NAMING “ANIMAL AMBASSADORS” AND ITS EFFECT ON ENVIRONMENTAL LITERACY RETENTION IN COLLEGIATE STUDENTS

by

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(Under the Direction of A. Christian Morgan)

ABSTRACT

This study explored the effect of naming an animal teaching tool on the knowledge retention of collegiate students. The study sample included 111 participants enrolled in several courses within the College of Agricultural and Environmental Sciences at a land-grant university. The study sample participated in a presentation where an owl was used as an educational tool and received a “human” name during the experiment. Following the presentation, participants completed a knowledge-based assessment. Knowledge scores for the participants only indicated retention in knowledge gained regarding owl adaptations. Male, urban participants also earned the highest knowledge score: a unique finding compared to other studies. Future research suggests the use of a different research design involving pretests; expanding the scope of the demographics to include a larger sample size, different educational levels, and various socioeconomic statuses; the use of different animal teaching tools including reptiles and mammals, and comparing the use of exotic versus native species; and determining the potential influence of the presenter on participant learning outcomes.

INDEX WORDS: Animal ambassadors; Teaching Tools; Knowledge Retention; Charismatic Megafauna; Empathy-Altruism; Environmental Education; Environmental Literacy; Story [Telling]; Drama Theory

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DEDICATION

This work is dedicated to my family and friends who have continuously supported my endeavors throughout the years. To my professors at the University of Georgia and the Pennsylvania State University who challenged me during my educational process. To all of my friends from Shaver's Creek Environmental Center who planted the seed for my passion in environmental education and justification for this research. To the Jekyll Island 4-H Center and the W. Alton Jones Environmental Center who fostered my passion. To Devika V. Rao who has always supported my decision for higher education, always seen the potential within me, and motivated me when I could not motivate myself despite our good times and trials and tribulations over the past nine years. Finally, to my father who I always strive to make him proud even as he is not here today to witness it. I am eternally grateful.

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CHAPTER 1

INTRODUCTION

There is a growing need for environmental education (EE) on a global scale. As the world population continues to grow and more nations begin to develop and practice customs from Western cultures, the need for resources and dependence on the environment will increase significantly (Martine, 2005). The Millennium Ecosystem Assessment indicates that 60% (15 out of 24) of the ecosystem services that humans depend on for sustenance are degraded or used unsustainably, and that "the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted" (McMillan & Vasseur, 2010, p. 435).

At the same time, we are finding more individuals not spending as much time participating in activities outdoors or interacting with nature as previous generations. According to research conducted by Hofferth and Sandberg (2001) who examined the lives of children in America, they found that children spend 12 hours (24%) of their free time watching television. There is a growing gap between humans and nature which could have implications on health and well-being or what is called "nature-deficit disorder" (Louv, 2009). A growing trend in youth of the Millennial generation is the lack of "environmentally literacy," that is, an inability to identify common species of plants and animals with their local community. The anticipated outcomes of society growing less connected with the environment will only compound the current status of the world. The notion of today's youth not possessing the interest, or inherent responsibility, to be

stewards of the environment has the possibility to amplify dramatically over time. Sir David Attenborough warned that children who lack any understanding of the natural world grow into adults who place little value on the environment (Cassidy, 2008). The effect of the lack of immersion in nature from youth does not solely concern the educational process. Evidence suggests that a pervasive disconnect between youth and nature threatens children's physical, social, and psychological well being. (Larson, Castleberry, & Green, 2010, p. 96) Environmental education programs represent a potential antidote to this nature-deficit disorder (Louv, 2009).

Environmental education programming utilizes a myriad of methods to reach an audience who are learners in formal, nonformal, and informal educational settings. Research has shown that effective EE may lie in entertaining, exciting programming: a delivery style that is not always possible in a formal school setting (Larson et al., 2010). Nature centers, zoos, and aquariums provide programming either onsite and/or via traveling shows. Organizations such as the National FFA Organization (FFA) and 4-H provide venues where children can attend activities and learn more about the environment. A growing number of educators are now using some type of animal teaching tool (either living or nonliving) to enhance the delivery of an environmental message. Animals can be incorporated into all academic areas; not only life science but economics, math, language arts, and social studies (Siegel, 2004).

When animal ambassadors (AA) are used in nonformal educational settings, captive live animals can provide memorable, safe encounters with wildlife, increase relevance of conservation issues, increase program attendance, and allow educators to link environmental messages to specific species. Likewise, when used in formal

(classroom) settings, live animals can be used to teach students about animal care, help eliminate misconceptions, and make science lessons more relevant by providing real-life examples of animals being studied (Fuhrman & Ladewig, 2008).

This use of live animals in education is appealing to many audiences due to the concept of "charismatic megafauna" where certain species seem to draw more attention because people anthropomorphize with the animal teaching tool. Most of the animals that draw a high frequency of visitors at wildlife institutions (WI) include large mammals and other exotic animals such as African lions, giant pandas, and Siberian tigers (not domestic). In past studies (Margulis, Hoyos, & Anderson, 2003; Anderson, Kelling, Pressley-Keough, Bloomsmith, & Maple, 2003; Swanagan, 2000; Yerke & Burns, 1991) researchers have focused on studying charismatic megafauna and exotic animals at WI and their effect on visitors' knowledge, attitudes, and behaviors. Indeed, the use of local, native wildlife in educational programming has been evaluated less often (Fuhrman & Ladewig, 2008).

The characteristics of the animals used as teaching tools may influence the learning outcomes of participants. Within the EE community, a debate has been growing concerning the use of animals in educational programming. There is an overall consensus promoting the use of AA to help teach about matters such as conservation and environmental issues; however, professionals are split on how attached individuals (both caregivers and visitors) should be to the captive animals. This includes the premise of naming the captive animals. Some professionals believe naming an animal in captivity is counterproductive to the overall goals of EE because visitors will believe the wild animals are "pets" and can be approached and handled. The opposing argument is that

named animals allow visitors to gain a greater connection with the animals they encounter at a zoo or aquarium and help the overall goals of EE:

> … (a) to foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas.
>
> (b) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment.
>
> (c) to create new patterns of behavior of individuals, groups, and society as a whole towards the environment. (UNESCO, 1980 p. 71)

Statement of Problem

The argument among environmental educators is whether or not to name AA, yet no literature was found assessing this concept. This study sought to answer the question: what impact does naming an animal teaching tool have on environmental literacy retention in collegiate students?

Purpose and Objective of Study

This study was formulated in order to expand the literature base with data on naming animal ambassadors and its effect on knowledge acquisition and sought to provide empirical data to this debate within wildlife institutions. It may also educate formal and nonformal educators about the use of live animals in educational programming, as well as inform participants about various educational techniques and about the animals used as educational tools.

This quasi-experimental, quantitative study addressed the effect of naming animal teaching tools on knowledge retention and its relation to environmental literacy. An experimental design was used where quantitative data was used to assess knowledge

retention and qualitative data informed the quantitative data. Study participants were part of in-tact college classes and participated in either a control (animal is not named) or a treatment (animal is named) regime in which a presentation was delivered on birds-of-prey, specifically owls, their adaptations, human-owl relations, and conservation efforts. After the presentation quantitative data was collected using a questionnaire to measure knowledge retention. Specifically, an owl knowledge-based questionnaire was developed for use in the study to test the ability of storytelling to disseminate information, Drama Theory to help the audience identify with a character (the owl), and the Empathy-Altruism Hypothesis to promote an emotional bond with the character to promote helping behavior. The qualitative data, collected through an open-ended question at the end of the questionnaire (see Appendix), was used to assess whether or not participants retained owl conservation knowledge.

The objectives of the study were to:

1. Describe the current behaviors of college students regarding environmental education participation.
2. Compare the retention levels of students who experience a named raptor to students who experience a non-named raptor.
3. Explore the influence of participant demographics on knowledge retention.

Study Hypothesis

The null hypothesis (H_O) is there is no significance in the difference in the level of knowledge retention between the control group (presentation using an unnamed animal ambassador) and treatment group (presentation using a named animal ambassador)

knowledge scores. The alternate hypothesis (H_A) is there is significance in the difference between the level of knowledge retention between the control and treatment group as evidenced by difference in knowledge scores (at the $\alpha = 0.05$ level).

Professional Significance of Study

The proposed study of naming animal teaching tools and its effect on environmental literacy retention can make a contribution to a major objective recognized by many educators in EE along the continuum from awareness to action: knowledge dissemination and retention. If naming AA proves to be effective in helping individuals identify with animals used in programming and retaining information provided during a presentation, it could benefit WI's and promote environmentally responsible behaviors.

There has been some debate within the EE/WI community regarding the naming of animals in captivity. Some institutions state that naming animals is detrimental to the overarching objectives of EE. Some professionals feel that naming animals in captivity will cause visitors and audience members to stop referring to the animals as "wild" (Appendix C). Some raptor professionals believe "that people walk away with a better sense of respect for these animals, and an understanding that these birds are still potentially dangerous and should be admired from a distance" (Sara Eisenhaur, Wildlife Services manager, Vermont Institute of Natural Science, personal communication, 2012). Another professional felt that:

> The more trained an animal is (i.e., the greater the distance from "perceived wild" behavior) the more difficult it becomes for "normal people" to distinguish a wild animal from a pet. In order to foster the appropriate behaviors and interactions between humans and wildlife, I feel that it is important to stress the natural history

> and minimize anthropomorphic language in any way possible (Stephen Schabel, Director of Education, The Center for Birds of Prey, personal communication, 2012).

The opposing view is that naming animals in captivity is beneficial to the profession because of the concept of connecting individuals with the animals. These professionals believe that an animal with a name allows for individuals to identify with the animals. One professional stated:

> These animals will live out their lives here at Beartooth Nature Center and they develop very strong bonds with their caretakers. Not naming them because of anthropomorphism would seem to be an effort to diminish the strong emotional connections that these animals can have with humans (Michelle Marion, Beartooth Nature Center, personal communication, 2012).

On the concept of naming animal teaching tools, another professional states several reasons in support of naming them:

> We have over 300 volunteers and it is a very special way to thank them by giving them the naming rights to one of our permanent residents. We think the bird's name is impactful in educating students about environmental conservation as it connects them to the birds they meet and tells a story. At the end of the day sometimes they don't necessarily grasp the entire topic we have been discussing in their classroom. A lot of times what they remember is that they like Lulu the barred owl they met and they remember that it's important to keep trash off the side of the road because that's why LuLu got hit by a car (Amber Rosintoski, Bird Curator, Carolina Raptor Center, personal communication, 2012).

Limitations to the Study

The purpose of this study is to measure knowledge retention of two different groups who participate in an environmental education presentation where an AA is either named or not named, the participants are only tested immediately after the presentation is delivered. The study did not measure change in knowledge retention by comparing pre and post knowledge scores. Prior research measured knowledge retention on several occasions, consisting of immediately after the experiment and on later dates (Kuhar, Bettinger, Lehnhardt, Tracy, & Cox, 2010; Zeppel, 2008). This study measured knowledge retention using a posttest only method.

Instrumentation: The instrumentation used to measure knowledge retained from the EE presentation is a research-developed instrument designed for use in this study. Education and evaluation experts assisted with the development of the instrument and a pilot test was conducted to determine face and content validity.

Sample Selection: The individuals within the population are all enrolled in courses within the College of Agricultural and Environmental Sciences at the University of Georgia. The classes were randomized as to which would be in the control group and treatment group. The course enrollment, already set in place, creates intact groups instead of having a completely randomized selection of students from across the university. Simple randomization assures unbiased assignment of experimental subjects to groups (Campbell & Stanley, 1963). It is unavoidable to use the established classes as groups for this study due to the accessibility of the sample.

The age range of the sample also provides a set of limitations to the study. A great deal of research on EE, the use of animal teaching tools and its effect on educational

benefits (Larson et al., 2010; Lien, 2007; Lock, 1993; Morgan & Gramann, 1989; Zalsoff, Hart, & DeArmond, 1999) and on knowledge retention (Knapp & Barrie, 2001; Kuhar et al., 2010) involved studies where youth (≤ 18 years old) made up the sample. On the other hand, there is research on EE that specifically focuses on adults (≥ 18 years old). Research suggests that statutory authorities must recognize that adults are the dominant decision-makers within communities and that it is their decisions and actions that affect the environment on a daily basis (Blair, 2008). A sample of various ages would represent a holistic view of the general population. The educational level of the study sample also presents a limitation. Research exists that examines EE, the use of animal teaching tools, and its effect on individuals ranging from grades K-12 (Knapp & Barrie, 2001; Kuhar et al., 2010; Larson et al., 2010; Lien, 2007; Lock, 1993; Morgan & Gramann, 1989; Siegel, 2004; Zalsoff et al., 1999; Zeppel, 2008). However, few studies have been conducted on post-secondary students. This study measures knowledge retention from a sample of individuals who attend a four year university and therefore, does not represent the entirety of the general population.

Definition of Terms

- *Animal ambassador* – a living or nonliving animal teaching tool used to support a lesson in an educational setting (Seaworld, 2005).
- *Bird-of-prey* – a bird that hunts for food (primarily vertebrates) on the wing, using keen senses such as eyesight and hearing, has strong feet and talons for grasping food, and a curved beak for tearing flesh (i.e., eagles, hawks, falcons, owls, harriers). Also referred to as a "raptor" (Crossley, 2011).

- *Charismatic megafauna* – a large animal that draws appeal from animal activists as well as visitors of zoos, aquariums, and other facilities that house or provide eco-tours (Rohlf, 1991).
- *Empathy* – the identification with the feelings and attitudes of another individual.
- *Environmental education (EE)*– the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture, and his biophysical surroundings (McMillan & Vasseur, 2010).
- *Environmental literacy* – possessing knowledge about the environment and issues related to it; capable of, and inclined to, further self-directed environmental learning and/or action (NAAEE, 2009).
- *Formal educational setting* – education that takes place in a familiar education system such as a classroom and is typically planned (NAAEE, 2009).
- *Informal educational setting* – any unstructured environmental education activity outside the formal system where people learn from exhibits, mass media, and everyday living experiences (NAAEE, 2009).
- *Innovativeness* - the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system (Rogers, 2003).
- *Knowledge retention* – the act of remembering information.
- *Nonformal educational setting* – education that takes place outside the classroom, including parks, zoos, nature centers, community centers, and youth camps. The learning is typically planned but takes place in a setting that is not as familiar to

the learner as a classroom. Any organized educational activity about the environment that takes place outside the formal education system (NAAEE, 2009).

- *Storytelling* – the art of disseminating information and conveying events using words, imagery, and sounds.
- *Student* – An individual enrolled in at least 9 credit hours at the University of Georgia (undergraduate or graduate), age ranging from 18-30 years old, and participating in courses on the Athens campus.
- *Traveling show* – A program activity implemented by nature center/zoo/aquarium staff which is held offsite; usually occurring at schools, meetings, or festivals.
- *Urban dwelling* – urban community.
- *Wildlife institution* (WI) –for the purpose of this study, it is an institution in which animals (living and/or nonliving) are kept and exhibited to the general public. This includes nature centers, zoos, aquariums, museums, wildlife refuges, wildlife reserves, and parks.

Summary

The purpose of this study was to determine the impact of naming live, animal teaching tools (in this study a Barred owl, *Strix varia*) on collegiate students' environmental literacy knowledge retention. Chapter one discussed the significance of the research to the profession and explained the limitations with the study design. It also provided a summary of the need for EE in the world, the methods in which environmental education is used, animal teaching tool use, and the need for this study. Chapter one also stated the research hypothesis, objectives of the study, and definition of terms. Chapter

two will discuss EE, the use of animal teaching tools in education, the concept of "charismatic megafauna," and owls. It will also explain the theoretical framework behind combining storytelling, Drama Theory, and the Empathy-Altruism Hypothesis.

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this chapter is to review literature pertaining to the topic of this research. The review will investigate environmental education and its need in today's society, the use of animal teaching tools in education, and the concept of "charismatic megafauna." The review is divided into the following sections: (1) Environmental Education; (2) Animal Ambassador; (3) Charismatic Megafauna; (4) Theoretical framework; and (5) Summary.

Environmental Education

The definition of EE has been altered slightly over the past 40 years. Stapp et al. (1969) stated environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solutions. Environmental education was defined by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) as an action process, it relates to, and builds upon, the work of almost all other subject areas; it is concerned with the dynamic interaction between humanity and nature; and it is directed at the improvement of the quality of existence for all living things (UNESCO, 1977). For the purpose of this study, we will use the goals developed by UNESCO to help define environmental education:

> … (a) to foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas;

> (b) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; (c) to create new patterns of behavior of individuals, groups, and society as a whole towards the environment (UNESCO, 1980 p. 71).

This definition displays environmental education as more than just covering specific science subjects or rehashing facts, but as an interdisciplinary concept that incorporates several other subjects and issues surrounding the environment. Conservation issues, even if controversial, must be presented to the public so that they can know how to think about environmental issues—not what to think about them (Swanagan, 2000). Environmental education has implications on political decisions, economic opportunities, relationships between communities on a county, state, and national level, and international relationships between nations. It is in our social self-interest to ensure that future generations are prepared to do a better job of conserving and protecting the Earth, if not for all the other species, then to preserve the physical, and psychological, health of the human race (McMillan & Vasseur, 2010).

Several benefits of EE (i.e., knowledge gain, positive changes attitudes and behavior) can vary depending upon the individual and/or community affected. Many EE instructors aim to affect the knowledge, attitude, or behavior of their audiences through educational programming. Providing positive experiences that demonstrate to learners they can have an influence in their own local environment helps to overcome "action paralysis" (Ballantyne & Packer, 2005). In this way, EE instructors can provide positive experiences which can have an effect on environmental action. Environmental action ranges from direct action (the respondent reports to perform a standard environmental

behavior himself or herself) to indirect action (i.e. to motivate others to perform an action or to take part in pro-environmental activism) (Bögeholz, 2006).

The immersion of individuals in EE can expose them to a world that is not readily available to some demographics. In the scope of youth, it can provide team building experiences and aid in the development of life skills. According to Lien (2007), outdoor education experiences (such as environmental education) offer students the opportunity to connect to the wilderness while they gain an appreciation of their classmates, and an understanding of themselves. In a study conducted by the American Camping Association (ACA) that surveyed 5,000 families who attended 80 different camps, parents, camp staff, and campers reported that the student had significant growth in: self-esteem, independence, leadership, friendship skills, social comfort, per relationships; adventure and exploration, environmental awareness, values and decisions, and spirituality (Lien, 2007). In another study conducted by YMCA Camp Greenville, teachers reported that their students gained self-confidence and conquered fears, learned to work as a team, enhanced their sense of community while making new friends, community, and were challenged to try new things or think in new ways. In addition, technical skills were learned, environmental awareness was enhanced, and leadership skills increased (Lien, 2007).

Environmental education has also been reported to promote pro-environmental attitudes in participants. These attitudes range from being conscious of the fauna and flora around a home and in the community to adopting highways, parks, bodies of water (i.e., rivers, lakes, streams, ponds) in order to keep them clean. Environmental education can lead to individuals becoming more aware of what is around them in the environment

and contribute input on environmental issues as leaders in a community. It has led to individuals participating in citizen science projects in order to improve their communities as well as visiting and volunteering at zoos, aquariums, nature centers, and rehabilitation centers, to name a few. A key focus of WI is to facilitate and support the development of pro-conservation attitudes, knowledge, and behavior among their visitors (Ballantyne & Packer, 2005). Zeppel (2008) states on-site benefits of increased understanding or emotional responses to marine wildlife encounters may lead to off-site benefits such as greater environmental awareness, support for nature conservation work, and protection of endangered species. Through these experiences, visitors respond to the innate human desire to interact with and interpret wildlife and the cultural and anthropomorphic appeal of animals.

Environmental education instructors often utilize the concept of nature and human emotions to appeal to individuals and elicit some type of behavioral change. Visitors at a marine life center in New Zealand gained psychological benefits such as "positive moods and emotions, environmental sensitivity, sense of place and species, and affective learning" from hands-on involvement with sea animals (Zeppel, 2008, p. 5). Ballantyne and Packer (2005) found that school students on field trips to natural areas reported that observing and experiencing wildlife in the natural environment aroused empathy. Research has also shown participation in EE programs affects participants long after the completion of the activities. Zeppel (2008) found that 74% of visitors surveyed six months after visiting a sea turtle beach reported talking to friends or family about turtles, removing beach litter, reporting turtle sightings, releasing turtles trapped in nets, and

volunteering. The concept of invoking emotions in EE can allow individuals to determine what they relate to and structure their motives and actions accordingly.

Some researchers believe the effectiveness of an EE program cannot be evaluated appropriately unless all of the steps in the chain, from program presentation to biological outcomes, are evaluated as the education component is one link to the chain (Kuhar et al., 2010). For this study, the focus was on the knowledge component EE provides to students (Figure 1). However, the use of EE in the classroom by some educators has been miniscule at best due to reasons such as lack of experience teaching EE and using the outdoors to further a lesson (Dillon et al., 2006). This lack of adoption can be equated as a viewpoint of an innovation by laggards. According to adoption theory, innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system (Rogers, 2003). There are five adopter categories identifying the rate to which an individual adopts an innovation; ranging from first individuals to adopt an innovation to the last individuals to adopt. Innovators are the first in a social system to adopt an innovation; being able to cope with higher levels of uncertainty about an innovation than are other adopter categories (Gill, 2006; Rogers, 2003). On the other hand, laggards are the last in a social system to adopt an innovation and are usually suspicious of innovations. These people want to ensure the innovation will not fail before they can adopt. Decisions are often made in terms of what has been done previously, and these individuals interact primarily with others who also have relatively traditional values (Rogers, 2003). Despite its benefits, some educators may refrain from using EE in their classroom due to lack of capability to implement it in their curricula.

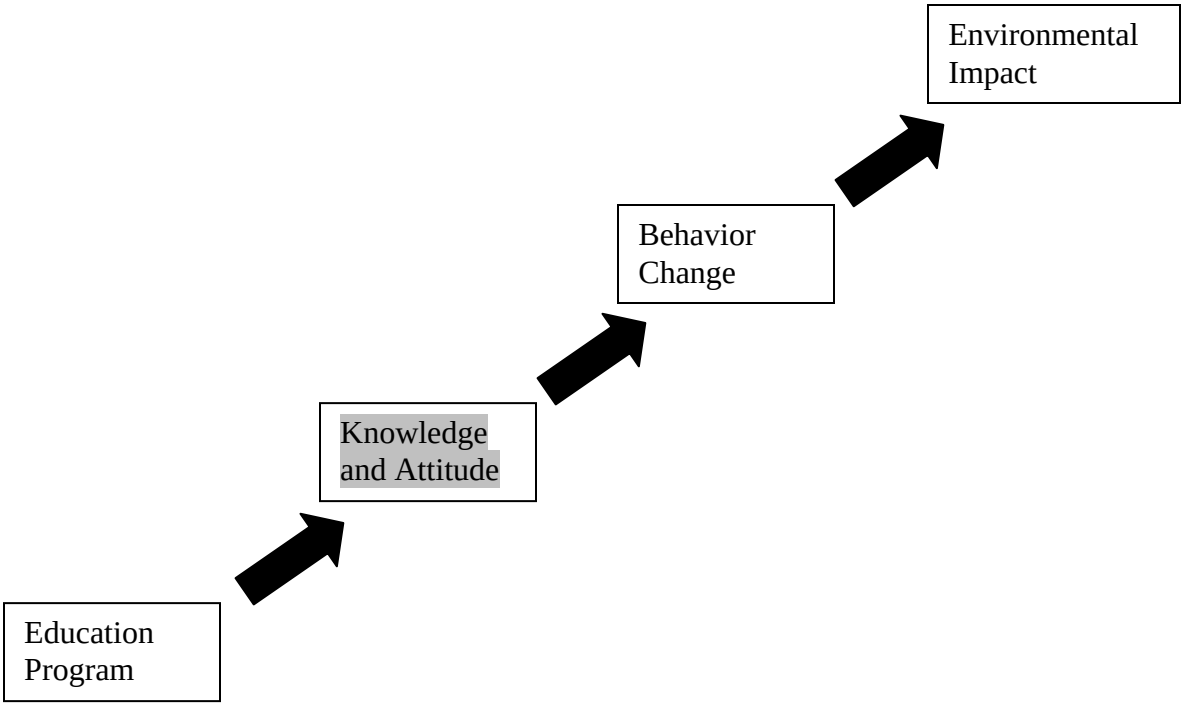

Fig.1 The relationship between conservation education programs and positive biological impact (Kuhar et al., 2010). Note the gray section indicates the focus of this study.

Environmental Education in the Classroom

Educators with a more traditional view of the educational process might be less likely to use EE in the classroom in comparison to their peers. The North American Association for Environmental Education (NAAEE) and the Environmental Literacy Council (ELC) stated that although 61% of public school teachers claim to include environmental topics in their curricula, most devote fewer than 50 hours to it throughout the course of an entire year (Coyle, 2005). Yet, research has shown that participation in EE has several positive implications on the educational system including improved knowledge retention, better cognitive function, and increased critical thinking skills

(Lien, 2007; Siegel, 2004; UNESCO, 1977). In a study conducted by the American Institutes for Research (AIR) comparing California students who attended EE programs with those who did not, students who participated in the EE experiences improved their science score by 27%, as measured by a pre- and post-survey (American Institutes for Research, 2005). The increase in science knowledge was maintained six to ten weeks following program participation, with no significant loss in science scores (American Institutes for Research, 2005). Another study conducted by the State Education & Environmental Roundtable (SEER) observing 40 schools involved in EE found the following results: better performance on standardized tests, reduced discipline problems in the classroom, development of problem-solving skills, increased engagement in the classroom, and greater pride and ownership in their education (Lieberman & Hoody, 1998). In a study conducted by SEER examining the effect of environmental-based education on elementary student academic achievement, students in the study's environment-based programs outperformed their traditionally educated peers in four core subject areas – reading, mathematics, writing, and spelling (State Education and Environment Roundtable, 2005). Another study found that outdoor learning experiences were more effective for developing cognitive skills than classroom-based learning (Dillon et al., 2006). The current study focused upon knowledge acquisition of college students following a presentation in a formal classroom setting rather than a nonformal classroom setting.

Environmental education programming has been reported to help individuals retain information and behaviors well after participation in activities. A study was conducted by Knapp and Barrie (2001) evaluating the impact of two different

environmental science field trips (one trip covered basic ecological concepts whereas the other trip covered environmental issues) on elementary students' knowledge and attitude toward the resource site. All participants attended two trips each (either on basic ecological concepts or environmental issues; not both) and took a pretest and posttest for each trip. Students' knowledge increased as a result of attendance of the first program. There is not a substantial amount of longitudinal research examining the effect of EE on knowledge retention. One study conducted by Kuhar, et al. (2010) explored the effect of an EE program on students' knowledge retention near the Kalinzu Forest Reserve in Uganda. The researchers found that participants retained information from the EE program for at least two years following the program.

Animal Ambassador

An animal ambassador (AA) is a living or nonliving animal teaching tool used to support a lesson in an educational setting. (Seaworld, 2005). The type of AA can range from nonliving specimens to the use of live animals during the educational process. A nonliving AA includes feathers, bones, horns, antlers, skins, fur, teeth, entire skeletons, shells, and taxidermy specimens. In a study conducted by Zasloff et al. (1999), 73% of the teachers who participated in the research reported they had specimens consisting of items such as feathers, bones, shells, mounted insects, taxidermied specimens, teeth, pelts, nests, owl pellets, and plastic models where a majority of the specimens were found at parks, zoos, beaches, and other field locations. Educators use nonliving AA to support lessons in several subject areas including science, math, English, history, and language arts. Zasloff et al. (1999) found that the application of nonliving AA ranged from general

science instruction to cross-curricular activities, such as helping kindergarten children learn the alphabet to a mock archeological dig for sixth graders.

The concern for the use of living AA is focused on providing proper animal care. Live animal use in the educational system often requires government permits obtained by the educators or the school district. The care of mammals usually requires the most work because of the possibility of the animals being disease vectors, the need for daily feeding, and clean-up of enclosures. Reptiles are similar to mammals because they require specific environmental conditions that use heat lamps and heating pads to maintain proper body temperatures. Zasloff et al. (1999) found that more than two thirds (68%) of the teachers in their study reported the extra work involved in caring for live animals, especially during holidays and vacation periods, as the greatest single drawback to having live animals in the classroom. Comparing the extra work that comes with live animal care to nonliving AA, some teachers choose to use the less arduous route by using nonliving AA in their lessons or invite guest speakers who bring live AA into the formal classroom setting (similar to the procedures conducted in this study).

A significant body of research exists that supports the use of living animals in the classroom and as educational tools. Several studies (Gee, 2010; Siegel, 2004; Zasloff et al., 1999) reported the majority of the teachers participating in their study stated the presence of live animals teaches their students care, responsibility, kindness, and respect for living things. Many teachers also reported that the opportunity for direct observation helps students to learn first-hand about the life-cycles, behavior, and habitats of the animals. Students who have experienced live animals in the classroom may develop

hobbies and interests involving animals and possible avenues of future employment may arise as a result (Lock, 1993).

Animals have helped zoo, and other nonformal, educators influence public attitudes about conservation and stewardship (Fuhrman & Ladewig, 2008; Swanagan, 2000; Yerke & Burns, 1991). Swanagan (2000), conducting research at Zoo Atlanta, found that individuals who have an active experience with the zoo's elephant show and bio-fact program are more likely to support elephant conservation than visitors who have only a passive experience of viewing the animals in their exhibit and reading the accompanying graphics. Yerke & Burns (1991) examined the impact of a flying bird-of-prey presentation on the attitudes and knowledge of zoo visitors in which they found there was no significant difference in the knowledge gain from before to after the presentation. Simultaneously, participants showed a positive increase in attitudes towards proconservation and the importance of personal action in protecting wildlife (Yerke & Burns, 1991).

Research has also stressed the importance of engaging participants in EE programming with the live AA, whereby participants are touching and interacting with the animal (Dillon et al., 2006). Dierking, Burtnyk, Buchner, and Falk (2002) have advocated that zoos and aquariums actively involve visitors in experiential exhibitions and programs, which allows them to have close contact with live animals in order to identify emotionally with them. Visitor knowledge and interest in supporting conservation is enhanced when they connect to animals on a more active and emotional level. However, little research exists discussing how to foster a personal connection with the AA, such as through naming.

In this current study, the focus was on the use of live AA in EE programming. The goal is to explore the potential emotional connection individuals can have with the living animals, either in a classroom, at a facility (i.e., zoo, aquarium, nature center) or a presentation. Prior research supports the use of living animal teaching tools as a method of assessing knowledge retention.

Charismatic Megafauna

The definition of "charismatic megafauna" is a large animal that draws appeal from animal activists as well as visitors of zoos, aquariums, and other facilities that house or provide eco-tours. Animals given the title of "charismatic megafauna" include lions, tigers, bears, sharks, whales, dolphins, apes, and birds-of-prey (Fuhrman & Ladewig, 2008). The "charismatic" component of the concept points to the characteristics of the animal where it tends to be active to the point of playful. This behavior, which can be seen in captivity as well as the wild, is what often lures and attracts human spectators of various demographics and is seen as valuable by many EE educators. In many instances, characteristics of the animal influence the behavior and perceptions of the visitor; specifically, visitors attend more to the behavior of animals when animals are more active (Anderson et al., 2003). In a study conducted by Margulis et al. (2003) testing the effect of felid activity on zoo visitor interest, they reported that visitor interest was significantly greater for the larger cats (lion, amur leopard, amur tiger, and snow leopard) when the cats were active. Zoo visitor viewing time at animal exhibits was approximately twice as long when animals were active than when they were inactive (Fuhrman & Ladewig, 2008).

Fuhrman and Ladewig (2008) found that fewer studies focused on the use of native species as teaching tools when compared to studies involving exotic, more traditional zoo species. Because of the lack of research on the use of native species as teaching tools, this study used an owl species native to the United States, specifically the state of Georgia. A bird-of-prey was chosen for use in this study over mammals because of several reasons despite taking advantage of the effect of "charismatic megafauna" on individuals. The possibility of mammals being disease vectors limits their use in educational settings (Gee, 2010; Zasloff et al., 1999). Georgia law also requires permits for holding mammals in captivity and using them in any fashion (Georgia Department of Natural Resources, 2012). The local agencies and facilities (i.e., Bear Hollow Nature Center) that house mammals also have mammals that are not suitable for educational programming in a classroom setting (i.e., black bears, bobcats, opossums). Reptiles could be used with ease due to the less apprehensive thought of them being disease vectors. However, the potential fear and phobia that is associated with reptiles (such as snakes) was viewed as a potential limitation to the research (Purkis & Lipp, 2007). Birds-of-prey or "raptors," were chosen over other bird orders because of the long history of use in educational programming and ease with which they can be transported offsite (Fuhrman & Ladewig, 2008; Yerkes & Burns, 1991). The raptors are docile birds that are large enough to draw audience members in based on the "charismatic megaufauna" concept. For this study, species were narrowed down the bird order even more by choosing owls. The barred owl was selected as the AA in this study because it is an owl species that participants will more likely to encounter within their local community; either by actual spotting the bird or hearing its call.

Theoretical Framework

For the purpose of this study, the concept of storytelling and a combination of theories (Drama Theory; Empathy-Altruism Hypothesis) was used to explain the concept of a named animal teaching tool and its effect on knowledge retention.

Storytelling is a form of communication that can inherently promote interest and engagement. For many thousands of years, the human race has passed knowledge, culture, history, attitudes, values and norms from generation to generation by means of stories. According to Hunter and Eder (2010), storytelling is inherent in the human experience and taps into emotion and memory in a way that is vital to teaching. Stories have a way of drawing in audiences and holding their attention more than simply stating facts about an event or phenomena. Many past civilizations utilized stories in the form of mythology (i.e., Greeks, Romans, Norse, etc) to help explain the world around them. Even in the 20th century, stories were used to help disseminate information, influence attitudes, and motivate behavioral change. Grace (2011) explains how Rachel Carson in her book, *Silent Spring*, was able to change the attitudes of Americans towards pesticide use in the United States in a more effective manner than her peers. Unlike other professionals and scientists, Carson addressed her book to the average citizen and, engagingly and persuasively, related her scientific findings to create a gripping narrative account which readers found moving, motivating and memorable (Grace, 2011). For this study, storytelling shall be equated to an environmental educator giving a presentation to an audience. The story itself shall be the content of the presentation whereas the character(s) shall be the animal teaching tool(s) used during the presentation.

Drama Theory

Kincaid (2002) argues that by telling an engaging story, involving the audience on an emotional plane and depicting changes in the characters(s) with which the audience identifies, human behavior can be affected. Furthermore, he states that the essence of drama is confrontation, which generates emotion. Emotion is the motivational force that drives the action of the characters, leading to conflict and its resolution. By means of involvement and identification, the confrontational and emotional response of the character(s) generates a corresponding emotional response in the audience. The empathic emotional response in the audience is the motivational force that induces members of the audience to reconceptualize the central problem depicted in the drama and to resolve it in a similar manner in their own lives (Kincaid, 2002). Drama Theory contains five hypotheses regarding which members of an audience are most likely to be affected by the story. This study will be utilizing hypotheses 2 and 3 for this study. Hypothesis 2 states: "A drama has greater impact on audience members who understand the story from the point of view of the character with whom they identify most closely" (Kincaid, 2002, p. 139). Hypothesis 3 states: "A drama has greater impact on audience members who feel more strongly (care more) about what happens to the character with whom they identify" (Kincaid, 2002, p. 139). Applying the two hypotheses to this study, audience members who participate in an EE presentation where a live AA is used should be more likely to feel a connection to the character of the story (the owl) if the AA is given a name and because of this connection, should be more likely to retain information which is shared.

Empathy-Altruism Hypothesis

At this point Empathy-Altruism Hypothesis contributes to the study, which posits the idea that empathic concern, as a situation-specific response of an observer witnessing another person's plight, motivates altruistic behavior, which is mainly performed as an attempt to reduce the other person's suffering (Batson, 1991; Batson, Ahmad, & Lishner, 2009; Bierhoff & Rohmann, 2004). According to this hypothesis, when an individual witnesses another individual's predicament, they begin to feel emotions towards the individual in trouble and choose to help alleviate the stress in the situation. For example, when an individual (empathy) will put themselves in the person's shoes (altruism), drops a large number of papers on the ground, a witness will feel sorry for the individual and choose to help pick up the papers (action).

For the purpose of this study, storytelling is synonymous with the EE presentation content and the AA is a character in the story. According to the theory, during the story, they will generate a sense of empathy towards the animal (emotional response and identification to the character of the story). This can be caused by knowing the history of the animal, why it is in captivity, or even the current status of its species worldwide (Dierking et al., 2002; Kellert & Berry, 1987). From there, the study investigates whether the audience members will retain more information due to identifying with the animal, knowing its story, and/or having empathic feelings towards its life (Figure 2). There is limited evidence on how the Drama Theory and the Empathy-Altruism Hypothesis affect knowledge retention in individuals, specifically participants in environmental education programming (Fuhrman, 2007). Yet, researchers have reported how an emotional response helps achieve the objectives of EE programming, including altering attitudes

and behavior change. According to Zeppel (2008), the emotional and aesthetic aspects of encountering wildlife play a key role in fostering visitor empathy and affinity for nature when visiting zoos and aquariums. Further research is needed on how storytelling and identifying with characters (Drama Theory) affects knowledge retention in EE and this study answers this call for knowledge.

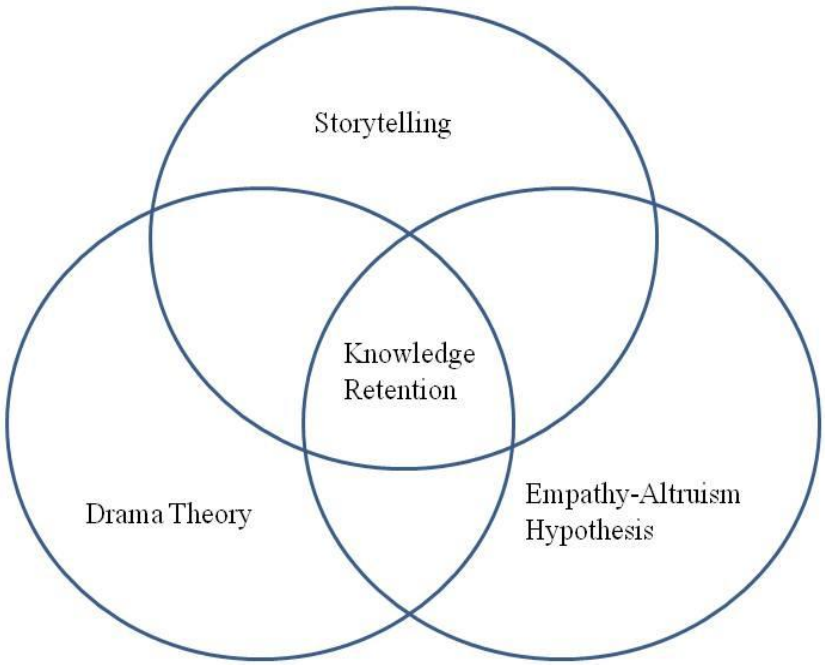

Fig. 2 Relationship between storytelling, Drama Theory, and Empathy-Altruism Hypothesis and their effect on knowledge retention.

Summary

In this chapter, the results of the review of the literature pertaining to EE and the concept of AA used in programming were presented. Environmental education was defined for the scope of this study and EE was discussed in terms of how it helps the educational system, alters attitudes on environmental issues, and motivates change in behavior towards conservation and sustainability efforts. The pros and cons of the use of non-living AA and living AA were compared. The concept of "charismatic megafauna" was explained and how EE facilities use it to their advantage. Birds-of-prey, specifically owls, are one example of a living AA often used in EE programming. Barred owls specifically serve as excellent living AA in comparison to mammals and reptiles. Barred owls are exceptional to use in EE programming for they are potentially one of the most "charismatic" owl species native to the United States and the state of Georgia and are commonly used in offsite EE activities.

Storytelling has been identified as an effective method of disseminating information to humans. Drama Theory has been shown to help explain how individuals identify with a character in a story. Furthermore, the Empathy-Altruism Hypothesis clarifies the concept individuals helping others in need due to empathic emotions. This chapter demonstrated the link between Drama Theory, storytelling, and the empathy-altruism hypothesis. In the next chapter, the research methods used in this study, and the concept of naming AA and its effect on environmental literacy retention, will be illustrated.

CHAPTER 3

METHODS AND PROCEDURES

Introduction

The purpose of the study was to examine the effect of naming living animal teaching tools on knowledge retention in environmental education programming.

The specific objectives of the study were to:

1. Describe the current behaviors of college students regarding environmental education participation.
2. Compare the retention levels of students who experience a named raptor to students who experience a non-named raptor.
3. Identify the influence of participant demographics on retention differences.

Research Design

The research design for this study is the Posttest-Only Control Group Design (Figure 3). According to Tuckman (1999), the posttest-only control group design provides ideal control over all threats to validity and all sources of bias. The design utilizes two groups, one that experiences the treatment (naming the owl) while the other does not, so it controls for contemporaneous events and maturation bias (the time period of each presentation is 50 minutes). Random assignment was used for the classes in the control and treatment groups which reduces problems with selection. The design also controls for pretesting for a pre-test is not used in the experiment due to the presence of a

control group. In educational research, researchers must frequently experiment with methods for the initial introduction of entirely new subject matter, for which pretests in the ordinary sense are impossible (Campbell & Stanley, 1963).

R X O

R O

Fig. 3. A diagram of the Posttest-Only Control Group Design for this specific study (Campbell and Stanley, 1963).

A 50-minute, scripted presentation was conducted for each of 6 classes at different times on different dates (November 11th, 2011; April 10th, 2012; April 24th, 2012) throughout a 6 month period. The presentation was given by the co-principal investigator, whose qualifications include a Bachelor of Science degree in Wildlife and Fisheries Science and more than four years of experience working with raptors and educating the public in various regions of the East coast of the United States (New England, Mid-Atlantic, Southeast). A script for the presentation was created which was reviewed by the other co-principal investigator and two University of Georgia faculty members (Appendix D). The presentation focused on delivering information on raptors, specifically owls, and their behavior, adaptations, relationship with humans, and conservation efforts. During the owl adaptations segment of the presentation, a Barred owl (*Strix varia*) was brought out to utilize as a living teaching tool. This allowed the participants to experience the owl adaptations in person rather than just hearing about them or seeing them in visuals (pictures, PowerPoint presentations). The owl was presented to the audience approximately half-way through the presentation (20 minutes out of a 40 minute presentation).

As previously stated, the control group participated in a presentation where the owl was only referred to as "Barred owl." The variable of the study, naming an animal teaching tool, was applied to the treatment group where the use of the personalized name for the Barred owl ("Henry") was utilized for the duration of the presentation rather than "Barred owl." At the conclusion of each presentation, participants voluntarily completed a mixed-method questionnaire before exiting the class. Presentations were also video-recorded to ensure the presenter maintained consistency with each presentation and to ensure that the owl's behavior did not adversely affect survey responses.

Data Analysis

Demographic questionnaire items and knowledge-based questionnaire items were coded and transferred into SPSS version 18.0. Descriptive statistics were used to classify age, gender, pet ownership status and number of pets, region of origin, whether or not the participant frequented an environmental education facility, and whether or not participants attended a similar EE presentation involving animals as teaching tools.

Independent samples *t*-tests and ANOVA tests were applied to detect for potential differences between the knowledge retained between the control and treatment groups and selected demographics (Campbell & Stanley, 1963). The significance level was set a priori at $\alpha = 0.05$. Practical significance was calculated using an Effect size calculator to determine Cohen's d for each *t* –test score. Qualitative data in the form of postcards written to family members on owl conservation activities was collected to add a layer of depth to the quantitative results. The data was entered into Microsoft Word documents, separating the results from the control and treatment groups. The data was then examined using domain analysis to search for emerging themes and domains within the qualitative

results. Two other researchers conducted separate domain analyses on the qualitative data to add trustworthiness and credibility to the initial domain analysis by the researcher. Participants were encouraged to share with their family member activities they would engage in to help wildlife like the animal they witnessed. The domains which emerged from the data were then placed into a tier system based on the average amount of time it would take to engage in each conservation activity mentioned by the participants. Domains of the treatment group were compared to domains found of the control group and used in combination with the quantitative data to determine impact of naming the AA on knowledge retention. This method of qualitative data analysis (tier system) was created distinctly for this study.

Population and Sample

The population for this study consisted of undergraduate and graduate students at the University of Georgia. For the purpose of this study, "student" is defined as an individual enrolled in at least 9 credit hours at the University of Georgia (undergraduate or graduate), age ranging from 18-30 years old, and participating in courses on the Athens campus. The students were enrolled in the following courses First Year Odyssey Seminar (FYOS 1001) in the fall of 2011 and Agricultural Leadership (ALDR 3900) (Leadership and Service), and Agricultural Communications AGCM 1200 (Introduction to Agricultural Communications) in the spring of 2012. Sampling college students also allowed the researcher to have access to a captive audience, thereby removing the need to reduce distractions and provide incentives that are typical of zoo-based research studies. Demographic variables used in this study (age, gender, and urban-rural residence) were

utilized in previous research (i.e., Kellert, 1980) and offered insight into how different types of participants may be impacted by a live teaching tool.

Regarding participant gender, a discrepancy exists in the literature between men and women on attitudes towards animals (Czech, Devers, & Krausman, 2001; Kellert, 1980; Kellert & Berry, 1987). Females are more likely to feel more anthropomorphic feelings towards animals, participate in outdoor activities such as bird watching, and belong to animal welfare organizations. Meanwhile, males are less likely to have anthropomorphic feelings towards animals, participate in more nonconsumptive activities such as competitive bird watching, natural history museum visitation, and the amateur scientific study of animals (Kellert & Berry, 1987). The researcher wished to determine if gender would influence the knowledge scores. Other demographic variables such as race and socioeconomic status (SES) allowed the researcher to determine if the sample represented the broader population of college students in the College of Agricultural and Environmental Sciences at the University of Georgia. Regarding participant residence, regions (i.e., rural, suburban, urban) were self-reported by participants.

The classes were randomly assigned to either receive the control or treatment. The control groups participated in an EE presentation with a live Barred owl where this specific owl was only referred to as “Barred owl” for the entire presentation. The treatment groups participated in an EE presentation with a live owl who was referred to by a name (for the study, the name was “Henry”) for the entire duration of the presentation rather than “Barred owl.” The classes are coded by letters from the Greek alphabet (Alpha, Beta, Gamma, Delta, Epsilon, Zeta). Classes Beta, Epsilon, and Zeta belong to the treatment group whereas classes Alpha, Gamma, and Delta belong to the

control group. Both the control group and treatment group comprised of three classes each and contained more than 50 individuals to ensure normal distribution and an adequate sample size for statistical analysis.

Maturation (the processes of change that take place within subjects during the course of an experiment) was not a factor in this study for students participated in a presentation followed by an assessment. Mortality (failure to collect posttest data from participants) can become an issue if participants choose not to fill out the questionnaire following the presentation. Incentives such as extra credit were not used in this study to avoid having participants complete the questionnaire for the wrong outcomes being measured in the experiment.

Instrumentation

At the beginning of this study there was not a standardized instrument for measuring knowledge retention, let alone owl knowledge retention within the environmental education profession. Therefore, an instrument, the Owl Knowledge-Based Questionnaire, was developed to collect data in the study. The instrument was used to measure the first objective of this study (determine if naming an AA has an effect on participants' environmental knowledge retention). The instrument consisted of 28 knowledge items and 8 contextual items. Previous studies have used multiple-choice animal-related knowledge assessments to measure knowledge with success (Kellert & Berry, 1987; Czech et al., 2001); therefore, the same procedure was used for this study. The first 27 items are based on a multiple choice test (each item has one absolutely correct choice and four incorrect choices) comprised of statements on birds-of-prey and owl information that was delivered during the presentation. These items reflected the

script that was followed during the presentation. Item 28 consisted of a qualitative statement asking the participant to complete a postcard to a family member explaining and detailing the steps anyone can execute to promote owl conservation. Face and content validity for the instrument was established by a panel of faculty, who have a high level of expertise in EE, owls, and questionnaire design. The development of this assessment aligns with guideline 6.2 and 6.3 in the Nonformal Environmental Education Programs Guidelines for Excellence. Guideline 6.2 states: "The environmental education program employs an effective evaluation strategy in order to promote success and meets stated goals, objectives and learning outcomes" (NAAEE, 2009, p. 23). Guideline 6.3 states:

> Reasons for evaluating the environmental education program and the use of data obtained are considered as an integral part of program development in which the results are used to help determine areas of strength and potential gaps, how work has impacted the community, and how to function more effectively (NAAEE, 2009, p 23).

The 27 multiple choice items were separated into six constructs: *Raptor Information (RI), Basic Owl Information (BO), Owl Behavior (OB), Barred Owl Information (BaO), Super Owl Adaptations (SOA), and Owl-Human Relations (OH).* The *Raptor Information* construct included general information on raptors (birds-of-prey). The *Basic Owl Information* construct included information that related to all owl species. The *Owl Behavior* construct encompassed information on daily owl behavior. The *Barred Owl Information* construct involved information specific to the barred owl (*Strix varia*). The *Super Owl Adaptation*s construct comprised of information on adaptations owls use

for engagement with their habitat, specifically when hunting. The *Owl-Human Relations* construct detailed information on the interactions between owls and humans.

Measures and Scoring

Frequencies were calculated for the demographic data including gender, age, pet ownership status, home residence region, and attendance at zoological facilities. Six constructs were established within the quantitative sections of the knowledge-based questionnaire (Table 3.1). Questions 1-4 comprise the *Raptor Information* construct, questions 5-8 comprise the *Basic Owl Information* construct, and questions 9-12 comprise the *Owl Behavior* construct. The range of possible scores for each construct is zero to four. Questions 13-15 and 21-24 comprise the *Owl Adaptations* construct where the minimum score is zero and the maximum score is seven. Questions 16-20 comprise the *Barred Owl Information* construct where the minimum score is zero and the maximum score is five. Questions 25-27 comprise the *Owl-Human relations* construct where the minimum score is zero and the maximum score is three. Reliability was measured with the *Cronbach's alpha Kuder Richardson formula (K-R formula 20)* despite the questionnaire items being scored with mutually exclusive categories *a* or *b* (for example, right or wrong). Cronbach's alpha is a generalization of the KR-20. KR-20 assumes the items are dichotomous while the alpha has no such restriction and is an appropriate method for determining internal consistency within constructs comprised of dichotomous response options (Dr. David Miller, Professor of Educational Research Methods, personal communication, 2012). Table 3.1 displays the results of the Cronbach's alpha test regarding the Owl Knowledge-based Questionnaire constructs. The low alpha scores were taken under consideration as a calculated risk for this exploratory

study due to factors such as sample size and number of items in each construct. Meanwhile, if all of the assessment items were collapsed into one construct, $\alpha = .771$.

Table 3.1

Reliability of Developed Constructs (N=111)

Constructs	Items	Cronbach's alpha	M	SD	Range
Raptor characteristics	1,2,3,4	.571	3.70	.68	0-4
Basic owl information	5,6,7,8	.473	3.22	.93	0-4
Owl behavior	9,10,11,12	.338	2.99	.94	0-4
Owl adaptations	13,14,15,21,22,23,24	.527	5.68	1.34	0-6
Barred owls	16,17,18,19,20	.293	3.23	1.18	0-5
Owl-human relations	25,26,27	.559	2.33	.89	0-3

Summary

The posttest only control group design was used for this study to determine the impact of naming living animal teaching tools on the knowledge retention of collegiate students. The sample included students from First Year Odyssey Seminar (FYOS 1001) in the fall of 2011, Leadership and Service (ALDR 3900), and Agricultural Communications AGCM 1200 (Introduction to Agricultural Communications) in the spring of 2012 at the University of Georgia. Presentations on raptors in general, owls, and Barred owls specifically were delivered to each class where a knowledge-based questionnaire was administered at the end of each presentation. The K-R 20 reliability

test was run to check the reliability of the constructs (raptor characteristics, basic owl information, owl behavior, owl adaptations, Barred owls, and owl-human relations). Demographic data was collected and Independent samples *t*-tests and ANOVA tests were implemented to determine if significant differences existed between the knowledge retained between the control and treatment groups and selected demographics. Chapter four will further discuss the data collected from the study's instrument.

CHAPTER 4

RESULTS

Introduction

In this chapter, the findings of the research are presented by research objective: 1) Describe the current behaviors of college students regarding environmental education participation; 2) Compare the retention levels of students who experience a named raptor to students who experience a non-named raptor; 3) Identify the influence of participant demographics on retention differences.

Objective One: Describe the current behaviors of college students regarding environmental education participation

The study sample (n = 111) included undergraduate and graduate students ranging in ages from 19 to 27 years old (M = 20.7, SD = 3.76). The age distribution was 2.7% did not report an age (n = 3), 13.5% were19 years old (n = 15), 17.1% were 20 years old (n = 19), 19.8% were 21 years old (n = 22), 29.7% were 22 years old (n = 33), 12.6% were 23 years old (n = 14), 3.6% were 24 years old (n = 4), and 0.9% of the sample was 27 years old (n = 1).

When asked about pet ownership, 77.5% own pets (n = 86) whereas 22.5% did not own pets (n = 25). One-hundred percent of the study sample visited a zoo in their lifetime (n = 111). Participants were also asked whether or not they participated in a presentation where an AA was used to support the lesson. Ninety-one percent have participated in a presentation where an AA was used (n = 101) while 1.8% had not

participated in a presentation where an AA was used (*n* = 2). Eight participants (7.2%) did not answer this item.

Table 4.1 identifies the gender breakdown of the study sample. The majority (60.4%) of the sample was female (*n* = 67), and 38.7% were male (*n* = 43). The number of females in the study sample was 1.5 times the number of males participating in the study.

Table 4.1

Frequencies and Percentages of Sample by Gender (n = 111)

Gender	*f*	%
Female	67	60.4
Male	43	38.7
No response	1	0.9
Total	111	100.0

Table 4.2 illustrates the distribution of study participants into three distinct geographical regions of residence: rural, suburban, and urban. About 30% indicated living/growing up in a rural living environment (*n* = 33), 57.7% reported living/growing up in a suburban living environment (*n* = 64), 11.7% stated living/growing up in an urban living environment (*n* = 13), and 0.9% did not complete this contextual item (*n* = 1).

Table 4.2

Frequencies and Percentages of Sample by Region of Residence (n = 111)

Region	*f*	%
Rural	33	29.7
Suburban	64	57.7
Urban	13	11.7
No response	1	0.9
Total	111	100.0

In the control group, there were 58 participants where 65.5% were females (*n* = 38), 32.8% were males (*n* = 19), and 1.7% (*n* = 1) did not answer the contextual item. Twenty-four percent (n = 14) did not own pets at the time of taking the assessment whereas 75.9% (*n* = 44) owned pets. All participants have visited a zoo at least once in their lifetime. Approximately 11% (n = 6) stated not witnessing a presentation where an AA is used while 89.7% (*n* = 52) did witness a presentation where an AA is used. In relation to the region of residence, 22.4% (*n* = 13) live in a rural setting, 63.8% (*n* = 37) live in a suburban setting, 12.1% (*n* = 7) live in an urban setting, and 1.7% (*n* = 1) did not answer the contextual item. Age (*M* = 20.33, *SD* = 4.135) ranges from 0-24 where 3.4% (*n* = 2) did not answer the contextual item, 19% (*n* = 11) were both 19 and 20, 17.2% (*n* = 10) were 21, 24.1% (*n* = 14) were 22, 13.8% (*n* = 8) were 23, and 3.4% (*n* = 2) were 24.

In the treatment group, there were 53 participants where 54.7% (*n* = 29) were females and 45.3% (*n* = 24) were males. Of the 53 participants, 20.8% (*n* = 11) do not own pets whereas 79.2% (*n* = 42) owned pets. All participants have visited a zoo at least once in their lifetime. 3.8% (n = 2) did not answer the contextual item and stated not witnessing a presentation where an AA is used whereas 92.5% (*n* = 49) states witnessing a presentation where an AA is used. In relation to the region of residence, 37.7% (*n* = 20) live in a rural setting, 50.9% (*n* = 27) live in a suburban setting, and 11.3% (*n* = 6) live in an urban setting. Age (*M* = 20.70, *SD* = 3.758) ranged from 19 to 27 where 2.7% (*n* = 3) did not answer the contextual item, 13.5% (*n* = 15) were 19 years old, 17.1% (*n* = 19) were 20 years old, 19.8% (*n* = 22) were 21 years old, 29.7% (*n* = 33) were 22 years old, 12.6% (*n* = 14) were 23 years old, 3.6% (*n* = 4) are 24 years old, and 0.9% (*n* = 1) was 27 years old.

Objective Two: Compare the retention levels of students who experience a named raptor to students who experience a non-named raptor

Table 4.3 indicates the results of the descriptive tests for the developed constructs and total score of the Owl Knowledge Assessment (*OKA*) for the entire study sample (*n* = 111). The *Total Owl Knowledge* score (the mean score of the all participants who completed the assessment; *TOK*) is 78.4% on an assessment with 27 multiple choice items (*M* = 21.17, *SD* = 3.95) with the lowest score being four and the highest score being 27. The control group earned an average score of 77.5% (*M* = 20.93, *SD* = 4.58) and the treatment group earned an average score of 79.4% (*M* = 21.43, *SD* = 2.87). A majority of the assessment dealt with owl information in which the *Basic Owl Information* (*BO*) construct (*M* = 3.22, *SD* = .93) (BO had a minimum score of zero and a

maximum score of four) and the *Barred Owl Information* (*BaO*) construct (*M* = 3.23, *SD* = 1.18) (*BaO* had a minimum score of zero and a maximum score of five) are similar when comparing the constructs. The *Raptor Information* (*RI*) construct possesses the highest score (*M* = 3.70, *SD* = .68) out of the entire assessment whereas the *Owl Behavior* (*OB*) construct possesses the lowest score (*M* = 2.99, *SD* = .94) out of the entire assessment (both constructs had a minimum score of 0 and a maximum score of 4). The *Owl-Human Relations* (*OH*) construct (*M* = 2.35, *SD* = .89) had a minimum score of zero and maximum score of three while the *Super Owl Adaptations* (*SOA*) construct (*M* = 5.68, *SD* = 1.34) had a minimum score of zero and maximum score of seven.

Table 4.3

Owl Knowledge Assessment (OKA) Constructs and Total Scores (n = 111)

Owl Knowledge	*M*	*SD*	Min	Max
Raptor Information (RI)	3.70	.68	0	4
Basic Owl Information (BO)	3.22	.93	0	4
Owl Behavior (OB)	2.99	.94	0	4
Barred Owl Information (BaO)	3.23	1.18	0	5
Owl-Human Relations (OH)	2.35	.89	0	3
Super Owl Adaptations (SOA)	5.68	1.34	1	7
Total Owl Knowledge (TOK)	21.17	3.95	4	27

Note: The maximum possible score of each construct was RI = 4, BO = 4, OB = 4, BaO = 5, OH = 3, SOA = 7, and TOK = 27.

Table 4.4 presents the results of the Independent-samples *t*-tests for the constructs and total score of *OKA*. Participants completed a multiple choice assessment analyzing their knowledge on raptor and owl information. Significance does not exist between the control and treatment groups for *TOK* (t = -.688, p = .506, *Cohen's d* = -.1262) as well as the other constructs except for the *SOA* construct. Significance does exist between the control and treatment groups for *SOA* construct (t = -2.503, p = .014, *Cohen's d* = -.4749) for the entire study sample. The effect size value means that from a practical significance standpoint, there is moderate evidence suggesting a true difference in the population.

Table 4.4

Owl Knowledge Assessment (OKA) Scores: Control versus Treatment groups – Total Score and Constructs (n = 111)

	Mean (*SD*)						
	Population	Control	Treatment				Cohen's
Instrument	(*n* = 111)	(*n* = 43)	(*n* = 67)	*t*-value	*df*	*p*	*d*
TOK	21.17 (3.95)	20.93 (4.58)	21.43 (2.87)	-.688	109	.506	-.1262
RI	3.70 (.68)	3.67 (.71)	3.74 (.66)	.488	109	.627	-.1022
BO	3.22 (.93)	3.28 (1.02)	3.15 (.82)	.706	109	.481	-.1397
OB	2.99 (.94)	3.09 (.94)	2.89 (.93)	1.119	109	.266	.2132
BaO	3.23 (1.18)	3.26 (1.31)	3.15 (1.03)	.228	109	.820	-.042
OH	2.35 (.89)	2.26 (.95)	2.45 (.82)	-1.149	109	.253	-.2136
SOA	5.68 (1.14)	5.38 (1.44)	6.00 (1.14)	-2.503	109	.014	-.4749

Note: *TOK* = "Total Owl Knowledge; *RI* = "Raptor Information" construct; *BO* = "Basic Owl Information" construct; *OB* = "Owl Behavior" construct; *BaO* = "Barred Owl Information" construct; *OH* = "Owl-Human Relations" construct; *SOA* = "Super Owl Adaptations" construct.

Storytelling, drama theory (Kincaid, 2002) and the empathy-altruism hypothesis were used to inform that analysis of qualitative data. Written responses in the form of postcards from the control and treatment group were transcribed. The responses were read and separated into eight themes. These themes were then placed into six overarching domains. Each of the domains pertained to a specific type of owl conservation method that individuals can perform in a given moment. Domain analysis was conducted two more times by an expert panel to create a stronger base for the specific domains and themes. The domains were placed into groups based on the time required for the

engagement in a specific owl conservation activity. This tiered system was comprised of three researcher defined tiers going from high time required to low time required for the level of engagement. Tier 1 is defined as a proposed owl conservation activity that requires 60 minutes or more to complete. Tier 2 is defined as a proposed owl conservation activity that requires 30-59 minutes to complete. Tier 3 is defined as a proposed owl activity that requires less than 30 minutes to complete. The tier system, domains, and themes were then compared between the control and treatment group.

The themes emerged from the qualitative data (the postcard responses) and were used to create overarching domains (Figure 4). These domains are: *Natural Habitat, Volunteerism, Pesticides, Bird Counts, Poaching,* and *Waste Management*. All domains have the same name as their theme except for the *Natural Habitat* and *Waste Management* domains. The themes within the *Natural Habitat* domain are "natural vegetation and building nest boxes" whereas the themes in the *Waste Management* domain are "littering and throwing food out of a moving vehicle." Listed here are examples of noteworthy statements representing the domains and themes. The listings include a description of the domains and themes for the corresponding example statements.

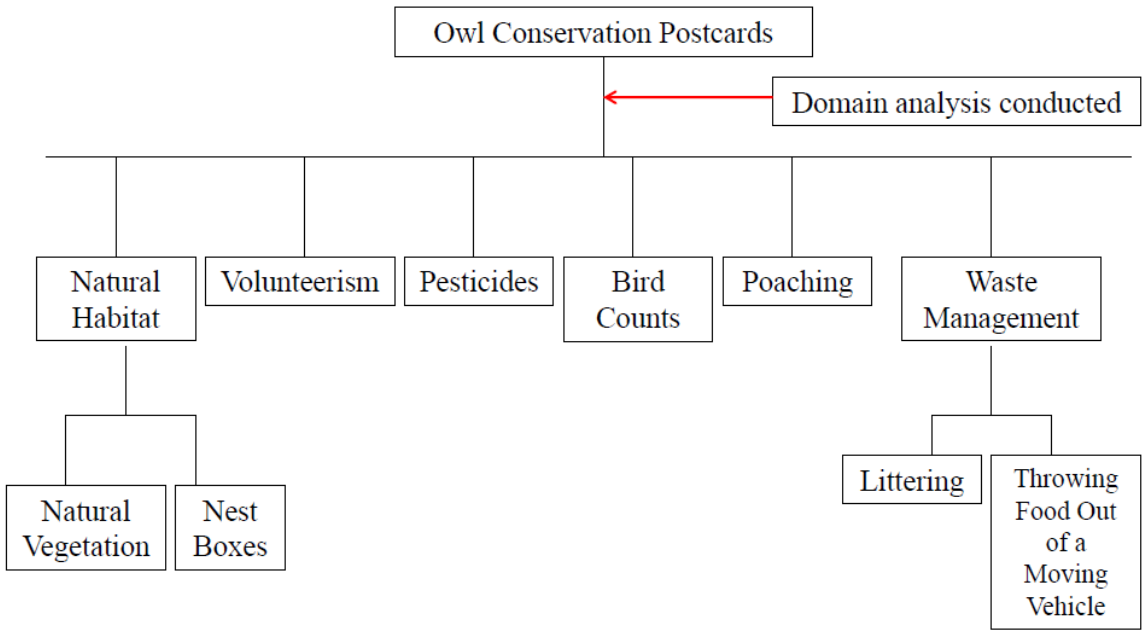

Figure 4. Relationship between qualitative data collection methods and the resulting domains and themes. The themes and domains are the same for *Volunteerism, Pesticides, Bird counts,* and *Poaching*.

The first domain to emerge when asked to write a postcard discussing how a family member can help save owls is the *Natural Habitat*. This domain is defined as an individual transforming a certain part of his/her property into an environment suitable for owl residence. The study defined the theme, "natural vegetation," as allowing the plants (i.e. grasses) to grow on a plot of land in order to attract the prey of owls. Examples of the comments include:

- "You can allow a little patch of grass to overgrow to allow rodent populations to nest there." (Tx-1)
- "Let part of your land grow, so that mice or rodents can gather, thus attracting owls." (Tx-32)
- "You can also make your backyard or property conducive to owls by planting grass to attract rodents…" (C-32)

The second theme in the *Natural Habitat* domain is "nest boxes." The study defined the theme as "the process of placing an owl nest box onto one's property which involves buying a constructed nest box and installing it or buying the materials, putting together the nest box, and establishing it on a structure at the proper height." Examples of the comments include:

- "They can build a nest box for owls and put it up in a tree or on a high pole." (C-3)
- "Build or buy a nest." (C-23)
- "Construct some nesting boxes." (Tx-34)

The second domain to emerge when asked to write a postcard discussing how a family member can help save owls is *Volunteerism*. The study defined the domain as "the process of performing tasks to help a government and/or non-profit organization in owl conservation." Examples of the comments include:

- "Volunteer at a zoo or local animal shelter." (Tx-30)
- "Volunteer time/research for organization (DNR) to provide community more info about owls." (Tx-10)
- "First, help out the DNR and Wildlife Conservationists…" (C-49)

The third domain to emerge when asked to write a postcard discussing how a family member can help save owls is the *Pesticides.* The study defined the domain as "the act of not administering pesticides on your property." Examples of the comments include:

- "Do not spray pesticides." (C-22)
- "Stop using pesticides and rodent killers." (Tx-20)

- “Avoid using pesticides for rodent control.” (Tx-25)

The fourth domain to emerge when asked to write a postcard discussing how a family member can help save owls is *Bird Counts*. The study defined the domain as “the act of counting birds and reporting the findings to researchers in order to track population numbers.” Examples of the comments include:

- “Count and report owl calls….” (Tx-39)
- “Report sightings and hearing to local wildlife specialists….” (C-19)
- “Keep track of owls….” (C-53)

The fifth domain to emerge when asked to write a postcard discussing how a family member can help save owls is *Waste Management*. The study defined the domain as “the act of properly disposing of finished food items.” The study defined the theme, “littering,” as “not throwing food items out in the natural environment.” Examples of the comments include:

- “One is to make sure you do not litter.” (Tx-21)
- “You can save owls by not littering.” (C-8)
- “You can save owls by not littering your trash.” (C-10)

The second theme of the *Waste Management* domain is “throwing food out of a moving vehicle.” The study defined the theme as “not throwing food onto a roadside while in a moving vehicle.” Examples of the comments include:

- “Don’t throw food out near roads.” (C-52)
- “One way is to not throw food out of your car.” (Tx-37)
- “You can help save owls by not throwing food out of your car. Then the food won’t attract rodents’ that attract owls near roadways.” (Tx-44)

The sixth and final domain to emerge when asked to write a postcard discussing how a family member can help save owls is *Poaching*. The study defined the domain as "the prevention of illegally hunting owls." Examples of the comments include:

- "To help save owls, you cannot illegally hunt them…" (C-14)
- "Do not poach, shoot, or kill owls." (Tx-46)

Table 4.5 presents the tier system of domains for the control and treatment group based on the amount of time it would take an individual to complete an owl conservation activity in a single instance. The control group made 90 owl conservation comments in comparison to the treatment group who made 102 owl conservation comments. When comparing the control and treatment groups in Tier One, the treatment group provided 52 comments whereas the control group provided 46 comments. Tier Two provided very similar numbers between control and treatment group. Similar to Tier One, the treatment group provided more comments (n = 36) in comparison to the control group (n = 28).

Table 4.5

Tier System of "Level of Engagement in Owl Conservation Activity" and Frequencies and Percentages of Comments made by Participants

Tier	Control (*n* = 90, 47%)	Treatment (*n* = 102, 53%)
1	Natural Habitat (*n* = 41, 46%)	Natural Habitat (*n* = 40, 39%)
	Volunteerism (*n* = 5, 6%)	Volunteerism (*n* = 12, 12%)
2	Pesticides (*n* = 3, 3%)	Pesticides (*n* = 10, 10%)
	Bird Counts (*n* = 13, 14%)	Bird Counts (*n* = 4, 4%)
3	Poaching (*n* = 2, 2%)	Poaching (*n* = 4, 4%)
	Waste Management (*n* = 26, 29%)	Waste Management (*n* = 32, 31%)

Note: Tier One equates to activities that take >60 minutes to complete in a single instance. Tier Two equates to activities that take 30-60 minutes to complete in a single instance. Tier Three equates to activities that take <30 to complete in a single instance. Two comments in the treatment group mentioned the owl, "Henry," by name in their response.

Objective Three: Identify the influence of participant demographics on retention differences

The results show that the entire male representation of the sample earned an average score of 80.4% (M = 21.70, SD = 3.41) where the male control group earned an average score of 79.9% (M = 21.58, SD = 4.06) and the male treatment group earned an average score of 80.7% (M = 21.79, SD = 2.87). Table 4.6 indicates the results of the Independent-samples *t*-tests for the constructs and total score of *TOK*, specifically

looking at the males of the control and treatment group. The results for the males followed a similar trend that the results of the entire sample follow. A significant difference was not found between the male control and treatment groups for *TOK* (*t* = -.201, *p* = .842, *Cohen's d* = -.061). However, the only significant difference found was in the *SOA* construct (*t* = -2.700, *p* = .010, *Cohen's d* = -.8346). All other constructs showed no significant difference. The effect size value means that from a practical significance standpoint, there is large evidence suggesting a true difference in the population.

Table 4.6

Owl Knowledge Assessment (OKA) Scores: Males Control versus Treatment groups – Total Score and Constructs (n = 43), d f = 41)

	Mean (*SD*)					
	Population	Control	Treatment			Cohen's
Instrument	(*n* = 43)	(*n* = 19)	(*n* = 24)	*t*-value	*p*	*d*
TOK	21.70 (3.41)	21.58 (4.06)	21.79 (2.87)	-.201	.842	-.061
RI	3.67 (.75)	3.74 (.56)	3.63 (.88)	.483	.632	.1459
BO	3.33 (.75)	3.53 (.70)	3.17 (.76)	1.596	.118	.4907
OB	3.02 (.91)	3.21 (.86)	2.88 (.95)	1.204	.236	.3635
BaO	3.21 (.91)	3.32 (1.42)	3.13 (1.08)	.502	.618	.1536
OH	2.51 (.83)	2.37 (.96)	2.63 (.71)	-1.010	.318	-.3144
SOA	5.95 (1.23)	5.42 (1.50)	6.38 (.77)	-2.700	.010	-.8346

For females, the average *TOK* score was 77.4% (*M* = 20.91, *SD* = 4.24). The female control group earned an average score of 76.8% (M = 20.74, SD = 4.84) and the

female treatment group earned an average score of 78.3% (*M* = 21.14, *SD* = 3.37). Table 4.7 displays the results of the Independent-samples *t*-tests for the constructs and total score of *OKA*, specifically looking at the females of the control and treatment group. Unlike the results from the total score of *OKA* for the entire sample and males control versus treatment, no significant differences were found between the *TOK* control and treatment groups for females (*t* = -.381, *p* = .704, *Cohen's d* = -.0937). No significant differences were found between the constructs for females control vs. treatment groups. Unlike with the males, none of the constructs for females control vs. treatment groups present any statistical significance, specifically comparing the *SOA* scores of the females (*t* = -.804, *p* = .425, *Cohen's d* = -.1991).

Table 4.7

Owl Knowledge Assessment (OKA) Scores: Females Control versus Treatment groups – Total Score and Constructs (n = 67), (df = 65)

	Mean (*SD*)					
Instrument	Population (*n* = 67)	Control (*n* = 38)	Treatment (*n* = 29)	*t*-value	*p*	Cohen's *d*
TOK	20.91 (4.24)	20.74 (4.84)	21.14 (3.37)	-.381	.704	-.0937
RI	3.73 (.64)	3.66 (.78)	3.83 (.38)	-1.074	.287	.2653
BO	3.16 (1.02)	3.18 (1.14)	3.14 (.88)	.182	.856	.0388
OB	2.97 (.97)	3.03 (1.00)	2.90 (.94)	.540	.591	.1334
BaO	3.27 (1.15)	3.26 (1.27)	3.28 (.99)	-.044	.965	-.0173
OH	2.24 (.92)	2.18 (.96)	2.31 (.89)	-.552	.583	-.1401
SOA	5.54 (1.35)	5.42 (1.39)	5.69 (1.31)	-.804	.425	-.1991

The *SOA* construct showed a significant difference when looking at the entire study sample *TOK* control vs. treatment groups (*t* = -2.503, *Cohen's d* = -.4749) and the males *TOK* construct vs. treatment groups (*t* = -2.700, *Cohen's d* = -.8346) but a significant difference was not found for the females *TOK* construct vs. treatment groups (*t* = -.804, *Cohen's d* = -.1991).

Upon further examination of the demographics, the "zoo visitation" and "experience witnessing a presentation where an AA was used" contextual items were not used in analyzing the results due to lack of variability in the sample. All participants have visited a zoo and the number of individuals who have witnessed a presentation where an

AA was used (n = 101) greatly outnumbers the amount of individuals who have not witnessed a presentation (n = 2). Meanwhile, the results show that non-pet owners earned an average score of 75.7% (M = 20.44, SD = 4.97) whereas pet owners earned an average score of 79.2% (M = 21.38, SD = 3.61). Table 4.8 presents the results of the Independent-samples t-test for the constructs and total score of *OKA*, specifically looking at pet owners vs. non-pet owners. The results are similar to the female control vs. treatment groups in which there are not any t-values that expressed significance between the non-pet owners and pet owners.

Table 4.8

Owl Knowledge Assessment (OKA) Scores: Pet owners (PO) vs. Non-pet owners (NPO) – Total Score and Constructs (n = 111), (df = 109)

	Mean (*SD*)					
Instrument	Population (n = 111)	NPO (n = 25)	PO (n = 86)	t-value	p	Cohen's d
TOK	21.17 (3.95)	20.44 (4.97)	21.38 (3.61)	-1.052	.295	-.2380
RI	3.70 (.68)	3.60 (.65)	3.73 (.69)	-.854	.395	-.1904
BO	3.22 (.93)	3.08 (1.12)	3.26 (.87)	-.832	.407	-.1937
OB	2.99 (.94)	3.00 (.82)	2.99 (.98)	.054	.957	.0106
BaO	3.23 (1.178)	3.00 (1.35)	3.30 (1.12)	-1.134	.259	-.2557
OH	2.35 (.891)	2.20 (1.12)	2.40 (.82)	-.965	.337	-.2244
SOA	5.68 (1.14)	5.56 (1.58)	5.71 (1.26)	-.490	.625	-.1119

When looking at regions [of residence] for the entire sample, there were no statistically significant differences in *TOK* scores between rural participants (78.4%; *M* = 21.18, *SD* = 5.14), suburban participants (78.6%; *M* = 21.23, *SD* = 3.34), and urban participants (78.6%; *M* = 21.22, *SD* = 3.40). Table 4.9 displays the results of the ANOVA test for the total scores and constructs for the entire sample rural vs. suburban vs. urban regions. ANOVA was used to determine that there were not statistical differences between the participant scores from rural, suburban, and urban regions (*F* = .002, *p* = .998, *df* = 109).

Table 4.9

Owl Knowledge Assessment (OKA) Scores by Region – Total Scores and Constructs (n = 110) (df = 109)

	Mean (*SD*)					
Instrument	Rural (*n* = 33)	Suburban (*n* = 64)	Urban (*n* = 13)	Total (*n* = 110)	*F*	*p*
TOK	21.18 (5.14)	21.23 (3.34)	21.23 (3.44)	21.22 (3.94)	.002	.998
RI	3.67 (.82)	3.70 (.66)	3.85 (.38)	3.71 (.68)	.325	.723
BO	3.06 (1.17)	3.30 (.81)	3.31 (.75)	3.23 (.93)	.762	.469
OB	3.06 (.90)	2.97 (.96)	2.92 (1.04)	2.99 (.94)	.139	.870
BaO	3.39 (1.20)	3.14 (1.17)	3.38 (1.19)	3.25 (1.18)	.605	.548
OH	2.39 (.97)	2.33 (.84)	2.31 (1.03)	2.35 (.89)	.071	.931
SOA	5.61 (1.50)	5.80 (1.21)	5.46 (1.39)	5.70 (1.32)	.465	.629

Note: one participant did not complete the contextual item to contribute data for this analysis.

When exploring within the region results, male participants from rural regions (*n* = 11) earned an average score of 82.2% (*M* = 22.18, *SD* = 2.93), participants from suburban regions (*n* = 27) earned an average score of 78.8% (*M* = 21.30, *SD* = 3.79), and participants from urban regions (*n* = 5) earned an average score of 84.4% (*M* = 22.80, *SD* = 1.92) on the *TOK*. Table 4.10 displays the results of the ANOVA test for the total scores and constructs for the male participants rural vs. suburban vs. urban regions. No significant differences were found between the participant scores from rural, suburban, and urban regions (*F* = .549, *p* = .582, *df* = 42).

Table 4.10

Owl Knowledge Assessment (OKA) Scores by Region – Male Total Scores and Constructs (n = 43) (df = 42)

	Mean (*SD*)					
Instrument	Rural (*n* = 11)	Suburban (*n* = 27)	Urban (*n* = 5)	Total (*n* = 43)	*F*	*p*
TOK	22.18 (2.93)	21.30 (3.79)	22.80 (1.92)	21.70 (3.41)	.549	.582
RI	3.91 (.30)	3.56 (.89)	3.80 (.45)	3.67 (.75)	.953	.394
BO	3.36 (.81)	3.26 (.76)	3.60 (.55)	3.33 (.75)	.446	.643
OB	3.00 (.63)	2.96 (1.02)	3.40 (.89)	3.02 (.91)	.476	.624
BaO	3.36 (1.12)	3.15 (1.29)	3.20 (1.30)	3.21 (1.23)	.116	.891
OH	2.55 (.93)	2.44 (.85)	2.80 (.45)	2.24 (.83)	.390	.679
SOA	6.00 (.78)	5.93 (1.47)	6.00 (.71)	5.95 (1.23)	.017	.983

Likewise, when female scores were explored within region results, female participants from rural regions (n = 22) earned an average score of 76.6% (M = 20.68, SD = 5.95), participants from suburban regions (n = 37) earned an average score of 78.5% (M = 21.19, SD = 3.03), and participants from urban regions (n = 8) earned an average score of 75% (M = 20.75, SD = 3.92) on the *TOK*. Table 4.11 displays the results of the ANOVA test for the total scores and constructs for the female participants rural vs. suburban vs. urban regions. No significant differences were found between the participant scores from rural, suburban, and urban regions (F = .204, p = .816, df = 66).

Table 4.11

Owl Knowledge Assessment (OKA) Scores by Region – Female Total Scores and Constructs (n = 67) (df = 66)

	Mean (*SD*)					
	Rural	Suburban	Urban	Total		
Instrument	(n = 22)	(n = 37)	(n = 8)	(n = 67)	F	p
TOK	20.68 (5.95)	21.19 (3.03)	20.25 (3.92)	20.91 (4.24)	.204	.816
RI	3.55 (.96)	3.81 (.40)	3.88 (.35)	3.73 (.64)	1.426	.248
BO	2.91 (1.31)	3.32 (.85)	3.13 (.84)	3.16 (.84)	1.146	.324
OB	3.09 (1.02)	2.97 (.93)	2.63 (1.06)	2.97 (.97)	.672	.514
BaO	3.41 (1.26)	3.14 (1.09)	3.50 (1.20)	3.27 (1.15)	.569	.569
OH	2.32 (.99)	2.24 (.83)	2.00 (1.20)	2.24 (.92)	.345	.711
SOA	5.41 (1.74)	5.70 (.99)	5.13 (1.64)	5.54 (1.35)	.742	.480

Summary

Chapter four introduced the results of the OKA related to the study demographics and the three research objectives: 1.) Describe the current behaviors of college students regarding environmental education participation; 2.) Compare the retention levels of students who experience a named raptor to students who experience a non-named raptor; 3.) Identify the influence of participant demographics on retention differences. Chapter five will contribute supplemental analysis and discussion of the displayed data, formulate conclusions, and establish recommendations based on the results of the research.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

The debate on naming animal ambassadors (AA) has continued to be centered upon the concept of individuals identifying with the AA through naming and anthropomorphizing: developing empathic feelings towards helping the animals versus the perception and treatment of the animals as "pets." Many professionals differ on this issue which creates conflict within the wildlife institution (WI) community. Some find naming AA to be beneficial (Appendix C):

> The majority of our animals do receive names. Not only does it enable the keeping staff to communicate naturally with each other about their charges, but also simplifies communication with the public during demonstrations. People name their pets and assume a similar relationship between us and our animals. It is also important to identify each animal to maintain their records, and using a name comes more naturally than purely assigning them a number. Perhaps it falls out of that nurturing trait we want our keepers to possess (Nick Bell, Education Coordinator, Australia Zoo, personal communication, April 2012).

An opposing view is naming AA diminishes the educational impact the AA have on audiences. Jason Jones (Program Director, Teton Raptor Center, personal communication, April 2012) states:

> The subject of naming our raptors has come up several times. I am of the opinion that captive raptors should not be named and that doing so is detrimental to their education value for several reasons.

Zoo, aquarium, and environmental education (EE) professionals recognize the importance of AA in educational programming to initially elicit knowledge retention, behavior change, and environmental impact (Kuhar et al., 2010). Yet, these professionals must also incorporate effective methods of teaching into educational programming where naming AA can become that new innovation. This study, guided by storytelling, drama theory, and the empathy-altruism hypothesis, explored if naming AA in educational programming influenced individuals' knowledge retention.

Purpose of Study

The purpose of this mixed methods study was to determine the effect of naming AA on knowledge retention and its relation to EE and addressing the following objectives:

1. Describe the current behaviors of college students regarding environmental education participation.
2. Compare the retention levels of students who experience a named raptor to students who experience a non-named raptor.
3. Identify the influence of participant demographics on retention differences.

Significance of Study

Animal ambassadors are utilized in educational programming at WI as well as formal and nonformal educational settings; some given identifying names while others referred to by their common name or scientific name (i.e., genus and species). Educators differentiate on the issue; many assuming their preference being the more beneficial choice to helping the profession and its overall goals. By using storytelling, Drama Theory (Kincaid, 2002) and the Empathy-Altruism Hypothesis (Batson, 1991, p.83-91; Batson et al., 2009, p. 417-426; Bierhoff & Rohmann, 2004) as a guide to understanding the influence of naming AA in education, the researcher sought to determine the role naming AA has on knowledge retention in college students. Environmental education today heavily relies on the impressions facilities make upon visitors and audiences where AA are used to invoke some type of emotional response, connection, and ultimately a behavior change. The ramifications of the results could provide answers to the debate on naming AA and affect EE in relation to volume of participants, influence of AA in educational programming, and the outcomes of EE (knowledge, attitude, and behavior change) (Kuhar et al., 2010).

Review of the Methods

The Posttest-Only Control Group Design was used as the research design for this study (Campbell and Stanley, 1963). This design enabled the researcher to reduce threats to validity and sources of bias. The control group was given a 40 minute presentation on raptor (specifically owl) natural history and conservation where a barred owl was used halfway through the presentation as an AA. During the presentation, the AA was only referred to the audience by its common name (barred owl). Following the presentation,

the participants were asked to complete an assessment with quantitative and qualitative open-ended items on the information disseminated during the lesson. Participants in the control group were expected to complete the assessment under the pretense of knowing the AA by simply "barred owl."

The variable of the study -- giving an AA a "human" name -- was applied to the treatment group. The treatment group was given a 40 minute presentation on raptor (specifically owl) natural history and conservation where a barred owl was used halfway through the presentation as an AA. Unlike the control group, during the presentation, the AA was only referred to the audience as "Henry" throughout the entire presentation rather than its common name. Following the presentation, the participants were asked to complete the same assessment as the control group, with quantitative and qualitative open-ended items on the information disseminated during the lesson. Participants in the treatment group were expected to complete the assessment under the pretense of knowing the AA by simply "Henry."

At the end of the data collection, demographic and assessment items were coded and transferred to SPSS Version 18.0. Descriptive statistics were used to identify pet ownership, participation in a presentation where an AA was used, zoo visitation, gender, and region of residence (rural, suburban, and urban). Independent *t*-tests were used to determine if significant difference existed between the control and treatment group, gender, and pet owners and non-pet owners. ANOVA was used to determine if a significant difference existed between the region of residence for control and treatment groups and gender.

The population of this study included students at the University of Georgia and the sample was comprised of 111 students from the University of Georgia, who were enrolled in the courses ALDR 3900 (Leadership and Service), AGCM 1200 (Introduction to Agricultural Communication), and FYOS 1001 (First Year Odyssey Seminar). The specific sample was chosen due to the availability of collegiate courses to administer a presentation and assessment to, as well as the abundance of individuals fulfilling the requirements for being participants in the study. In addition, these students were a captive audience capable of testing the validity and reliability of the researcher developed instrument for potential use in other studies.

Findings and Conclusions

The results of the *Total Owl Knowledge (TOK)* and developed constructs of the *Owl Knowledge Assessment (OKA)* with a focus on the control and treatment groups were reported. The average score of the entire *TOK* (78.4%, $n = 111$) was higher than the average score of the control group (77.5%, $n = 58$) but lower than the average score of the treatment group (79.4%, $n = 53$). The average scores in this study are consistent with or higher than the knowledge scores for assessments in other studies that uses an AA (Kellert & Berry, 1989; Morgan & Gramann, 1989; Yerke & Burns, 1991; Kuhar et al., 2010; Larson et al., 2010). In this study, the *Raptor Information* (*RI*) construct received the highest average score of all constructs (92.5%) whereas the *Owl Behavior* (*OB*) construct received the lowest average score of all constructs (74.75%).

Objective one: Describe the current behaviors of college students regarding environmental education participation.

Results of the independent samples *t*-tests for the total score and developed constructs for the *OKA* with a focus on the control and treatment groups were reported. Participants completed the items in the assessment, resulting in either a "correct" or "incorrect" answer for 27 items. For the *TOK* score ($p = 0.05$, equal variances assumed), $t < 2$, which indicates no significant difference between the control and treatment groups. For the scores of the developed constructs, only *Super Owl Adaptations (SOA)* indicated significance between the control and treatment groups ($t = -2.503$, $p = .014$, *Cohen's d* = -.4749).

The lack of significant difference between the control and treatment groups for *TOK* and most of the constructs of *OKA* in this study suggests diminutive minimal effect of naming an AA on knowledge retention in collegiate students. However, the *SOA* construct showed a significant difference between the control and treatment groups. From a practical significance standpoint, there is moderate evidence suggesting a true difference in the population. Kellert (1980) provided insight through his attitude typology toward wildlife and the environment, suggesting the scientific attitude which focuses on the biological and physical characteristics of an animal where individuals expressing this perspective value animals largely as sources of curiosity, study, and observation. This may imply that participants focused on the physical attributes of an owl discussed during the presentation (i.e. talons, asymmetrical ears, facial discs, feathers, and large eyes) in which the treatment group may have identified with "Henry" more than the control did with the "barred owl" due to a personal name.

Objective two: Compare the retention levels of students who experience a named raptor to students who experience a non-named raptor.

Qualitative data was collected from study participants by means of an open-ended assessment item asking respondents to write a postcard to family members in another part of the United States discussing owl conservation methods. The responses were separated between the control and treatment groups and analyzed using domain analysis. The responses for the control and treatment groups were counted and separated into their respective domains, in sum 90 responses for the control group and 102 responses for the treatment group. This resulted in the emergence of themes and domains common to the written responses. These domains were:

- Natural Habitat
- Volunteerism
- Pesticides
- Bird Counts
- Poaching
- Waste Management

The domains were then placed into a tier system based upon the time required to complete a specific activity. Tier One represents activities that take more than 60 minutes to complete in at a time. Tier Two represents activities that take 30-59 minutes to complete at a time. Tier Three represents activities that take less than 30 minutes to complete at a time. Once placed into the tier system, the quantity of each category of response codes was compared between the control and treatment groups.

The domains *Natural habitat* and *Volunteerism* fell into Tier One. For the control group in Tier One, the *Natural Habitat* domain contained 41 responses and the *Volunteerism* domain contained 5 responses. For the treatment group in Tier One, the *Natural habitat* domain contained 40 responses and the *Volunteerism* domain contained 12 responses. The treatment group possessed more responses in Tier One (n = 52) than the control group (n = 46).

The amount of responses in Tier One being higher for the treatment group than the control group may allude that the treatment group was affected by "Henry" more than the control group was affected by a "barred owl." Kincaid (2002) provides understanding through the Drama theory, stating individuals will be impacted more by a drama when they identify with a character in a drama and develop strong feelings towards that character. None of the respondents from the control group referred to the AA as a "barred owl." Meanwhile, two of the responses from the treatment group mentioned the name "Henry" when referring to the AA. These responses are:

- "Save the owls! Do not poach, shoot, or kill owls. They are necessary to our society and without them we would have too many rodents, so save the owls! Protect our beloved Henry!" (Tx-46)
- "Hi cousin, I hear you're interested in helping out Henry, the barred owl…."(Tx-53)

In this instance, the "drama" is represented by the presentation given to the study participants in which the story of how the AA came into captivity was publicized. Participants may identify with the AA due to comparing its life story and basic daily activities (i.e. eating, cleaning, movement, interaction with the environment) to their own.

If participants develop empathy towards an AA, strong caring and nurturing emotions may potentially arise as well as the need to help the AA, as according to the Empathy-Altruism Hypothesis (Batson, 1991, p.83-91; Batson et al., 2009, p. 417-426; Bierhoff & Rohmann, 2004).

Stating the name "Henry" aligns with the humanistic and moralistic attitudes from Kellert's typology toward wildlife and the environment (1980). Kellert (1980) states that the humanistic attitude primarily emphasizes feelings of strong affection and attachment to individual animals, typically pets. The animal is the recipient of feelings and emotional projections, somewhat analogous to those expressed toward other people. In relation to wildlife, the humanistic attitude involves strong affection for charismatic megafauna. The moralistic attitude is concerned with the ethical, appropriate human treatment of animals. It dictates a commitment to protect other forms of sentient life from human domination and exploitation, except in situations where survival is at stake or to serve "higher ends." It might be said that participants in the treatment group wanted to protect "Henry" due to identifying with him as a charismatic megafauna who has been a victim of human exploitation. If we apply this same line of reasoning to the total number of responses between the control group and the treatment group, the treatment group had more responses than the control group perhaps due to their empathic feelings towards "Henry" since they identified with him. The control group contained more instances where participants did not respond to the qualitative, open-ended item at the end of the assessment. This may be attributed to a lack of connection the participants in the control group have toward the "barred owl." This lack of a bond with a character may lead to an

absence in empathic feelings and little to nonexistent desire to engage in owl conservation activities.

These results are interesting to analyze as an unexpected outcome of this research. However, prior research exploring the quantity of responses from participants is nonexistent. If possible, this would install a precedent to examine this in future studies. Upon further examination of the quantity of responses of the control and treatment groups, the control group has fewer responses from participants but more females than the treatment group. Kellert and Berry (1987) reported females are more likely to form an emotional bond with animals and voice greater opposition to laboratory experimentation, killing of nonendangered animals for fur, and hunting for recreational and meat-gathering purposes. Results of the study are not supported by literature. More research is needed to see whether or not the results are conclusive. Future research should look at the quantity and specific quality of responses from participants in an EE program where an AA is used and the effects on knowledge are examined and if participants mention the AA by anthropomorphized or species name in a similar study.

Objective three: Identify the influence of participant demographics on retention differences.

When analyzing the results of the *Total Owl Knowledge (TOK)* between males and females, the males earned a higher average score of 80.4% (M = 21.70, SD = 3.41) where the females earned an average score of 77.4% (M = 20.91, SD = 4.24). The trend of these results (males scoring higher than females) is uniform with the earlier literature (Kellert & Berry, 1987, Yerke & Burns, 1991). In a study conducted by Kellert and Berry (1987), males scored 55.4% whereas females scored a 51% on a knowledge-of-animals

assessment. In a study conducted by Yerke and Burns (1991), males scored 85.8% on a knowledge assessment about raptors compared to females who scored 81.5% on the same assessment. Yet in this study, when examining the results of the Independent samples *t*-tests for male control versus male treatment groups *TOK* score, no significant difference between the groups was found. Although, a similar trend occurred with the constructs where none of them showed a significant difference except for the *Super Owl Adaptations (SOA)* construct for males control versus treatment groups (t = -2.700, p = .010, *Cohen's d* = -.8346). Meanwhile, for the results of the Independent *t*-tests for female control versus treatment groups *TOK* score, no significant difference was found. Significance also did not exist within any of the constructs for female control versus treatment groups.

The lack of significant difference between the male and female control and treatment groups for *TOK* and most of the constructs of *Owl Knowledge Assessment (OKA)* in this study also suggests that naming an AA did not have a detectable effect on knowledge retention in collegiate students. However, the *SOA* construct indicates significance only between the male control and treatment groups. From a practical significance standpoint, there is high evidence suggesting a true difference in the population. According to Kellert and Berry (1987), gender is among the most important demographic influences on attitude towards animals in our society. In their knowledge and attitude assessment study, males had significantly higher knowledge-of-animals scores than did females. Males are more inclined to express a desire for direct contact with wildlife in the context of exposure to nature (naturalistic attitude in Kellert's typology) and possess a greater concern for maintaining viable relationships between

wildlife and natural habitats and for ecosystem balance and functioning (ecologistic attitude) (Kellert & Berry, 1987). This may explain why males displayed significance in the *SOA* construct. This construct covers the adaptations owls possess for hunting. These adaptations help an owl interact with its environment and keep a balance in their prey populations. The knowledge of these adaptations and how they aid in keeping a stable environment might influence males to retain more information about owls because they can identify with the behaviors more.

The type of animal used as an AA can also contribute to the *TOK* results. Kellert and Berry (1987) asked study participants to rate their preference for 33 animals on a 7-point scale. Females were reported giving significantly higher ratings to domestic animals (i.e., dog, cat) and attractive creatures (i.e., swan, ladybug, butterfly, robin). On the other hand, males were far more likely to award a positive rating to predatory animals (i.e., wolf, snake), invertebrates (i.e., beetle, spider), or game animals (i.e., trout, moose). The animal chosen as the AA for this study was a barred owl. Based on Kellert and Berry (1987), it would be logical that females would not find this species of owl appealing and not form anthropomorphic feelings towards it. Despite strong emotional attachments to pets, women express substantially more fear and indifference toward wildlife (Kellert & Berry, 1987). The barred owl is a wild animal. This lack of domestication may influence female participants. Yet, the owl is a predatory animal, that which males are likely to find more it appealing. In this study, males appeal more to the barred owl, thus retaining more information than females who might not find it appealing. Additional research is therefore needed to determine if non predatory animals (like a box turtle) elicit similar results.

When examining the results of pet owners versus non-pet owners, the pet owners earned an average score of 79.2% (M = 21.38, SD = 3.61) whereas non-pet owners earned an average score of 75.7% (M = 20.44, SD = 4.97). The results of the Independent *t*-tests for *TOK* and construct scores indicated no significant difference between pet owners and non-pet owners. This result seems surprising knowing the positive effect using AA in educational programming (Siegel, 2004; Zasloff et al., 2000). Females made up the majority of the study sample (n = 67, 60%) and a majority of the pet owners (n = 53, 62%), and this simple fact could be responsible for the results found in this study. As stated earlier, females have been reported to form stronger feelings towards domestic animals such as dogs and cats as well as charismatic megafauna. Czech et al. (2001) found women valued the preservation of plants, mammals, and birds more than other taxa (i.e., reptiles, amphibians, invertebrates, microorganisms) as much as males. Some charismatic megafauna have been viewed with mammalian characteristics (i.e., fur that can be perceived as "soft and fuzzy"). Since the AA used in this study is a barred owl and does not exhibit mammalian characteristics, it might not be seen as a pet or charismatic megafauna by females compared to a dog, lion, or bison despite their value for species preservation.

The study also investigated the effect of naming an AA on individuals from rural, suburban, and urban residential settings. The average *Total Owl Knowledge (TOK)* score for participants from a rural setting was 78.4% compared to the participants from suburban and urban settings who received an average score of 78.6%. The results of the ANOVA test (F = .002, p = .998, df = 109) suggested that a significant difference did not exist between the scores from the three residential settings. When comparing the *TOK*

scores between region of residence for the entire sample versus region of residence for specifically females, the average *TOK* scores for females were lower (78.5%) than the average *TOK* scores for the entire sample. Meanwhile, the average *TOK* scores for the males were all higher than the scores for the entire sample and the females with the highest score belonging to participants from urban settings earning an 84.4%. However, both of the ANOVA scores for males and females ($F < 1$) revealed that a significant difference does not exist between the scores from the three residential settings. According to prior research (Kellert, 1980), the results of the high average *TOK* score for males from an urban setting appear to be conflicting. Kellert (1980) found that males are included amongst the most knowledgeable about animals in a large, various demographic group (i.e., race, gender, population of present residence, education, religiosity, socioeconomic status, marital status, and occupation).

College education also was an indicator of high knowledge score within the scientific, ecologistic, and naturalistic attitudes; which correspond with knowledge of the physical attributes of animals, primary interest for wildlife, and the concern for the environment as an interrelated system of wildlife and natural habitats. Participants in this study were students of a flagship university with strict and arduous admission requirements. This specific sample may present a lack of variability in the data due to intelligence. Upon this result, future research may be structured to the inclusion of participants with varying intelligence levels in order to generalize a broader population.

What is striking is that the highest scores come from males from urban settings and not from those who reported living in rural or suburban areas. Kellert (1980) established that one of the demographics which is the least informed about animals were

residents from urban settings. Yet, in this study, male, urban participants earned the highest scores. At first thought, it might be assumed that males from a suburban or rural setting would earn a higher score on the assessment due to the greater possibility of viewing animals such as a barred owl within their residential region.

When comparing different regions of the United States on animal knowledge scores and attitudes, individuals from Western states on the Pacific coast (i.e., Washington, Oregon, California, and Alaska) reported having greater animal appreciation and knowledge while the South was characterized by the least concern and interest for animals (Kellert, 1980). This study took place in the state of Georgia, which includes many rural and suburban communities. A possible occurrence here is individuals from suburban and rural settings have experience witnessing animals such as a barred owl in the vicinity of their homes and do not have a deep desire to view or learn about them in an educational setting even with an AA present. Therefore, the opposite could be true where individuals from an urban setting might retain more information than citizens from suburban and rural settings because of the novelty of the experience with an AA in an educational setting. The possibility may be that individuals from urban settings are more likely to view wildlife at a wildlife institution (WI). Visitation of WI often requires a specific range of income, educational opportunity, time availability, and accessibility for individuals to frequent. Nonetheless, when animals are brought into schools as AA, it provides a positive experience for individuals who would not normally see wildlife to interact with it in a controlled environment. Herein lays the possible motivation and influence for male, urban participants to retain more information. Participation in

educational programming where an AA is utilized is so novel that it motivates an urban individual to retain more information than his suburban and rural counterparts.

Recommendations

Results of this study indicate that naming AA does not have an effect on knowledge retention on college students, specifically the students within the demographic scope of the research. Despite a lack of significant difference being discovered between the control and treatment groups, gender, pet owners versus non-pet owners, or region of residence (rural versus suburban versus urban) for this study, the results do express some significant differences within specific subjects and demographics; mainly males learning about owl adaptations and male, urban participants retaining information. The research design of this study causes the researcher to be cautious about generalizing the results outside the specific study population. The study sample was small (n = 111) where a larger sample and randomization could help generalize the results to a larger population. This study also specifically involved college students within a particular age range and educational level. To generate results that can apply to a greater population, individuals of a larger age range (children, teenagers, adults over the age of 30) and diverse educational level (high school diploma, GED, professional degree, advanced degree) need to be tested in order to see the effects of naming an AA has on knowledge retention. Future research can also explore the effect of naming an AA on individuals who attend WI for entertainment purposes rather than learning opportunities.

Continuing with analyzing the effect of demographics on this study, future research should look into different methods of writing contextual items in an assessment. A critical step towards writing good questions is to understand the extent to which

respondents have an accurate, ready-made answer, and whether creating an answer demands considerable thought that is subject to myriad influences, including the context in which the question is asked (Dillman, 2007, p. 37). It would be arduous to get an accurate answer if people do not have a ready-made answer to a question (Dillman, 2007, p. 37). The contextual item asking participants about their original region of residence was not defined by the study but rather allowed the participants to self-report the data. Instead of participant self-reporting this data, the assessment could have asked for zip codes and allow the researcher to utilize U.S. census data to determine the proper region for each participant. Future studies should create contextual items that collect data specific to the scope of the research.

The research design of this study, Posttest-Only Control Group Design, only uses a posttest to measure knowledge and helping behavioral intent (postcard) of study participants. The participants were exposed to the presentation and then asked to complete a knowledge-based assessment. Other studies utilized a pretest-posttest research design to assess knowledge before and after the application of an experiment (Larson et al., 2010; Morgan & Gramann, 1989; Yerke & Burns, 1991). A possible adaptation to this study would be to implement a pretest to the participants prior to conducting the EE presentation. In this study, males from urban settings received the highest average scores on the OKA out of the entire sample. Assessing participant prior knowledge and attitudes can assist in rationalizing the results to the posttest data such as why certain demographics earned higher scores than others.

Another possible factor to consider for future research is the instrument used to measure knowledge acquisition. As previously stated, more thought should be placed into

creating questions for an assessment (Dillman, 2007, p. 32-78). The alpha scores for each construct in the *Owl Knowledge Assessment (OKA)* were low. A satisfactory alpha score ($\alpha = .771$) was only achieved when all of the assessment items were collapsed into one construct. The *OKA* may not be sensitive enough to detect what this study was measuring. Future research should invest in more emphasis on measurement. Possible solutions include altering the number of items per construct and pilot testing the new instrument with a larger sample and making amendments with the type of knowledge items until the reliability of the assessment is at a sufficient level. Another possible solution may be to be specific in the research by focusing on a specific construct and building an instrument based on the construct.

One unforeseen factor to this study was the impact the presenter may have had on the study participants. Larson et al. (2010) took measures to reduce variation associated with different teaching styles and techniques by using the same instructor to conduct each program session in their research. In this study, the same educator was used to conduct the presentations, a script was written and used as well and the presentations were videotaped to reduce variation. However, the charismatic teaching style of the educator could have played a role in influencing participants and the results. Individuals react differently to educators with various teaching styles. Participants could retain more or less information due to the presenter being charismatic or boring. The speed and audibleness of the speech during the presentation could also determine if participants retained the disseminated information. The seemingly underlying factor in this study is that the AA did not influence participant knowledge retention but rather the instructor

galvanized the knowledge retention or, the presenter taught with a level of enthusiasm that encouraged knowledge retention.

Prior research (Kellert, 1980; Kellert & Berry, 1987) examined animal knowledge and attitude scores of a wide range of demographics. However, other supporting studies were conducted over 20 years ago (Morgan & Gramann, 1989; Yerke & Burns, 1991) and since then societal changes (i.e., advancements in education, an increase in the positive opinion of the environment and EE, greater eco-awareness) could have potentially altered the results; as in the circumstance with male, urban participants in this study having a higher score than their counterparts. Czech et al. (2001) found women and men both value preservation of species, specifically plants, mammals, and birds. More current research analyzing the various demographics that Kellert assessed in his initial typology study should be conducted. It may be possible that the demographics assessed in these studies may have changed in some way (i.e., frequency, addition/deletion of a demographic item, change in distribution). This may allow for a comparison between studies and analysis for consistencies. On the concept of Kellert's typology of attitudes toward animals and the natural environment, future research should investigate the effect that naming an AA has on knowledge retention as well as participant attitudes on the AA. This study only looked at knowledge retention due to the scope of the research (i.e., time conflictions, study sample accessibility, instrument development, and validation). Including an assessment of participant attitudes may help explain the current results. Keeping along with this study, future research can look at the type of name provided to an AA and assessing its effect on knowledge retention in participants.

In this study, a specific animal ambassador (AA) was used for educational programming (a barred owl). Participants were able to see the AA but did not have interaction (i.e., petting, holding, playing with, and feeding) with it like an individual would have with domestic animals. The AA used is perceived as a predatory animal but not a dangerous animal like snakes and certain invertebrates. Future research should look at the effect of naming AA with a wider assortment of animals. Such a study could look at the use of an AA from the major animal classifications (mammal, bird, reptile, amphibian, fish, terrestrial and aquatic invertebrate), naming them, and assessing knowledge retention and attitudes. A barred owl was also used as an AA due to the species being a native animal to the geographic region of the study. Fuhrman and Ladewig (2008) point out that research making a direct comparison between using exotic and native species in zoo interpretation has not been conducted. Yet, various studies have looked at the effect of exotic animals on animal knowledge, attitudes, and behavior. Swanagan (2000) examined the effect of an interactive elephant demonstration and bio-fact program on zoo visitors' conservation attitudes and behaviors. Margulis et al. (2003) researched the effect of exotic felid activity (i.e., African lion, snow leopard, Amur tiger, Amur leopard, clouded leopard, and fishing cat) on zoo visitor interest. Meanwhile, there are studies that specifically assess the effects of native species have on individuals. Yerke and Burns (1991) measured the impact of bird-of-prey species (such as a golden eagle, red-tailed hawk, and great-horned owl) shows on zoo visitors. Morgan and Gramann (1989) utilized snakes native to eastern North America to measure students' attitudes and knowledge towards snakes. Several studies measured the effect of both native and exotic species on individuals' knowledge, attitudes, and role in education (Gee, 2010; Zasloff et

al., 1999; Zeppel, 2008). This void in the research justifies the need for a direct comparison between native and exotic species in zoo interpretation where the extra layer assessing the effect of naming the AA can be implemented.

This study looked at how storytelling, the Drama Theory, and Empathy-Altruism Hypothesis can affect knowledge retention. The null hypothesis of this study was that there was not a significant difference between knowledge scores of the control and treatment groups whereas the alternate hypothesis of this study was that there would be a significant difference in knowledge scores between the control and treatment groups. Yet, according to the study results, we failed to reject the null hypothesis.

Upon further analysis, the results of this study did not align with the theory base. The presentation given to the study participants may or may not have been perceived as a story. A story normally includes a plot, protagonist(s), antagonist(s), plot changes, a climax, and a conclusion (Kincaid, 2002). Drama theory states audience members are able to identify with a specific character in the narrative and place themselves into the role of that character (Kincaid, 2002). The lack of a concrete story used in this study may have affected the participants in ways such as identification with a character. To better incorporate storytelling into the research, new studies should involve the use of an actual story, complete with the previously stated criteria, to disseminate information.

This study was also based upon the Empathy-Altruism Hypothesis, where an individual develops empathy towards another individual in plight and is influenced to help the individual in need (Batson, 1991, p.83-91; Batson et al., 2009, p. 417-426; Bierhoff and Rohmann, 2004). Participants would develop empathic feelings towards the AA they identified with and have a yearning to want to help it. This help has the

possibility to be in many forms, including owl conservation knowledge retention. Yet, according to the study results, significant differences did not exist between a majority of the demographics (the exception being retention of owl adaptation information for the entire sample and for male participants). We cannot definitively state that the participants of this study developed empathy towards the AA or that it played a role in owl information retention. Future research should explore knowledge scores and retention within a wider range of demographics (i.e., age range, socioeconomic status, education level, region of the country, and race) following methods used in prior research (Kellert, 1980; Kellert and berry, 1987, Swanagan, 2000; Larson et al., 2010) and appling the Empathy-Altruism Hypothesis as a theoretical base.

Due to time constraints, this study only included one method of collecting qualitative data. Future research needs to incorporate interviews with participants or focus groups in order to collect data about how the participants felt about the presentation, the AA, and any other emerging data. Including qualitative data from interviews and focus groups can strengthen the quantitative results or help provide and explain specific justifications that can only be speculated from the quantitative data. A mixed methods study incorporating all of these suggestions could generate results that can be more applicable to general public and help supply answers to the debate on naming AA in WI.

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APPENDIX A

Informational Consent Form

April 24, 2012

I am a graduate student in the Department of Agricultural Leadership, Education, and Communication at The University of Georgia. I invite you to participate in a research study entitled "Naming Animal Teaching Tools and its Effect on Environmental Literacy Retention." The purpose of this study is to help better understand how providing a personal, specific name to an animal affects the environmental literacy retention in adults. Students must be 18 years or older in order to participate in this research study.

Your participation will involve completing a short questionnaire consisting of 36 questions and should only take about 25 minutes to complete. You may also be asked to voluntarily participate in a follow up interview which should only take 15 minutes to complete. Your grades and class standing will not be affected by your decision about participation. Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time without penalty or loss of benefits to which you are otherwise entitled. Because no identifying information will be collected, the data collected in the questionnaire will be anonymous, and the data collected in the interview will be kept confidential. The results of the research study may be published, but your name will not be used. In fact, the published results will be presented in summary form only. Your identity will not be associated with your responses in any published format.

This study may not benefit you directly, although you may gain knowledge about owls. The findings from this project may provide information on the effects of giving an animal teaching tool a personal name has on adults retaining information about an environmental topic. There are no known risks or discomforts associated with this research.

If you have any questions about this research project, please feel free to call me at (706) 542-6601 or send an e-mail to miltron3@uga.edu. Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, 629 Boyd GSRC, Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

By completing and returning this questionnaire you are agreeing to participate in the above described research project.

Thank you for your consideration! Please keep this letter for your records.

Sincerely,

Milton G. Newberry, III

Chris Morgan, PhD

APPENDIX B

Naming/Anthropomorphizing Animals Email to Raptor Centers

To whom this may concern,

Hello my name is Milton Newberry, III and I am currently a graduate student at the University of Georgia. I have been an environmental educator for over 5 years now and am extremely passionate about it. I've worked at the raptor center at Shaver's Creek Environmental Center at Penn State as well as other nature centers. I am working on my thesis which is exploring the question of naming animals teaching tools and its effect on knowledge retention.

What I would like to know from you is your opinion on naming animals in facilities such as zoos, aquariums, nature centers, etc. What I mean by "naming animals" is giving them a personal name that might be provided to the public (in a minute sense, “anthropomorphizing” the animals). Do you believe animals should receive personal names or not be named at all? Why?

Your response will help add a great deal of strength to the introduction and literature review of my thesis. I know you have an extremely rigorous schedule. If possible, please get back to me as soon as you can. Thank you for your time and cooperation. I would really appreciate any help you can provide. Again thank you and have a great day!

Milton G. Newberry, III

APPENDIX C

Email Discussion over Concept of Naming vs. Not-Naming Animals at Facilities

Our philosophy here is that it is important to name our birds for a number of reasons.

1. It acknowledges and honors their individuality, rather than implies to the public that we see them as interchangeable, say, just a number or just a representative of a species, but a living, breathing being who has a life story that brought him/her here.

2. It allows the public, and staff/volunteers, to learn their personal stories and makes the lessons more personal. Since we often keep the birds in pairs, it's important that staff/volunteers be able to identify them individually - I don't want a panicked phone call from a volunteer on rounds that says that 'one of the long eared owls is on the ground' or even 'the merlin that is usually in the back of the enclosure is bleeding, you know, the darker one.' I want to know that Ariadne is on the ground - and then I can tell that volunteer that that's not unusual for that bird on a sunny day, etc. Whereas her cage mate might NEVER be seen on the ground and if SHE were on the ground, that would indicate something might be wrong with her. And the merlin that is bleeding, during molting season, may not be unusual IF it's the one with the healed broken wing that always seems to break a blood feather at least once a year ... etc.

3. The birds also have a strong following by sponsors who 'adopt' a bird - they choose them by story, by appearance, by the fact that the name means something to them ... but they definitely identify 'their' adopted bird by name. This is a major source of income for us and helps to build rapport between members and our mission, and it gives an individual bird one more person who cares specifically about it.

4. One of our primary goals with young children is to build empathy. Since our birds all have names and stories (just like the children have names and personal stories), the youngsters are able to build connections with these animals and begin their journey towards respect for all things wild, and the habitat they depend upon.

5. Picking a name for a new bird can be engaging for the public and/or

volunteers. We had over 480 names submitted by the public when naming a new
resident bald eagle. Our volunteers like to research new names or vote on ones being considered for new birds. It gives them a stake in the organization and the birds for which we care.

HOWEVER: Though we name our birds, we use those names with certain caveats.
1. The names are on their enclosure signs, but are not particularly prominent - they are in the bottom corner, below their species, Latin name, and personal story - which is separate from their natural history interpretive signage. 2. When we do a program with a bird, we do not introduce the bird as 'Uriel, a red-tailed hawk' - we say 'this bird is a red-tailed hawk.' If there are children in the audience, you can be guaranteed the question: what's her name? - and then we provide it. But we don't lose sight of the fact that what's important is that this is a red-tailed hawk, not that her name is Uriel.

And 3. We are careful about the names we pick - they need to mean something relevant to the bird in its personal and/or natural history, and are not typical 'pet' or cutesy names like Rover or Spot or Gloria. We use a wide selection of mythological names, from all different cultures and periods around the world - e.g., Odin was a one-eyed barred owl and her name was picked because Odin, the Norse God, sacrificed an eye in search of wisdom; Freyja is a peregrine falcon, and Freyja (a goddess, also Norse, coincidentally) had a magic cape of feathers that allowed the wearer to fly like a falcon; Ki, a red-shouldered hawk who overcame a number of problems as a nestling and always demonstrated a very strong 'life force;' Ceres, goddess of agriculture for a female northern harrier often found in our area in agricultural fields or Diana, who was paired with Artemus, both barn owls; and 'culture' includes popular culture, and we have had a Frodo, Pippin and Merry (pygmy owls) and Gandalf (great gray owl).

Mostly it comes down to respect - we think it is important for the public to see the birds as individuals, not just 'wildlife' or 'hawks' but to take to heart the travails that have brought them to a life in captivity, most of which are human-caused. And we are careful NOT to treat them as pets, not to touch or pet them familiarly.

I also think it's a bit of a leap to say that by giving them names we give them human qualities or anthropomorphize them. It seems arrogant to me to assume that 'naming' is a human thing. Recent research has indicated that some species of birds have 'names' - i.e., they have call notes that are

used by their parents and each other for them and not for others in the nest. How do we know that a dog visiting the local fire hydrant, 'reading' the newspaper (by his nose) of which neighborhood dogs have been by recently, doesn't have a 'name' for each one of them? They are familiar to him, and we don't know how their brain works: I would think he recognizes the German shepherd who lives a block away, as his nose can differentiate between that and the female cocker who lives next door. I would guess he has a short-hand way of mentally cataloguing them which would be the equivalent of a name. Scientists have shown that dolphins have very complex names for themselves, including surnames.

Most of the time in this field, the argument I hear against naming is that it might make them seem to the public like pets - I can't say I've heard the anthropomorphizing issue. But even those who don't give their display animals a 'name' still have a way of identifying them - maybe it's a number. Not sure how that's different, really. Naming them is certainly more fun! And, in my experience, more engaging for the audience. Maybe some people feel that if we 'name' something we declare ownership? OR possessiveness? Not sure, but it feels insulting to me NOT to name them - that it demeans them not to be acknowledged as an individual. Hope this helps. Louise (and Kit and Laurin contributed to this response)

Louise Shimmel, Executive Director,
Kit Lacy, Education Director
Laurin Huse, Rehabilitation Director

Cascades Raptor Center Eugene OR USA - 541-485-1320 - www.eRaptors.org

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Hi Milton,

We do name all of our birds and have their names on display for the public to see. There are a couple reasons we name our birds. 1) We have over 300 volunteers and it is a very special way to thank them by giving them the naming rights to one of our permanent residents. 2) We think the birds name is impactful in educating students about environmental conservation as it connects them to the birds they meet and tells a story. At the end of the day sometimes they don't necessarily grasp the entire topic we have been discussing in their classroom. A lot of times what they remember is that they like Lulu the barred owl they met and they remember that it's important to keep trash off the side of the road because that's why lulu got hit by a car. So yes it's anthropomorphic but we always discuss "Do you think Lulu would make a good pet" and we talk

about how she is a wild animal. So as long as the people are walking away with a greater appreciation of lulu and all her barred owl friends then it's worth it. If for some reason they thought they should go out and get an owl because Lulu is so cute then we have done something wrong with our messaging and it wouldn't really have mattered if we had told them her name or not.

The Center for Birds of Prey in Charleston, South Carolina names their birds but does not tell the public their names. So you might consider contacting them if you haven't already.

Please let me know if you have any further questions.

Amber Rosintoski
Bird Curator
Carolina Raptor Center
PO Box 16443 | Charlotte, NC 28297
http://www.carolinaraptorcenter.org

Hi Milton,

The majority of our animals do receive names. Not only does it enable the keeping staff to communicate naturally with each other about their charges, but also simplifies communication with the public during demonstrations. People name their pets and assume a similar relationship between us and our animals.

It is also important to identify each animal to maintain their records, and using a name comes more naturally than purely assigning them a number. Perhaps it falls out of that nurturing trait we want our keepers to possess.Nick Bell

Education Coordinator

Australia Zoo
Steve Irwin Way, Beerwah, QLD 4519

Now...your question. I have heard many theories to that...but here is what we practice at VINS:
We do not give our birds names. That is one of the first sentences we say when presenting in a public program. All of our educational and exhibit raptors were once wild, but then sustained a certain injury that rendered them non-releasable. Even though most of them have been in captivity for years, they still "act" wild. I

have seen over the years, that many people assume that these birds are friendly, approachable, you can pet them, etc. And that is certainly not the case. That is why we do not give them names, we feel that if you give a name (other than it's species name) to a raptor, people will assume that these animals are tame, and would make good pets. We tell people that our birds are tolerant of our presence, but are certainly not cuddly or tame as your cat or dog would be. I feel that people walk away with a better sense of respect for these animals, and an understanding that these birds are still potentially dangerous and should be admired from a distance. From my own professional point of view, and speaking from the rehab aspect, I try not to anthropomorphize these animals, for I do not want the general public to assume that it is okay to take a wild bird out of it's natural habitat and make it into a pet.

Sara Eisenhaur
Vermont Institute of Natural Science

Milton-

I am glad to see someone looking into this question in more detail. I (and we at the Center) feel strongly that "names" are inappropriate in most contexts for "wild animals." Here at the Center, we do not use names for our birds in front of the public. I feel that the more trained an animal is (i.e. the greater the distance from "perceived wild" behavior) the more difficult it becomes for "normal people" to distinguish a wild animal from a pet. In order to foster the appropriate behaviors and interactions between humans and wildlife, I feel that it is important to stress the natural history and minimize anthropomorphic language in any way possible. I would love to talk to you in more detail about your project and contribute in any way I can. This is an issue that we deal with on a daily basis and I look forward to seeing what you uncover in your research.

Stephen

Stephen Schabel

Director of Education

The Center for Birds of Prey

www.thecenterforbirdsofprey.org

Milton,

I am the Program Director at Teton Raptor Center. The subject of naming our raptors has come up several times. I am of the opinion that captive raptors should not be named and that doing so is detrimental to their education value for several reasons which I will detail below. That being said, I believe I am in the minority at our raptor center, and our resident, non-releasable education raptors, which were part of the collection before I arrived, all have names. The position in support of naming the non-releasable raptors is generally that people tend to be able to relate better to these animals as those that will always need human assistance. I have also heard the position that named birds are simply more personable, and thus, more likely to receive help from a person. The same concept applied to marketing and sales, countless studies show that if someone likes the salesperson, they are more likely to want to help them by buying an item from them. Unlikeable salespeople are unlikely to receive support and the same theory could possibly apply to un-named animals. These un-named animals may appear more distant, less personable, less likeable, and thus less likely to receive support from a person. It has also been presented that the birds with names are more easily recognizable, and memorable, to children which may be to young to allow them to understand identification of the individual birds by species. Simply, young children remember "owly" the owl that had big eyes verses the more abstract concept that great-horned owls have large eyes. I see merit in all of these arguments but still see naming as carrying potentially negative effects in a captive wild-animal for education setting.

I have presented educational lectures with live wildlife, mostly raptors, for over 20 years. A good portion of the programs I presented prior to coming to Teton Raptor Center were at elementary level public schools. I stopped referring to my raptors by name a long time ago because it creates a sense of confusion with young children in regards to differentiating between domestic animals and those that are considered wildlife. Depending on their individual background relating to wildlife, it can cause confusion with adults as well. A theme in all of my programs in the past, and the presentations we now present at Teton Raptor Center, is that wildlife belongs in the wild. The concept that although wilderness requires the care and support of humans in order to be sustainable, altering or domesticating wilderness is not our goal. With children, giving the animals names blurs the line between "wild animal" and pet, or domestic animal, more than necessary. Children come and see the non-releasable raptors in a cage, being handled, fed, and cared for, by people. That is very similar to hamsters, dogs, or cats they may have at home. We of course give the explanation that the birds are only with us because they can't be released back to the wild. Still, adding a name is one more tie to the domestic pets they see and relate to everyday. I see great conservation benefit in having children appreciate the distinction, and uniqueness, of wildlife verses domesticated life. Refraining from naming helps in maintaining this distinction in children.

Additionally, my experience has shown that children are more likely to identify an animal

by its species if that is the only method of categorizing the animal they are presented with. If I introduce an owl as "Owly the great-horned owl", of course the young children are going to focus on the name and not the species to identify the owl. It is easier. If I introduce her simply by species only, I see a higher percentage of the young children in the audience will retain that species information because it is the only identifier available to them. With very young children, I would rather introduce a bird in a less specific manner, but still taxonomically correct fashion, than use a name. For example, with very young children I would simply introduce our owl initially as "our great-horned owl" once and then continue to reference her simply as the "owl" for the remainder of the presentation. I think the conservation education value is greater by having the young children simply remember they saw an "owl" rather than the given name of the owl.

I hope this is useful.

Jason Jones

Milton,

I see no harm in naming captive animals but there are some who think it is a crime. We have 27 birds in our education program to identify. These aren't display birds. We travel with them on programs. Solo, Stitch and Adama were with me on programs today. All of our volunteers know which birds they are. We have had some of our birds for nearly 20 years - how can they not have a name? We do get attached over the years. We do care about them. We usually don't name the rehab birds because they aren't here that long. Legally we only have 180 days to get them in and out.

Isn't there an experiment done where you ask students to name their pencil, talk to the pencil and then suddenly tell them break the pencil to see how they feel about it? Naming something can make you care more about it. Many nature centers are starting to name their big old trees. We want the public to care.

I think people make way too much out of whether or not to name their animals. The way a presenter acts with a captive wild animal is way more important than the animal having a name. "Cutsie, huggie, lovie" actions and talking to the animal as if it knows what you are saying is what gives the public the idea that a wild animal can be a pet. Giving an animal respect for its wildness in front of an audience during a presentation is what is important - whether or not you give it a name.

That's my opinion. Hope it helps.

Serving the people and wildlife of Illinois with wildlife rehabilitation and conservation education since 1991.

Visit us at www.illinoisraptorcenter.org

Milton,
I have an undecided opinion about naming the animals. For negative reasons I think naming them give people an idea that these animals could be pets. On the other hand giving them a name does make it a little more personable and could stick in that childs mind and really make a difference. It can help when non profits offer an adoption or sponsorship of an animal that has to spend its remaining life in captivity.
Becky Kean
Montana Raptor Conservation Center
Bozeman, MT
www.montanaraptor.org

Milton,
An interesting, and very appropriate, subject.
At our Center, which was established in1983, has many birds with names and all other birds are identified with numbers.
All birds are assigned with a number that represents the species as well as the year it was received and the numerical order it was received at the Center. For example, if the fifth bird we received in 2012 was an eastern screech owl it would be identified on our admittance form simply as ESO-0512. This is used for scientific data gathering purposes.
Occassionally we will have a numbered rehab bird that is here for a long time. If there is something striking or unusual about that bird it might get a nickname, unofficially, to suit it. For instance, we once had a red-tailed hawk that was extremely emaciated when we received him. After tube feeding followed by hand feeding the bird perked up. It was put in a flight cafe some time later where it seemed to have taken on the objective of never going hungry again. There were other red-tails in this cage but this one would grab all the food even though it could not possibly eat it. We affectionately called him Pig Pen.
Our education birds are different stories. We name all of them...in addition to having numerical names. The names may or may not have a special meaning but this is done for the public. All of the birds we have, same species or not, have their own personalities much like humans. The audiences as well as the handlers need, for themselves, to be able to relate to the specific animal. Those in the audience are made aware that the names are only for recognition purposes. We emphasize the importance of recognizing these birds are wild animals and not at all like the family pet that is held, petted and treated as though it is a human. It is important that our audiences relate to each education bird and even have a favorite. This, when instructed properly as to the nature of the specimen, yields a

respect for the individual bird as well as the species. Our entire educational application is to convey to the audiences, regardless of age, that man is a part of nature and not apart from nature. We all must coexist and we, as the more capable of all species, needs to take the necessary responsibility for the effect of our actions. We want them to understand the interrelationships of all species in an environment. As a wildlife biologist I sometimes think that anthropomorphism is far too prevalent within our society but I have also found that teaching the correct information is done most effectively with a less structured scientific slant. None of the birds really recognize their names, however I'm sure that many of our great volunteers might take exception to that statement. The birds do, however, recognize a tone or intent, just like your dog or cat.
So, to simply answer you question, yes we do believe it necessary to name some of our birds, but not for the obvious reasons of self fulfillment or out of a sense of dominance but rather to let everyone know that if someone illegally shoots a raptor, it is in fact shooting an individual raptor.

Good luck with your research. I hope this was the info you were seeking and that you find it to be of some benefit.

Sincerely,

Michael S. Book
Chairman, Board of Directors
WVRRC

Milton:
Sorry for the late response. We name educational animals, but not rehab animals.
It makes thing easier to say, to someone, can you go out and get "Rocky" and have them know exactly what you mean.
We give our animals respect, and don't talk to them in baby talk like a pet. They are wild and we know it.
That said, the term "anthropomorphizing" is an old school term invented by zoologists back when they tried to tell the rest of us that animals were not at all like people. They were non-feeling things. They kept them in small wire or concrete sterile cages and they told people they were never bored, didn't feel pain and had no or other feelings. The world has changed and they are now kept in more realistic exhibits or caging and given enrichment. The term anthropomorphizing should be, in my opinion, very seldom used now.

Gary Siftar
Oklahoma Raptor Center

Hi Milton,
I wanted to let you know that Jeff is no longer with the Nature Center. He is now at Zoo Montana.

For whatever it's worth, I feel strongly as the ED of a Nature Center, that the animals should have names. Our animals are all rescued and cannot be released into the wild because injury or over habituation. These animals will live out their lives here at BNC and they develop very strong bonds with their caretakers. Not naming them because of anthropomorphism would seem to be an effort to diminish the strong emotional connections that these animals can have with humans. My understanding is that scientists used to believe that non-human mammals could not experience emotions like love and fear. My understanding is that we've proven over and over again that they can. I completely understand why animals that are part of wildlife studies and research projects would not be named (more for the sake of the humans)...or even animals that are in rehab with the intent of release into the wild. But to not name animals that live their lives out with humans seems so strange.

On a completely different note, having animals named is critical to our fundraising efforts. It would be a lot harder to get someone to give money to black bear 1 then to Bluebeary the gregarious and playful young girl. I can't imagine running a facility like this successfully without naming our animals.

Just my two cents. Good luck with your project.

Michelle Marion
Beartooth Nature Center

APPENDIX D

Raptor/Owl Presentation Script

Good afternoon everyone. My name is Milton Newberry, III and I am here to teach you about raptors, specifically owls. I am going to educate the class on what makes raptors distinct from other birds, what makes an owl an owl, their adaptations, and lastly their importance to humans. So let us begin shall we? Raptors, also known as "birds of prey" are birds that hunt for food primarily while flying, using keen senses such as eyesight and hearing. They are defined as birds that normally hunt vertebrates, including other birds, mammals, reptiles, amphibians, and fish. They possess large, sharp claws called "talons" which are used to grasp and, at times, kill prey. Talons are planted on feet with incredible crushing power where some birds of prey can break the bones of their prey. Raptors also possess a sharp, hooked beak adapted to tearing and/or penetrating flesh. They have binocular vision whereas some species have keen hearing like owls or a keen sense of smell like vultures. This group of birds differs from other birds who hunt other animals such as wading birds (storks, herons, and egrets) and shore birds (gulls, pelicans, and sandpipers) who strictly utilize their beaks to catch and kill prey. Raptors fall under two categories: diurnal, "active during the day," or nocturnal, "active during the night." This presentation will focus specifically on the nocturnal raptors, owls.

Owls are a group of raptors making up 200 living species today. Most species are solitary and nocturnal with few exceptions (such as the Northern Hawk Owl). A group of owls is called a "parliament." Now I know Great Britain has a parliament but it's no reason to get your feathers ruffled! Well, owls do a lot. An owl tends to get their feathers ruffled, therefore daily activities include preening or cleaning its feathers, combing its head, and stretching to prepare for flight. Owls have very animate body language. For instance, many species will bob and weave their head and even turn it upside down in a way that it seems curious in nature. However, they are really trying to get a 3 dimensional image of what they are viewing and use triangulation to pinpoint something they hear. Whenever owls are relaxed, their feathers are loose but whenever they are scared, owls stand up straight, tighten their feathers to their body, and try to look as slim as possible if their enemy is larger than them. If they are larger, they try to appear bigger by puffing their feathers out and swaying from side to side. Owls produce a number of vocalizations ranging from hoots to whistles, hisses, purrs, screams, screeches, and snorts. However, not all owls hoot. These sounds are used to mark territory, court mates, and in threat displays. When feeding, owls are known to swallow prey whole if possible. Yet, they cannot digest the bones, fur, and feathers and must regurgitate pellets, balls of fur and bones, after eating. There are two types of owls: the Strigidae or "typical owls" and the Tytonidae or "Barn Owls." These raptors are found in all regions of the Earth except for Antarctica, most of Greenland, and some remote islands. They tend to

be resident birds where they do not migrate but there are accounts of northern species migrating south to avoid harsh winters.

Owls possess a number of adaptations that aide them in hunting prey. First off, these raptors have a great sense of vision. Owls possess binocular vision where their eyes lie on the front of the face rather than the side. This allows the birds to utilize depth perception when searching for prey. Their eyes are disproportionally large for their heads and lie in tube-like eye sockets. Because of the size of their eyes and the shape of the eye sockets, owls do not have muscles that attach to the eyes to help them move like a human's eye. Normally, this would mean their range of vision is limited. However, the swiveling radius of an owl's head is 270 degrees, easily allowing them to see behind them without moving their torso. They have this ability due to the number of bones in their neck, which is fourteen. In comparison, all mammals have seven bones in their neck, including humans. Owls also possess a large amount of rod cells in their eyes. These cells are sensitive to light and movement which is perfect for a nocturnal creature. On the other hand, owls have a poor sense of smell. Some owls, such as Great-horned owls, one of the few animals that regularly hunt skunks!

Meanwhile, the feathers of owls allow them to be excellent hunters in the night. I would like everyone to take their right hand, make sure it is open completely with all fingers pressed together, hold it up close to your right ear, and wave it back and forth very fast like what I am doing. You should hear the

sound of air moving past your ear. Now I would like you all to take your right hand again and wave it by your right ear again but this time spread your fingers apart, like what I am doing. You should hear a sound but it is not as loud as when you waved your closed hand by your ear. The closed hand represents the feathers and wings to most birds because they can create a loud sound. For example, when an eagle flaps its wings, it is a relatively loud sound. Yet, the open hand represents the feathers and wings of owls. The feathers on the wings of owls have a comb-like edge along each of them, allowing the owls to fly more quietly than other birds. This is suitable for owls who predominantly hunt mammals with a great sense of hearing. The stealth flight gives owls an added advantage in hunting.

Before I continue, I would like to bring out a special guest this is [Henry/Barred Owl]. [Henry/Barred Owl] can be found living across North America except for some western states such as Nevada, Arizona, New Mexico, and Utah. They are found in abundance on the eastern half of the continent, ranging from Florida to southern Canada. The average life expectancy of [Henry/Barred Owl] is 10-13 years in the wild whereas in captivity, [Henry/Barred Owl] can live up to 32 years! [Henry/Barn Owl] like to live in dense foliage during the day, usually high up and may also roost on a branch close to a broad tree-trunk, or in a natural tree hole. It is very common to see [Henry/Barred Owl] take over an old nesting site of a red-shouldered hawk, cooper's hawk, crow, or squirrel. The feathers on the chest of [Henry/Barred

Owl] resemble bars from a jail. [Henry/Barred Owl] is an opportunistic hunter which means he will eat almost any animal he can catch. [Henry/Barred Owl] preys upon insects, small birds, frogs, turtles , small fish, squirrels, young rabbits, bats, moles, opossums, mink, weasels, lizards, and small mammals especially mice, voles, and rats. [Henry/Barred Owl] is also called the "Swamp Owl" because of hunting around water sources and "Rain Owl" because of being seen hunting on cloudy days. It's main call is a series of 8 hoots that sounds like "Who cooks for you? Who cooks for you all?" Let's all try it together! "*Hoo, hoo, too-HOO; hoo, hoo, too-HOO, ooo!*"

Let's continue covering adaptations using [Henry/Barred Owl] here. [Henry/Barred Owl] uses talons when capturing prey. Talons are large, sharp claws on the feet which are utilized for crushing, grasping, and, at times, killing prey. The talons are attached to four toes on each foot with 3 toes in the front and 1 toe in the back. Yet, one of the 3 toes in the front is flexible and can rotate to the back of the foot to help grasp prey.

The beak is what [Henry/Barred Owl] uses to eat prey and is specialized just for this occasion. The beak is short, curved with a hooked ending; ideal for gripping and tearing flesh. The beak also possesses crushing power to assist in killing the prey if the talons do not suffice. If you look at its shape, the beak is curved downward to keep the field of vision clear.

If you look at [Henry/Barred Owl]'s face, it is very round. This is because of the facial discs owls have. These actually funnel sound to each ear. The

feathers on the face can be controlled to act as a buffer when there are loud noises or as a means to hear better in a silent night. Ears are covered by feathers and are asymmetrical where the left ear is higher and the right ear is lower. This enables [Henry/Barred Owl] to use depth perception with sound and hunt at night. [Henry/Barred Owl] has such acute hearing that [he/they] can hear a mouse walking through leaves a quarter of a mile away! Combine all of these adaptations and you will see why owls, especially [Henry/Barred Owl], are superb nocturnal hunters.

Yet, owls like [Henry/Barred Owl] can help we humans in our everyday lives. Rodents such as mice and rats cause vast amounts of damage to humans such as food and crop consumption, building degradation, and disease vectors (carriers of diseases that are humans can catch). Owls keep the populations of rodents in a natural balance. [Henry/Barred Owl] can consume several thousand mice in a year! Imagine a world without owls…mice populations would increase dramatically and cause widespread havoc.

Owls like [Henry/Barred Owl] here end up in captivity due to incidents such as being shot by people, flying into barbed wire fences, illegal hunting, and being hit by cars. If the birds survive, they are injured in a way where they cannot be released back into the wild. Owls are very common throughout the world but many species including [Henry/Barred Owl] are seeing severe declines in numbers due to habitat loss ranging from deforestation to human encroachment on their territory. The rampant use of pesticides and rodenticides

also lower owl populations, including owls like [Henry/Barred Owl]; either by owls dying from eating infected prey or the number of prey declining so much that the birds starve to death. However, there are many people in the world who are fighting to save owls. They are accomplishing this through education and research on owl behavior and habitat preferences. This way land use projects can be planned in relation to owls such as [Henry/Barred Owl]. Education also allows for people to influence and motivate others to use more natural and sustainable methods of pest management such as leaving parts of property in a way that promotes owls, including ones like [Henry/Barred Owl] to live there and to reduce the use of pesticides and rodenticides. People also volunteer at nature centers and non-profit organizations raising money, building nest boxes, educating the public and monitoring owls like [Henry/Barred Owl]. People help count the number of owls for scientists to keep population records in order to better watch over them.

So what can you do to help protect owls like [Henry/Barred Owl]? For starters, we can refrain from throwing food out of a moving vehicle onto the side of the road. Roadsides are adequate hunting grounds for most owls because of the open space to hear prey and here in Georgia, we have copious amounts of roadsides where owls like [Henry/Barred Owl] frequently visit. The food we throw out attracts rodents which attract the owls even more. Unfortunately, owls fly low to the ground when hunting and tend to get hit by cars when crossing a street. It is a simple task and can save many owls from a gruesome

fate. Another easy task we can do to help owls is to build nest boxes and install them on our property. These are easy to build where you can obtain the blueprints from any Department of Natural Resources or DNR representative or online. If you are not handy with tools, some nature stores and government agencies, like the DNR, sell fully constructed nest boxes where all you have to do is install it by attaching it to a tree, side of a building, or metal post about 10 to 15 feet above the ground, which is easily accessible by a ladder. You can also volunteer at nature centers, zoos, and government agencies putting up nest boxes in habitat suitable for owls like [Henry/Barred Owl]. These facilities love having volunteers where even 1 hour of volunteering a week helps. You can help count the birds by listening to their calls at night and/or seeing them in the wild and report the sightings to the DNR and local nature centers. This is an effortless job which can also be fun for you get to see the owls like [Henry/Barred Owl] in the wild. If you live on a farm, it is possible to leave a small plot of land growing with wild grass which would attract the prey of owls and subsequently the owls. There are many ways in which we can help owls, from being completely involved and "knee deep" in the work to just helping from home and during our daily activities.

Owls are wonderful birds who serve a great purpose to both the environment and mankind. These nocturnal raptors can be found worldwide eating an assortment of vertebrates like smaller birds and mammals. They possess incredible adaptations such as acute hearing, keen vision, talons, hooked

beak, and comb-like edges on the feathers on their wings to help them become the perfect night predator. We can do our part to save owls like [Henry/Barred Owl] by building and/or putting up nest boxes and refraining from throwing food out of moving cars onto the roadsides. We can also help by volunteering at nature centers and by counting the owls to assist state agencies like the DNR. We can painlessly count the amount of owls we see or even search for owl pellets below trees and leave some of our property wild grown to attract prey for owls like [Henry/Barred Owl]. I hope you enjoyed this presentation with [Henry/Barred Owl] and I. If you would like any more information on owls, especially individuals like [Henry/Barred Owl], please feel free to contact me via email at miltron3@uga.edu. Thank you and have a great day.

APPENDIX E

Postcards from Owl Knowledge-Based Assessment – Control Group

C1)

- "Hey y'all! You can build a really nifty owl nest in your backyard or go to the zoo to learn more!"

C2)

- "They can stop throwing food out their car windows, so that owls aren't attracted to the roadside where they can possibly be hit by a car."

C3)

- "They can build a nest box for owls and put it up in a tree or on a high pole. They can listen for owls in their backyard and count them and report the number to nonprofit organizations that help save owls. The can stop throwing food out their car window and they can make more fliers to stick on street signs to encourage others to stop throwing food out the car window."

C4)

- "Hey cousins! There are some practical ways to help owls: build a nest, count how many owls live in your area and keep track of numbers, don't throw food out the window of your car. Good luck!"

C5)

- "try to not litter or throw food out near roads. The owls eat rodents who eat that food and may get hit by cars."

C6)

- "Dear cousin, Contact your local DNR, report the number of owls you heard, and they will contact owl protection agencies!"

C7)

- "Dear cousins, to help owls you can build or buy nest boxes and put them in high locations."

C8)

- "You can help save owls by not littering. Do not throw trash out of car windows because rodents are attracted to it, and owls are attracted to rodents. Save an owl's life, don't litter."

C9)

- "To help save owls, don't throw food out of your car window. It can prevent owls from being hit by cars. You could also put a barn owl nest in your backyard and keep track of the owls."

C10)

- "You can save owls by not littering your trash."

C11)

- "To save owls you can build nest boxes, listen to them and keep a count of how many you hear, and also you can volunteer to help owls by taking care of them."

C12)

- "Build nest boxes, count the number of owls they hear and report to the DNR or non-profit organization, inform people about the danger of throwing food out the window to owl populations."

C13)

- "Please help protect owls by keeping them away from busy roads! Every effort helps; one of the most important things you can do is not throw your trash outside of your car! Thank you!"

C14)

- "To help save the owls you cannot illegally hunt them and make sure they aren't in captivity!"

C15)

- You can help owls by not throwing food out your window and don't kill owls.

C16)

- Construct a home for owl. Blueprint can be found online or can buy one fully constructed. You can put a perch up about 10-15 ft in the air. Keep area at property natural for owl to live in.

C17)

- Dear long lost cousin,

  It is important that we save the owls. They are an important part of our ecological system. They are smart animals that are beneficial to society. They help keep away human pests and are not major disturbances to humans.

  Thanks

C18)

- Nothing was written

C19)

- You can sure you don't throw food out of the windows of your cars, report sightings & hearing to local wildlife specialists & place nest boxes around your property

C20)

- Dear cousin,

  In order to help the owls you could report your sighting to an owl

researcher build a nest-box, or attract rodents for owls to eat. All of these things will help the owl population.

C21)

- Build a habitat

C22)

- Love the owls. Do not spray pesticides. Give them a box to live in up in a tree. Google more info on owls.

C23)

- Don't throw food out the window. Don't cu lawn all the grass so rodents can live. Build or buy a nest. Don't eat owls.

C24)

- Nothing was written

C25)

- Nothing was written

C26)

- Nothing was written

C27)

- Go to your local zoo or government shelter to assist putting nest boxes in trees or putting them on your own property. You could also simply listen for owls & report it to the government shelters.

C28)

- Quick tips:

  Leave natural/dense vegetation for rodents. Provide nest boxes. DON'T LITTER!

C29)

- Leave natural habitat for the owls. Volunteer at local zoo/nature center. Don't throw food out of a car window.

C30)

- Keep counts of owls you hear or see. Volunteer at zoos or animal shelters. Build nesting boxes. Don't dump food outdoors.

C31)

- Report the # of owls they hear to wildlife reserves, build nest boxes and put them in trees and don't throw food on the side of the road.

C32)

- Hi!

  If you want to help protect owls, you can do many easy things. First, you can volunteer at government agencies, wildlife organizations & zoos toke

care of owls. You can keep count of the owls in your neighborhood as well! You can also make your backyard or property conducive to owls by planting grass to attract rodents & building owl's nest.

C33)

- Family,

  I think that you can help the owls in your yard by putting up a nest box in your backyard. It needs to be 10-15ft in the air. You can make one or buy one. The owls will help control the rodent population. Thanks!

  Thanks!

  P.S. remember to not throw food out the window!

C34)

- Nothing was written

C35)

- Nothing was written

C36)

- Nothing was written

C37)

- Nothing was written

C38)

- Nothing was written

C39)

- Build an owl nest or leave a portion of your property like a natural habitat so rodents will congregate and owls will have prey.

C40

- Build a nest. Don't throw food out window.

C41)

- Hey Cousins, you should put up a pole with a large bird house on it. The pole should be 10 to 5 high. Then don't cut part of your lawn to attract rodents. The owl will will the rodents you are attracting. Hope this starter kit will help!

C42)

- Plant trees (with a picture of a tree with an owl in it)

C43)

- Create a nest for the owl or tell a preservation center for owls

C44)

- Make a nest for them

C45)

- Don't litter! The owls won't hurt you if you don't hurt them.

C46)

- A picture of 2 trees and an owl

C47)

- Nothing was written

C48)

- Nothing was written

C49)

- First, help out the DNR and Wildlife Conservationists. Also, do not throw food out of the car so that owls will not be hit by cars.

C50)

- Nothing was written

C51)

- To help the owls go to a nature center and ask an expert about constructing box nests. Also allow some of your land to grow freely to attract rodents for the owls to eat.

C52)

- Don't throw food out of car. Let apart of your yard grow naturally.

C53)

- To help owls you can put nest boxes, keep track of owls, let areas of property grow up to attract rodents & provide a home to the owls & don't throw food out near roads.

C54)

- Save the owls! Don't throw trash out car window!

C55)

- Dear cousins,

  Please leave a natural area of growth around your house where rodents can live and will attract owls. Please don't throw trash/food out your window. Thanks!

C56)

- Nothing was written

C57)

- Picture of a nest box on a pole which labels the pole 10-15 feet above ground

C58)

- Build a nest box. Allow grass to grow more in a specific area. DON'T THROW FOOD OUT OF YOUR CAR.

APPENDIX F

Postcards from Owl Knowledge-Based Assessment – Treatment Group

Tx1)

- You can allow a little patch of grass to overgrow to allow rodent populations to nest there. The owls will then eat the mice. You can also build an owls nest and put it in your yard.

Tx2)

- You can build a birds house for a owl. You can buy a birds nest for owls. You can keep track of owls in the area and turn it into scientist.

Tx3)

- Build house for the owls. Don't throw food out of the car.

Tx4)

- Nothing was written

Tx5)

- Don't throw out food by the road and help prevent owls being hit by automobiles (picture of car driving with owl swooping down to catch mice).

Tx6)

- Hi cousins,

  I hear that you are interested in helping protect an owls habitat. The best way to do this would be to purchase/construct a nest for the owl and place it approximately 10-15 ft up on a pole. Also, do not throw food out of your car- as this will attract mice & rats to gather near the roadside & owls will fly too close to passing cars. I'm not sure if you use pesticides or not but don't do that either.

  Thanks & good luck

Tx7)

- Hey cousin,

  In order to help owls, you can build/buy them a nest. You could also volunteer with your local DNR. Also don't throw trash along side roadways!

  Love, ******

Tx8)

- Cousin,

  To help them you can set up a place for a hurt owl to live and keep the

grass long to attract mice for your owl. You can also not throw trash/old food out the window of your car because they attract owls and they'll get hit. You can also count the # of hoots and report them to scientists.

Love, *****

Tx9)

- Keep your Apples, Save the Owls!

  Less roadside food scraps lower the chances of owls being hit by vehicles.

Tx10)

- Cousins,

  Some things you can do to help save owls include…

  -Not throwing garbage out window of car, leading to owls being hit by cars.

  -Volunteer time/research for organization (DNR) to provide community more info about owls

  -Build owl nest and place in high tree to provide owl home. Also let grass grow tall in small area to attract mice.

Tx11)

- Dear cousins,

  Google it.

  Love, your cousin

Tx12)

- Cousin,

  Remember the owls from the summer? They're such an amazing raptor & I think we should help protect them by building bird houses. See you soon! (insert owl pic)

Tx13)

- Build bird boxes, don't throw food on the side of the road.

Tx14)

- You can build owl homes just like bird houses! You can build them yourself, or buy one. Get one and put it up in a tree! They'll eat all the rodents by your house!

Tx15)

- Remember throw away your trash not only will it benefit humans, but also save so many owls. Donate and volunteer to places that save wildlife, its worth it.

Tx16)

- To save the owls, build owl nests out of wood from the blueprints you can find on the internet. Hang them in trees on the secluded area of your property.

Tx17)

- Nothing was written

Tx18)

- Nothing was written

Tx19)

- Don't throw food out windows. Build/put up nests. Let some of your land be a natural area

Tx20)

- Help keep bird count. Aid in building nest boxes. Volunteer at shelter. Stop using pesticides & rodent killers. Raise awareness. (drawn picture of owl)

Tx21)

- Dear cousins,

  There is a couple simple things you can do to help the owls. One is make sure you do not litter. That can attract owls near roads. Two is to build nest boxes for the owls!

  See you soon!

Tx22)

- I would tell them to go online and contact/read information from a government agency.

Tx23)

- Build nests! Don't throw food out windows! Volunteer at sanctuaries.

Tx24)

- Nothing was written

Tx25)

- Here's how you can protect owls: Don't throw food on the sides of the road. Avoid using pesticides for rodent control. Volunteer at a nature center

Tx26)

- Conserve a untouched piece of land and avoid food on the side of the road to preserve owls.

Tx27)

- Tell them to not throw food out of their car windows. Go volunteer at government agencies. Put up an owl nest box

Tx28)

- Do not throw food out your car windows: food attracts rodents which in turn attract owls and they have a higher chance of being hit by a car. Volunteer at zoos, forestry centers, etc. You can help keeping track of owls in captivity and rescuing owls from the wild.

Tx29)

- Build or buy a nesting box for owls to live. Do not throw out food on the road that would attract mice which would in turn attract owls.

Tx30)

- Don't throw food from the window with the car. Volunteer at a zoo or local animal shelter.

Tx31)

- Help build an owl nest box (picture of bird house in here.)

Tx32)

- Do not throw food out of vehicle. Let park of your land grow, so that mice or rodents can gather, thus attracting owls. Build owl boxes.

Tx33)

- Do not throw food out by the roadside. Don't put pesticides and rodenticides out.

Tx34)

- Call DNR and get more info. Construct some nesting boxes. Educate people about decreasing numbers. Encourage others to not throw trash out of their vehicles.

Tx35)

- Picture of trees and grass with the words "Keep it NATURAL for the OWLS"

Tx36)

- Help us Help you (owl picture in the corner)

Tx37)

- You can help save owls in several ways. One way is to not throw food out of your car. Another is to build an owl house on your property. And finally you can volunteer and help out the owls.

Tx38)

- Throw your trash away from your house and away from the roads so the rodents will go there to get the old food, then owls will rid of the rodents for you!

Tx39)

- Make a owl house, let part of your land grow naturally, count and report owl calls, volunteer at a zoo.

Tx40)

- Go to an outdoor information center to find out how to construct an owl "home." Put it in your backyard 15-20 feet up a tree. Also, never throw food out your car while driving! This will help protect the owl population!

Tx41)

- Go online and find out how to build nest boxes for them. They will really appreciate it, not to mention they will keep all the mice out of the house

Tx42)

- Picture of person in car throwing food out with caption “Don’t throw food SAVE the Owls!!!”

Tx43)

- You can purchase a nest area to set up in your yard to provide a home. You may also leave a section of your property completely natural and unharmed attracting rodents to that area, letting the owl prey on them as a reliable food source. Finally, while driving, make sure not to throw food scraps out the window. This will prevent rodents from being attracted to the road and in turn stop owls from hunting them in the roads, limiting the number that will be hit by cars.

Tx44)

- You can help save owls by not throwing food out of your car. Then the food won’t attract rodents that attract owls near roadways.

Tx45)

- To help save owls, don’t throw food out your car window. The food will attract rodents which in turn attracts owls to the side of the road. If an owl is flying close to the ground by the road, they will face a great risk of being hit and possibly killed.

Tx46)

- Save the owls! Do not poach, shoot, or kill owls. They are necessary to our society and without them we would have too many rodents, so save the owls! Protect our beloved Henry!

Tx47)

- First thing you'll can do is to not lay out poison that kills small rodents because the owls eat the rodents and it will harm them. The second thing is possibly create a good living environment such as letting the fields thicken up, or create poles with nest type thing on the end of it so they can live in a safe home.

Tx48)

- Hey cousins,

  I learned about owls today and I wanted to let you know how you can help. Don't throw food out of your car window while driving, it attracts rodents which attracts owls. Another thing is that you can get an owl nest box and put in your back pasture by the woods so that the owls can live there. Hope this helps!

  Me ☺

Tx49)

- Giant picture of an owl with the caption "Save the Raptors"

Tx50)

- Stop using pesticides. Let you grass grow naturally. Don't throw food outside.

Tx51)

- What can you do to help owls is not throw food out of the car window while driving because that attracts rodents, which attracts owls, which causes the owls to get hit by cars. Also, if you own a lot of land, let some of it grow up to where the rodents can live so the owls can safely hunt. Also, build names for them on your land so they can have somewhere to live.

Tx52)

- Aunt *****,

  Please leave some part of your woods around your house as untouched as possible. For the owls to survive, they have to stay in their native habitat!

  Love, *****

Tx53)

- Hi cousin,

  I hear you're interested in helping out Henry, the barred owl. Due to your state's sub-par educational system, you probably have no idea where to start. That's ok, I've got some tips for you! 1) leave a section of your yard clear so that mice can play. 2) build some owl boxes on your property. They have plans for them online. Since you probably don't know what

"online" is you can probably pick one up at the Home Depot or something. 3) Next time you eat at the Burger King, don't throw your trash out the window, ya "fuckin" litterbug. That shit'll attract prey, increasing the frequency of car-owl collisions. (I've drawn an illustration below to help you out). 4) get off your ass and volunteer at a nature center – you know you've got some time before the NASCARS come on. I hope this info helps. Please give my regards to your wife, Trish, who also happens to be my cousin.

Insert picture of Henry before and after car collision

APPENDIX G

Questionnaire and Answer Key

Thank you so much for your participation in this questionnaire. This survey is utilized to assess knowledge of owls where the data will be used for thesis research. Again, your responses will be ANONYMOUS and are greatly appreciated. This questionnaire will take approximately 20-25 minutes to complete. Please answer each statement to the best of your knowledge based on what was shared by the educator. Once you are done, there will be a page asking you to provide some background information. Names are not required. Once completed, please wait patiently until your questionnaire is collected. Again thank you and you may begin.

In this section, we are covering the characteristics of raptors. The questions are multiple choice. Please select the single, one best answer.

1. Raptors are also known as...

- ◯ Song birds
- ◯ Birds of prey
- ◯ Wading Birds
- ◯ Shore birds
- ◯ Waterfowl

2. Raptors predominantly find their food while...

- ◯ Standing in the water
- ◯ Digging through the soil
- ◯ Swimming
- ◯ Flying
- ◯ Hiding and waiting in dense vegetation.

3. Raptors primarily eat...

- ◯ Vertebrates (mammals, reptiles, birds)
- ◯ Fruit
- ◯ Seeds and nuts
- ◯ Insects
- ◯ Plant leaves

4. The shape of a raptor's beak is...

- ◯ Small, conelike
- ◯ Thin, straw-like
- ◯ Large, triangular
- ◯ Spoon-like
- ◯ Sharp, hooked

In this section, we discuss basic information on owls specifically. The questions are multiple choice. Please choose the single, one best answer.

5. The number of living species of owls is...

- ◯ 90
- ◯ 147
- ◯ 200
- ◯ 350
- ◯ 473

6. A group of owls is called a ...

- ◯ Herd
- ◯ Flock
- ◯ Gaggle
- ◯ Pride
- ◯ Parliament

7. The number of bones in an owl's neck is...

- ◯ 14
- ◯ 12
- ◯ 7
- ◯ 17
- ◯ 5

8. What does an owl do with the bones, feathers, and fur of its prey when it is done eating?

- ◯ Bury them to avoid scavengers
- ◯ Use them to help build a nest
- ◯ Regurgitate them in the form of a pellet
- ◯ Leave them where it was eating
- ◯ Hide them for later consumption

In this section, we are covering owl behavior. The questions are multiple choice. Please select the single, one best answer.

9. An owl cleans its feathers to...

- ◯ Make it look attractive for a mate
- ◯ Better hide in its surroundings
- ◯ Express a sense of happiness
- ◯ Prevent microbes from growing
- ◯ Prepare itself for flight

10. An owl bobs and weaves it head to...

- ◯ Stretch the neck out in order to turn it
- ◯ Get a 3D picture of what it sees and triangulate what it hears
- ◯ Attract a mate
- ◯ Scare off predators
- ◯ Communicate with one another

11. Owls can produce all of the sounds EXCEPT....

- ◯ Hoots
- ◯ Whistles
- ◯ Howls
- ◯ Screams
- ◯ Screeches

12. Owls fly low to the ground and water to...

- ◯ Acquire heat from the ground/water
- ◯ Attract a mate
- ◯ Gather together in a group
- ◯ Search for prey
- ◯ Hide from predators

You are on the halfway mark here! In this section, we are discussing owl adaptations. The questions are multiple choice. Please choose the single, one best answer.

13. An owl can rotate its head.....degrees.

- ◯ 360 degrees
- ◯ 90 degrees
- ◯ 180 degrees
- ◯ 240 degrees
- ◯ 270 degrees

14. Owls possess a large amount of rod cells in their eyes which help see...

- ◯ Heat
- ◯ Light and movement
- ◯ Ultraviolet light
- ◯ Color
- ◯ Objects very far away

15. Owls have comb-like edges on the feathers on their wings to...

- ◯ Cool down in warm weather
- ◯ Attract a mate
- ◯ Camouflage in its surroundings
- ◯ Scare away predators
- ◯ Fly silently

In this section, we are measuring your knowledge of barn owls specifically. The section is multiple choice. Please choose the single, one best answer.

16. The average life expectancy of a Barred owl in the wild is...

- ◯ 10-13 years
- ◯ 7-9 years
- ◯ 17-20 years
- ◯ 3-5 years
- ◯ 22-25 years

17. Barred Owls can be found in all of the following states EXCEPT...

- ◯ New Mexico
- ◯ Louisiana
- ◯ Wisconsin
- ◯ New Jersey
- ◯ Texas

18. Barred owls are known to live in all of the following places EXCEPT...

- ◯ Church steeples
- ◯ Hollow cavities in trees
- ◯ An old squirrel's nest
- ◯ An abandoned crow's nest
- ◯ On branches in thick foliage

19. The shape of a barred owl's beak allows it to....

- ◯ Smell the air more efficiently
- ◯ Have a clear field of vision
- ◯ Not block sound from its ears
- ◯ Feel insects fly by in order to catch them
- ◯ Have an acute sense of taste

20. The feathers on a barred owl's face allows it to...

- ◯ Allow air to reach its nose faster
- ◯ Prevent its nestlings and prey from poking out its eyes
- ◯ Attract low levels of light to its eyes
- ◯ Funnel and block sound from its ears
- ◯ Fly more aerodynamically

In this section, we are returning to owl adaptations. The questions are multiple choice. Please choose the single, one best answer.

21. The facial discs of an owl are used to...

- ◯ Direct light towards its eyes
- ◯ Catch breezes and direct them towards its nose
- ◯ Focus its eyesight
- ◯ Sense vibrations
- ◯ Direct sound towards its ears

22. The ears of an owl are asymmetrical to....

- ◯ Gather sound and create a sense of depth perception
- ◯ Gather sound above and below the owl simultaneously
- ◯ Gather sound from the left and right sides independently
- ◯ Amplify the sound gathered
- ◯ Prevent parasites from entering

23. The talons of an owl are used to....

- ◯ Grasp and at times kill its prey
- ◯ Cut out a cavity in a tree
- ◯ Collect water to drink
- ◯ Attract a mate
- ◯ Carry nestlings from one nest to another

24. One of the front toes on the foot of an owl is able to rotate to the back part of the foot to....

- ◯ Grasp onto a perch
- ◯ Hollow out a cavity in a tree
- ◯ Help grasp prey
- ◯ Help create a threat display
- ◯ Dig up a burrow

You are almost done! In this section, we are covering owl-human relations. The questions are multiple choice. Please choose the single, one best answer.

25. Owls help keep agricultural pest numbers down. In one year, a barred owl can eat...

- ◯ 500 mice
- ◯ 2000 mice
- ◯ 250 mice
- ◯ 9000 mice
- ◯ 12000 mice

26. Owls are brought into captivity due to all of the following incidents EXCEPT

- ◯ Being attacked by natural predators
- ◯ Being shot
- ◯ Being hit by a car
- ◯ Flying into barbed wire
- ◯ Poaching

27. Owls can become sick from pesticides and rodenticides by...

- ◯ Drinking contaminated water
- ◯ Breathing contaminated air
- ◯ Touching contaminated plants
- ◯ Eating contaminated prey
- ◯ Living in contaminated areas

This is the last section. We are discussing owl conservation and what people can do to save the owls. This is an open-ended answer section. Please write down the best answer.

28. Imagine that you are writing a postcard to cousins living in Pennsylvania. The outdoors around their home looks similar to the outdoors here. You all heard some owls hooting over the summer which intrigued your cousins. They decide to help the owls in Pennsylvania. However, your cousins do not have any information on how to protect and help owls. Based on today's presentation, construct a postcard where you explain to your cousins what they can do to help save owls.

Please tell us a little about yourself and then you are done!

29. Do you currently own any pets?

- ◯ Yes
- ◯ No

30. If you answered yes to the question above, what kind of pets do you have?

31. Have you ever visited a zoo, aquarium, or nature center?

- ◯ Yes
- ◯ No

32. Have you ever experienced a presentation that used animals as part of the act?

- ◯ Yes
- ◯ No

33. What is your permanent (where you live most of the year)residence?

34. You are a...

- ◯ Male
- ◯ Female

35. What area are you from?

- ◯ Rural
- ◯ Suburban
- ◯ Urban

36. In what year were you born?

Thank you so much for completing the questionnaire! Your responses will stay anonymous and will greatly help with thesis research. Once you are finished, you may turn in the questionnaire to the proctor. Again thank you and have a great day!

Owl Knowledge Assessment Questionnaire
Answer Key

1. Birds of prey
2. Flying
3. Vertebrates
4. Sharp, hooked
5. 200
6. Parliament
7. 14
8. Regurgitates them in the form of a pellet
9. Prepare itself for flight
10. Get a 3D picture of what it sees and triangulate what it hears
11. Howls
12. Search for prey
13. 270
14. Light and movement
15. Fly silently
16. 10-13 years
17. New Mexico
18. Church steeples
19. Have a clear field of vision
20. Funnel and block sound from its ears
21. Direct sound to its ears
22. Gather sound and create a sense of depth perception
23. Grasp & at times kill prey
24. Help grasp prey
25. 2000
26. Being attacked by natural predators
27. Eating contaminated prey