	.313			

* p is significant at the .05 level, *** p is significant at the .001 level ;
[A] indicates animal-background-related factor

Changes in conservation behavior by interest. A simple repeated measures ANOVA of conservation behavioral intents from T1 to T2, using animal-interest at T2, revealed a significant interaction between time and animal-interest. Although Levene's test for the equality of variances was violated (F(22,53)=1.648, p>.05; F(22,53)=1.758, p =.048) at T2, the analysis continued given the degree of violation and the robustness of analysis of variance (see Table 20).

Table 19.

Descriptives for general behavioral intents at T1 and T2 with interest2

DV	Time 1			Time 2		
	N	Mean	SD	N	Mean	SD
General Behavioral Intent	76	3.652	.523	76	3.545	.631

Table 20.

Repeated measures ANOVA of general behavioral intents with interest2

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
Interest	16.334	22	.742	1.612	.079	.401
Error	24.410	53	.461			
Within Subjects						
Time	.480	1	.480	4.954*	.030	.085
Time x Interest	4.484	22	.204	2.103*	.014	.466
Error	5.137	53	.097			

* p is significant at the .05 level

A graph of these relationships showed what seemed to be a complex, but mostly positive correlation between interest scores and the change in conservation behavioral intent scores. To support interpretation of these results, one more repeated measures ANOVA was run, but in this instance, three categories of interest scores were used: Low (interest < 2.50), Neutral (2.50 < interest <3.50), and High (interest >3.50). These cutoffs were selected because they represent a theoretical cutoff for students who were disinterested, neutral, or genuinely interested in the presentation animals, respectively. Results of this analysis are contained in Table 21, Table 22 and Figure 4.

As anticipated, this produced significant results for time and interest while also satisfying the assumptions of the homogeneity of variances ($F(2,73) = 2.387$, $p>.05$; $F(2,73)=.196$, $p>.05$). Table 21 contains these results.

Table 21.

Descriptives for general behavioral intents at T1 and T2 with interest2

DV	Interest Level	Time 1			Time 2		
		N	Mean	SD	N	Mean	SD
General Behavioral Intent	Low	6	3.486	.666	6	2.963	.436
	Neutral	17	3.476	.624	17	3.299	.592
	High	53	3.727	.461	53	3.692	.606
	Total	76	3.652	.523	76	3.545	.631

Table 22.

Repeated measures ANOVA of general behavioral intents with interest2

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
Interest	4.497	2	2.249	4.529*	.014	.110
Error	36.247	73	.497			
Within Subjects						
Time	1.103	1	1.103	9.020**	.004	.110
Time x Interest	.697	2	.649	2.852	.064	.072
Error	8.924	73	.122			

* p is significant at the .05 level, ** p is significant at the .01 level

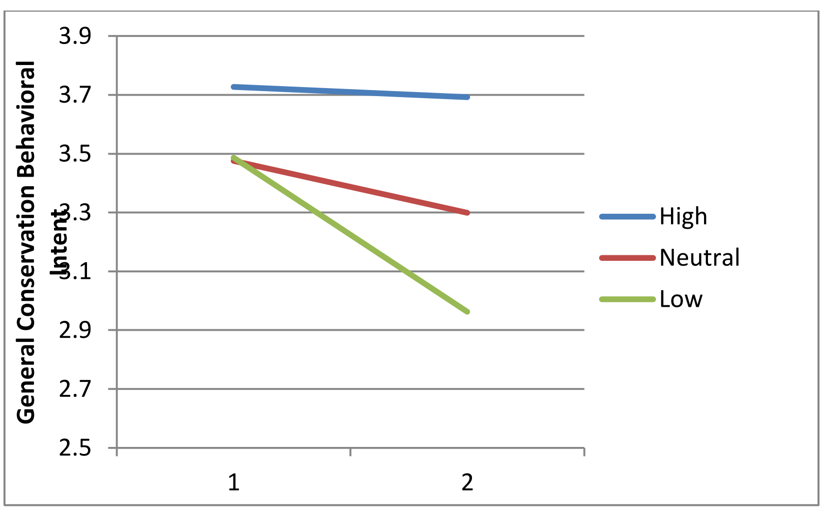


Figure 4. *Interaction of interest level on general conservation behavioral intents*

Figure 4 illustrates the relationship between levels of interest and changes in conservation behavior intents. It is also worth noting that other models were explored, including splitting the data into thirds as opposed to determining high-low relationships by theory. These models showed similar trends, but demonstrated a positive relationship between the highest interest-level subjects and their changes in conservation behavioral intents rather than the general sustainment of intents indicated in Figure 4.

Question 3: The Changes of Outcomes over Time

General conservation behavioral intent. RQ2 demonstrated several significant effects when general behavioral intents were measured against having a touch experience while accounting for multiple covariates. Therefore, an exploration of these variables over extended time was warranted. A repeated measures ANOVA of general conservation behaviors at T1, T2 and T3, emotional predisposition, animal freetime, and animal excitement in addition to the experimental condition, touching animals, was conducted. The Mauchly's Test of Sphericity was not violated, $\chi^2(2) = .859$, p=.651, and the sphericity-assumed values are representing in Table 23 below.

Table 23.

Descriptives for general behavioral intents at T1, T2 and T3 by touch

DV	No Touch			Some Touch		
	N	Mean	SD	N	Mean	SD
General Behavior 1	47	3.614	.553	99	3.670	.523
General Behavior 2	47	3.452	.666	99	3.688	.542
General Behavior 3	47	3.278	.722	99	3.602	.575

Table 24.

Repeated measures ANOVA of general behavioral intents at T1, T2, and T3 by touch with covariates.

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
EmoPred [A]	2.782	1	2.782	3.897*	.050	.027
Freetime [A]	.247	1	.247	.346	.557	.002
Excitement [A]	4.517	1	4.517	6.327*	.013	.043
Touch	2.970	1	2.970	4.159*	.043	.029
Error	100.674	141	.714			
Within Subjects						
Time	1.390	2	.659	6.167**	.002	.042
Time x EmoPred [A]	.885	2	.443	3.929*	.021	.027
Time x Freetime [A]	.134	2	.067	.593	.553	.004
Time x Excitement [A]	.191	2	.096	.850	.429	.006
Time x Touch	1.097	2	.548	4.867**	.008	.033
Error	31.772	282	.113			

* p is significant at the .05 level, ** p is significant at the .01 level
[A] indicates animal-background-related factor

Effects of time, emotional predisposition, excitement and touch as well as the interactions between time x emotional predisposition and time x touch were significant. Post-Hoc analysis shows the differences between T1 and T2 as well as T1 and T3 general behavior scores are significant in this model. Figure 5 shows these changes over time.

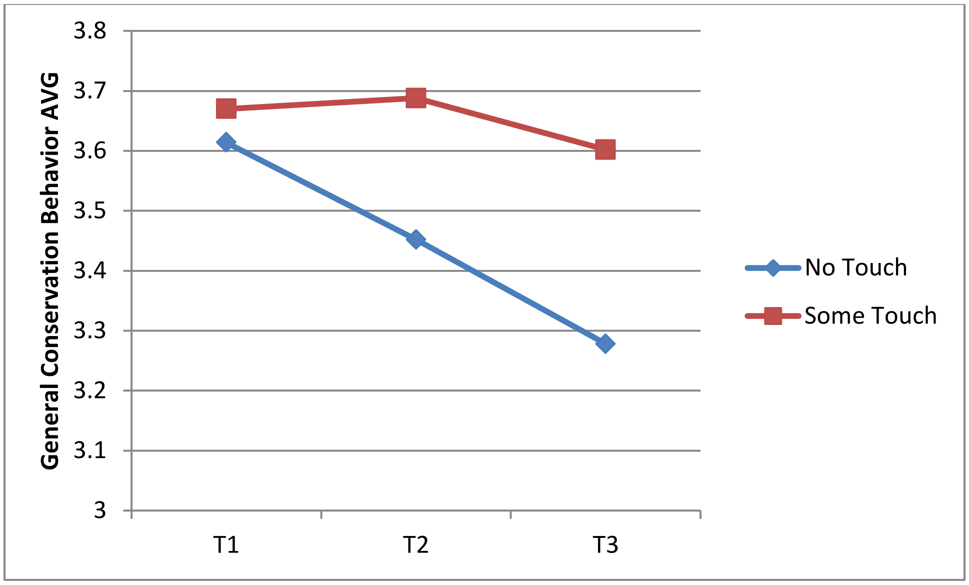


Figure 5. *Interaction of touch on time for general conservation behavioral intents, T1-T3*

Target behaviors. As discussed earlier, Target Behaviors were worded actively, and for students to be able to respond to a target behavior measure, they must be given time to change recent behavior. Research question three allows for these changes to occur during analysis. Recall the significantly correlated factors for Target Behavior were grade, white (formerly ethnicity), zoo visits, animal freetime, and knowledge of presentation animals. A repeated measures ANOVA was run using these factors in addition to the dichotomous touch variable. In this case, Mauchly's Test of Sphericity was violated, $\chi^2(2) = 10.825$, $p=.004$, and the more conservative Greenhouse-Geisser cutoffs were used in estimation. There were only significant main effects of being White and touching the animals; no other effects were observed (see Table 26).

Table 25.

Descriptives of target behaviors by touch

DV	Ethnicity	No Touch			Some Touch		
		N	Mean	SD	N	Mean	SD
Target Behavior 1	Non-white	20	3.250	.710	48	3.563	.685
	White	27	3.409	.705	51	3.710	.637
	Total	47	3.341	.704	99	3.638	.661
Target Behavior 2	Non-white	20	2.992	.636	48	3.406	.685
	White	27	3.580	.760	51	3.593	.578
	Total	47	3.330	.761	99	3.502	.636
Target Behavior 3	Non-white	20	3.180	.693	48	3.350	.635
	White	27	3.620	.705	51	3.730	.589
	Total	47	3.430	.726	99	3.540	.638

Table 26.

Repeated measures ANOVA of target behavior over time by touch with covariates.

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
Time	.728	1.859	.392	1.590	.208	.011
Time x Grade	.374	1.859	.201	.815	.436	.006
Time x ZooVisits [A]	.300	1.859	.161	.654	.510	.005
Time x Freetime [A]	.002	1.859	.001	.005	.993	.000
Time x Knowledge [A]	.592	1.859	.318	1.291	.276	.009
Time x White	.941	1.859	.506	2.054	.134	.006
Time x Touch	.374	1.859	.201	.816	.436	.015
Time x White x Touch	.628	1.859	.338	1.371	.255	.010
Error	63.240	256.512	.247			
Within Subjects						
Grade	.167	1	.167	.205	.651	.001
Zoo Visits [A]	2.952	1	2.952	3.629	.059	.026
Freetime [A]	2.032	1	2.032	2.498	.116	.018
Knowledge [A]	1.062	1	1.062	1.305	.255	.009
White	9.727	1	9.727	**11.955****	.001	.033
Touch	3.842	1	3.842	**4.722***	.031	.080
White x Touch	.790	1	.790	.971	.326	.007
Error	112.283	138	.814			

* p is significant at the .05 level , ** p is significant at the .01 level;
[A] indicates animal-background-related factor

Finding White as a significant factor led to a test of the homogeneity of variances between the white and non-white participants in order to better understand the significance indicated. An independent t-test of the change in Target Behaviors from T1 to T3 showed that the variances were within an acceptable range of the assumption of homogeneity of variances (F = .166, p = .685).

Interest in animals. The final series of analyses also used a repeated measures ANOVA to assess the impact of touch experiences on reports of animal-interests. Recall that RQ1, the T2 SAQ and TAQ scores were significantly different from one another. As with the previous RQs, a two-way repeated measures ANOVA was conducted for SAQ and TAQ scores using T2 and T3 outcomes with gender and the four animal-related covariates. Levene's tests were violated for the TAQ2 (F(3,70)=3.783, p=.014) meanwhile the sight and touch T3 scores did not violate the assumption of equality of variances (F = .858, p>.05; F=1.590, p>.05; F=1.534, p>.213, respectively). The results for the analyses, including the potential covariates, are in Table 28.

Table 27.
Descriptives of SAQ and TAQ scores on quantity of touch over time.

DV	Gender	1 Animal Touched			2 Animals Touched		
		N	Mean	SD	N	Mean	SD
SAQ 2	Male	4	3.444	.642	22	3.574	.891
	Female	6	3.611	.342	42	3.623	.752
	Total	10	3.544	.458	64	3.606	.796
SAQ 3	Male	4	3.472	.532	22	3.505	.950
	Female	6	3.656	.239	42	3.468	.755
	Total	10	3.582	.367	64	3.480	.820
TAQ 2	Male	4	3.555	.271	22	3.720	.801
	Female	6	3.500	.272	42	3.941	.623
	Total	10	3.521	.174	64	3.865	.691
TAQ 3	Male	4	3.333	.406	22	3.464	.869
	Female	6	3.648	.302	42	3.694	.722
	Total	10	3.522	.363	64	3.915	.777

Table 28.

Repeated measures ANOVA of SAQ and TAQ on quantity of touch over time with covariates.

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
EmoPred [A]	1.079	1	1.079	.734	.395	.011
Afraid [A]	.032	1	.032	.022	.883	.000
Freetime [A]	5.041	1	5.041	3.429	.069	.049
Excitement [A]	13.630	1	13.630	9.237**	.003	.123
QuantTouch	.459	1	.459	.312	.578	.001
Gender	.142	1	.142	.096	.757	.001
QuantTouch x Gender	.286	1	.286	.195	.661	.003
Error	97.005	66	1.470			

** p is significant at the .01 level; [A] indicates animal-background-related factor

Not one of the within-subjects variables was statistically significant even at the p=.10 level; these values were excluded from the table to conserve space. Only the between group scores are reported. In this case, excitement was the only statistically significant factor impacting animal-interest scores of students.

Finally, using the T2 and T3 Interest scores from students who had no touch or all touch experiences with animals, a repeated measured ANOVA including the emotional covariates was conducted. Levene's tests were not violated (F=.598, p>.05; F=.574, p>.05).

Table 29.

Descriptives for interest at T2 and T3 with gender and covariates

DV	Gender	No Animals Touched			All Animals Touched		
		N	Mean	SD	N	Mean	SD
Interest 2	Male	29	4.019	.689	6	4.314	.568
	Female	13	3.359	.624	21	3.619	.694
	Total	42	3.815	.730	27	3.773	.721
Interest 3	Male	29	3.689	.881	6	4.055	.810
	Female	13	3.170	.784	21	3.512	.732
	Total	42	3.529	.877	27	3.633	.768

Table 30.

Repeated measures ANOVA of interest at T2 and T3 with gender and covariates

Source	SS	df	MS	F	Sig	η^2_p
Between Groups						
EmoPred [A]	3.022	1	3.022	4.664*	.035	.071
Afraid [A]	.140	1	.140	.216	.644	.004
Freetime [A]	2.139	1	2.139	3.302	.074	.051
Excitement [A]	5.481	1	5.481	8.460**	.005	.122
AllTouch	.875	1	.875	1.351	.250	.022
Gender	2.466	1	2.466	3.806	.056	.059
AllTouch x Gender	.018	1	.018	.028	.869	.000
Error	39.522	61	.648			
Within Subjects						
Time	.656	1	.656	3.695	.059	.057
Time x EmoPred [A]	1.040	1	1.040	5.853*	.019	.088
Time x Afraid [A]	.060	1	.060	.338	.563	.006
Time x Freetime [A]	.029	1	.029	.164	.687	.003
Time x Excitement [A]	.246	1	.246	1.383	.244	.022
Time x AllTouch	.001	1	.001	.008	.931	.000
Time x Gender	.081	1	.081	.455	.503	.007
Time x AllTouch x Gender	.003	1	.003	.016	.900	.000
Error	10.839	61	.178			

* p is significant at the .05 level, ** p is significant at the .01 level
[A] indicates animal-background-related factor

Results show significant main effects of emotional predisposition and excitement, and there is a significant interaction between emotional predispositions and time.

CHAPTER 5

DISCUSSION

With this study, I sought to investigate the role of animal presentations and associated factors on student's conservation behaviors and interests over time. My findings are thought-provoking but varied. I address each of the three research questions through multiple outcome measure analyses. Then, I summarize factors related to each of the outcome measures using figures. I share study limitations, future directions and discuss the measures used themselves because these provide some preliminary insights into future research directions. I conclude by highlighting the key finding for zoo programming significance and final thoughts.

Addressing the Research Questions

RQ1: The Role of Touch on Behaviors and Interests

I hypothesized that touching live animals leads to greater levels of behavior change than seeing alone. Changes in student conservation intents show a significant role of the interaction between touch and time, which demonstrated a medium effect size with a practical significance of 3% (see Table 8). Figure 2 shows the slight increase in conservation intents of students who touched at least one animal versus the notable decrease in conservation intents of those students who did not touch any animals. This suggests that conducting this presentation without any touch experiences is detrimental to the conservation goals it promotes. An alternative explanation is that, if the behavioral intent construct is more of a reflection of student enthusiasm than actual conservation propensities, then students who did not touch any presentation animals transferred their disappointment into their conservation survey items. Either way, however, there is a notable difference between student scores for those who touched in addition to seeing the animals. If behavioral intents are indeed precursors to behavioral engagement (Hughes, 2013; Powell & Ham, 2008) then this finding indicates that presenters need to incorporate touch experiences in order to support conservation behavior change. This is similar to Finger's (1994) work, which demonstrates that nature experience are more important for developing conservation orientations than other factors such as values. This finding supports my original hypothesis that touch promotes conservation behavior intents. Furthermore, it is of great interest to the animal husbandry world, which has subjectively weighed the merits of animal training and use in educational programming experiences against the potential welfare detriments to the animals (Fraser, 2009; Westlund, 2014).

I also hypothesized that touching animals would stimulate greater levels of caring for the animals than only seeing them. Using the animal interest measure to monitor caring, I discovered the role of touch varied between the analysis of students reporting sight and touch-related animal interests from mixed experiences and those who had no touch versus all touch experiences. For students who reported interest levels for both sight and touch animals, touch scores were statistically significantly higher than sight scores (see Table 10). This could be due to a number of reasons. One possibility is that reporting on two surveys could have led to a bias in which students felt compelled to report animals they touched more favorably. Another option is that completing the questionnaire consecutively could have helped make the comparison more obvious to students, who may have more accurately assessed their own interests. For cases in which students only saw or additionally touched animals, touch was not a significant factor in students' scores (see Table 12). Taken together, this either means that students who had the opportunity to score sight only and touch animals together inflated their scores or they had more accurate scores because of the opportunity to directly compare the types of experiences (unlike the all touch and no touch groups). Given that Prokop and Tunnicliffe's (2008) study, which provided the basis for my interest scale, encourages direct experiences with animals to improve student attitudes toward animals, it is worthwhile to continue this exploration to parcel out what level of interaction indeed sparks interests. For now, findings lead me to reject my hypothesis that touching a program animal promotes interest immediately following the presentation.

Future research should focus on a variety of animal interactions and settings in relationship to animal interests. We know from the literature there appears to be a widespread appeal of animals to humans (Allen, 2002; Shipman, 2011). Another study highlighted that even young children and their parents demonstrate interest in observing and discussing small animals over playing with novel toys (Lobue, Bloom, Sherman, Axford, & Deloache, 2013). Factors demonstrating impact on human-animal interests include species charisma and proximity (Fuhrman & Ladewig, 2008; Ward, Mosberger, Kistler, & Fischer, 1998). Perhaps extended opportunities to interact with animals, at close proximity, will generate more pronounced differences in animal interests.

RQ2: Emotional Factors

I originally hypothesized that emotional predispositions to animals have a significant impact on the level of caring and the level of engagement with conservation behaviors. After analyzing the potential control variables, the only significant factors were animal-related excitement and emotional predispositions to animals. This supports my hypothesis that animal-related emotions (whether pre-existing or reactionary) regulate outcomes. In the sections that follow, I briefly summarize the role of touch when controlling for these emotional variables. I also then elaborate on the findings of how interest in the animals presented impacted behavior outcomes.

When addressing the outcome of general conservation intents, the interaction between touch and time remained significant even when controlling for the statistically significant role of animal-related excitement (see Table 14). This evidence supports the strategy of allowing students to touch even one of the presentation animals because it suggests that this program feature improves student's propensity to engage in conservation behaviors over students who do not touch animals.

In exploring excitement, I discovered that there were no significant trends in classification of species that elicited more excited responses. Developing suggestions for which categories of species created more excitement and, therefore, had the potential to increase conservation intents, cannot rely on traditional classification categories alone, but should rather consider traits such as size and charisma (Fuhrman & Ladewig, 2008). Nonetheless, Chart 2 shows the variation in excitement levels between individual species. Given that similar species, such as bearded dragons and blue tongued skinks, produced such different excitement levels, I would also add morphology as a factor to be considered in an animal's "charisma" factor.

Further differences between gender-based excitement levels showed that boys were more excited than girls when presented with the rainbow boa and blue-tongued skink while girls were more excited by rabbits than boys. While a cursory glance may make this seem as though boys are more excited by reptiles and girls by small mammals, it is important to remember that bearded dragons and chinchillas did not follow this trend. Therefore, some species may have more universal appeal, and finding animals with high universal appeal may be a fruitful endeavor in eliciting desirable outcomes. Furthermore, it suggests that having a variety of species, which appeal to different genders, may also improve presentation value. This is a consideration which many zoo educators have suspected and practiced for years.

Results for the comparison of SAQ and TAQ animal interest scores changed once the emotional factors were controlled for. Unlike for RQ1, which demonstrated a significant impact of touch on interest scores, this model showed a statistically significant (at the $p < .001$ level, see Table 16) impact of excitement on students' animal interests. This finding suggests a practical significance of 17.7% of the variance between students' scores is accounted for by their animal-excitement level alone.

For students who had only a no touch or all touch experience, analysis, which controlled for emotional variables, showed statistically significant impacts of excitement, gender and touch (see Table 18). In this model, excitement accounted for about 18.4% of the variance, touching all the animals impacted about 7.5%, and gender accounted for a massive 70.9% of the variance in the results for animal interests. It makes sense that results from the latter analysis would have more pronounced differences in touch because the quantity of touch experiences differs by three as opposed to one. However, the significance of the role of touch can easily be overshadowed by the other two variables. I would suggest this further supports the suggestion that zoos investigate which collection animals elicit the most excitement in addition to encouraging touch experiences during outreach programs. While I had hypothesized that emotions were an important factor in regulating outcomes, I had not predicted that they would play a greater role in determining animal-interests than the ability to touch animals. Essentially, students' interests in animals are most heavily influenced by the animal itself and not how they interact with the animal during a short presentation.

The role of interest on conservation intents. In theoretically grounding this study, I made a conjecture that interest levels in the presentation animals would serve as a regulator in student conservation behavior change. When I grouped students into low, neutral and high interest categories and compared their changes in conservation intent before and after the presentation, there was a significant impact of interest on the outcome conservation intents (see Table 22 and Chart 3). Specifically, students with low interest in the presentation animals had statistically significantly lower conservation scores after the presentation than before. Students with neutral interests, had a mild loss in conservation intents, and students with high interest levels maintained their conservation intents. Had the cutoffs for high interest levels been a few point fractions higher, Chart 2 would show an increase in conservation intents (as opposed to a sustainment of them) for the high interest group. Thus, higher interests in the presentation animals resulted in more positive changes to conservation intents.

While this generally supports my hypothesized pathway for behavior change, I would encourage further exploration of this question for several reasons. First, the sample size of 76 students within animal-interest analysis is minimally adequate to investigate this question. Second, since the pre-survey was the first encounter students had with the upcoming zoo presentation, it is reasonable to anticipate that pre-survey scores may be slightly inflated due to student excitement and novelty with this concept. Based on student reactions to survey administration, I believe that many participants discovered the upcoming zoo presentation as a result of the first survey administration, and resulting classroom excitement was highest on the first day of survey administration for each school. If T1 conservation intent scores were indeed inflated, then changes may be more substantial than this data suggests. Additionally, it stands to reason inflated T1 scores might account for the deflated scores of students who were not excited by the presentation animals brought the following week. Further research is required before I can accept my hypothesis that promoting animal-interests is a pathway to increasing conservation behavior change.

I am interested in exploring this question again when targeted behavior measures are more consistently referenced in presentations. With the poor internal consistency score of this measure, future instruments might benefit from narrowing the behavior focus. Future work should also explore more measures of caring, aside from interest. Since Conservation Psychology (CP) work suggests that nature experiences promote caring for a resource as well as predicts behaviors that help conserve that resource (Finger, 1994; Kals, Schumacher, & Montada, 1999), multiple facets of caring are worth consideration. The specific measure used in this study addresses only interest as a form of carine, but I suspect CP research will need to quantify other forms of caring that measure animal connections on a motivational or even spiritual level.

RQ3: Important factors over Time

Conservation intent. I hypothesized that touching animals led to more internalized consideration than sight alone and, therefore, would produce longer lasting behavior changes in student participants than seeing the animals alone. Unfortunately, because the longest delay in surveys was about 5 weeks after the presentation, it is difficult to make inferences on the long-term impact of this presentation. However, within the timespan analyzed, it seems that animal-predispositions and touch both impact intent outcomes over time (Table 24). Figure 5 shows that touching even one animal had a significantly different impact on changes in student scores from T1 to T2 as well as from T1 to T3. This finding extends research indicating that opportunities to touch animals have a more profound impact on attitudes than just seeing them alone (Morgan & Gramann, 1989; Randler, Eberhard, & Prokop, 2012). Perhaps this zoo experience does just as Hungerford and Volk (1990) propose in environmental education by raising environmental sensitivity and laying a foundation for conservation skills. Together, this information begins to demonstrate the deeper impact of personal interactions with animals on youth, and this is a result that zoos will be eager to further explore.

Once again, I question the accuracy of the T1 behavioral intent scores because I suspect a Hawthorne Effect impacted their first scores. By surveying or interviewing participants' parents, I might be able to help triangulate results and determine what really happened with T1 scores in this instance. With the current data, it appears that conservation behavior intents decrease for both groups over time. Perhaps the most telling feature of this analysis is that students who touched animals experienced a statistically significant lower level of conservation intent loss than did students who did not touch animals. It is also possible that conservation on this scale is more abstract of a concept for elementary students, and that initial scores were built on ideals while follow-up scores better reflect reality. In future studies that better alleviate score inflation, we may see a greater gain in conservation intents and perhaps better sustainment over time with increases in program effectiveness. Of course, many more studies of similar programs are needed before these refinements can be made and conclusions realistically be drawn to this extent.

Target behavior. The first and only analysis of target behavior engagement showed that ethnicity and touch were both significant factors in student scores (Table 26). While I would have expected to see a significant interaction of time with touch, no such relationship existed. Interpretation of the role of touch beyond stating its significance is not advisable. Because touching an animal shows a direct effect on targeted behaviors at T1 and T3, I am left wondering how this treatment relates to variables existing before the intervention. Is there some unmeasured variable, beyond school, SES, and teacher, that correlates both with which students who were able to touch animals and their engagement in target behaviors?

For now, I am left questioning the validity of targeted behaviors measure. Presenters varied significantly in the consistency of suggesting any number of the five measured targeted behaviors. Realistically, different presenters had different conservation behaviors they consistently emphasized. The suggested behaviors were additionally influenced by which species were present that could directly link to the behavior (i.e. Amazon Parrots tie in directly to aluminum recycling). In an effort to overcome this shortcoming, I created a target-behavior fidelity measure to control for the percentage of the five factors that were explicitly suggested during the presentation. However, this variable, which ranged from 0% to 60% suggestion rates, did not seem to correlate nor impact any of the target-behavior outcomes. Questioning the utility of this measure is further supported by internal reliability, which was below typically acceptable cutoffs as referenced in Chapter 3. For now, findings on target behavior change are inconclusive.

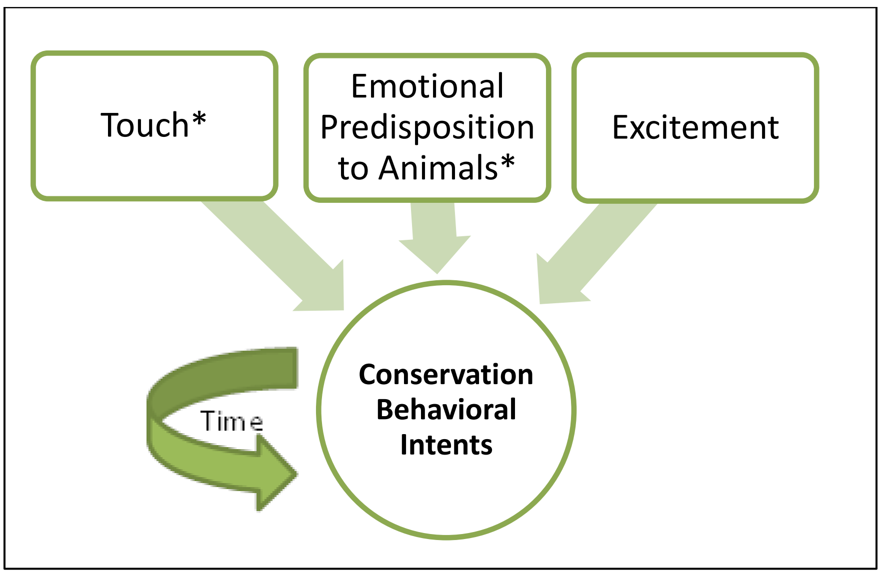
Interest. In the last analysis, I addressed changes in interest over time. I previously shared surprise with the extent to which emotions were impacting animal interests over touch experiences. This final analysis further exemplifies the significance of the role of predispositions and excitement. For students with mixed touch and sight experiences, the main effect of excitement was the only effect (see Table 28). For students with either no touch or all touch experiences, the main effects of emotional predispositions and excitement as well as the interaction between emotional predisposition and time maintained (Table 30). A significant impact of touch disappeared from this analysis, which means that touch is not a lasting factor whereas emotional predisposition continues to play a role in student interests for weeks after the presentation. Students who had animal outlooks that were more joyful than fearful also had better interest scores on the delayed post survey. So while my hypothesis that touch makes a difference over time was supported for behavioral intents, touch was not supported for promoting long-term interest in animals.

Additional Findings

Control Variables

Out of a large range of possible variables, only a handful of factors demonstrated any level of correlation or significance with the three outcomes variables within this study. These findings may help guide future research and are highlighted in the following subsections.

Impact on conservation behavioral intents. Of four potentially correlated student-animal variables, my analysis suggests a statistically significant role of excitement on conservation intent as well as an interaction between students' emotional predisposition to animals with time (see Table 23, Figure 6).



Note: * indicates an interaction between the variable with time

Figure 6. *Factors of significance on conservation behavioral intent*

These variables should be considered for control in future studies as well as by education staff who design curriculum and select species.

It may benefit zoos to analyze species-specific excitement levels within their communities because excitement appears to enhance conservation propensity. Zoos may wish to select program animals utilizing this strategy once other logistical considerations are satisfied. While zoo staff cannot alter students' emotional predispositions to species groupings and classifications, it is helpful for them to know that these predispositions may impact changes in intentions over time. Individuals or groups who have more negative predispositions to animals may require different program strategies in order to produce more desirable conservation buy-in. Further research could help address ways to best reach students with differing predispositions.

Factors for targeted behavioral engagement. Target behavior outcomes measured students' reporting of actual, recent engagement in zoo program-specified behaviors. Recall that this outcome variable had low reliability. Of five potentially correlated control variables, only ethnicity demonstrated a significant impact on engagement with target behaviors (see Figure 7). Ethnicity – specifically whether a student was white or not – had a statistically significant impact on targeted behavior engagement scores both before and after the presentation. At every time point, white students had higher reported levels of target behavior engagement than did their non-white counterparts, and those who touched animals we more likely to score higher levels of engagement with targeted behaviors (see Table 25 and Figure 7). While some might infer that this finding is linked to socioeconomic status, it is important to remember that school SES was not a correlate nor a significant factor at any point in analysis.

Based on this evidence and observations from these schools and the insignificance of SES as a variable, I originally suspected this specific finding was a product of the

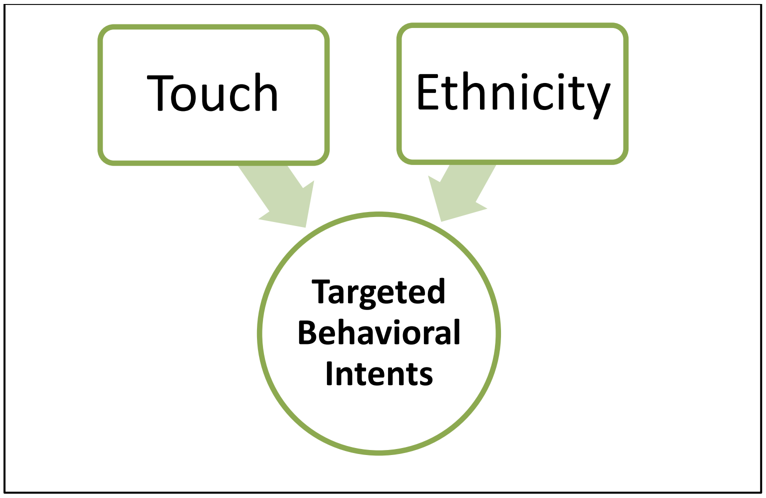
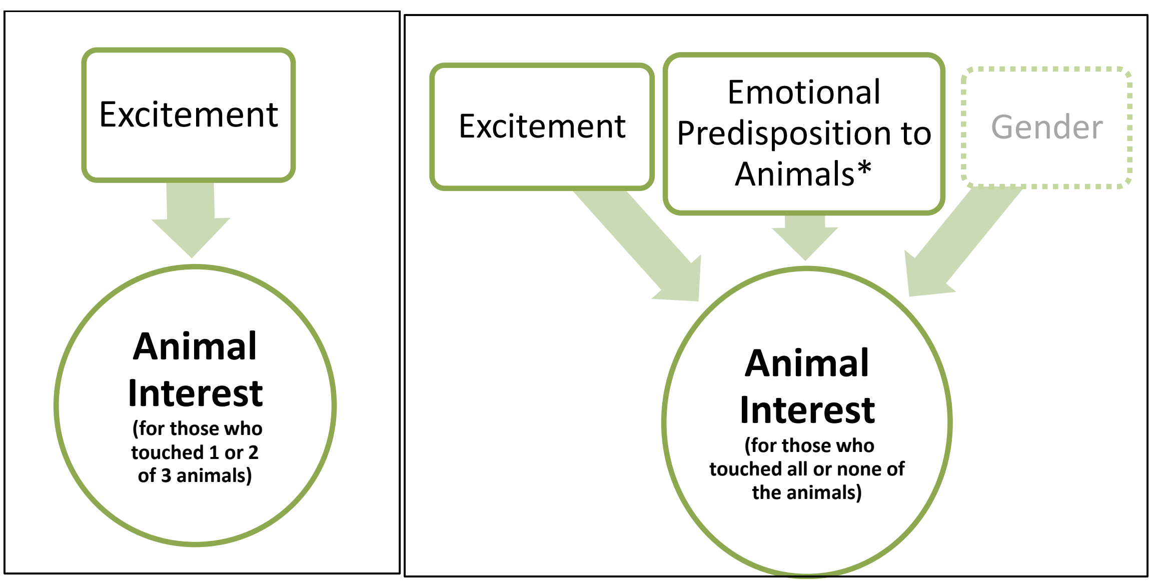


Figure 7. *Factors of significance on targeted behavioral engagement*

curriculum used by a large, predominantly white school. The only participating teacher from this school, whose students represent 31% of the study sample, was in the midst of a multiple-week project on conservation. This assignment required students to take ownership of a local environmental issue, research the cause, and present it to peers. Observations led me to believe these students were the most knowledgeable of the program-targeted behaviors. However, after running the one-way ANOVA on teachers discussed in Chapter 3, I must reject the basis of this suspicion. Target behavior scores and changes in these scores did not vary significantly between teachers. This means that schools and teachers were not the impactful variable, and that either ethnicity, or an unmeasured related variable, is indeed the factor deserving consideration. More research is needed to better understand these differences. For now, it is worth consideration that while one set of behaviors may be perceived as relevant and accessible to one ethnic group, it may not be for other groups (Axelrod, 1995). An appropriate means of investigating this inference would be to take ethnographic approaches such as observing classes and personally interviewing students to better understand the variable, the students' interpretation of these behaviors, and their relationships to the behaviors themselves.

Factors on presentation animal interests. The animal interest outcome from T2 through T3 time points was primarily influenced by animal excitement and animal predispositions (see Figure 8). One T2-only model also showed gender to be significant, but this relationship disappeared when including delayed post-survey scores. Because excitement was a main effect, there is a possibility that students who were more prone to report higher excitement levels were also more likely to report higher interest levels. Without a pre-intervention score, it is difficult to better understand this factor. However, the interaction effect of animal predisposition with time lends support for a difference in the waning of animal-interest based on animal predispositions before the presentation ever took place.



Note: * indicates an interaction between the variable with time; faded box indicates a variable that became insignificant in the longitudinal model (RQ3).

Figure 8. *Factors of significance on presentation animal interest*

Again, this would suggest that students who generally view all classes of animals more favorably (meaning more joy and less fear), are more likely to maintain higher levels of interest in presentation animals over time than are students with more negative animal predispositions.

Non-significant variables. Some of the more surprising results come from factors that were believed to play a significant role that did not impact the outcomes. For a full list of control variables that were not mentioned in the previous section (because they were not significant), refer to Table 3 in Chapter 3. I specifically address a few variables here because they are of interest to zoo personnel or because they are suggested in prominent literature.

First, some presenters suspect that the "exotic-ness" of an animal plays a factor in zoo visitor interests. Research, however, shows conflicting findings about whether exotic animals elicit different reactions than native species (Mendes da Silva & Carodo da Silva, 2007; Wilson, Trainin, Laughridge, Brooks, & Wickless, 2011). To help account for this variable on a student-appropriate level, I created a familiarity variable to accompany each presentation animal. However, there was no correlation between student familiarity with the presentation animals and any of the conservation behavior or interest outcomes. This corroborates the zoo research that shows no difference in reactions to native versus exotic species (Mendes da Silva & Carodo da Silva, 2007). However, this finding contradicts research that demonstrates more exotic animals sparked more effort, creativity and interest in classroom assignments and that rareness is a factor in species charisma (Furhman & Ladewig, 2008; Wilson, Trainin, Laughbridge, Brooks, & Wicless, 2011). Due to these conflicting findings, it would be wise to examine this factor with a wider range of age groups because developmental stages may impact familiarity and connections with exotic species (Kellert, 1985). It would also be useful to explore a variety of onsite programs to see if familiarity plays a role; perhaps if an animal encounter is being facilitated, familiarity is not a factor in interest or behavior outcomes. This study suggests that familiarity is not major factors impacting visitor interest.

Remember that several fidelity measures were created to help control for program content variations. Previous research indicated that a presentation quality measure at national park interpretive presentations accurately predicted visitor outcomes (Stern & Powell, 2013). With the inclusion of these measures in this study, I was anticipating at least some level of significant correlation between presentation content or quality and the student outcome variables. However, this did not prove to be the case for any fidelity or quality measure.

These non-significant results could be due to any number of reasons. First, my quality measure may not align with the perception of quality of students. Stern and Powell's (2013) quality measure, which was a significant factor in visitor outcomes, had a much more adult audience than this study. While the inter-rater reliability was high for fidelity and quality measures, both adult reviewers may evaluate presentations on a different scale than students. Second, the fidelity measures do not account for all content or themes presented to students but they rather measure the presentation against the written curriculum. Thus, there may be more or less consistency between the presentations than the fidelity measures capture. Thirdly, communication is more than just the words that are explicitly stated (Berger, 2005). For students, teachers' perceived communication skills shape attitudes towards the subject (She & Darrell, 2002). In

Journey to Survival, the presenter demeanor could convey additional messages to students that are not measurable through quantitative means. Much in line with the sentiment that “a whole is greater than the sum of its parts,” these presentations contained a great deal more information that was captured during this study. I suspect some of these as-of-yet unmeasured variables play a significant role in the messages students receive and their attitudinal and behavioral outcomes.

Limitations

From the onset of this study, I knew there were going to be some challenging limitations. However, I felt the results could serve as a needed foundation for further investigation. In addition to the limitations proposed within each section, there are other design restrictions worth recognition.

As previously discussed, animal selection for each presentation was beyond research control. Animal husbandry issues, such as shedding and feeding schedules, limited which animals were available on any given day. Furthermore, presentation variations impacted content and touch experiences alike. The student experiences and resulting survey data were subject to these constraints. Ultimately, many measures were taken to help to account for as many species and presentation differences in the findings as possible.

The survey instruments might have been a problem due to both the measures collected and length of the survey. Because emotions and personal histories differ from student to student, the surveys were designed to capture some indicators such as personal reports of excitement to serve as a proxy for understanding different student responses to the same experience. Reflective self-reports such as these carry a certain level of controversy. However, by staging the first post-survey immediately following the experience the study aimed to reduce reporting errors (Manfredo & Shelby, 1988). Additionally, by reading questions aloud, I tried to alleviate survey fatigue that may occur due to survey length or repetition.

Finally, the reliance of this study on one zoo and one program is a limiting factor in understanding how this applies to the zoo industry as a whole. Future work should repeat similar studies, with modifications based on suggestions within this paper, in order to understand zoos in a variety of urban, suburban and rural contexts around the country. These studies should also target a wider audience base with more diverse backgrounds in order to gain a better understanding of the overall impact of zoo outreach. It is also worth noting that discussions are underway in the U.S. zoo community to conduct such a comprehensive evaluation of animal programs in order to weigh outcomes against animal welfare issues.

Future Directions for Research

Outcome Measures

This study is novel in both the application of Conservation Psychology to this setting and in its combination of measures used to assess outcomes. Due to this, a discussion of the measures and their utility may help further guide the field of conservation education. I additionally review the findings in light of Conservation Psychology research and directions.

I think there is value in exploring generally relevant conservation behaviors as well as ones specific to program objectives. Leeming, O'Dwyer and Bracken's (1995) "Intent to Behave" survey was both reliable for this population and provided useful findings. There is also a definite need to explore explicitly targeted behaviors when they are routinely incorporated into presentations. Nonetheless, intent to behave is important because intentions are tied to behaviors (Ajzen & Fishbein, 1997; Hughes, 2013; Powell & Ham, 2008). Perhaps a reduction in total behavior suggestions during a presentation may help streamline student outcomes as well. CP researchers need to explore the difference between measuring intents and actual behaviors. While measuring intents is helpful when follow-up can be difficult, there is a genuine and ethical impetus to understand actual behavior change amongst populations before relying too heavily on measures of intent. Thus, I would suggests zoos and other conservation organizations explore generic and specific behavior outcomes according to program goals and that they further analyze the relationship between visitor reports of intent and their resulting behaviors in their community in the following months and even years.

Petty and Cacioppo's (1986) Elaboration Likelihood Model provides us one conceptual framework for how people are moved to behave differently. In applying the ELM to the notable differences in students' propensities to engage in conservation behaviors, I would suspect that physically connecting with an animal provided the additional impetus to shift some unmeasured aspect of attitude toward conservation behaviors, and thus, these students were more likely to maintain or even build conservation intents as a result of the presentation. The act of personally experiencing the animal through touch plays a role in how the conservation agenda of this program was received. In searching for other models that might help explain behavior change, I also reflecting upon the Theory of Planned Behavior (Ajzen, 1991), which similarly suggests that changes in understanding, perceived norms, and perceived behavioral control impact intents. However, this lens would not help to explain the difference between responses of those who touched animals versus those who only saw them. As a result, I would encourage continued exploration of the ELM and experiential learning models in conservation behavior studies of animal programs as well as personal connections with nature.

The interest measure, derived from Prokop and Tunnicliffe's (2008) attitudes survey, was used to gauge interest as a facet of student caring about presentation animals. However, this is not the only manifestation of caring that might serve the purpose of studies such as this one. I would encourage multiple explorations to address the notion of caring; results may be more indicative of change with the use of other measures. Rabb and Saunders (2006) suggest that zoos focus on developing "care for" an animal or species; how to effectively measure care for a resource, however, is still a very real question within the Conservation Psychology community. Myers, Saunders and Birjulin (2010) illustrate the efforts and challenges of those trying to measure sentiments, emotion and affect in zoo settings while pointing to the need for further study and more holistic methodologies in additions to those that effectively capture in-situ variables such as immediate thoughts and emotions during an animal-experience itself. Approaches such as these might help to illuminate how various elements of care develop.

Further Investigation

Future research efforts into zoo learning should incorporate a more flexible approach to data collection, requiring the use of qualitative methods. In particular, I would like to focus some of my energy on ethnographic studies of both student program experiences and regular zoo visitor experiences. Marcus (1998; 2009) suggests that multi-sited ethnographies help to draw connections between the settings in conjunction with the observer as an element and interpreter of those environments. Given my background in zoos and the richness of the ethnographic approach to understanding, as a researcher, I would come away with a greater appreciation and better insight into student experiences by sitting alongside them in class, conducting interviews, and reflecting on my experiences in classrooms (Eisenhart, 2001). Furthermore, by observing not just the program, but the students' lives surrounding the program experience, I would develop a great appreciation the real, in-situ variables that may contribute to study outcomes in ways not previously understood before investigation.

Zoo programs and visits are such fleeting events within the contexts of participants' everyday school activities. Therefore, there is a great deal of information that could be uncovered by sitting in a classroom in the weeks leading up to and following zoo visits. Similarly, following zoo visitors around for their full visit, and perhaps even having a window into families' follow-on activities would help paint a more accurate picture of how an individual experiences the zoo event and how social contexts and personal backgrounds continue to shape the meaning drawn from the experience. Much as Allen (2002) inferred that cognitive learning from a zoo visit evolves differently over time, taking an ethnographic approach could help identify factors outside of the zoo that contribute to attitudinal and behavioral development of participants. By placing myself in multiple classroom sites and holding face-to-face interviews with subjects, I might be able to uncover answers for remaining questions, such as "why does ethnicity impact engagement in target behaviors?"

This study needs replication in a variety of zoo communities before the findings can paint a picture of wider trends. Attempts at replication should ensure that targeted behaviors are explicit and consistent components of study presentations. Ideally, the aforementioned ethnographic studies could help guide refinement of these instruments. Future studies might also streamline data collection by decreasing the volume of survey items with guidance from this study's findings on control factors. It is important to evaluate actual behavioral outcomes if at all possible, and it is best to do so with a timeline ranging from months to a year later if behavior trends continue to change. Realistically, future research may also wish to focus on programs with repeated participant engagement that supports behavior change through motivation, buy-in, and skill-development (Ham, 2013; Hungerford & Volk, 1990). It is also important to validate the accuracy of initial measures and improve collection techniques if survey scores are indeed inflated.

Furthermore, it would also be ideal for zoos to deliberately experiment with different species, different levels of student interactions, and different age groups in order to create more experimental control. By either reducing presentation animals, or substituting one animal at a time, researchers could better isolate the roles of these factors in student outcomes. It is also worth applying this study and similar curriculum to older audiences to understand if touching animals and nature experiences impact adult learners any differently. While existing developmental literature suggests that students are able to build empathy and consider health and ethical implications by age nine, perhaps fully integrating the learning experience on a topic as large as conservation is appropriate for more adult audiences (Kellert, 1985; Kidd & Kidd, 1996).

A wide range of unexplored and underexplored questions in Conservation Psychology within the world of zoos and aquariums yet exist. I hypothesized a link between caring for animals and caring for their environments that stretched existing theories of conservation education beyond their original boundaries, which suggest that public connections to nature are key to the future of conservation (Balmford & Cowling, 2006). In doing so, I've discovered a few promising findings buried amongst many more questions. One of the first priorities would be to explore caring and interest in resources, and to see what similarities there are between natural spaces preservation through personal nature experiences and species habitat preservation through personal animal experiences. The question remains: can animal experiences translate into wild space preservation through participant conservation behavior change? Answering this will likely demand qualitative studies of how zoo patrons perceived their experiences in relationship to nature. Additionally, it would be useful to explore how these venues can better facilitate visitor connection-building with wild environments and encourage buy-in to habitat preservation.

Final Thoughts

There is a growing demand for conservation education accountability from professional organizations, funding agencies, and advocacy groups. Combine this with the need of formal education systems to increase student interest, motivation and understanding of environmental sciences, and there has never been a more compelling time to evaluate conservation education outcomes. I began this study with hopes of laying the groundwork for future research into conservation behavior change through zoo experiences. More specifically, I sought to explore changes in students' behavioral dispositions and animal-interests resulting from a zoo outreach program. This study showed some promising findings; in particular, discovering that touching presentation animals leads to more desirable and sustaining conservation intents than seeing them alone is of importance to the zoo community.

This research also sparked many more questions that warrant investigation in order for zoo education programs to better understand their resources in relationship to desired conservation behavior change. How closely linked do conservation objectives need to be to animal ambassadors? In what other contexts do animal interactions promote behavior change? Do extended animal interactions promote interests or further enhance behavior change? What presentation content best supports the goals of interactive animal presentations? Do groups with different animal predispositions respond better to different presentation techniques? Based on my research and the literature, I feel there is enough evidence to anticipate that well-choreographed animal presentations - with touch experiences - can better support conservation goals than presentations without touch opportunities. Additional studies will enable the conservation outreach community to better address their missions and, eventually, build greater capacity for environmental science issues at large.

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APPENDICES

APPENDIX A

"JOURNEY TO SURVIVAL" ZOOMOBILE CURRICULUM AT THE KANSAS CITY ZOO

JOURNEY TO SURVIVAL

Grades: 4th – 7th

Topic: Endangered species

Length: 45 - 50 minutes

Objectives: Each student will be able to:
- Define the terms endangered, threatened, and extinct.
- Identify four reasons that lead to endangerment.
- Describe at least two actions they, the students, can take to assist in the continued survival of the animals we have left.

AZA Message/s Addressed:
- All life on Earth exists within an ecosystem.
- Human beings are an integral part of all ecosystems.
- Healthy ecosystems provide for humans.
- Humans are responsible for changes to ecosystem.
- We can positively impact ecosystems.
- Promotes positive action for the natural world. (information about animals)

Materials:
- Beach Ball Globe
- Flags of Countries for Beach Ball Globe
- Biofacts (leopard pelt, rhino horn and skin, elephant tusk and skin, macaw feathers)
- Colored Cards
- Posters: Black Rhino Baby (born here), Bilby, Jacob's Sheep

Animals:
- Australian animal – Blue-tongued Skink (touchable), Bearded Dragon (touchable), Sugar Glider (touchable), Lorikeet (not touchable), Marine Toad (not touchable)
- Amazon animal – Amazon Parrot (not touchable), Dart Frogs (not touchable), Rainbow Boa (touchable), Red-footed Tortoise (touchable)
- U.S. Domestic animal – Chicken (touchable), Rabbit (touchable), Chinchilla (touchable)

Program Preparation:
1. Training and familiarization with program
2. Review program objectives and your part in the program prior to presenting
3. Retrieve animals from the EAF, using proper EAF Animal Handling Procedures
4. Be at facility 15 minutes prior to the start time of the program.
5. Set up table and all necessary props for program.
6. Talk to teacher/contact about behavior expectations and how they are in charge of their audience.

Program:

I. INTRODUCTION:
- Introduce yourself and the other presenters. If necessary explain Docents are Volunteer Educators.
- Ask the students:

Have you ever been to the Kansas City Zoo? Do you remember all the animals you saw? Well I have exciting news for you, we have animals from the Zoo with us today that you probably haven't seen before. They are our special education animals and they are here to help us today.

II. SET THE GROUND RULES:
(It works best to insert rules as you approach the topic—i.e. biofacts or live animals—rather than information overload in the beginning)

A. At the beginning of the program
- Inform the students:

If you would like to see the animals please sit on your pockets so those around you can see too. We should be listening carefully and using quiet voices so we can hear not only each other but the animals too. If we are able to do this, the animals will be nice calm and relaxed around us.

- Tell the students:

You may ask questions but you should raise your hand to be recognized. Make sure it is a question. We have so many things to share with you that there isn't any time for stories. Please save stories for later with your friends, so if you want to tell something that will happen after we leave.

- Instruct the students:

Now, please point to your teacher. Great! Remember even though you might not be in your normal class, your teacher is still in charge and classroom rules still apply.

B. During the program before taking an animal around to touch
- Tell the students:

If you would like to touch the (insert animal), please do so with one/two finger/s. Please touch only on the back, not the head or tail. If you do not want to touch, just keep your hands in your lap and say no thank you.

III. BACKGROUND INFORMATION
A. Program Introduction
1. Ask Students:
   Are you ready to go on a Journey?
2. Explain:
   We are going on a Journey to learn about Endangered Species from around the World.
3. Briefly, and define Endangered and Extinct
   a. Endangered is when few animals are left of a particular animal species. The animal species is close to extinctions.
   b. Extinct is when we no longer have that species in existence, we will NEVER see a member of that species alive again.

IV. AUSTRALIAN JOURNEY
A. Australia
1. Locate Australia on the Beach Ball Globe
   a. Ask for volunteers
   b. Pick a person to toss the globe to in the class and have that person locate Australia by sticking the flag in the right place. If they are unable to locate Australia solicit help from a neighboring student.

c. Have student toss back the globe
d. Then show the rest of the class where Australia is on the globe by holding the globe up and pointing.
2. **1st Staff/ Docent -Take students to Australia.**
3. Ask students what animals they could see in Australia, but also see at the KCZOO. Prompting students if they have no animals to name.
4. Show the Australian Animal
   a. Identify the animals to the students as native animals to Australia.
      - *Native Animals: are animals originally found in region of the world.*
      - *Native animals have many adaptations to help them live in their habitat. Note some adaptations the animal has. Then have the students guess what habitat they are found.*
      - **This is all they need to know about the animal!!!**
   b. **Presenter** continues - Australia is unique in its diversity of animals
      - Australia is home to many kinds of animals that are not found anywhere else in the world, mainly the **marsupials**.
5. Problems facing Australia causing animal loss
   a. **Habitat Destruction** is the biggest reason for the loss of animals
      - Destruction of habitat happens for several reasons two reasons in Australia are:
        1) population growth on the East coast -- more and more people need space to live.
        2) diversion of water in Australia, which is a very important resource due to little annual rain fall
           - annual rainfall is low in Australia, transportable water is a major problem, and so manipulating the habitat to make water more available is a common practice.
           - draining of the wetlands
           - building of dams
      - An animal we have in Australia at the zoo that has been affected by the loss of their habitat is the **Tree Kangaroo**.
   b. **Introduce Species** – the introduction of new animal species is also a large reason for animal loss
      - **Reminder**: what a native animal is.
      - Non-native species or, animals brought into a region where they were not found already, are using up resources that native species need to survive.
      - Example: introduced rabbits compete with the bilby for burrows or places to live and for food. ***Show the picture of the bilby.***
6. Review 2 reasons for endangered animals in Australia
   a. Habitat Destruction
   b. Introduced Species

V. **AFRICAN JOURNEY:**
A. Africa
1. Locate Kenya, Africa
   a. Again ask for a volunteer, toss the Beach ball globe to a person to have them place the Flag on Kenya, Africa on the globe.
   b. Have the student toss the beach ball globe back to you.
   c. Be sure to show the class where Kenya, Africa is on the globe.
2. **Presenter:** Now take them over the Indian ocean to Kenya, Africa
3. Again ask the students if they know any African animals that they can see in while here in Africa, but also at the KCZOO. Prompting maybe necessary.
4. **THE BLACK RHINO ACTIVITY**
   a. Pass out card to students.

- It is **recommended** to pass cards out while students are naming African animals to save time.
- Other presenters may help with passing cards out.
- Once all students have card, they will all stand up. Here could be a way to include the teacher give him/her a colored card too!!

b. **The History of the Black Rhinoceros**
- 1970 there were 65,000 living Black rhinos.
- ***Explain that each student standing represents a portion or percentage of those black rhinos alive in 1970.***
- 1980, ten years later, there were only about 13,000 living Black rhinos.
- ***Now have all the students with the blue color cards sit down. Explain that this is a picture of how many rhinos were lost in those 10 years. Roughly 80%.***
- 1992, there were only 2,450 Black rhinos alive on Earth in the wild.
- ***Next the students with the yellow colored cards will sit down leaving only the one student with the red card. This shows the loss of rhinos from 1980 to 1992. Roughly another 80%. Leave the one student standing while you explain the following:***
- Ask, *"Why do you think the huge losses have occurred"?* Then explain that: The **loss of rhinos is due primarily to poaching.**
- Ask, *"What are the Rhinos poached for"?*

  Their horns, which are made up of a protein, called keratin. Keratin is the chief protein of our hair, nails and horses' hooves. (**Show the rhino horn and hide. Remember the skin is not valued for anything and is often left to decay**)
- Rhino horns are used to make many things, which are then sold for money.

  In some countries, such as China, people believe that rhino horn has medicinal — almost miraculous — powers. (Indicate the rhino tablets and claims of curative powers, if available.)
- ***Is student still standing?? Should be! Can't let the black rhino go extinct!!!!***
- Tell the students that the future of the black rhino is still a concern. Poaching continues in the wild because of the high price of rhino horn and the animals are hard to keep and breed in captivity.
- However, efforts are being made and some progress is being seen.
- ***Now have the 1 student with an orange dot on the back of their card stand back up. Now have them squat or kneel.***
- This represents the increase in numbers of the wild population of black rhinos from 1992 to 2004.
- 2004 there was an increase to 3,600 in the wild, which is enough to have a 2nd student fully standing.
- ***Ask all the students that are sitting to make a choice, whether or not they want to see the black rhino numbers increase even more, if so have them stand back up.***

APPENDIX A

- ***Then explain we have a long way to go and one day we would like to see as many black rhinos in the wild as there were in 1970, if not more. It would be great to have enough Black Rhinos in the wild again to be able to have all the students to be able to stand.***
- **Before having all students sit down pose the question, what will you do to help the black rhinos? (Don't wait for answers keep moving with program)** *Mention: It is easy for us to make a decision. It's much more difficult to take action.*
- **Have students sit and pass their cards to the left and the 2nd staff/ docent will collect them.** If they want to give answers to the question, politely inform them that we will discuss it later and that you will leave a list of ideas with their teacher that they can look at.
  1) *Collect Cards*
  2) *Place back in bag*

B. African Biofacts
1. **African Elephant**
   a. Tusk – made of ivory
   b. Pelt – which, like the rhino hide is not worth anything, so is often left to decay.
2. **Leopard Skin**
   a. Show the leopard print side
   b. Then show the side with stitches
3. **Synthetic Cat Print Gloves**
   a. Show the synthetic gloves
   b. Explain there are ways to get animal prints in clothing without illegally killing any animal.

C. Baby Rhino Picture
1. Ask students if they can remember seeing a baby black rhino at the Zoo. – **The baby black rhino was born.** – *Imara*
2. **Show a picture of our baby rhino**
   a. Shows a successful breeding program at the KC Zoo
3. Tell the students that the KC Zoo is playing an important role in rhino conservation by participating in a breeding program in cooperation with other zoos and supporting conservation in Africa. The Kansas City Zoo has two young males (captive born) and one young female (from the African wild) and one young girl born at our Zoo.

VI. AMAZON JOURNEY

A. The Amazon within S. America
1. Locate the Amazon region on the globe
   a. Again ask for a volunteer to toss the globe to. They will locate the Amazon region of S. America. The largest country in the Amazon is Brazil so have the student place the Brazilian flag on Brazil.
   b. Have student toss globe back.
   c. Be sure to show the rest of the class where the Amazon is.
2. Ask students if they are now ready to travel to the Amazon in S. America. Take them over the Atlantic Ocean to the Amazon in South America.
3. Again ask if students have seen any of the Amazon animals we have at the KCZOO. Prompting maybe necessary.
4. **Show Amazon animal**
   a. Ask students why they think parrots like this one are endangered.
   b. There are many reasons, but our focus is the **Pet Trade.**
5. **PET TRADE**

   a. Poachers in the Amazon will take animals out of the wild to bring them into captivity to become future pets.
   b. Many of these animals die due to malnutrition, being mistreated and being out of their natural environment.
      - Parrots are captured by cutting down trees or netting trees to get to nests
      - Their beaks are taped shut and wings taped down
      - The parrots are then stuffed in small places and shipped into other countries like the United States illegally.
   c. If the animal eventually becomes someone's pet then there are many consequences:
      - The animal can bring disease
      - The animal is wild and could act aggressively toward humans
   d. Take a closer look at the characteristics of parrots, specifically Macaws that make them less desirable as a pet
      (Remember: we are here to give information, not make the decisions for the students!)
      - Longevity – they can live 80 – 100 years. Ask, "If someone gave you a baby parrot today and it lived to be 100 years old, how old would YOU be when it died?" - take a 2 to 3 answers
      - Social Animals – they live in large groups in the wild and can get very lonely in captivity if left alone or destructive and loud in order to get attention
      - Beak – large strong beak
      - Intelligence – parrots are thought to have the intelligence of a 2 to 3 year old child. – ***Just think of having a 2 or 3 year old younger brother or sister around for the next 100 years that wants nothing more than your full undivided attention and if they don't get it the become loud and destructive.***
      - Often parrots become unwanted by their owners and the owners try to get rid of them. The zoo gets calls everyday from someone wanting to get rid of their unwanted exotic pet.
6. **What You Can Do**
   a. First remember that some parrots are here legally. Some are born here in the United States in captivity.
   b. However, if you come across a parrot that is being sold and the seller can't prove it is legally here get some adult help and report it.

VII. JOURNEY HOME

A. Missouri (Kansas)
1. Locate the Midwest on the Beach Ball Globe by tossing the ball to a student volunteer, having them place the U.S. flag on the Midwest and toss the beach ball back. Same as before.
2. Define Domestic Animal
   a. Domestic Animals – are animals that we breed over time for a specific purpose and are then used by humans for that purpose.
   b. Ask, "Do you think domestic animals can become endangered?"
3. Show the chicken while continuing to talk about the chicken. (Presenter could use assistance here. While one presenter talks another can hold the chicken.)
   a. The chicken is an example of a domestic animal.
   b. Now what would happen if no one wanted to eat chicken meat or eggs any more?
   c. Farmers would no longer breed chickens and they would become endangered.
4. The Jacob's Sheep is an example of an endangered domestic.
   a. It was used throughout history for its wool.

APPENDIX A

b. Today, however, we use a different kind of sheep, so the Jacob's Sheep is not being bred by farmers
c. It has become an endangered domestic animal
d. There are several zoo's and concerned farmers that are participating in conservation efforts to ensure the survival of Jacob's Sheep

VIII. EVALUATION

Ask the students:

Did everyone have fun on their journey?

Ask the students as a group the following questions paying close attention to how many of them associate the animal with its correct covering immediately or did you have to help them. Please make note of this on the instructor evaluation.

- Ask the students what is the definition of endangered.
- Ask the students why animals are becoming endangered in Australia.
- Ask the students what term we use when animals are hunted illegally for certain parts.
- Ask the students why they should ask where their next pet came from.
- Ask the students how animals that are domesticated can become endangered.

VIII. SO WHY DO I CARE:

A. If animals are continually hunted and captured for the pet trade and for their pelts and they also loose their habitat which to survive in, then animal species will cease to exist, they will become **extinct**.
B. The cure for a future disease could be found in the wild. If species continue to go extinct then we will never know if the hold the key to unlock a new cure for a known disease or a future disease.
C. Once a species becomes extinct, that's it. We will never see another of its kind.
D. When a species becomes extinct, it's not only that species that is affected, but also animals around it.
   - For Example: Elephants in Africa use their tusks to find water during the dry season. When they have gotten their fill of the water they move on. Other animals then come in to drink the water the elephants found. What would happen then to the other animals if elephants were to go extinct?
   - They would find it difficult to find water and could die or even become extinct themselves.

IX. WAYS YOU CAN HELP:

A. Actions Mentioned in Class

You don't have to mention every action; a copy of this list will be given to the teacher. However, point out several, including #10.

1. Plant **NATIVE** trees, flowers in your community and leave some wild areas.
2. Provide birdhouses and feeders for **NATIVE** species of birds.
3. **Conserve:**
   - Water (turn off tap while brushing teeth, etc.).
   - Energy (turn off lights when you're not in the room. It will save electricity and the number of light bulbs used will decrease. This will then decrease the waste material produced in making light bulbs.)
   - Paper (recycle phonebooks, newspapers & junk mail. Remember, things like glass are recyclable too)_
4. Cut up six pack rings before putting them in the trash.
5. Use rechargeable batteries. Regular batteries contain mercury or cadmium, which is toxic when released into the environment.
6. Use products made from recycled materials.
7. Stay up on current events and write your congress representatives on important issues.
8. Do research on topics related to the Endangered Species using libraries, bookstores and video stores.

9. Write to organizations with information on Endangered Species and ways you can help specific animals.
10. Don't buy endangered animals or plants or products made from them.
11. Support organizations like the **KC Zoo** that work toward solutions to the problems facing endangered animals, both here in the U.S. and in other countries.

SHARE WHAT YOU'VE LEARNED WITH OTHERS!!!!!

B. A separate list will be given to the teacher with these ideas on it
C. Post – Packet for teacher with activity instruction needs to be left.

X. EVALUATION

Ask the audience:

Did everyone have fun?

Ask the audience as a group the following questions paying close attention to how many of them answer correctly or did you have to help them. Please make note of this on the instructor evaluation.

Why are animals becoming endangered in Australia?
Define poaching.
Why are animals becoming endangered in South America?
How do a variety domestic animals help us?

XI. CONCLUSION

A. Answer any last questions.
B. Thank audience for your visit and invite them to visit the Kansas City Zoo to see many endangered animals.
C. Quickly and quietly pack up pictures, biofacts, and animals.
D. Collect the completed evaluation from the teacher/contact.
E. Provide group with post-packet.

APPENDIX B

RECRUITMENT MATERIALS

ZOO LETTER

Kansas City ZOO

Good Day Zoo Friends,

We're excited to be joining you and your students in the near future, and we're very eager to share a **unique opportunity** with you. We've joined forces with a team from Temple University that is hoping to help zoos across the country better understand how our school presentations impact our audiences.

That being said, we cannot do this without your help. In order to learn what students get out of animal presentations, we need to gain a little more access to your students than usual. As such, **we are asking for your support** by allowing us to survey your students before, directly after, and several weeks following their zoo presentation experience. Our researcher will administer the surveys, so we only ask for your help getting the consent forms signed and a little time in your class. Your participation will enable us to discover some important things that zoos have not yet studied; **these findings have the potential to further fuel zoo-school partnerships in coming years.**

With your support and enthusiasm, our team will quickly work with you to get parent consent to this study as well as to streamline the survey procedures so that we maximize the little time we take to collect the much needed information. **It is vital, that we have as much participation as possible from our "Journey to Survival" program participants as possible.**

Please contact our research partner, Mandy Kirchgessner, to accept or decline this opportunity. Her information is included on the attached flyer. Thank you.

Most Sincerely,

Debra Ryder
Director of Education

Kelly Martin
School and Outreach Coordinator

Randy Wisthoff
Executive Directo/CEO

The **mission** of the Kansas City Zoo is to
*"Conserve and provide experiences with wildlife
in order to entertain and educate our audiences
and to instill a lifelong respect for nature."*

6800 Zoo Drive • Kansas City, MO 64132 • phone: 816-513-5800 • fax: 816-513-5850 • www.kansascityzoo.org
The Kansas City Zoo, a private, non-profit organization, is operated in agreement with the Kansas City, MO Board of Parks and Recreation Commissioners, partially funded by the Zoological District and is accredited by the Association of Zoos and Aquarium.

APPENDIX B
FLYER

Help us…

Learn What a Difference it Makes

You've already signed up for a Zoo presentation, and now your school can do something that will help education across the country!

The Kansas City Zoo is partnering with researchers from Temple University to help understand exactly what students gain from zoo animal presentations. We've all seen faces like these at programs, and we can feel the excitement from the children. Now it's time to truly understand how these experiences impact them.

Since zoo missions aim to inspire interest in animals and conservation behaviors, and because schools use these programs to educate and motivate their students, it is important that we learn as much as possible about their benefits. Our study will help us understand if these presentations have the potential to change behaviors.

You can help with three small steps:

1) Give us permission to observe the zoo presentation(s) at your school,
2) Help us get student and parent consent, and
3) Allow us to conduct 3 15-minute surveys with participating students over the 8-10 weeks surrounding your experience.

Kansas City ZOO

Please contact Mandy Kirchgessner for more details and to verify your participation in this study:

MandyK@temple.edu
847.612.5240

APPENDIX C

PRESENTATION OBSERVATION FORM

Presentation Observation Form:

Date: Time: Location: Grade:

Class: Presenters:

Animals Presented:
(*any animals touched)

Presentation Fidelity – *Check all content areas covered*

Check all boxes that occur within the presentation *Record anomalies in the presentation sequence Below*

- ☐ *Defines endangered and extinct*
- ☐ *Australia – animal encounter*
- ☐ *Australia – marsupials*
- ☐ *Australia – habitat destruction*
- ☐ *Australia – introduced species*
- ☐ *Africa – Black rhino activity*
- ☐ *Africa – biofacts* ________________________
- ☐ *Africa – KCZ rhino conservation*
- ☐ *Amazon – animal encounter*
- ☐ *Amazon - pet trade description*
- ☐ *Amazon – pet trade call to action*
- ☐ *Home – define domestic animal*
- ☐ *Home – pet encounter*
- ☐ *Home – chicken*
- ☐ *Home – endangered sheep*
- ☐ *Terminology Recap*
- ☐ *"So WHY do I care?"*
- ☐ *Ways you can help*
  - *Plant native*
  - *Provide bird houses and feeders*
  - *Conserve Water*
  - *Conserve Energy*
  - *Conserve Paper*
  - *Cut up 6-pack rings*
  - *Use rechargeable batteries*
  - *Used recycled products*
  - *News and policy action*
  - *Write organization about endangered species*
  - *Don't buy endangered animals or products made from them*
  - *Support animal conservation organizations*
  - *Share what you've learned*
- ☐ *Second evaluation (beyond terminology)*

Presentation Quality (1-10) ______________

Definition: The researcher's individual perception of the level of quality and the audiences' apparent reaction to the presentation.

APPENDIX D

SURVEY 1 (PRE-SURVEY)

Name: ______________________ Date: ____________ Teacher: ____________________

ANIMAL PRESENTATION
Survey 1 (Pre-Survey)

Please answer the following questions as best as you can. Your answers will help us better understand who you are.

1. How old are you? ________

2. I am a boy / girl. (circle one)

3. Please check your ethnicity:
   - ☐ African American/ Black
   - ☐ Caucasian/ White
   - ☐ Asian American
   - ☐ Hispanic/ Latino
   - ☐ Multi-Racial
   - ☐ Other ___________

4. What is your preferred language?
   - ☐ English
   - ☐ Spanish
   - ☐ French
   - ☐ Japanese
   - ☐ Chinese
   - ☐ Other ___________

5. How often do you go to a zoo?
   - ☐ I've never been to a zoo
   - ☐ I've been once, but <u>not</u> in the past two years.
   - ☐ I've been once or twice in the past two years.
   - ☐ I go several times a year.
   - ☐ I go many times each year.

6. Do you have a pet at home? Yes / No

7. What type of pets do you have? ____________

____

____

8. On average, how many hours do you spend each week watching animal TV and reading about animals?

[ ]

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APPENDIX D

For the following items, please circle a number that shows how true (1 or 2), not sure (3) or false (4 or 5) each statement is related to your behaviors.

	Very False	False	Not sure	True	Very True
9. I would be willing to stop buying some products to save animals' lives.	1	2	3	4	5
10. I would not be willing to save energy by using less air conditioning.	1	2	3	4	5
11. To save water, I would be willing to use less water when I bathe.	1	2	3	4	5
12. I would not give $15 of my own money to help the environment.	1	2	3	4	5
13. I would be willing to ride the bus to more places in order to reduce air pollution.	1	2	3	4	5
14. I would not be willing to separate family's trash for recycling.	1	2	3	4	5
15. I would give $15 of my own money to help protect wild animals.	1	2	3	4	5
16. To save energy, I would be willing to use dimmer lights.	1	2	3	4	5
17. To save water, I would be willing to turn off the water while I wash my hands.	1	2	3	4	5
18. I would go from house to house to pass our environmental information.	1	2	3	4	5
19. I would be willing to write letters asking people to help reduce pollution.	1	2	3	4	5
20. I would be willing to go from house to house asking people to recycle.	1	2	3	4	5
21. I usually recycle aluminum cans.	1	2	3	4	5
22. I do not usually recycle plastic or paper.	1	2	3	4	5
23. I usually cut up six-pack rings from soda.	1	2	3	4	5
24. I have recently talked to someone about protecting the environment or saving animals.	1	2	3	4	5
25. I do not recycle batteries or use rechargeable batteries.	1	2	3	4	5

Once you have completed this survey, please bring it to the front of the room and place it in the envelop provided for your class.

APPENDIX E

SURVEY 2 (POST-SURVEY)

Name: ________________________ Date:_____________ Teacher:______________________

ANIMAL PRESENTATION
Survey 2 (Post-Survey)

1) For <u>each</u> animal you saw, circle a number, from 1-10, for how excited you were to see it.

	Not excited									**Very excited**
a) Animal ________________	1	2	3	4	5	6	7	8	9	10
b) Animal_________________	1	2	3	4	5	6	7	8	9	10
c) Animal ________________	1	2	3	4	5	6	7	8	9	10
d) Animal_________________	1	2	3	4	5	6	7	8	9	10

2) For <u>each</u> animal you saw, circle how much you knew about the animal before meeting it today.

a) Animal ________________	It's new to me	I knew a little	I knew some	I knew a lot
b) Animal_________________	It's new to me	I knew a little	I knew some	I knew a lot
c) Animal ________________	It's new to me	I knew a little	I knew some	I knew a lot
d) Animal_________________	It's new to me	I knew a little	I knew some	I knew a lot

3) Today, I could **touch** the ____________________________________.

I was mostly scared / nervous / happy / excited / too afraid to touch the animal(s). (circle one)

<Continue to next page>

APPENDIX E

4) Which (if any) animal made you the most afraid? ____________________ Why? ______________

Write "Nothing" if you were not afraid ____

____

5) What do you remember most from the presentation? ______________________________________

____

____

6) Did you choose NOT to touch an animal? Yes No

If Yes, which one(s)? ____

For the following items, please circle a number that shows how false (1 or 2), not sure (3) or true (4 or 5) each statement is related to your behaviors.

	Very False	False	Not sure	True	Very True
7. I usually recycle aluminum cans.	1	2	3	4	5
8. I do not usually recycle plastic or paper.	1	2	3	4	5
9. I usually cut up six-pack rings from soda.	1	2	3	4	5
10. I have recently talked to someone about protecting the environment or saving animals.	1	2	3	4	5
11. I rarely think about animal conservation.	1	2	3	4	5

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APPENDIX E

For the following questions, please circle a number that shows how much you disagree (1 or 2), are not sure (3) or agree (4 or 5) with each statement. Please, ONLY think about the animals you TOUCHED when you respond.

	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
12. I would like to read a book about the animals I touched.	1	2	3	4	5
13. Greater attention should be dedicated to the animals I touched.	1	2	3	4	5
14. I would like to know more the behavior of the animals I touched.	1	2	3	4	5
15. I would like to watch the natural behaviors of the animals I touched.	1	2	3	4	5
16. Researching the animals I touched would be exciting to me.	1	2	3	4	5
17. The animals I touched are quite interesting animals	1	2	3	4	5
18. We should learn more about the animals I touched in school	1	2	3	4	5
19. I would like to know how scientists investigate the animals I touched.	1	2	3	4	5
20. I would like to participate on an expedition which investigated the animals I touched.	1	2	3	4	5

For the following questions, please circle a number that shows how much you disagree (1 or 2), are not sure (3) or agree (4 or 5) with each statement. Please, ONLY think about the animals you only SAW (but did not touch) when you respond.

	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
21. I would like to read a book about the animals I saw.	1	2	3	4	5
22. Greater attention should be dedicated to the animals I saw.	1	2	3	4	5
23. I would like to know more the behavior of the animals I saw.	1	2	3	4	5
24. I would like to watch the natural behaviors of the animals I saw.	1	2	3	4	5
25. Researching the animals I saw would be exciting to me.	1	2	3	4	5
26. The animals I saw are quite interesting animals	1	2	3	4	5
27. We should learn more about the animals I saw in school	1	2	3	4	5
28. I would like to know how scientists investigate the animals I saw.	1	2	3	4	5
29. I would like to participate on an expedition which investigated the animals I saw.	1	2	3	4	5

APPENDIX E

For the following items, please circle a number that shows how false (1 or 2), not sure (3) or true (4 or 5) each statement is related to your behaviors.

	Very False	False	Not sure	True	Very True
30. I would be willing to stop buying some products to save animals' lives.	1	2	3	4	5
31. I would not be willing to save energy by using less air conditioning.	1	2	3	4	5
32. To save water, I would be willing to use less water when I bathe.	1	2	3	4	5
33. I would not give $15 of my own money to help the environment.	1	2	3	4	5
34. I would be willing to ride the bus to more places in order to reduce air pollution.	1	2	3	4	5
35. I would not be willing to separate family's trash for recycling.	1	2	3	4	5
36. I would give $15 of my own money to help protect wild animals.	1	2	3	4	5
37. To save energy, I would be willing to use dimmer lights.	1	2	3	4	5
38. To save water, I would be willing to turn off the water while I wash my hands.	1	2	3	4	5
39. I would go from house to house to pass our environmental information.	1	2	3	4	5
40. I would be willing to write letters asking people to help reduce pollution.	1	2	3	4	5
41. I would be willing to go from house to house asking people to recycle.	1	2	3	4	5

Once you have completed this survey, please bring it to the front of the room and place it in the envelop provided for your class.

APPENDIX F

SURVEY 3 (DELAYED POST_SURVEY)

Name: ________________________ Date:_____________ Teacher:______________________

ANIMAL PRESENTATION

Survey 3 (Delayed Post-Survey)

For the following items, please circle a number that shows how false (1 or 2), not sure (3) or true (4 or 5) each statement is related to your behaviors.

	Very False	False	Not sure	True	Very True
1. I usually recycle aluminum cans.	1	2	3	4	5
2. I do not usually recycle plastic or paper.	1	2	3	4	5
3. I usually cut up six-pack rings from soda.	1	2	3	4	5
4. I have recently talked to someone about protecting the environment or saving animals.	1	2	3	4	5
5. I rarely think about animal conservation.	1	2	3	4	5

<Continue to next page>

For the following questions, please circle a number that shows how much you disagree (1 or 2), are not sure (3) or agree (4 or 5) with each statement. <u>Please, ONLY think about the animals you TOUCHED when you respond.</u>

	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
6. I would like to read a book about the animals I touched.	1	2	3	4	5
7. Greater attention should be dedicated to the animals I touched.	1	2	3	4	5
8. I would like to know more the behavior of the animals I touched.	1	2	3	4	5
9. I would like to watch the natural behaviors of the animals I touched.	1	2	3	4	5
10. Researching the animals I touched would be exciting to me.	1	2	3	4	5
11. The animals I touched are quite interesting animals	1	2	3	4	5
12. We should learn more about the animals I touched in school	1	2	3	4	5
13. I would like to know how scientists investigate the animals I touched.	1	2	3	4	5
14. I would like to participate on an expedition which investigated the animals I touched.	1	2	3	4	5

APPENDIX F

For the following questions, please circle a number that shows how much you disagree (1 or 2), are not sure (3) or agree (4 or 5) with each statement. <u>Please, ONLY think about the animals you only SAW (but did not touch) when you respond.</u>

	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
15. I would like to read a book about the animals I saw.	1	2	3	4	5
16. Greater attention should be dedicated to the animals I saw.	1	2	3	4	5
17. I would like to know more the behavior of the animals I saw.	1	2	3	4	5
18. I would like to watch the natural behaviors of the animals I saw.	1	2	3	4	5
19. Researching the animals I saw would be exciting to me.	1	2	3	4	5
20. The animals I saw are quite interesting animals	1	2	3	4	5
21. We should learn more about the animals I saw in school	1	2	3	4	5
22. I would like to know how scientists investigate the animals I saw.	1	2	3	4	5
23. I would like to participate on an expedition which investigated the animals I saw.	1	2	3	4	5

For the following items, please circle a number that shows how false (1 or 2), not sure (3) or true (4 or 5) each statement is related to your behaviors.

	Very False	False	Not sure	True	Very True
24. I would be willing to stop buying some products to save animals' lives.	1	2	3	4	5
25. I would not be willing to save energy by using less air conditioning.	1	2	3	4	5
26. To save water, I would be willing to use less water when I bathe.	1	2	3	4	5
27. I would not give $15 of my own money to help the environment.	1	2	3	4	5
28. I would be willing to ride the bus to more places in order to reduce air pollution.	1	2	3	4	5
29. I would not be willing to separate family's trash for recycling.	1	2	3	4	5
30. I would give $15 of my own money to help protect wild animals.	1	2	3	4	5
31. To save energy, I would be willing to use dimmer lights.	1	2	3	4	5
32. To save water, I would be willing to turn off the water while I wash my hands.	1	2	3	4	5
33. I would go from house to house to pass our environmental information.	1	2	3	4	5
34. I would be willing to write letters asking people to help reduce pollution.	1	2	3	4	5
35. I would be willing to go from house to house asking people to recycle.	1	2	3	4	5

Once you have completed this survey, please bring it to the front of the room and place it in the envelop provided for your class.

APPENDIX G

CODEBOOK

Question Inventory		Question	Pre-Survey	Post Survey	Delayed Survey
Demographic Questions					
1		Age	1		
2		Gender	2		
3		Ethnicity	3		
4		Preferred Language	4		
5		Zoo visits in the past 2 years	5		
6		Do you have a pet at home?	6		
7		What types of pets?	7		
8		How many hours of animal TV and reading do you do each week?	8		
Animal Presentation Experience					
9		Each Animal Excitement Level		1a-d	
10		Each Animal Familiarity		2a-d	
11a		Animals touched (validated by observation data)		3a	
11b		Feeling about touching the animal.		3b	
12		Which animal made you the most afraid?		4	
13		What do you remember the most from the presentation?		5	
14		Did you choose NOT to touch and animal? Which?		6	
Selection of "Journey to Survival" Target Behaviors					
15	+	I usually recycle aluminum cans.	21	7	1
16	-	I do not usually recycle plastic or paper.	22	8	2
17	+	I usually cut up six-pack rings from soda.	23	9	3
18	+	I have recently talked to someone about protecting the environment or saving animals.	24	10	4
19	-	I do not recycle batteries or use rechargeable batteries.	25	11	5
Touch Attitudes Questionnaire (TAQ) modified "Wildlife Attitudes Survey" from Prokop and Tunnicliffe (2008)					
20	+	I would like to read a book about the animals I touched		12	6
21	+	Greater attention should be dedicated to the animals I touched.		13	7
22	+	I would like to know more the behavior of the animals I touched.		14	8
23	+	I would like to watch the natural behaviors of the animals I touched.		15	9
24	+	Researching the animals I touched would be exciting to me		16	10
25	+	The animals I touched are quite interesting animals		17	11
26	+	We should learn more about the animals I touched in school		18	12
27	+	I would like to know how scientists investigate the animals I touched.		19	13
28	+	I would like to participate on an expedition which investigated the animals touched.		20	14
Sight Attitudes Questionaire (SAQ) modified "Wildlife Attitudes Survey" from Prokop and Tunnicliffe (2008)					

APPENDIX F

29	+	I would like to read a book about the animals I saw.		21	15
30	+	Greater attention should be dedicated to the animals I saw.		22	16
31	+	I would like to know more the behavior of the animals I saw.		23	17
32	+	I would like to watch the natural behaviors of the animals I saw.		24	18
33	+	Researching the animals I saw would be exciting to me.		25	19
34	+	The animals I saw/I touched are quite interesting animals.		26	20
35	+	We should learn more about the animals I saw in school ..		27	21
36	+	I would like to know how scientists investigate the animals I saw.		28	22
37	+	I would like to participate on an expedition which investigated the animals I saw.		29	23
CHEAKS: Verbal Commitment by Leeming, O'Dwyer & Bracken (1995)					
38	+	I would be willing to stop buying some products to save animals' lives.	9	30	24
39	-	I would not be willing to save energy by using less air conditioning.	10	31	25
40	+	To save water, I would be willing to use less water when I bathe.	11	32	26
41	-	I would not give $15 of my own money to help the environment.	12	33	27
42	+	I would be willing to ride the bus to more places in order to reduce air pollution.	13	34	28
43	-	I would not be willing to separate family's trash for recycling.	14	35	29
44	+	I would give $15 of my own money to help protect wild animals	15	36	30
45	+	To save energy, I would be willing to use dimmer lights.	16	37	31
46	+	To save water, I would be willing to turn off the water while I wash my hands.	17	38	32
47	+	I would go from house to house to pass our environmental information.	18	39	33
48	+	I would be willing to write letters asking people to help reduce pollution.	19	40	34
49	+	I would be willing to go from house to house asking people to recycle.	20	41	35