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Effective Methods For Using Live Animals For Instruction In Environmental Education

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EFFECTIVE METHODS FOR USING LIVE ANIMALS FOR INSTRUCTION

IN ENVIRONMENTAL EDUCATION

by

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"It is our collective and individual responsibility…
to preserve and tend to the world in which we all live."
- Dalai Lama

"An animal's eyes have the ability to speak a great language."
- Martin Buber

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CHAPTER ONE

Introduction

Humans have long had a fascination and interest in wild animals. Viewing them in their natural setting is a site to behold, and of course humans want to learn more. Where do they live? What do they eat? How long is their lifespan? To help the public learn more, live animals have been incorporated into environmental education programming at day-use nature centers, zoos, or residential environmental learning centers. But what are the best ways to utilize these animals to provide a meaningful learning experience? I have investigated the research question, *what are the most effective methods for using live animals for instruction in environmental education?*

Personal Background

Since a very young age, I have had a personal interest in animals. When people asked what I wanted to be growing up, I had the same answer as many other kids in my generation, a marine biologist. Specifically, I wanted to care for and train dolphins. My career choice switched to fourth grade teacher as I got older because it had been my favorite year in school. But while applying for college, my focus shifted back to science after taking a trip to a marine center in the Florida Keys through my high school's biology program. Our days were spent snorkeling and exploring different habitats and the evenings were spent studying fish and coral species. The content of the trip itself was

fascinating, but I didn't have a true love for fish. Nevertheless, that experience was an amazing exposure to hands-on, experiential learning, and it fueled my desire to learn more about the world around me.

Once in college, I declared a biology major without any clear career goal. I knew I was not aiming to attend a master's program or go into research, so instead I chose classes that were interesting to me, including Conservation Biology, Plant Morphology, and Animal Behavior. The class with the greatest long-term impact for my eventual career was Zoo Biology, taken my senior year. In a single month, we spent multiple days a week visiting the Minnesota Zoo in Apple Valley, Minnesota. We learned about the history of zoos, conducted a research project about one of the animal species, and met with zoo staff to hear about career paths. The path that stood out to me was led by a member of the education team. He brought up the term "environmental education" and explained that his team had developed and implemented the educational programs for the zoo. Having loved the time I spent as a camp counselor in college, something clicked during his presentation; this could be a great career for me. The field of environmental education would allow me to combine my enjoyment of working with children along with my interest in a wide variety of biological topics.

I researched jobs in environmental education in Minnesota and chose a school-year job as a Wildlife Intern at the Audubon Center of the North Woods (ACNW) in Sandstone, Minnesota. ACNW is one of six residential environmental learning centers (RELCs) in Minnesota. An RELC offers an immersive learning experience, allowing students (and their teachers) to visit with their entire grade and stay overnight for one to five nights. While in residence, students take day classes with science, history, and

adventure themes. In the evenings, programming often includes interpretive presentations and hands-on activities, much like the facility I visited in Florida as a high-schooler. My job as a Wildlife Intern was to instruct students during day classes and present one-hour programs in the evening with ACNW's resident birds of prey. The animal education portion of the job was something I quickly came to love the most. For many students, this was the first time they'd had the chance to see a great-horned owl or red-tailed hawk up close. It was amazing to be able to watch their reactions to a bird standing on my glove, shaking out its feathers, or even pooping.

I enjoyed the job so much that I pursued jobs at other RELCs in both Minnesota and California. I continued to develop my skills as an educator during the day classes, and I made sure I would have the opportunity to use birds of prey as a part of the center's educational programming. In 2012, I got a permanent job as the Raptor Program Coordinator at Eagle Bluff Environmental Learning Center in Lanesboro, Minnesota. The center has four resident birds of prey that are held under permits from the U.S. Fish and Wildlife Service (USFWS) and the Minnesota Department of Natural Resources (DNR). The permits state that the birds are non-releasable due to permanent injuries and are to be utilized for educational programming. They will live the rest of their lives in captivity, educating the public. Annual reporting through both the DNR and USFWS is required to show how often the center uses the birds and with what audiences.

Project Context and Rationale

At Eagle Bluff, we mostly utilize our raptors during a one-hour interpretive program that focuses on basic raptor characteristics and adaptations for school audiences ranging from kindergarten to twelfth grade. The program is executed twice a week for the

majority of visiting school groups. Adult groups also experience our program about ten times per year. In 2017, we presented 111 programs to 10,935 people! We receive feedback from each group about the program, which is consistently favorable.

- "*Raptors* was informative and great. Kids love seeing the hawk eat, and it was fun to see the kestrel in the program.*"* - Visiting 7th grade teacher
- "*Raptors* was great; a very quiet student got to feed the hawk and it was wonderful to see her come out of her shell." - Visiting 6th grade teacher

The staff members that present the Raptor Program have a variety of experience with bird handling, but each member consistently receives this favorable feedback no matter how long they have been presenting with the birds. Of the five staff involved, three are permanent education staff at Eagle Bluff and have been presenting raptor programs for a minimum of seven years. The other two are Fellowship Naturalists, who are seasonal staff hired for one to two years. They are usually recent college graduates, often in their first year or two of teaching in environmental education, and have to apply to be a raptor handler after they have arrived. As the Raptor Program Coordinator, I personally select who joins the presentation team. New staff go through about two months of training with the birds before they present their first program. This is interesting to note because during my time as the Raptor Program Coordinator, the Fellowship Naturalist presenters receive the same amount of positive feedback as the seasoned members of the team, regardless of the number of times they have presented the program. To me, this implies that experience as an educator and presenter is not necessarily the main factor for a successful program; it is the presence of live animals.

We receive similar positive feedback for our live animal reptile program, but when comparing feedback for all of the live animal programs to the other nine evening programs that Eagle Bluff offers, the feedback can vary. At times the feedback we receive about these other nine programs, which include topics such as cave ecology, white-tailed deer, and star stories, is very positive, but often when compared to the Raptor Program, they usually are not as popular with the audiences. Here is some of the feedback the programs received in 2017:

- "*Raptors* [is] always a good program. *Caves* content was good but didn't hold everyone's interest." - Visiting 9th grade teacher

- "*Bats* had good info, debunked myths, [instructor] did a nice job. *Raptors* was awesome. Live animals wins every time. [The instructor] was so calm with the animals, it was amazing." - Visiting 7th grade teacher

- "Both *Coyotes* and *Raptors* were great. Kids were clearly more inherently engaged in raptors. *Coyotes* had a lot more side conversations, but wouldn't put that on the instructor." - Visiting 8th grade teacher

- "It was very difficult for our students to sit the entire time and be in a presentation, sit and listen setting during *Bats*. *Raptors* was very good and kept the kids more engaged." - Visiting 5th grade teacher

- "[Name] did a very nice job with *Whitetails*, but the program itself could use a little spark, something to energize the students. More movement. *Raptors* was good. A nice combination of getting kids involved. It is a fascinating subject. Live animals are great." - Visiting 5th grade teacher

As you can see from the above comments, the feedback for the non-live animal programs isn't necessarily negative, but it is generally less positive than the Raptor Programs. The Raptor Programs do not actually have more hands-on activities, movement, or student volunteers than the non-live animal programs--in fact, they often have less due to time constraints of using live animals. However, because live animals make the Raptor Program more engaging, the commenters perceive the program to include more hands-on activities. The rest of the presentations offered are all led by the Fellowship Naturalists eleven months of the year, who are typically new to the interpretation field. Sometimes, the new staff members arrive with confident delivery techniques, while others must dedicate more time to developing a successful style. Therefore, it may not be fair to our less confident staff members to be expected to be equally as engaging in their non-live animal presentations.

Eagle Bluff's education team meets once a month to review teacher feedback, and we noticed this trend after reading many comments like the ones above. The education team decided to minimize the number of programs available for schools to choose from and acquire more education animals to use in these interpretive programs. This was done not only because of the consistent comparison feedback but also because new educators primarily give our evening programs. By including more live animals, we anticipate that our programs will become more inherently engaging to the point that the experience level of the presenter will not be as critical.

In addition to increasing the amount of live animal programs, we also wanted to go more in depth about specific topics and diversify the available programs with the animals we currently have. For example, instead of offering a general program about

raptor species and characteristics, we were interested in diving deeper, perhaps offering a

program that focuses on predator/prey relationships and includes a red-tailed hawk and a

fox snake. Through this capstone project, I developed three new live animal interpretive

programs to educate our users in the most effective and engaging way. These new

programs were also developed to fulfill Eagle Bluff's mission "to empower people to

care for the earth and each other" (Sturgis, 2018). Our goal is to increase environmental

awareness and understanding of birds of prey in order to promote long-term stewardship.

Deciding on three new program topics, creating a script, and creating new presentation

slides for these programs was the easy part. I researched how to use live animals most

effectively in presentations to ensure that these new programs had long-term impacts on

the participants. By using previous research on the use of live animals, considerations

were made to include best practices as I developed the topics, activities, and themes for

each program. This was especially appropriate as I have found that the youth we work

with today are increasingly distanced from connecting with nature. It was my hope that

the live animals would be a tool to drive interest and create further care for the

participants' local environments.

Summary

The first chapter focused on my personal background, the context in which Eagle

Bluff uses birds of prey, and why the organization has identified a need to diversify its

program offerings. I discussed how my personal interest and profession experience led to

my research question, *what are the most effective methods for using live animals for*

instruction in environmental education? The second chapter explores and reviews the

goals and tenets of environmental education and to what extent live animals improve a

learner's long-term understanding. Chapter three provides context for the curriculum

framework and educational setting where the project is implemented, and chapter four is

a reflection of the capstone project experience.

CHAPTER TWO

Literature Review

To guide the construction of my capstone project, this chapter reviews the literature related to my research question, *what are the most effective methods for using live animals for instruction in environmental education?* The chapter discusses the tenets of effective environmental education by exploring the history and guiding principles of the field. It provides context for effective environmental education practices, both in general and specifically with the use of live animals as educational tools. Finally, it explores how environmental education, interpretation, and live animal education could be integrated into an effective program for students in grades four through eight.

Environmental Education (EE)

My capstone project will be utilized within the context of environmental education (EE). Because 'environmental' and 'education' are both broad in nature, it is important to start by defining what EE is, including its goals. Finally, this section includes a review of pertinent literature in order to see what aspects of EE have been the most effective.

Defining Environmental Education and Its Goals

A definition of EE was first developed and published in *The Belgrade Charter* by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Environment Programme (UNEP) in 1975. When compared to the current

2018 definition listed on the U.S. Environmental Protection Agency's (EPA) website, one

will find many similarities. Both sources state that EE is a process that does not aim to

simply inform the public about current issues, but equip and prepare individuals with the

ability to manage, solve, and prevent environmental problems (EPA, 2018; The Belgrade

Charter, 1975, p. 3).

The overarching objective of EE is included in its definition, but other goals have

been elucidated: awareness, knowledge, skills, attitude, and participation. An EE

experience should foster a clear awareness and concern about ecological issues and

provide every person with opportunities to acquire more knowledge, skills, and values in

order to protect and improve the environment. These opportunities can lead to changes in

the attitudes and actions of individuals, groups, and society as a whole to create new

patterns of participatory behavior in support of the environment (Altham & Monroe,

2001; Carter & Simmons, 2010; Environmental Protection Agency (EPA), 2018;

Simmons et al., 2009; Thomson & Hoffman 2003). In addition, EE should not advocate

for a specific viewpoint with those goals; rather, it should teach critical thinking and

problem-solving skills to enhance an individual's ability to weigh multiple viewpoints

and make an informed decision (EPA, 2018).

Characteristics of Effective Environmental Education

Knowing the characteristics of EE is just as important as understanding EE and its

objectives. Characteristics, when applied in combination with the goals of awareness,

knowledge, skills, attitude, and participation, allow educators to plan appropriate

programming for their audiences (Thomson & Hoffman, 2003). The next section

discusses what the literature emphasizes as being important characteristics.

I went through thirteen literature references and made a list of what characteristics each source listed as important for effective EE. There were two types of literature utilized to compile characteristics. First, there were resources that came from published literature, such as books, journals, and independent publications released by organizations and experts in the field. Some of the published articles were designed to be resources for environmental educators, and others that gather results from research, that combine findings and present them as recommendations (Blumstein & Saylan, 2009; Chawla & Cushing, 2007; Horowitz, 2013; Hungerford & Volk, 1990; North American Association for Environmental Education (NAAEE), 2009; Palmer, 1996; Thomson & Hoffman, 2003; White & Stoecklin, 2008; Wilson, 2011). Second, there are resources from results-based research. The data from the research papers help to support the recommendations and guidelines from the experts and organizations (Better Environmental Education, Teaching, Learning & Expertise Sharing (BEETLES), 2018; Chawla, 1999; Drissner, Haase, Rinderknecht, & Hille, 2013; Torkar, 2014). Combining content from varied sources written for and by different audiences provides a reliable base for defining effective characteristics of EE.

EE Characteristic	Resources
1. Participants are challenged to take individual and collective action as a result of the learning process	Athman & Monroe, 2001; Blumstein & Saylan, 2009; Chawla & Cushing, 2007; Hungerford & Volk, 1990; Palmer, 1996; Thomson & Hoffman, 2003; White & Stoecklin, 2008; Wilson, 2011
2. The information must be relevant for the audience	Athman & Monroe, 2001; Chawla & Cushing, 2007; Hungerford & Volk, 1990; NAAEE, 2009; Thomson & Hoffman, 2003; White & Stoecklin, 2008; Wilson, 2011
3. Environmental Education programs must be credible and include viewpoints from multiple perspectives	Athman & Monroe, 2001; Blumstein & Saylan, 2009; Chawla, 1999; Hungerford & Volk, 1990; NAAEE, 2009; Palmer, 1996; Thomson & Hoffman, 2003
4. The organization is utilizing the best educational practices	Athman & Monroe, 2001; BEETLES, 2018; Chawla, 1999; Chawla & Cushing, 2007; Hungerford & Volk, 1990; Palmer, 1996; Thomson & Hoffman, 2003; Torkar, 2014; White & Stoecklin, 2008; Wilson, 2011
5. EE fosters the role of active stakeholder	Athman & Monroe, 2001; Chawla, 1999; Chawla & Cushing, 2007; Thomson & Hoffman, 2003; Torkar, 2014; Wilson, 2011
6. EE experiences should enhance empathy for the plants, animals, and the environment, which leads to emotional connections; this has the most effective long-term impact if this happens when the learner is young	Chawla, 1999; Drissner, Haase, Rinderknecht, & Hille, 2013; Horowitz, 2013; Palmer, 1996; Torkar, 2014; White & Stoecklin, 2008; Wilson, 2011
7. EE is more successful when it includes families and role models	Chawla, 1999; Chawla & Cushing, 2007; Torkar, 2014; Wilson, 2011
8. EE programs should be in a continual process of evaluation and improvement	Athman & Monroe, 2001; Blumstein & Saylan, 2009; NAAEE, 2009; Thomson & Hoffman, 2003

Figure 1. EE Characteristics with Resources. Figure 1 displays the eight characteristics of effective environmental education as listed in the literature.

Figure 1 displays the entire list of EE characteristics with their accompanying resources. The next section provides more detail and context about each characteristic.

Participants are challenged to take individual and collective action as a result of the learning process. The 'superordinate' goal of effective EE is that it should aid citizens in becoming environmentally knowledgeable and skilled, and it inspires them to work individually and collectively towards environmental quality (Hungerford & Volk, 1990). As previously discussed, a major goal of EE is to create awareness and knowledge, but research has found that these skills alone do not lead to a successful program because EE is not simply an informational process; it should prompt individuals to be actively involved (Athman & Monroe, 2001; EPA, 2018). Wilson (2011) stated that by giving people a personal sense of competence as well as a belief in their collective competence, they will be more likely to engage in pro-environmental behavior. This includes empowering participants through developing knowledge and understanding for decision-making, planning, and taking action. Furthermore, by teaching students not 'what to think' but 'how to think,' they are more likely to feel empowered to participate in debates and adopt pro-environmental behaviors (Athman & Moore, 2001; as cited in Thomson & Hoffman, 2003, p. 11; Palmer, 1996).

A study done by Drissner, Haase, Rinderknecht, & Hille (2013) illustrates this process. Drissner et al. evaluated the outcomes of a half-day learning experience at a facility called the Green Classroom, located in the Botanical Garden of the University of Ulm in Germany. First, students learned about small invertebrates by exploring various habitats and then observing the creatures through magnifying glasses. Throughout the lesson, information was introduced about each invertebrate, and students were prompted

to complete assignments specific to their grade. Students were asked about the invertebrates one week after their experience and months after their experience. Results from both studies demonstrated that hands-on, experiential education provided students with a valuable, formative learning experience, helping to develop opinions and emotions towards specific animals. Over time, because they have a stronger knowledge base and more positive attitudes towards those animals and their importance, that could mean that students are more likely to take action to protect those species.

Even individuals as young as twelve can understand their connectedness to society and feel inclined to save the world (Wilson, 2011). Therefore, providing opportunities for students to get involved should be focused at the local level, where they can relate to the outcomes and actually see for themselves how their behaviors can lead to results (Chawla & Cushing, 2007; White & Stoecklin, 2008). Blumstein and Saylan (2009) and Chawla and Cushing (2007) provided an example of how students might participate in relation to human consumption habits. These habits are not typically focused on in EE programs, but the U.S. has high energy consumption per capita and pollution emissions (Blumstein & Saylan, 2009). Therefore, Blumstein and Saylan (2009) and Chawla and Cushing (2007) recommended that an emphasis on changing consumption habits should be included as an action step.

Because this first characteristic, p*articipants are challenged to take individual and collective action as a result of the learning process,* relates most directly back to the main goal of EE, it was listed and discussed first. The remaining seven characteristics represent the various puzzle pieces needed to compile the big picture of this first

characteristic. If all of the characteristics are carried out effectively, they help lead to individual and collective action.

     The information must be relevant for the audience. Wilson (2011) and NAAEE (2009) explained that learning happens most effectively if the subject matter is perceived by the learner as being personally relevant. By grounding programming in a real-world context specific to age and place, participants are encouraged to gain a personal affinity with the earth; this is especially effective when it is hands-on (as cited in Thomson & Hoffman, 2003, p. 10). Rather than looking across the world to learn about a topic, it is more useful to study what is in the participants' own backyard. For example, a program for students in Florida on endangered species that highlights the manatee will be more effective than learning information about Siberian tigers. Tigers, pandas, and rhinos are engaging, charismatic megafauna, but if students spend too much time focusing on what is happening outside of their own community across the world, they may not would not know what is happening to their local species and habitats until it is too late (Athman & Monroe, 2001). Also, according to White and Stoecklin (2008), if educators teach about nature in the context of far off distant places that are not a part of a learner's regular experience, the learners limit their idea of what nature is to those locations and not to what is in their local environments.

     Providing relevant information seems especially important when considering the first principle listed. If learners are supposed to take individual and collaborative action, they need to first be aware of their own environment so they know what appropriate actions to take. Allowing students to get outside and explore nearby environments helps them develop a sense of wonder and place, which fosters awareness and appreciation. In

turn, this motivates them to question further and take appropriate action to support their local environments (Athman & Moore, 2001).

Environmental Education programs must be credible and include viewpoints from multiple perspectives. Information presented in EE programs must be based on a foundation of quality instructional materials that are credible, reputable, and based on facts, traditional knowledge, or science (as cited in Thomson & Hoffman, 2003, p. 10; NAAEE, 2009). The idea is to provide a lesson that results in an in-depth understanding of the concepts and issues (Hungerford & Volk, 1990). Highly valued skills by environmental professionals include being familiar with all sides of the issue in addition to knowing the facts. This perspective balance makes finding and defending solutions to relevant environmental problems more likely (Chawla, 1999).

Athman and Monroe (2001) also explained that over-discussing the issues can intimidate children. Menzies explained that EE too often seems to focus on the imminent danger of our planet and how we must work immediately to save it (as cited in Athman & Monroe, 2001, p. 41). This teaching strategy can be overwhelming for young environmentalists. Instead, by providing well-documented facts that come from multiple viewpoints, students learn in a balanced way that encourages inquiry, exploration, and formation of individual opinions (Athman & Monroe, 2001).

The Better Environmental Education, Teaching, Learning & Expertise Sharing Program (BEETLES) (2018) has stressed the importance of students making careful observations, asking questions, and searching for evidence. By emphasizing scientific habits and reasoning skills, students are able to better understand science, critically think about new information, and deepen their relationship with the natural world. If educators

use scientific language, students will copy, increasing environmental literacy (BEETLES, 2018).

Therefore, when designing programming, a lesson also needs to be well-balanced, incorporate multiple perspectives, and be interdisciplinary in nature (Athman & Monroe, 2001). These perspectives are encouraged to be scientific, geographical, historical, social, economic, political, moral, and respectful of the diversity of values in our society (Blumstein & Saylan, 2009; as cited in Thomson & Hoffman, 2003, p. 10; Hungerford & Volk, 1990). Palmer (1996) clarified that "the environment is not just plants, animals, and the physical world: it is also people and social structures (p. 109)." Presenting the picture at large with multiple, factual viewpoints will help learners have a better understanding of the issues and how they're connected.

The organization is utilizing best instructional practices. While all of the characteristics relate to best educational practices, this characteristic is specifically discussing techniques used while instructing a group of students. The sources highlight multiple instructional practices which should:

- Match children's developmental needs and cater to multiple learning styles as children work best when using hands-on, sensory-based techniques that encourage self-discovery (Athman & Monroe, 2001; as cited in Thomson & Hoffman, 2003, p. 10; White & Stoecklin, 2008; Wilson, 2011).

- Promote student-centered, free-choice learning. When an environmental educator allows the students, not the teacher, to take control over the what, when, and why of learning, it allows and encourages students to focus on their interests and as a result, promote lifelong learning (BEETLES, 2018). When students discover the

answers for themselves, they will be more likely to remember the connections long-term. (as cited in Thomson & Hoffman, 2003, p. 10; Wilson, 2011).

- Eliminate misconceptions and counteract stereotypes. Students often come in with a knowledge base that is varied. Making sure everyone is on the same page and clarifying biased ideas is important before moving forward. (Athman & Monroe, 2001; Palmer, 1996). This can be done through the use of formative and summative assessments, prompting students to make observations, provide evidence for their statements, and apply their ideas in new situations (BEETLES, 2018).

- Include discussions in order to help process ideas and actions. Students are more likely to discover the answers for themselves and eliminate misconceptions when they are working cooperatively with their peers in small groups. They are able to focus on basic nature knowledge at first and then expand to include environmental issues as they get older (Torkar, 2014). Talking through issues and reaching a consensus while showing consideration for other ideas is a very successful learning tool (Athman & Monroe, 2001; Chawla & Cushing, 2007; Wilson, 2011).

BEETLES (2018) has stated that student discourse needs to be intentionally included throughout activities. Discussions are useful for students because they help build on prior knowledge, encourage divergent thinking, and challenge the strength of their evidence. Instructors benefit from student discourse as well; they are given a window into students' thought processes, which allows them to lead future discussions and activities more effectively and provide context

from different viewpoints when applicable. Students are not generally used to so much discussion, so instructors must set guidelines, use broad questions, be non-judgmental as they respond to ideas, and express genuine interest in what the students share (BEETLES, 2018).

- Teach students critical thinking skills, i.e. how to think, not what to think. Beginning with hands-on instruction, students are encouraged to be the teachers while the educators are there to help guide and facilitate discussions. This challenges students to develop higher order thinking skills (as cited in Thomson & Hoffman, 2003, p. 10). An effective EE program builds critical thinking opportunities like discussion routines and opportunities to apply concepts into curriculum (Athman & Monroe, 2001; BEETLES, 2018; Blumstein & Saylan, 2009; Hungerford & Volk, 1990).

- Help form social connections. EE is not just an individual learning process. Instructors should utilize their lessons to help create a supportive social network for students that allows them to build trust, foster friendships, and have fun in the process (Chawla, 1999; Chawla & Cushing, 2007). For older students, giving them the opportunity to socialize and be with friends may even be a motivating factor for engaging with the environment (Chawla & Cushing, 2007; Wilson, 2011).

The North American Association for Environmental Education (NAAEE) (2009) added that these effective instructional strategies may not be utilized unless the staff members are well-trained. Curriculum should include best practices, and the organizations should teach their staff how to effectively utilize those teaching techniques.

For example, at Eagle Bluff, our staff members are trained in the fundamentals of EE through graduate coursework supported by a local university. New educators attend seminars each Friday during their first three months on the job to learn about effective teaching practices. They are also formally observed, evaluated, and receive ongoing feedback regarding teaching effectiveness.

EE fosters the role of active stakeholder. The sources in support of this characteristic made a distinction between participant action and fostering the role of active stakeholder; the authors pointed out that if learners are to make a change as a result of attending an EE program, the skills need to be developed, nurtured, and promoted (Athman & Monroe, 2001; Chawla, 1999; Chawla & Cushing, 2007; Thomson & Hoffman, 2003; Torkar, 2014; Wilson, 2011). Research shows that it is important for children as young as six to be encouraged to become active decision makers (Wilson, 2011). Children need to believe in their own capacity and be optimistic about the future; the more involved they are, the more likely they are to feel optimistic about the future (Wilson, 2011).

Two studies done by Chawla (1999) and Torkar (2014) interviewed adults in the environmental fields to discover what experiences led them to their pro-environmental roles as adults. Key moments as children were important influencers for participants, and this was in part due to time spent outdoors from a young age. These locations include where they grew up (rural), vacations taken with families, opportunities to explore outside, or enjoying activities like hiking, gardening, and camping, among others. The participants emphasized that the opportunity to let their love for the outdoors flourish led them to their environmental career (Chawla, 1999; Torkar, 2014).

In addition, they students should be taught manageable ways to be involved with the environment by prompting them to make their own choices about problems, encouraging them to assess the opinions of others, and providing opportunities for people to apply action skills successfully. Participants in the Torkar (2014) study suggested projects involved with recycling, sustainable energy use, providing bird feeders in winter, and cleaning school grounds. Additionally, the Norwegian adults in the Chawla (1999) survey placed the most value (88%) on the effectiveness of joining an environmental organization. Chawla believed this may relate to Norway's socialist democracy culture, a culture in which citizens are more used to collective action and cooperation. Norway also has popular organizations for youth that are incredibly visible to the public. The Norwegians recommended group participation so strongly because they felt like individuals can use that organization to not only learn information but also have a greater effect on the issues as part of a larger group (Chawla, 1999).

Environmental projects in communities often depend on the cooperation of many, including youth. If young people experience positive outcomes with initial experiences, it will foster continued behaviors, perhaps even leading to an environmental career (Chawla, 1999; Chawla & Cushing, 2007). Additionally, individuals care about how they are involved, so it is important to engage young people to play a central role in setting their own involvement goals. (Chawla & Cushing, 2007).

EE experiences should enhance empathy for the plants, animals, and the environment, which leads to emotional connections; this has the most effective long-term impact if this happens when the learner is young. John Burroughs wrote, "Knowledge without love will not stick. But if love comes first, knowledge is sure to

follow" (as cited in White & Stoecklin, 2008, p. 2). Burroughs elaborates on the fact that educators should encourage children to first form an emotional connection with nature, which acts as a precursor to awareness and responsibility (Wilson, 2011). Getting people into their environment helps increase familiarity and can enhance empathy for animals and their natural surroundings. Horowitz (2013) even suggested looking for appropriate ways to bring out the anthropomorphic qualities of animals to take advantage of the fact that humans most readily feel empathy for other humans.

In a study completed by Drissner, Haase, Rinderknecht, & Hille (2013), Drissner et al. found that students who had participated in a half-day experiential experience at the Green Classroom showed a significant improvement in their attitudes toward a majority of their ratings about invertebrates. However, students that did not participate in the programming had attitudes that mostly stayed the same, although some thought small animals had gotten "uncooler" in the two weeks (Drissner et. al, 2013).

White and Stoecklin (2008) called this love for the earth and its environments 'biophilia.' Palmer (1996) explained that primary school years are when individuals should begin the lifelong EE process. Research from Chawla (1999) and Torkar (2014) supports that statement; they determined through surveys with environmental professionals that experiences such as time spent outdoors, having an older role model, and participating in organizations as a child had the strongest impact in leading them to their current jobs. Contrastingly, biophilia was developed for some of the surveyed participants at a young age because they witnessed negative consequences play out in places that were valuable to them, such as destruction of a valued place, pollution, or radiation. Because these negative consequences happened in a place that was relevant and

important to them, they decided to take action (Chawla, 1999; Torkar, 2014). Therefore, efforts should be made to educate the youth about our environment by encouraging them to develop connections when they are young as it will likely influence their concern for the environment in later years.

EE is more successful when it includes families and role models. Wilson (2011), Chawla (1999), and Torkar (2014) posited that having a parent, teacher, or other guide be present in the outdoors, show interest in nature, provide knowledge, or teach skills causes students to be more predisposed to taking an interest in the outdoors themselves. In turn, students would be more likely to work to protect it. At times, parents exhibited concern about environmental issues, such as mining or refugees, which led to it being a significant part of their youth (Torkar, 2014). While studies found that adults were the main role models for behavior, Chawla and Cushing (2007) recommended encouraging students to look to peers as well and create opportunities for exchanges in demonstrations of skills or discussions.

EE programming should be in a continual process of evaluation and improvement. An effective and successful program is continually assessing its effectiveness and impact in addition to the needs of its users. Therefore, the programming itself should be designed to include an ongoing evaluation process. It must have clearly defined and measurable lesson objectives as well as systems in place to evaluate the results (Blumstein & Saylan, 2009). This will allow program staff to redesign the lessons as needed in order to maximize the success of future programming (as cited in Thomson & Hoffman, 2003, p. 10; NAAEE, 2009).

In summation, the resources identified eight characteristics that are important for successful and effective EE programming, including recommendations for instructional techniques, encouraging participation for all ages, and providing opportunities for a love of the local natural world to develop as soon as possible. The next section narrows in on a specific branch of EE: Animal Education. Similarly, this section identifies recommendations for the effective use of live animals in educational programming.

<div align="center">**Animal Education Recommendations**</div>

The final part of this literature review compiles research and ideas from the field about live animal education, much of which come from zoos.

Effectiveness of Live Animal Interpretation

In reviewing the literature, research supports that not only is the use of live animals more captivating for audiences, but also that these animals are more effective educational instruments of behavioral change; that is, people are more likely to complete pro-environmental actions after they have seen live animal programs than they are after a presentation without live animals.

First, Orams (1997) completed a study about the effectiveness of an educational program with native dolphin species, which allowed tourists to interact with and feed them. There were also tourists who were not provided with structured educational programming. The study found that both groups enjoyed seeing the dolphins, but results suggested the formal programming increased their enjoyment; the engaged participants provided more compliments about the facility and caretaking methods of the animals (Orams, 1997). In addition, guests were surveyed two to three months after their experience, and a statistical difference in the amount of behavioral change was found

between that guests that attended the educational program and those that had not. While both groups had initially intended to exhibit behavior change as a result of visiting the dolphin center, only program guests actually obtained more information about dolphins, picked up more trash along beaches, had become more environmentally involved, and had donated to an environmental organization (Orams, 1997). Orams (1997) was pleased with these results as the ultimate objective of the program was to produce behavioral change in alignment with the overarching mission of EE.

There are similar results from a study at the Point Defiance Zoo in Washington state, which compared visitor responses between a traditional zoo exhibit and an interpretive program with a keeper and a live animal (clouded leopard). Povey and Rios (2005) evaluated the effectiveness of the two settings based on the time spent viewing the leopard and the effort spent seeking information. Visitors at both were asked to complete a survey after their experience. Povey and Rios (2005) determined that there was a substantial difference in all categories of evaluation. Visitors viewed the clouded leopard 336% longer during the interpretive presentation with the live leopard versus those at the static exhibit. Also, only 25% of the people at the static exhibit even read the signs for more than five seconds. Comparatively, 45% of visitors who attended the presentation actively sought information by asking a question; many asked more than one. Povey and Rios (2005) also remarked that even though not all visitors asked a question, they still benefited by hearing the answers provided to those who did. Finally, the survey results indicated that guests at the presentation believed more strongly that the animal had a high quality of life and was more well-cared for than those who visited the static exhibit.

Both the study by Orams (1997) and Povey and Rios (2005), among many others, found strong evidence to show that when audiences participate in programming with a live animal, they learn more information and may be more likely to participate in pro-environmental behavior (Kidd & Kidd, 1995; Morgan & Gramann, 1989; Povey, 2002; Sorge, 2008; Swanagan, 2000; Yerke & Burns, 1991, 1993 as cited in Schwartz, 2013). However, in the studies by Orams (1997) and Povey and Rios (2005) the control groups did not actually experience any verbal programming, which begs the question: was it actually the live animals that produced this result or was it simply because they participated in programming?

A study completed by Anderson, Kelling, Pressley-Keough, Bloomsmith, and Maple in 2003 at Zoo Atlanta found that there is a difference in effectiveness between interpretation and interpretation with a live animal. Researchers focused on animal demonstrations and interpretation at an Asian small-clawed otter exhibit. At the exhibit, visitors experienced various types of education: sea otter demonstrations with zookeepers, demonstrations by zookeepers with interpretation from docents, only interpretation with a docent, or no demonstrations or verbal interpretation (signage only). Visitors spent an average of two minutes when no staff were present, six minutes when demonstrations were taking place, and eight minutes for demonstrations with interpreters. Guests who participated in the demonstration and interpretation reported a more positive zoo experience and had a better perception of animal training practices. This is similar to results from the Povey and Rios (2005) study at Point Defiance Zoo with the otters. The results from the study by Anderson, Kelling, Pressley-Keough, Bloomsmith, and Maple (2003) support the idea that interpretation alone is not as impactful as interpretation with

an animal demonstration, which aligns with the feedback that Eagle Bluff's programs without live animals (e.g. white-tailed deer and bats) has received; those programs may not provide an ideal setting for learning and might provide less overall positive experiences for the audience. While this study did not evaluate the educational impact of the demonstrations and interpretation, previous recommendations discussed in this chapter impress upon the importance of encouraging students' empathy and connection with animals (Horowitz, 2013; Palmer, 1996; White & Stoecklin, 2008; Wilson, 2011), and this study showed that demonstrations and interpretation with live animals help to create a positive experience with and perception about the animals.

Another study from Weiler & Smith (2009) supports the idea that multiple layers of interpretation in a zoo setting lead to greater visitor outcomes. There were five layers of interpretation that a visitor could experience at Werribee Open Range Zoo in Victoria, Australia:

- "Walk: the visitor walks along a walking trail containing static displays.
- Talk: the visitor attends a keeper talk (held twice a day) which lasts around ten minutes.
- Volunteer: the visitor interacts with a volunteer guide who responds to questions and/or offers a variety of information through casual interactions.
- Actor: the visitor encounters a role-play presented by a thematic interpreter who assumes a character and deliberately solicits interaction or a response from the visitor in an informal manner.

- Tour: the visitor pays extra to be taken behind the scenes for a 'Rip Roaring Feed Tour' which includes, in addition to a lion talk, viewing the animals 'holding facilities culminating with lion feeding.'" (Weiler & Smith, 2009)

Before leaving the zoo, visitors were asked to fill out a survey about their educational experiences at the exhibit. They indicated how many interpretive layers they experienced and answered questions designed to evaluate the cognitive, affective, and behavioral changes of the visitor. Compilation of the guest answers showed that 41.3% of visitors did the Walk; 35.4% did the Walk plus either the Talk, Volunteer, or Actor; 22.6% experienced the Walk plus two additional interpretive experiences; and only .7% (two people) participated in four layers; none did all five (Weiler & Smith, 2009). Researchers compared the number of experiences with survey results and found that for each additional number of interpretive experiences, there were positive changes in the visitors' knowledge level, attitudes towards conservation, and their desire to participate in more activities, stay longer, and return again to the exhibit. When visitors participated in only the Walk, there were fewer outcomes reached. Beyond that, the study found no individual interpretive method performed better than another (Weiler & Smith, 2009).

To summarize, the use of live animals helps create emotional connections between visitors and the animal, leads to an increase of knowledge about the subject matter, and is more likely to enable behavioral change compared to no interpretational programming, static exhibits with animals on display, and/or interpretation-only programming.

Best Strategies for Animal Education

When planning a program that includes live animals as educational tools, there are multiple considerations for educators throughout the programming process as recommended by Ballantyne, Packer, Hughes, and Dierking (2007), Batt (2009), Gates and Ellis (1999), the National Science Teachers Association (NSTA) (2008), Povey and Rios (2005), and Schwartz (2013):

- Proper staff training prior to programming

- An emphasis on delivering relatable content and creating emotional connections with the animals during the experience

- Creating simple, achievable behavioral change after leaving the presentation.

Having well-trained staff is essential for a successful program (Gates & Ellis, 1999; NSTA, 2008; Povey & Rios, 2005). At the start, facilities and presenters should be aware of the local, state, and national laws and regulations that need to be followed (NSTA, 2008). Additionally, having knowledgeable educators that have gathered information from reputable sources, both about program topics as well as animal care (NSTA, 2008; Povey & Rios, 2005). Povey and Rios (2005) elaborated on how animal handlers need to be sensitive to the animal's safety and comfort, as visitors will quickly change their opinion if the animal appears stressed during presentations. For this reason, it is recommended that handlers receive extensive training in both animal training protocols and interpretation.

When designing programs, educators should first create an emotional connection between the audience and the live animal; secondarily, the content should focus on providing relevant information (Ballantyne et al., 2007; Batt, 2009; Gates & Ellis, 1999;

Schwartz, 2013). Schwartz (2013) recommended focusing on general affective objectives; the audience may not walk away with a huge amount of knowledge, but they will remember how they felt. Thus, concentrating on creating connections with the animals is important. Many educators in Schwartz' (2013) study perceived that an emotional connection influenced the audience's attitude and led to pro-conservation behavior. Ballantyne et. al (2007) and Gates and Ellis (1999) specifically recommended introducing the animals as individuals so that they are not just random animals but individuals that a guest can relate to and remember long-term.

Another tactic highlights the existence of a link between the likability of an animal because of its biobehavioral similarity to humans: emphasizing an animal's likeness to humans is a meaningful way to create a connection (Ballantyne et al., 2007; Batt, 2009). Horowitz (2013) suggested finding ways to anthropomorphize animal traits to increase the audience's interest, care, and concern for the animal. That being said, care needs to be taken to not cause an overestimation of similarities, otherwise that could eliminate the understanding of these animals as still being wild (Batt 2009). Also, in the study done by Batt (2009) that looked at human attitudes towards animals in relation to species similarity to humans, it was found that birds received many positive ratings, even though they are physiologically different than mammals. Examples of ways humans may see similarities between birds and humans include their frequent social nature, bipedalism, and pair-bonding with high levels of biparental investment.

Regarding the order of information presented during a program, educators Gates and Ellis (1999) at Chessington Zoo recommended starting a program by personalizing the animals and providing information and demonstrations that are designed to grab the

audience's attention. They suggested the program middle should cover adaptations, and the ending concludes with a main educational message about how guests can help the animals directly. They designed their programs this way because people have a primacy/recency memory; they store and can more easily recall the first and last pieces of information (Gates & Ellis, 1999). Gates and Ellis (1999) and Ballantyne et al. (2007) also pointed out that visitors like to see animals interact with trainers. Not only does it provide trainers with more time to shape behaviors, it gives guests a glimpse at the relationship between the animal and their handler. Training can also conjure negative images about how animals are treated in captivity, and this type of demonstration helps to dispel previous myths audiences might have (Gates & Ellis, 1999). Having them exhibit extensions of their natural behavior also provides a personal encounter with another world (Ballantyne et al., 2007).

By designing programs that provide relevant content and emotional connections, audience members are more likely to leave the program feeling motivated to participate in pro-environmental behavior (Ballantyne et al., 2007; Gates & Ellis, 1999; NSTA, 2008; Schwartz, 2013). Actually having live animals is a useful tool that should be utilized to promote an appreciation for the value of life and the importance of caring for animals responsibly (NSTA, 2008). Rather than focusing on simply imparting knowledge about a particular issue, interpretation should target relevant behavioral, normative, and control beliefs (Ballantyne et al., 2007; Schwartz, 2013). Targeting these beliefs can be accomplished by placing this messaging in different places and settings at the facility through displays and handouts or by positioning the presenter at the exhibit (Gates & Ellis, 1999). Providing handouts, options to sign petitions, joining a mailing list to hear

about upcoming events, and utilizing pre and post activities are some suggestions from Schwartz (2013) and Orams (1996).

Implementation of proper staff training prior to programming, emphasizing delivering relatable content and creating emotional connections with the animals during the experience, and creating simple, achievable behavioral change after leaving the presentation will help Eagle Bluff support the goals of EE.

This section reviewed the effectiveness of live animals in interpretive education. In addition, it provided strategies for planning and executing programs with live animals as well as suggestions to increase learning and support after viewing a program.

<div align="center">**Summary**</div>

The literature review provides clarification and recommendations for my research question, *what are the most effective methods for using live animals as instructional devices in environmental education?* This included the definition, goals, and characteristics of EE, highlighted the importance of behavioral change, focused on providing relevant information during lessons, utilized the most effective instructional strategies, and impressed upon the importance of the emotional connection with the natural world. In addition, the best practices for live animal education were explored, from the importance of multiple layers of interpretation to suggestions for implementing effective programming. The results from the literature review directly influenced the design, content, and goals of the capstone project curriculum.

Chapter three provides an overview of the capstone project, including the research paradigm and curriculum framework, educational setting where the curriculum will

primarily be used, length and frequency of the programs, and intended audience for the

presentations.

CHAPTER THREE

Project Description

This chapter provides context for how this project was constructed based on literature reviewed from the research question, *what are the most effective methods for using live animals for instruction in environmental education?* It supplies a detailed explanation of the project and its goals, the research paradigm and curriculum framework, target audience, educational setting where the presentations will take place, and how the programs will be implemented and evaluated.

Overview

This capstone project was the creation of three programs featuring live animals, specifically birds of prey, to be used in an interpretive setting. The programs are one-hour in length (but adaptable to shorter or longer time frames) and delivered to participants at a residential environmental learning center (Eagle Bluff). Audience members are primarily students in grades four to eight who come from a variety of backgrounds, including public and private schools, rural, suburban, and urban communities, and states in the upper Midwest. The programs are intended to be given on-site but could be taken "on the road" in the form of outreach programs.

The three lesson plans were written with recommendations discussed in chapter two regarding effective environmental education principles and uses of live animals,

which are further discussed in the Research Paradigm section featured next. The curriculum framework is guided by Eagle Bluff's mission and educational principles along with the effective interpretation recommendations from the National Association for Interpretation (NAI). A program lesson plan and digital slides were created for instructors to use as a guide when preparing for their own presentations.

The purpose of this project is to provide an effective learning experience for audience members attending an interpretive program with live animals. Many students do not get the opportunity to see wild animals up close, and if this is their one experience, instructors must create cognitive, behavioral, and emotional change within a one-hour time constraint.

This section provides a brief overview of my capstone project, the construction of three new hour-long interpretation programs. The next portion discusses the process used to construct the programs based on discoveries during the literature review.

<div align="center">

Research Paradigm

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First, it is important to note one of the driving forces behind this capstone: audiences find live animal programs inherently more engaging than programs without live animals. Because of this feedback, Eagle Bluff decided to incorporate more live animals into our evening programming. In reviewing the literature, research supports that not only is the use of live animals more captivating for audiences but it is also a more effective educational instrument of behavioral change; people are more likely to complete pro-environmental actions after they have seen live animal programs than after presentations without them (Anderson, Kelling, Pressley-Keough, Bloomsmith, & Maple,

2003; Ballantyne, Packer, Hughes, & Dierking, 2007; Batt, 2009; Gates & Ellis, 1999;

Orams, 1997; Povey & Rios, 2005; Schwartz, 2013).

The curriculum team at Eagle Bluff met to discuss potential new program topics

and considerations were made with regards to the number of current live animals

managed by Eagle Bluff. Seven of the twelve programs that were offered in the 2017-

2018 school year were eliminated, so the team decided that in addition to other new live

animal programs, the number of live birds of prey programs would increase from one to

three.

The first part of the project design process was determining the overarching

program goals applicable for all three programs regardless of content. An interpretation

model (see Appendix A) from Orams (1997) was utilized to help construct the three

programs. In his interpretation model, Orams (1997) stated that presenters should target

the affective (emotional) domain during program implementation. In the context of Eagle

Bluff, the programs will utilize live animals to influence the affective domain and should

help create an emotional connection as it lends support towards creating the desire to care

about the natural world. This is supported by the literature reviewed in chapter two,

which stated that an emotional connection influenced the audience's attitude and led to

pro-conservation behavior (Ballantyne et al., 2007; Batt, 2009; Gates & Ellis, 1999;

Horowitz, 2013; Schwartz, 2013; Webb, 1996; White & Stoecklin, 2008; Wilson, 2011).

Sources mention the emotional connection as an important characteristic for effective EE,

but for effective live animal programming, this connection is explicitly listed. In order to

reach the affective domain, each audience will hear the individual bird's injury story but

it will be at the instructor's discretion to decide if they want to use any additional

techniques to create an emotional connection. Horowitz (2013) and Batt (2009) suggested highlighting similarities between the birds and humans, since humans are more likely to care about creatures that are similar to them. Schwartz (2013) mentioned that the mere wonder of seeing a live animal up-close leads to an emotional connection, which is the technique Eagle Bluff handlers have used prior to this capstone project.

The other part of program implementation in the Orams (1997) model is cognitive dissonance. This theory, originally proposed by Festinger in 1957, states that cognitive dissonance occurs when an individual's perception of two elements are in opposition of one another (as cited in Orams, 1997, p. 87). An example of cognitive dissonance provided by Orams (1997) is 'I do litter' and 'I know litter has a negative impact on the environment.' Essentially, the information presented during our programs should challenge audience members' current belief systems and knowledge structures by challenging them to ask themselves why, how, and when questions. An example in our birds of prey program may be discussing the existence of a bird's wishbone but asking the students if they know the purpose of this bone.

Fishbein and Ajzen (as cited in Orams, 1997, p. 88) argued that the greater the magnitude of dissonance, the greater the expected change in belief which leads us to the next part of Orams' interpretation model: the Motivation/Incentive to Act. Knowledge alone is a typical strategy of interpretation programs but the link between knowledge and behavior change is weak (Orams, 1997). However, the combination of cognitive dissonance and an emotional connection can help prompt behavior change. Wilson (2011) similarly stated that encouraging an emotional relationship with nature acts as a precursor to awareness (knowledge) and responsibility. Providing examples of human

activities that harm local environments is one strategy that can help create behavioral change and motivation. Helping to promote the idea that individuals can do something about the problems and make a difference is a critical piece of an interpretation program's central message (Orams, 1997).

This affectual delivery needed to be encouraged in my programs because having an individual recognize that they can be a part of the solution helps lead to actual participation (Palmer, 1996; White & Stoecklin, 2008; WIlson, 2011). This will eventually cause behavioral change, the ultimate goal of EE (Blumstein & Saylan, 2009; Chawla & Cushing, 2007; Hungerford & Volk, 1990; Thomson & Hoffman, 2003; Webb, 1996; White & Stoecklin, 2008; Wilson, 2011). Orams (1997) called this step in his model 'Opportunity to Act,' and this may be one of the major additions to our current programming. At the time of this capstone writing, encouraging participation is something that was interwoven into day classes and conservation activities during a group's stay, but Eagle Bluff instructors have used the evening naturalist program to focus more on sharing interesting and relevant information to the students. While relevancy is important (as stated by Athman & Monroe, 2001; Chawla & Cushing, 2007; Hungerford & Volk, 1990; NAAEE, 2009; Thomson & Hoffman, 2003; White & Stoecklin, 2008; Wilson, 2011) and was included in the new programs, participants should be challenged to take individual and collective action as a result of the learning process (Blumstein & Saylan, 2009; Chawla & Cushing, 2007; Hungerford & Volk, 1990; Thomson & Hoffman, 2003; Webb, 1996; White & Stoecklin, 2008; Wilson, 2011). For that reason, action challenges were embedded into the conclusions of each new program, as recommended by Gates and Ellis (1999).

Additionally, results from a study by Weiler and Smith (2009) supported the idea that multiple layers of interpretation within a learning setting lead to greater visitor outcomes. Eagle Bluff can do a better job of demonstrating these pro-environmental behaviors, especially as they relate back to programming messages. For example, one of the designed capstone programs highlights the negative impacts windows can have on birds and encourages audience members to take action to help. Participants will see concrete examples of Eagle Bluff taking action to help birds avoid windows, which helps reinforce the program action challenge. Further, Eagle Bluff's animals are not on display full-time like a zoo; by having the instructor available for questions and other interactions after the program, students are able to find them later if they have more questions or comments about the program. This availability has worked well in the past since most Eagle Bluff visitors are participants in a multi-day experience.

The final portion of Oram's (1997) model listed was Evaluation and Feedback, during which presenters should assess the feedback and effectiveness of the program results in order to make changes to the current programming or help with future program planning. This step was not a part of this capstone project, a limitation discussed in more detail in chapter four of this paper.

The important takeaways from Orams' (1996) interpretation model and chapter two greatly influenced the project program goals. The takeaways include: creating an emotional connection with the live animals and challenging students' current knowledge base to help create behavioral change. The following section orients the reader to the process used to construct the curriculum for the programs.

Curriculum Framework

The overarching program goals were written based on recommendations from the previous section, but choices about the type of curriculum framework were guided by multiple perspectives. These perspectives included Eagle Bluff's current evening program lesson plan structure, its mission and educational principles, and also the effective interpretation recommendations from the National Association for Interpretation (NAI).

At Eagle Bluff, our three-hour day classes have a set curriculum framework that has been designed internally. It informs audiences and staff about the amount of time spent outside, weather considerations, intended grade levels, universal concepts, Minnesota Academic Standards met, STEM (Science, Technology, Engineering & Mathematical) components, and International Baccalaureate (IB) Learner Profiles. However, our one-hour Naturalist Programs do not currently fit a similar set framework as teachers have not expressed a desire for these programs to connect with any of the previously mentioned standards. Instead, presenters receive a script of their program and an accompanying digital slides; I constructed both of those materials for each of my three programs.

The program script outlines the purpose and concepts for the hour-long program. This set-up was recommended by NAI, an organization that Eagle Bluff utilizes as a resource for its staff. Generally, the program purpose relates back to the organization's mission statement (Brochu & Merriman, 2015). Eagle Bluff's mission statement is "To empower people to care for the earth and each other" (Sturgis, 2018). As this statement

encompasses all programming done at Eagle Bluff, the education department also utilizes

five guiding principles:

1. Impart life skills such independence, facing challenges and problem solving.

2. Foster a sense of teamwork, community, and stewardship.

3. Promote positive outdoor experiences.

4. Spark an interest in and appreciation for the natural world.

5. Increase environmental & academic literacy. (Sturgis, 2018)

The presentations written for this project comply with the overarching mission of Eagle

Bluff and aim to support these educational principles.

The mission and principles are a starting point for the purpose of all the evening

presentations at Eagle Bluff, but each individual program has a specific concept (also

referred to as a theme). The topic of the program is given in the title, but the theme

narrows the focus and is the actual message to be conveyed throughout the program.

Each program written for this capstone project has its own individual theme, which can

sum up the entire program in one sentence. Part of the need for additional programming

is not only to utilize more live animals in programs, but also to narrow the focus for each

program. Therefore, each program theme is more specific than programs currently given.

A program also generally has sub-themes, which are supporting ideas to the main

theme. These are used to guide the organization of the program outcomes. The outcomes

are a summary of what we hope the audience will internalize while viewing the program

or take action on as a result of participating in the learning experience. The outcomes

were written in alignment with Eagle Bluff's mission and educational principles.

Additionally, the outcomes are three-pronged: cognitive, behavioral, and emotional (or

affective) change. Each program has content that highlights multiple viewpoints but is relevant to the audience, aims to create an emotional connection between the birds and the students, and offers at least one challenge action for visitors to take when they return home.

The next part of the script is an outline, which includes the preparation needed before the program begins and an order for the main program topics. For the content portion, a picture of the slide is used as a visual guide, and the accompanying information is listed below each slide. Instructors have some freedom to adjust the content of the presentation and the digital slides, especially as it relates to which bird is being handled during the program, but they still need to deliver the same program theme and reach the outcomes as stated in the script.

The presentation techniques, or delivery of the program, is just as important as the script and content choice. Brochu and Merriman (2015) recommended starting with an introduction of yourself and the organization and taking care of any logistical announcements first. Then, the presenter could ask some initial questions that help gauge the audience's background before stating the program theme and giving the audience an overview of the main program outline. Providing context for where the program is going helps keep an audience engaged throughout the presentation (Brochu & Merriman, 2015). During the rest of the program, topics should transition clearly and effectively. The message in the conclusion should not include new information, but rather review the content as it relates to the final take-away challenge for the audience (Brochu & Merriman, 2015).

The literature reviewed in chapter two highlighted the importance of effective instructional techniques, or program delivery (Athman & Monroe, 2001; BEETLES, 2018; Chawla, 1999; Chawla & Cushing, 2007; Hungerford & Volk, 1990; Palmer, 1996; Thomson & Hoffman, 2003; Torkar, 2014; White & Stoecklin, 2008; Wilson, 2011). The programs cater to multiple learning styles by using the digital slides for visual and audio support to the script. The programs also include hands-on experiments and demonstrations. Second, discussion opportunities for students to 'turn and talk' to their neighbors are written into the script to help students process ideas. Presenters will also allow them to react to interesting pictures and videos before providing the related content.

I explored the curriculum framework for this capstone project. The program scripts and digital slides were designed based on Eagle Bluff's mission and educational principles and techniques utilized and recommended by NAI. Additionally, proper program delivery is highlighted based on recommendations from the literature review. Next, the program setting followed by the intended audience is explained in detail.

Program Setting and Audience

Program Setting

The three programs developed through this capstone project will be used as a part of educational programming at Eagle Bluff Environmental Learning Center, a 501(c)3 non-profit organization located in Lanesboro, Minnesota. Eagle Bluff has programming that is executed on a privately-owned 127-acre campus. The facility is located in the southeastern portion of the state, which is characterized by its karst topography: bluffs, spring-fed rivers, sinkholes, and caves. Some know it as the "Driftless Area", named for the lack of glacial-deposited debris (known as drift) because of the absence of glaciers

during the most recent major ice age. This section of the state is also a mix of Minnesota biomes: the tallgrass prairie, maple-basswood broadleaf, and floodplain hardwood forests, and burr oak savanna. Eagle Bluff has made efforts to restore the main campus as well as parts of the state forest land to its native vegetation, although the surrounding area is primarily dominated by farmland.

Eagle Bluff has five core programs that carry out its mission: the Outdoor School, the Skills School, Summer Camps, Seasonal Events, and Graduate Programs. Eagle Bluff has an average of 16,000 visitors each year that attend these programs. This capstone project is designed for participants in the Outdoor School, which account for 85% of Eagle Bluff's total visitation. The Outdoor School is also known in the environmental education field as a residential environmental learning center (RELC), as mentioned in chapter one. An RELC is a professionally staffed facility that provides participants with in-depth, multi-day experiences to engage with and learn about the outdoors, year-round. Programs are typically two to five days; on-site lodging and meals are provided for participants (ANCA, 2005).

Eagle Bluff students stay an average of three days (Monday to Wednesday or Wednesday to Friday). On an average trip, students take four, three-hour long classes that vary in topics and theme and are chosen by the school teachers. The center offers thirty classes within three core curricula topics: (1) adventure (e.g. high ropes courses, team building, archery, navigational skills), (2) science (e.g. nature exploration and identification, ecology, geology), and (3) history (e.g. Native American and pioneer life studies). All classes begin and end in a traditional indoor classroom space but spend a majority of the three hours outside, learning through activities and lessons; sheltered

teaching spaces are available, and lesson plans may be modified in case of inclement weather. Each evening, students attend a one-hour Naturalist Program, which is an interpretive program about a natural history subject, as discussed in chapter one. Students attend two naturalist programs during a three-day trip.

Length and Frequency

The evening Naturalist programs are one-hour in length and can be given each night of the week when groups are in residence. Currently, raptor programs are given twice a week, although they can go up to four times per week depending on the variety of audiences visiting Eagle Bluff. However, scheduling more than two programs in a week, stretches staff as only one quarter of the teaching staff are trained to give this program. Also, we typically use two birds per program, but with the live animal diversification, it will be more typical for one bird to be used instead. This will allow the programs to be given more often as we can schedule the programs to be delivered with different birds. Wild animals often have a threshold at how long they can handled in front of an audience, so having multiple programs, with different animals, will give them a break. There will also be an increase in the number of staff available to give the program if they only need to be trained on how to handle one bird, which allows the program to be given with more frequency.

Intended Audience

Visitors that participate in the Outdoor School program are primarily fourth through eighth graders but could vary in age from kindergarten through twelfth grade. Table 1 displays a breakdown of the different grades that have attended the RELC

program during the past five years, including those scheduled to attend during the current

2017-2018 academic school year (September to June).

Table 1. *Grades attending the Outdoor School program each academic year.*

Grade(s)	2017-18	2016-17	2015-16	2014-15	2013-14	Average
K-3	3	3	3	2	2	**3**
4	18	15	14	13	13	**15**
5	50	44	48	43	45	**46**
6	48	51	52	48	49	**50**
7	27	26	30	32	25	**28**
8	30	27	31	29	27	**29**
9-12	8	5	6	5	5	**6**

Note. Discrepancies between the number of total grades and total schools due to some schools bringing multiple grades. *Source.* Anderson, 2017

Since K-3 and post-secondary education participant groups are not the primary

audience and make up a small percentage (6% in 2017-18) of the participants using this

curriculum, the content of the programs will be tailored to fourth through eighth graders.

When presenting to younger or older audiences, presenters will be encouraged to adjust

the vocabulary level and amount of content to fit the audience's age and attention span.

Through personal experience, high school and adult groups learn the same amount during

the current program as the elementary students, but are able to view the large, ecological

picture more completely.

The students are from the tri-state area of Minnesota, Wisconsin, and Iowa. Table 2 displays the designation of the communities where the schools are located. Communities are categorized as urban (population greater than 50,000), urban cluster (population ≤ 2500-50,000), or rural (all populations, housing, and territories not included within an urban area) as classified by the United States Census Bureau in 2010.

Table 2. *Location of schools attending the Outdoor School program each academic year.*

School Location	2017-18	2016-17	2015-16	2014-15	2013-14	Average
Urban	39	32	35	32	26	33
Cluster	53	45	52	41	42	47
Rural	47	49	50	49	51	49

Source. Anderson, 2017

The schools can be categorized by type as well: public or private. A private school is further designated as religious or secular (e.g. charter, Waldorf, and Montessori schools). Table 3 designated the type of schools attending the RELC program with these three categories.

Table 3. *Types of schools attending the Outdoor School program each academic year.*

School Type	2017-18	2016-17	2015-16	2014-15	2013-14	Average
Public	78	72	80	66	66	72
Private (Religious)	27	31	29	30	30	29
Private (Secular)	34	24	28	26	24	27

Source. Anderson, 2017

This section provided detailed background information about the educational setting where the project will be implemented, including descriptions about Eagle Bluff, the length and frequency of the program, and intended audience. A full description of the project is explained next.

Project Description

The new programs written for this capstone are RaptorPHYSICS, RaptorFORCE, and RaptorCARE. Each program is intended to utilize one live bird of prey. However, the programs were designed so that any of the four raptors could be handled. Each program has digital slides and accompanying script for presenters to use as a guideline. The scripts all have the same structure: program theme and outcomes listed first, any setup considerations and props needed prior to the program, and then the program script, written as an outline to correspond with the program outcomes. The slide numbers are embedded throughout the presentation with the correlating information.

RaptorPHYSICS

The RaptorPHYSICS program focuses on understanding the logistics of flight and how humans can enjoy and support birds in flight. It first looks at the physics of flight, both in broad terms by investigating how Bernoulli's Principle works as well as specifically with different types of birds. Students then meet one of Eagle Bluff's birds of prey, hear its story about how it arrived in captivity, and learn about the flight adaptations specific to that bird species. Finally, students learn about the issues wild birds face in their natural habitats and are given multiple ideas about how to help support their local, native bird species.

RaptorFORCE

This program investigates how birds of prey and humans have been interconnected throughout history and remain connected to this day. The program begins by exploring the long history of falconry, the sport of using birds of prey to catch quarry, because it is a clear example of a human-bird relationship that still exists today. The students then meet a live bird of prey and learn about that bird species' connection to falconry. Next, students hear about the use of DDT in the United States and see a demonstration about egg shell strength. The program concludes by sharing stories of birds of prey and humans working together to solve pest issues and providing ways for students to work together with their local, native bird populations.

RaptorCARE

The RaptorCARE program examines the many ways in which Eagle Bluff cares for and manages its live birds of prey. The digital slides give students a glimpse at the enclosures the birds live in, the food they eat, and how they stay mentally active. Second,

the presenter explains and demonstrates the training process used by Eagle Bluff raptor handlers with its birds. Students then meet a bird of prey and see a demonstration of a trained behavior. The program concludes by offering ways for students to become animal caretakers, both professionally and at home with their native, local bird populations.

The purpose of this project is to connect audiences with a live animal that they do not usually have the opportunity to see up close. Combining the personal experience with the main program content and the examples of ways the students could help local bird populations at the end of every program, students will ideally leave Eagle Bluff empowered to implement an action step, such as putting up bird feeders, picking up litter along highways, or switching to lead-free ammunition.

Summary

This chapter went in depth about my capstone project. First, it elaborated on the research paradigm, which utilized an interpretation model from Orams (1997) to demonstrate that the affective domain and cognitive dissonance could be used to help motivate audiences to adapt their behaviors. Then, the curriculum framework was reviewed in detail. The chapter explained how Eagle Bluff's own mission and educational principles were paired with guidelines from NAI to create scripts and digital slides for use in our Outdoor School evening programming. It also included more details about the project setting at Eagle Bluff, the intended audience of fourth to eighth grade students and their community and school type, and program length. Finally, a program description was provided for each of the three new programs.

CHAPTER FOUR

Conclusions

The intent of this capstone project was to answer the question, *what are the most effective methods for using live animals for instruction in environmental education?* This project was chosen and created due to a program needs at Eagle Bluff, an environmental learning center. However, working with live animals and using them in presentations has always been an exciting experience. Going through the entire capstone creation process has naturally been stressful at times, but ultimately rewarding, both personally and professionally. This chapter explores both personal and content-based discoveries from the capstone development process. It also discusses the implications, implementation process, and limitations of the project. Finally, it offers ideas for future research within the field of live animal education.

Learning Discoveries

Through my last eight years of experience in the environmental education field as an instructor, presenter, and coordinator, I have had access to many great learning opportunities. These include participating in graduate level courses, on-the-job trainings, attending conferences, and shadowing both new and experienced instructors. While I still would not consider myself an expert, I felt like I had a really good understanding of what the environmental education (EE) field was trying to accomplish. And as I found literature that discussed the history, definition, background, and guidelines for EE, much

of it provided information that I already knew: EE programs should use best teaching practices, evaluate themselves, and include multiple viewpoints. I did learn some interesting points about the start of EE and the importance of including participants of all ages; however, the findings also led me to a new perspective on the mission of EE.

For years, I generally accepted that the goal of EE was informationally based: to inform participants about their local habitats and share why they are important. A few years ago, when I was exploring potential capstone research options, I looked into completing a survey about the students' residential learning experience at Eagle Bluff. My vision was to focus on the information learned in the different classes, but my Hamline advisor and my supervisor at Eagle Bluff pointed out that it was not just about the knowledge gained but also about how the experience affected the user emotionally. At the time, that made sense to me in the following manner: we, Eagle Bluff, want the students to have a positive, engaging experience outdoors so that even after they return home, they are interested in learning more. But the research reviewed during this process emphasized that it is not just about the positive experience, but also about creating emotional connections between students and their environment. Multiple sources note how helpful empathy is for long-term, pro-environmental behaviors (Horowitz, 2013; Webb, 1996; White & Stoecklin, 2008; Wilson, 2011).

Interestingly, my live animal programs with raptors support this idea. Our users have given us great feedback about our raptor programs: "*Raptors* was great; a very quiet student got to feed the hawk and it was wonderful to see her come out of her shell" Visiting 6th grade teacher; and "*Raptors* was awesome. Live animals wins every time.

[The instructor] was so calm with the animals, it was amazing," Visiting 7th grade teacher.

The comments made the programs appear successful, but the resources even recommend using live animals as educational entertainment to draw the audience in and to emphasize the qualities that are similar to humans (Gates & Ellis, 1999; Horowitz, 2013). I found this perspective especially interesting because many EE facilities, including Eagle Bluff, try hard not to give human-like qualities to animals. Our birds in captivity are wild animals and not pets; at Eagle Bluff, we do not give them names, and presenters do not refer to birds as having a personality. In my new presentations, I have made it a point to emphasize the human-like qualities as just being able to see a bird of prey ten feet away from you and then hearing the birds' stories is inherently emotional. However, I know our audiences love when we state that the owl eating a mouse tail is just like eating spaghetti. I think there are more opportunities to find simple comparisons, and I am excited to see how our audiences will react.

However, the most meaningful discovery is an additional step up from the importance of factual information and emotional connections. As discussed in chapter two when defining EE, the Environmental Protection Agency (2018) stated that EE goes beyond providing basic knowledge by teaching critical thinking, decision making, and problem-solving skills. From there, learners are able to participate in activities that lead to positive and impactful environmental change. The literature frequently emphasized that successful and effective EE programs should challenge participants to participate and take individual and collective action as a result of the learning process (Blumstein & Saylan, 2009; Chawla & Cushing, 2007; Hungerford & Volk, 1990; Thomson &

Hoffman, 2003; Webb, 1996; White & Stoecklin, 2008; Wilson, 2011). This was the most surprising piece of information that I learned, but it soon became the driving force behind my new programs. The new programs were no longer focused on presenting interesting information in an engaging way; instead, the focus became determining the ultimate action goals of each program. I identified simple recommendations and steps that students could take to help Eagle Bluff's birds of prey, and more importantly, the birds that live near their own homes. In combination with the emotional connection students form with the live animals, they will be more likely to help support wild animals at home because they will be given clear ideas at the programs.

This section reviewed the discoveries made throughout the capstone process, which included realizations about the importance of emotional connections with live animals and the true goal of EE. In the next section, the focus shifts to implications for my project in regards to the other live animals that are managed at Eagle Bluff.

Implications

The goal of providing action steps during my programs also had implications for the Eagle Bluff education department as a whole. The studies from Weiler and Smith (2009) and Anderson, Kelling, Pressley-Keough, Bloomsmith, and Maple (2003) demonstrated that the more that guests are exposed to multiple layers of interpretation, the more likely they are to support a cause and become involved long-term. While discussing my new programs with my content expert and Education Director, I thought that the action goals from my programs would be more impactful if they saw examples of Eagle Bluff demonstrating the behaviors as well. That way, students would not only see examples with some informational signage both before and after the program, they would

also learn more of the why behind the action during the program, with the help of an exciting and engaging live animal.

Coincidentally, we are in the process of deciding how to manage the educational displays of all of our live animal species living at Eagle Bluff, and the results from my research will help determine our path. Thus far, we have only had a small number of reptiles, both native and non-native, on display in the lobby of our office building. The space has essentially functioned as a nature center lobby, but as we think through our branding and messaging, we are trying to decide the ultimate purpose of the space. Many staff would like to have the live animals moved to our classroom building so the animals are more visible to the majority of our guests in the Outdoor School program, while others would prefer to keep them in their current space for the stop-in visitors. We have not yet had our team discussion; however, based on my findings during the research process, it has become apparent that the messaging can no longer just be animal fun facts. Rather, the signage needs to be relevant to the audience type, and Eagle Bluff should include an example of an action item for viewers to do back at home to help support their local populations (Athman & Monroe, 2001; Chawla & Cushing, 2007; Hungerford & Volk, 1990; NAAEE, 2018; Thomson & Hoffman, 2003; White & Stoecklin, 2008; Wilson, 2011).

This section explained that my research will impact how the other live animals at Eagle Bluff will be used for education. In the following section, I explain the process for implementing my program, which includes staff training and scheduling limitations.

Implementation

The education department at Eagle Bluff decided that it was going to move forward with its new live animal program options beginning with the new school year in the fall of 2018. We have updated our program descriptions online and included the new options on our planning forms as of March 2018, as we receive scheduling documents for our schools typically three months in advance. Since teachers are unavailable during the summer months, we have already been sent program requests for my three new raptor options for the month of September.

To successfully execute the delivery of our programs at Eagle Bluff, we will be piloting them with certain schools in the spring of 2018. While I have a good idea how they will go, based on prior experience, it will be important to have small details determined before training the rest of the program presenters. I also plan on reviewing teacher feedback from the pilot programs to decide if any additional changes need to be made from the user perspective before the fall of 2018.

For teaching the three new programs to the other presenters, there will be a three-pronged approach. First, I plan on giving a mock presentation, without a student audience or live bird, so that the presenters are given visual and auditory context for how the program was designed to be given. The second step will be for the presenters to review the materials on their own. They will have access to the scripts and digital slides for their planning purposes. Typically, staff do some personalizing of the program, although due to the more specific nature of these program topics, that will probably happen less than it does now with our very broad-topic program about basic raptor characteristics. I plan to be available for any questions that arise about content, activities, and bird handling

techniques. Finally, I expect them to attend the programs with a live student audience and bird. Presenting a program to a small group of trained adults versus 150 fifth graders has a vastly different feel, so watching it one more time should help clarify any final questions about audience management with the new content and demonstrations. I can also be present for their first program if they would like feedback about their delivery. I always do this with new handlers, but my current handlers may find that last step unnecessary for their learning process.

We will continue to use the feedback we receive in the fall to make small adjustments as needed. However, I have every confidence that my team will be able to learn and execute these new programs without major complications or concerns from our users. After all, it was their feedback that drove us to diversify our programming in the first place, so we expect that they will be very curious and excited to experience our new programs.

To summarize, this section discussed the implementation process at Eagle Bluff. The next section tackles the project limitations in regards to staffing and reproducibility.

Limitations

The programs have a few limitations in regards to staffing, both of the human and bird variety. From the human perspective, we have staff turnover the same time every year, without any overlap, which largely decreases the number of available presentation staff at the beginning of the school year. In September and October, there are typically only three handlers available to give the bird of prey programs. This has been sufficient when the program has been automatically assigned to groups and is given one to two times a week. However, because the program number is now increasing from one to three

options and groups could potentially select to have raptor programs both nights, we may be unable to accommodate their requests until our new bird handlers are trained in and checked off on all of their handling skills.

In addition, while all three programs are designed to be done with any of our four birds of prey, we are working with live animals, so their schedules also need to be considered when assigning programs. Naturalist evening programs have historically been assigned the week before the schedule is printed, but to ensure we are not overworking our animals and that we have a trained handler available for the correct bird, evening programming schedules will most likely have to be planned for the entire month in advance. It is entirely possible that a raptor program could be scheduled each evening, and if the same bird were used each night, we would have a very displeased animal on our hands that may be less willing to participate in programs in the future.

The use of live animals is also a limitation in and of itself. There are always unknowns when working with wild animals. One day, the bird may decide not to perform a well-established behavior for unknown reasons, or a health issue could arise with no warning. As handlers, we will have to be adaptable in the moment. More experienced handlers have the option of using another bird, even though it is less ideal with the busier schedule, but new handlers will only have one bird option for their first few months of programming. Staff will be required to be flexible and adaptable if any issues arise. Proper handling training should help to prevent many of these issues.

Another limitation for this capstone project is its reproducibility for other audiences outside of Eagle Bluff. First, these programs are intended to be done with live birds of prey, so if presenters do not have legal access to captive raptors, the programs

may be less impactful. Having live animals present is intentionally done to create an emotional connection and produce more audience engagement. If presenters do have access to live raptors, these programs were designed for implementation indoors. What we choose to demonstrate behaviorally with our raptors, like cued flight from a perch to a glove, are not skills that our handlers would feel comfortable doing outside. Finally, we intend to highlight our program messages not only during the evening programs, but also around campus with various examples of positive environmental behaviors. This may not be possible or feasible at another location, so the take-home message may not be as successful long-term.

Human and animal staffing availability and the ability to effectively present these programs without live animals was discussed under limitations. The following section explores options for expanding future programming as well as ideas for more live animal program analysis.

Thoughts on Future Research

Moving forward within the context of Eagle Bluff, I think some of my ideas for future research and program development will come from our teacher feedback. Two other programs are being written in addition to my three programs, but as we determine which animals and topics are the best fit for Eagle Bluff audiences, there is the potential to create more. When we originally brainstormed new live animal programs, we narrowed our focus and chose five, but there are many additional ideas waiting on the backburner.

As for research outside of my personal workplace, I think it would be wonderful if there was more investigation into the effectiveness of live animal interactions at nature

centers and residential learning programs. I was typically only able to find research that was executed in the zoo and ecotourism settings during my literature review, and while there is some overlap, the goals and audiences of those educational settings varies from our audiences at Eagle Bluff. Additionally, there were not many results about the effectiveness or strategies for bird-specific programming. This paper's research would have ideally focused specifically on that group of live animals, but there is not a large enough body of work to support that avenue at this point in time.

Ideas for future research were discussed. The conclusion summarizes the chapter and my thoughts on the capstone process.

Conclusion

This chapter elaborated on surprising but important key findings from the research process: the emphasis on utilizing live animals to create an emotional connection and the ultimate goal of environmental education, to produce behavioral change. Additionally, I discussed the implications and limitations for the project, and I provided my ideas for potential future research.

The entire capstone process, from choosing a topic and then a research question, to combing through the existing literature and research on my subject, and finally the design process for three new programs proved to be a stressful but very rewarding growth experience. By going in depth, I was able to create effective environmental education programs that our users will not only enjoy but also walk away from with clear ideas of how to be environmentally supportive. In addition, it was useful for both my role as Raptor Program Coordinator and my workplace as a whole to be able to finish this capstone process with a clear product versus research results. I am excited for the

programs to be useful and utilized by our visiting groups. This is what kept me motivated throughout the whole process.

I hope that my research and presentations prove beneficial not only for our audiences but also for other presenters looking to refresh their own programming. It is easy to stick with the same style of programming year after year when you consistently get great feedback for it. However, by really examining the efficacy and the goals of your programs based on solid research and effective educational techniques, others may come to realize, as I did, that choosing to narrow the focus will only prompt more audiences to reach the ultimate goal of EE: to be successfully environmentally engaged with their communities in the future.

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APPENDIX

Appendix A

Interpretation Model
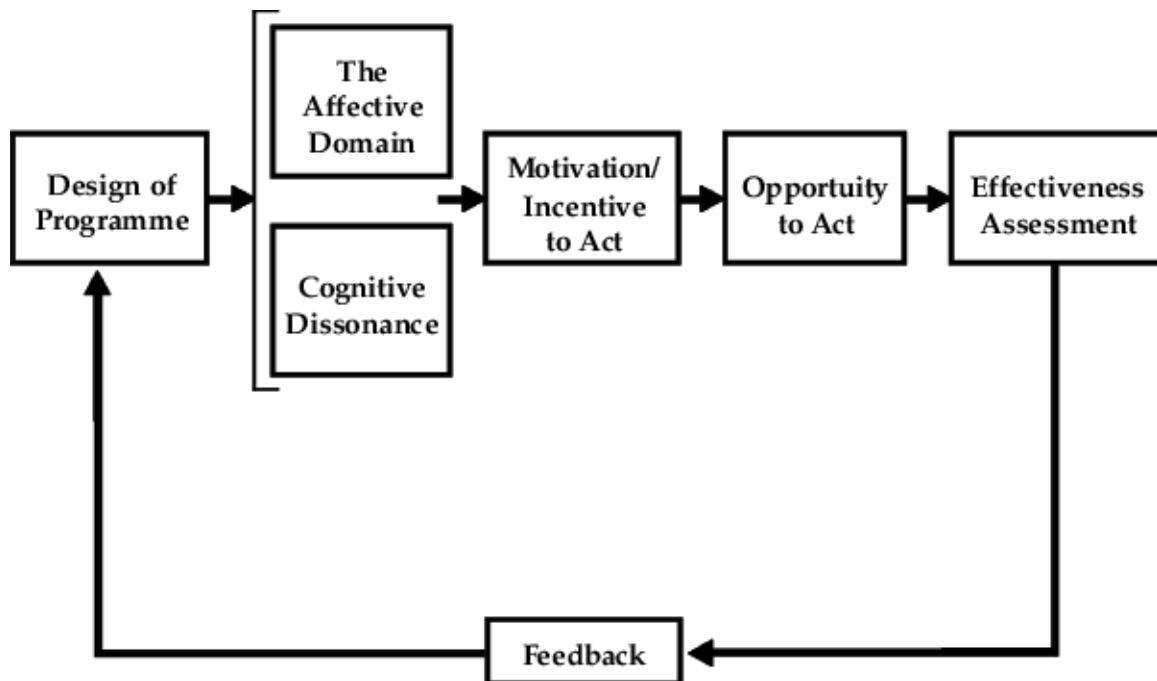
Source. Journal of Sustainable Tourism, Using Interpretation to Manage Nature-based

Tourism by Mark Orams, 1997, p. 86. https://www.researchgate.net/figure/nterpretation-

techniques-features-of-an-effective-interpretation-programme_fig2_249023867