

ASSESSMENT OF CHANGE IN CONSERVATION  
ATTITUDES THROUGH ZOO EDUCATION

By

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## CHAPTER I

### INTRODUCTION

#### **Background**

Zoos and aquariums in the United States are making a difference for wildlife and wild places as change agents to develop a passion for conservation with more than 143 million visitors a year (J Falk, Bronnenkant, Deans, & Heimlich, 2007). The question, however, is do zoos and aquariums inspire visitors to care about and care for the natural world, and take meaningful conservation action? What are the changes that occur in conservation knowledge, understanding and attitudes for those who visit a zoo or aquarium? The 2003 International Zoo Educators Association conference was held to affirm the fundamental role of zoos (West, 2008). “Zoos in the 21st Century: Catalysts for Conservation” attempted to answer whether zoos do what they claim. The conference revealed that there is a great need for evaluation to demonstrate real impact.

A 2008 research study looked at the mission statements of Association of Zoos and Aquarium (AZA) accredited zoos and aquariums (Muraoka, 2008). The single most widely used word is “conservation”, occurring in 126 of 162 mission statements; followed by “education” which appears in 111 mission statements. AZA institutions are leaders in conservation education and are constantly seeking to become more effective in connecting visitors with nature and inspiring them to become personally involved in conservation (Vernon & Boyle, 2008). A study of 97 AZA institutions investigated the

current practices for conducting visitor research and measuring mission-related outcomes (Luebke & Grajal, 2008). Despite the fact that many of the institutions conduct visitor research, most only collect measures related to their operational performance and not their mission performance.

A literature review reveals that even though zoos and aquariums promote the importance of inspiring conservation action, they have done little to assess their impact (Vernon & Boyle, 2008). In 2003, the AZA initiated a nation-wide multi-year, multi-faceted research project entitled “Assessing the Impact of a Visit to a Zoo or Aquarium” oftentimes referred to as the “Visitor Impact Study”. Over a three-year period, more than 5,500 visitors and twelve AZA institutions participated in the study. The Visitor Impact Study was funded by the National Science Foundation (award # DRL-0205843) and sought to answer four questions (Vernon & Boyle, 2008): (1) How do zoos and aquariums contribute to visitors’ understanding and perceptions of animals and their conservation? (2) How do zoos and aquariums contribute to visitors’ personal and emotional connections to animals and their conservation? (3) How do zoos and aquariums contribute to the ways visitors act and behave towards animals? And (4) who are their visitors?

The Visitor Impact Study produced four well-tested, practical visitor research tools. Listed in the Visitor Evaluation Toolbox (Falk, Bronnenkant, Vernon, & Heimlich, 2009), Tool One is a survey designed to assess the motivational categories of visitors. Tool Two is a personal meaning map which assesses personal meanings that visitors construct while at the facility and how they come to understand and make meaning of the information they encounter. Tool Three is a reflective map which tracks visitors

throughout the course of their visit by recording where they go, what they do, and the amount of time spent at various stops. Tool Four is a survey that assesses conservation attitudes as a result of a zoo/aquarium visit. The overall objective is to provide evaluation tools to AZA institutions so they can conduct qualitative and quantitative visitor studies in order for AZA to capture, compile, and continue to track zoos and aquariums collective impact (Vernon & Boyle, 2008).

The Visitor Impact Study was groundbreaking though only certain variables were studied. The population utilized spanned twelve AZA institutions of varying sizes however their sample was adults ages 18 years and older. Additionally, they evaluated visitors who had free-choice learning experiences. As quoted by Jim Maddy, President and CEO for the AZA , “For the first time we have reliable data validating the positive impact zoos and aquariums have in changing visitors’ feelings and attitudes about conservation. This study clearly shows that visitors believe that accredited zoos and aquariums are deeply committed to animal care and education, and that we play an important role in species conservation. These findings enhance our goal to build America's largest wildlife conservation movement” (Falk, et al., 2009).

### **Statement of Problem**

Differing from the AZA Visitor Impact Study, the population for this study will be visitors to the Oklahoma City Zoo, and the sample will be visitors 14-18 years of age who engage in either a free-choice or formal learning experience.

### **Purpose and significance of study**

The purpose of this study is to determine if a zoo visit influences teen visitors’ attitudes towards conservation. Affective outcomes of teen visitors having formal vs.

free-choice learning experiences will be measured via tool four, the conservation attitudes survey, of the Visitor Evaluation Toolbox.

In the last ten years, AZA-accredited institutions provided school field trips that connected more than 12- million students with the natural world (AZA, 2009a). Five percent (5%) of zoo visitors in the United States are teenagers, and yet they are the most neglected age group with respect to zoo planning and programming (Wineman, Piper, & Maple, 1996). According to Wray-Lake, et.al (2010, p.82) “youth have much to contribute to environmental issues yet they do not get the attention they deserve from environmental scholars.” Reasons teenagers will be selected for this research study are: (1) Teenagers are emerging adults, and adults made up 56.3% of Oklahoma City Zoo visitors in 2009 (Foltz, 2010) (2) The number of zoo field trips typically drops off after the seventh grade. If zoos are aware of both the cognitive and affective domain teens bring with them during a visit and know how to use this information to develop programs that reach young adults, they may also be able to increase the number of teenagers who visit the zoo (3) Teenagers are concerned about the role of zoos in environmental affairs (Wineman, et al., 1996). Likewise, teenagers are future voters who will influence the nation’s politics (Chapin, 2000) and their views offer insight into the likely nature of future environmental policies, since younger generations will inevitably become national and global leaders with responsibility for environmental stewardship and sustainability (Wray-Lake, Flanagan, & Osgood, 2010) and (4) according to Piaget’s theory of development, teenagers have reached the formal operational stage of development and are capable of thinking logically and abstractly (Piaget, 1929). Zoo visitors interpret information they are given based on their previous knowledge, understanding,

experiences, and beliefs (Falk & Dierking, 2000; Kolbert, 1995). Therefore, it is important for zoos and zoo educators to know if students' conservation attitudes change as a result of a learning experience at the zoo. Once managers of zoos have an understanding of their impact on student attitudes, they will have a quantitative foundation on which to inform and build future educational programs and activities.

Education is a lifelong endeavor. Formal zoo education is conducted in the framework of the curriculum of educational institutions (IUDZG/CBSG, 1993) while informal zoo education is not connected with the curricula of formal educational institutions. The Oklahoma City Zoological Park and Botanical Garden serves as the setting for both by providing structured conservation education classes/programs as well as free-choice learning opportunities throughout zoo grounds. Free-choice learning is learning that people engage in throughout their lives to find out more about what is useful, compelling, or interesting to them (Falk, 2005). Falk and Dierking (2002) maintain that most environmental learning is not achieved in school but through free-choice learning experiences. Research suggests that while learners spend only a short amount of time engaged in the learning experience in informal educational settings, these experiences can have considerable influences on attitudes and behavior (Roy Ballantyne & Packer, 2005). Yet zoos have conducted little research that assesses best practices in program delivery or the impacts of different teaching styles on visitors regarding cognitive or affective changes (Bell, Lewenstein, Shouse, & Feder, 2009; Visscher, Snider, & Stoep, 2009). Therefore, in addition to sampling teenagers, this study will further look at the type of learning experience they were engaged in, either formal or free-choice.

Lastly new data will add to the dialogue and exchange of educational knowledge, information, and expertise between zoos and as a result may enhance the effectiveness of zoo networks for conservation education.

### **Delimitations**

This study was designed with the following delimitations:

1. Subjects will be visitors to the Oklahoma City Zoological Park and Botanical Garden.
2. Subjects will be ages 14-18 years old.
3. Subjects will have either had a formal or free-choice learning experience while at the zoo.
4. The instrument used will be the AZA "Conservation Attitudes" survey.

### **Limitations**

1. Subjects will self-report their age(s).
2. During the survey subjects might discuss the questions.
3. Subjects will be only teen visitors to the Oklahoma City Zoological Park and Botanical Garden.
4. Subjects without necessary consent forms will not be allowed to participate.
5. There will be no attempt to account for variability due to individual demographics, zoo visitation, and previous exposure to zoo education class, or school affiliation.

### **Assumptions**

The following assumptions were made related to this study: Subjects will make an honest effort:

1. To state their true age.
2. In answering the instrument questions.
3. To refrain from discussing the survey with other participants during the survey itself.

## **Definitions**

In 2006, the Definitions Project grew out of a need to establish common vocabulary for joint agencies and organizations associated with education and interpretation in non-formal settings. Representatives from over two dozen federal agencies, nonprofit professional organizations, and not-for-profit organizations came together to agree on the definitions of common terminology used by interpreters, environmental educators, historians, and others in non-formal settings such as parks, aquariums, zoos, nature centers, historic sites, and museums ("Definitions Project,"). Unless otherwise cited, all definitions listed below are taken from the Definition Project website.

**Zoo**- Places where non-domesticated animal species are kept for the purposes of conservation and protection from extinction, by strengthening wild populations whose genetic variability have been lost (Kola-Olusanya, 2005).

**Conservation** - An ethic of planned management of a natural resource or a particular ecosystem based on balancing resource production, use, allocation, and preservation to ensure the sustainability of the resource.

**Formal Education** - The hierarchically structured, chronologically graded “education system”, running from primary school through the university and including, in addition to

general academic studies, a variety of specialized programs and institutions for full-time technical and professional training.

**Informal Education** - The truly lifelong process whereby every individual acquires attitudes, values, skills, and knowledge from daily experience and the educative influences and resources in his or her environment -- from family and neighbors, from work and play, from the market place, the library, and the mass media.

**Free-choice learning** - The type of learning guided by a person's needs and interests -- learning people engage in throughout their lives to find out more about what is useful, compelling, or interesting to them.

**Interpretation** - A mission-based communication process that forges emotional and intellectual connections between the interests of the audience and meanings inherent in the resource.

**Environmental Education** - A learning process that increases people's knowledge and awareness about the environment and its associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action.

**Conservation Education** - The process of developing an individual's knowledge, values, and skills to foster an ethic of planned management of a natural resource or a particular ecosystem.

**Experiential education** - A philosophy and methodology in which educators purposefully engage with learners in direct experience and focused reflection in order to increase knowledge, develop skills, and clarify values.

**Nature** - The external world in its entirety ("Merriam -Webster online dictionary," 2009)

## **Research Questions**

The research questions incorporated into this study were designed to directly investigate the possibility of attitudinal change related to conservation as influenced by educational programs at the zoo.

1. Does a visit to the zoo affect conservation attitudes? This question permitted the investigation of the possibility that any visit to the zoo may influence conservation attitudes.
2. Does learning method (free-choice vs. formal) affect conservation attitudes? This question permitted the investigation of the possibility that the program offering learning opportunities while at the zoo may affect conservation attitudes.

## **Hypothesis**

Two hypotheses tested in this study and designed to answer the foregoing research questions are:

1. There is no difference in conservation attitudes within groups as measured by the conservation attitude survey.
2. There is no difference in conservation attitudes as measured by the conservation attitude survey between groups participating in two different types of learning experiences.

## CHAPTER II

### REVIEW OF LITERATURE

#### **Perceptions of Nature**

*“A kid today can likely tell you about the Amazon rain forest – but not about the last time he/she explored the woods, lay in a field listening to the wind or watching clouds move.” (Louv, 2006)*

*“More daunting is the prospect of today’s children (tomorrow’s parents) in a culture devoid of contact with the evolutionary driver and life-support system that is our natural world.” (Zaradic & Pergams, 2007)*

#### **MODES OF EXPERIENCING NATURE**

E. O. Wilson’s biophilia hypothesis states that humans have an innate desire to categorize, understand, and spend time with other life-forms (S. Kellert & Wilson, 1993). It further asserts that all people are characteristically drawn to nature and need to have an affiliation with nature in order to obtain the optimal level of self-value. Wild animals inspire humankind’s innate caring about species and nature because of their dependence on ecosystems, their beauty, and because we relate to them as sensing creatures (S. Kellert & Wilson, 1993).

Kellert (2002) describes three modes of experiencing nature: direct, indirect and vicarious. Direct experiences involve physical contact with natural settings and non-

human species and are free of human intervention. Indirect experiences with nature involves physical contact but in a more controlled and restrictive setting. Zoos, nature centers, and museums provide indirect nature experiences. Vicarious experiences are devoid of actual physical contact with nature. Photographs, television, videos, the internet and virtual webcam tours are examples of vicarious experiences.

Historically what is unique about the United States is its citizen's relationship to the land. In the span of only a century, the relationship with land went from utilitarian, to romantic, to electronic detachment. Laying the framework for how American's relationship with the land has changed is Frederick Jackson Turner's Frontier Thesis. According to Turner, the frontier had been the most important factor in shaping a distinctly American character and in differentiating America from Europe (Whitehead, 2001). Turner's work chronicled three distinct frontiers. In the First Frontier, the relationship was utilitarian and land was viewed as something to be tamed. It was a time of exploration and Westward expansion and settling of land, due to the Homestead Act. Signed into law by President Abraham Lincoln in 1862, the Homestead Act encouraged western migration by providing settlers 160 acres of public land ("Homestead Act,"). The new law required three steps: file an application, improve the land, and file for deed of title. The Homestead Act led to the distribution of 80 million acres of public land by 1900. However in 1890, the U.S. Census Bureau had announced the disappearance of a contiguous frontier line and thus the first frontier was considered "closed". The Second Frontier saw a shift to a more romantic view of and relationship with the land. Citizens became more immersed in the domesticated landscape. A rise in populations moving to urban and even suburban areas took place. President Teddy Roosevelt was a driving

force in the idealism of the “outdoorsman” and asked Americans to take stock of, celebrate and preserve the land. His popularity influenced Americans to become concerned with the preservation and conservation of America’s treasures. The creation of the National Park Service occurred during this frontier. Marking the end of the Second Frontier was the disappearance of familial and cultural links to farming. Baby boomers, Americans born from 1946-1964, may be the last generation to share a familial attachment to the land and water (Turner, 2008). The Third Frontier was ushered in around 1990, when the US Census count showed that less than 2% of Americans resided in rural areas. The relationship with the land is of complete detachment. This Frontier is now shaping how current generations of young Americans and their children will perceive nature. Americans in the Third Frontier are electronically detached from nature. According to Richard Louv (2006) nature is no longer romanticized because it’s no longer relevant to the American experience.

### **Trends that De-Nature Childhood**

Today’s children are tomorrow’s parents, but with a greatly decreased connection to nature (Zaradic & Pergams, 2007). Research related to direct experiences with nature is growing. Richard Louv’s book, *Last Child in the Woods*, confirms this by bringing together a diverse body of research indicating that direct exposure to nature is essential for healthy childhood development and for the physical and emotional health of children and adults (Louv, 2006). He also coined the term “Nature-Deficit Disorder” (NDD). According to Louv, “Nature-Deficit Disorder is not an official diagnosis but a way of viewing the problem, and describes the human costs of alienation from nature, among them: diminished use of the senses, attention difficulties, and higher rates of physical and

emotional illnesses”. This disorder can be seen in individuals, families, and even communities (Charles, Louv, Bodner, & Guns, 2008). Louv (2008) identified four emerging trends that play a role in a de-natured childhood. Trend one: human disconnection regarding the origins of food due to lack of any personal experience in raising food. Trend two: a disappearing line between humans and animals due to the emergence of genetic engineering. As of 2000, several hundred animals had been genetically altered with human genes and even patented. For baby boomers this was seen as fascinating, strange and even disturbing while third frontier children simply accepted it as everyday. Trend three: perceptions of other animals due to increased scientific research which focuses on the similarities of animals to humans has led to a more intellectualized view point. Trend four: invasion of cities leading to increased contact with wild animals due to urban sprawl and depletion of animal habitat. Louv further cites both public and private governments as a barrier for connections to nature. Public government restricts children’s access to nature by zoning and permitting lawsuits that forbid forts and playhouses or through regulatory oversight of natural places. Land use decisions made by both state and federal governments have closed public access areas in order to reduce human impact; however at the same time it has escalated pressure on other natural places that remain accessible. Currently 47-million Americans live in properties ruled by cooperatives and homeowners associations that have strict covenants. An unintended consequence of some covenants is the discouragement of natural play. Louv summarizes by stating “the cumulative impact of overdevelopment, multiplying park rules, environmental regulations, building regulations, community covenants and fear of litigation sends a message to children that free-range play is unwelcome”.

Another factor linked to NDD is videophilia. Videophilia is defined as “the new human tendency to focus on sedentary activities involving electronic media” (Zaradic & Pergams, 2007). Children between the ages of 8-18 spend an average of 6.5 hours/day with electronic media (Roberts, Foehr, & Rideout, 2005). Perhaps this is best summed up by Paul, a fourth grader from San Diego, “I like to play indoors better ‘cause that’s where all the electrical outlets are” (Louv, 2006).

Yet another current trend plays a role as well. Today’s children are described as the backseat generation—riding in cars to/from school, after-school activities, dance classes, sports practices and other extracurricular events (Karsten, 2005). Children are too busy and their lives too structured (Clements, 2004).

Likewise, the AZA 2004 report on conservation education trends stated that “increasing urbanization and technology has separated people from authentic experiences with the natural world, while experiences to superficial representation of nature have increased” (Ogden, Gentile, & Revard, 2004). Kellert suggests that direct nature experiences play the most significant role in cognitive and evaluative development (in Zaradic & Pergams, 2007), but adds that indirect nature experiences may exert the greatest positive effect in conjunction with direct encounters. Zoos offer an educational opportunity to come in contact with nature (Hancocks, 2001). Kellert (2002) corroborates this by asserting “that due to the deterioration in spur-of-the-moment and direct encounters in the natural world, zoo opportunities serve as a sufficient replacement”. *Children and Nature: a report on the movement to reconnect children to the natural world* substantiates this too (Charles, et al., 2008). They call upon zoos to become centers for regional children and nature campaigns in order to help transform

communities. Recreational settings such as nature centers, zoos, parks, and historic sites are now becoming more important because they put both children and adults back in contact with the real resource, not an electronic or print image of it (Brochu & Merriman, 2002). Zoos are not only windows into vanishing worlds but also community centers where city dwellers go to recharge their batteries and connect, even if only subconsciously, with nature (West, 2008).

## **ZOOS**

*“To tour the cages of a zoo is to understand the society that erected them”.*

*(Baratay & Hardouin-Fugier, 2004)*

### **The Evolution of Zoos**

Throughout the history, great importance has been placed on collecting both fauna and flora (Croke, 1997; Hancocks, 2001). Historians believe the earliest animal collections began in ancient Egypt (Dembeck, 1965; Diess & Hoage, 1996). Early animal collections included both domesticated and exotic animals and were used for hunting, personal satisfaction and entertaining guests (Diess & Hoage, 1996). Crowds watched lions being fed live prey at local temples. Gladiators were sent into battle against hundreds of bears and lions and occasionally coliseums would be flooded to accommodate fights against hippos, seals, and crocodiles (Croke, 1997). During this time trading between nations increased and animals became political pawns. Ownership of animals was considered proof of wealth and stature (Croke, 1997). The gift of an animal was seen as powerful for both the gift giver and the recipient (Baratay & Hardouin-Fugier, 2004).

In the second half of the seventeenth-century, places where animals were kept as collections were called menageries (Baratay & Hardouin-Fugier, 2004). The term menagerie was first used in 1664 to describe a collection of animals at Versailles (Baratay & Hardouin-Fugier, 2004). Zoo design was limited primarily to the construction of individual animal cages with human safety as the main goal. The ability to see the animals was secondary. The relationship between the organism and its natural environment was not considered in menagerie design (Croke, 1997; Koebner, 1994).

During the eighteenth-century many people were exposed to exotic animals at local fairs. Animals in traveling shows were often taught tricks to entertain the public. In the United States, traveling shows and menageries were thriving by 1813 (Baratay & Hardouin-Fugier, 2004). As a result zoos became popular places for the public to see exotic animals. The design of zoos centered on taxonomy, physical characteristics and relationships of the animals (Diess & Hoage, 1996; Karkaria & Karkaria, 1998; Rabb, 1994). Interpretation was restricted to the name of the animal and comparative anatomy and physiology (Karkaria & Karkaria, 1998) and little was done to support the understanding of ecological relationships and the importance of habitats.

As zoos became public institutions in the nineteenth-century it became important for them to reflect on how to best share the zoo's collections with visitors (Croke, 1997; Koebner, 1994). The need to provide visitors a place for public viewing gave rise to exhibits. Zoo exhibits are defined as a space in which one or more animal specimens form the focal point (Tunncliffe, 1996). Toward the end of the nineteenth-century, scientific study of animal species found in zoos became more popular (Harrison, 1991).

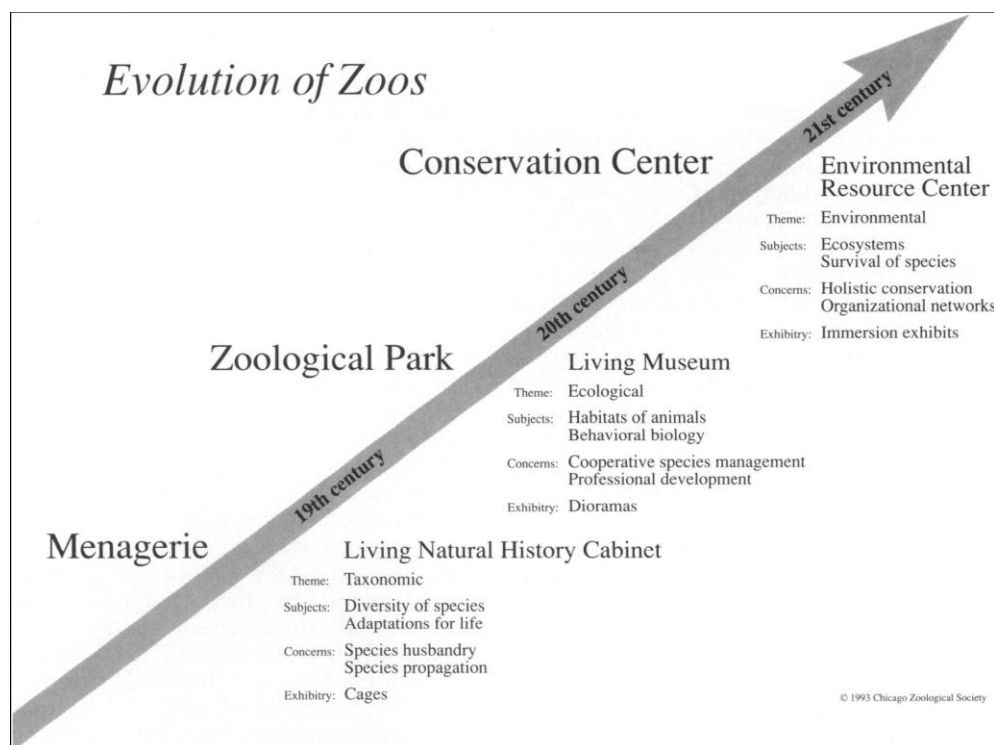
The twentieth-century zoological parks were designed to show the natural habitat

of the animal in an enclosure. Ecological themes were introduced and the information conveyed concerned the habitats of animals and their behavioral biology. The view of the visitor became more important. Exhibits were often enclosures surrounded by moats, designed to be similar to the animal's natural habitat and consisted of larger areas for the animal, artificial rockwork, and some vegetation. Animal exhibits were laid out zoo-geographically, arranging species based on shared or similar geographical settings (Baratay & Hardouin-Fugier, 2004; Croke, 1997; Diess & Hoage, 1996; Harrison, 1991; Koebner, 1994). Still most emphasis was on the exhibit itself and not on science or education (Karkaria & Karkaria, 1998).

Zoos in the twenty-first century are still evolving. Moving from past roles as menageries and living museums, zoos are shifting to roles in research and conservation. Modern day exhibits, design, layout and messaging support the concept of zoos as conservation centers. Evolving in respect to preservation of biological diversity, zoos have begun to make significant contributions as genetic refuges and reservoirs, especially for large vertebrate species threatened with extinction (Rabb, 1994). The challenges in maintaining biodiversity by zoos have changed to include not only the welfare of individual animals, but also long term population management and species survival strategies. Some animal behaviorists, geneticists and ecologists now view zoos as valuable resources for preserving the diversity and long-term survival of many rare and endangered species (Turley, 1999). According to AZA, their institutions use extensive animal care and management practices to save species from extinction by determining the best *ex situ* (occurring outside the animal's natural habitat) ways to care for, reproduce for genetic diversity, and develop reintroduction programs to re-establish *in situ* (the

animal's natural habitat ) populations ("Conservation commitments and impacts," 2009). Current exhibit style associated with twenty-first century zoos is habitat immersion. By designing an enclosure landscaped with both real and artificial material, the visitor feels as if they are a part of the animal's habitat. The overarching central theme is the animal's environment and everything within the exhibit is oriented to the theme. In a habitat immersion zoo experience all thematic elements contribute to a visitor's feeling of being in the organism's habitat (Karkaria & Karkaria, 1998). Moreover, immersion exhibits contribute to favorable reception by visitors who hold strong conservation messages (IUDZG/CBSG, 1993). Summarizing the evolution of zoos is Figure 1 which shows that zoos are rapidly evolving to serve in various ways as conservation centers.

Figure1: Evolution of Zoos



(Rabb, 1994)

## **Zoo Design: Form and Function over Time**

Early zoos displayed wild animals in cages and grouped them to emphasize species identification and classification (Woods, 2003). Referred to as first generation exhibits, these concrete enclosures primarily housed larger animals. They facilitated viewing by visitors and allowed keeper access for daily tasks such as feeding and cleaning, but added little towards the welfare of the animals or visitor learning. Opportunities to learn about the animals' natural habitats, behavior and traits were limited.

In the early 1900s, zoos started to use moats, shrubbery and artificial rocks instead of bars, to provide both visitors and animals with a more natural experience (Ebersole, 2001). Second generation exhibits had a more natural appearance but still incorporated lots of concrete and artificial structures in the design.

The latest trend in modern zoos is to design enclosures that mirror features found in the animals' natural habitat (R. Ballantyne, Packer, Hughes, & Dierking, 2007). Third generation exhibits use natural vegetation and landscaping to create the illusion that animals are living in their native environment. Third generation exhibits often include wide open areas, water features and give visitors the feeling that animals have the freedom to roam (Woods, 2003). As well as recreating habitats that mimic those found in the wild, third generation exhibits usually provide information about both animals and conservation issues (Swanagan, 2000). In addition to their aesthetic appearance, modern enclosures are often designed with enrichment as a focal point. Enrichment is defined as stimulating and challenging environments, objects, and activities for animals to enhance their mental and physical well-being (AZA, 2009c). The purpose is to stimulate species-

specific behavior that provides visitors insight into how captive animals would behave in the wild (Tofield, Coll, Vyle, & Bolstad, 2003). Observing this naturalistic behavior has the potential to increase visitors' understanding of the animal but to encourage positive attitudes towards conservation of the species. Table 1 summarizes various zoo design generation exhibits with regard to costs and benefits to the visitor experience.

Table 1: Costs and benefits of first, second and third generation exhibits

Design Type	Benefits	Costs
Generation 1- 2 exhibits	Close and easy access	Negative impact on visitor experience and animal welfare
Generation 3 exhibits	Natural appearance and showcase animal enrichment	Animals may not be visible Natural appearance is an illusion

(R. Ballantyne, et al., 2007)

### **Zoos in North America**

In 1924 the Association of Zoos and Aquariums (AZA) was organized under the name American Association of Zoological Parks and Aquariums. It was formed to provide a professional forum for zoo officials to discuss their animals. It underwent several name changes, becoming the American Zoo and Aquarium Association in 1994 and in 2005 adopted the name Association of Zoos and Aquariums. The AZA is a nonprofit organization committed to the progression of accredited zoos and aquariums in the areas of animal care, wildlife conservation, education and science (AZA, 2009b). With 218 accredited members, AZA considers itself North America's largest wildlife conservation movement by drawing more than 175 million visitors every year, reaching more people than the combined annual game attendances of the National Football League, National Hockey League, and National Basketball Association and Major

League Baseball (AZA, 2009). “Zoos and aquariums accredited by the AZA are continuously evolving accredited institutions are expected to be leaders in the field and to embrace the highest quality facilities, programs, and staff available” (“Association of Zoos and Aquariums,” p. 4)

### **Modern Roles of North American Zoos**

One important way in which zoos have worked towards conservation is by inspiring and educating their visitors. Citing Michael Hutchins, AZA director of conservation and science: ‘Zoos and aquariums have the ability to influence a lot of people ... about 140 million people go through AZA facilities every year. That’s half the US population’ (Ebersole, 2001). Ebersole (2001) goes on to cite John Flicker, Audubon’s president, stating: ‘They reach into communities that no one else has figured out how to reach and provide an emotional connection to wildlife’. Conservation messages in zoos and aquariums may encourage visitors to care for natural resources, maintain local habitats for wildlife and participate in local community-based efforts to restore and protect the environment (Rabb, 2004).

A fundamental principle of zoos and aquariums is to facilitate and support conservation attitudes, knowledge, and behavior among their visitors (Broad & Weiler, 1998). Every zoo realizes that its mission is to conserve wildlife and natural habitats through changing the attitudes of its visitors ((Norton, Hutchins, Stevens, & Maple, 1995). Present-day zoos are positioned to shape public opinion, to encourage empathetic attitudes toward wildlife, in addition to educating visitors. According to AZA over the past twenty years there has been a paradigm shift within its education focus and efforts (Ogden, et al., 2004). Initially coined the Public Education Committee, a name change to

the Conservation Education Committee (CEC) occurred in 1997 as AZA responded to changing times and trends of the outside world. Previous educational focus was largely aimed at teaching animal facts to school-aged children. While still teaching animal facts (cognitive goals), current focus has become more inclusive of a wider audience and is designed to instill caring for animals (affective goals) and also to inspire conservation action (behavioral goals). AZA's current educational focus is placing more attention on attaining affective and behavioral goals with visitors. In 2007, one core value listed by AZA's long range planning and prioritization committee addressed conservation education for both the public and members (AZA, 2007). The committee called for strengthening and promoting public conservation education programs. It further stated that AZA should strive to accelerate positive conservation action through individual and collaborative educational efforts of its member institutions. AZA's commitment to support its member institutions in becoming leaders in conservation education was affirmed.

### **Studies on Zoo Visitor Research**

A 2008 study of 97 zoos and aquariums asked about their efforts in conducting audience research. Three respondents did not provide an answer, therefore N=94 for the reported data. Only 35.1% of respondents indicated that they had regularly conducted visitor research within the past five years while 64.9% report that they occasionally, rarely or never conduct visitor research (Table 2).

Table 2: Frequency of visitor research conducted during the last five years

	Count	Percent
On a regular basis	33	35.1%
Occasionally for special project or events	25	26.6%
Only rarely for special projects or events	19	20.2%
No visitor research in the last five years	17	18.1%
Total	94	100%

(Luebke & Grajal, 2008)

Furthermore, when asked to identify all the types of visitor information they collect over 90% indicated that they collect visitor demographic information and satisfaction measures about specific event or attractions. Measures related to mission performance such as knowledge gains, affective reactions to animal and visitors' intended conservation actions were collected to a much lesser degree (Table 3).

Table 3: Types of visitor information collected

	Frequency of Visitor Research			Overall
	Regular basis	Occasionally for special projects or events	Rarely for special projects or events	
Visitor demographics (age, gender, ethnicity, zip code, etc)	100%	96%	78.9%	93.6%
Satisfaction with specific events or attractions	97%	84%	94.7%	92.3%
Satisfaction with specific visitor services or amenities	87.9%	80%	63.2%	79.5%
Visitors' motivations/reasons for visiting the facility	81.8%	64%	57.9%	70.5%
Gains in knowledge or understanding of animals, nature, ecosystems or conservation	57.6%	52%	31.6%	50%
Visitors' prior interest or knowledge of animals, nature, or conservation	42.4%	52%	26.3%	42.3%
Intentions/motivations regarding future conservation efforts	42.4%	44%	21.1%	37.2%
Affective/emotional reactions to animals, exhibits, or animal demonstrations	42.4%	44%	21.1%	37.2%
Other experiences or reactions related to the organizations mission	27.3%	16%	5.3%	17.9%

(Luebke & Grajal, 2008)

Survey respondents also described the tools and techniques they used to conduct their audience research. Table 4 provides the list of evaluation methods and tools used.

Table 4: Evaluation Methods and Tools Employed

Type of Method or Tool	Count	Percent of all respondents
Focused educational evaluations-programs, exhibits, shows, docent stations, tours, fee-based classes, off-site programs	37	39.4%
General satisfaction survey, gate/exit/demographic surveys	34	36.2%
Visitor comment cards/books/sheet, verbal feedback, casual conversations, visitor letters/emails	12	12.8%
Observational/tracking/time studies	8	8.5%
Working with outside consultants, marketing companies, university professors or students	7	7.5%
Visitor on-line,/telephone surveys	7	7.5%
Front-end, formative, or summative evaluations (new exhibits or interpretive signs)	7	7.5%
Teacher evaluation forms (school-based programs)	6	6.4%
Attendance data, repeat booking for programs or events	5	5.3%
Visitor focus groups	5	5.3%
Secret/mystery shopper program	5	5.3%
Evaluation components within grant-funded projects	4	4.3%
Visitor interviews	3	3.2%
Pre/post measures	2	2.1%
Staff-volunteer assessments	2	2.1%

Note: Percents will not total 100% due to respondents listing multiple types of efforts used.

(Luebke & Grajal, 2008)

### **Research on the Impact of Zoos and Aquariums**

In his introduction letter in Visitor Learning in Zoos and Aquariums, Sydney

Butler stated:

“Inherent in most zoo and aquarium missions is a desire to change visitor behavior and attitudes, with the aim of creating a more environmentally aware and responsive population. Our institutions hope to increase awareness of conservation and conservation actions so visitors will become better stewards of the environment, yet we lack the data to determine the extent to which we are successful. We’re convinced of the value of our exhibits and programs, yet we are hard pressed to cite specific research when questioned” (Dierking, Burtnyk, Buchner, & Falk, 2002).

Research specifically documenting the impact of conservation messages in zoos is in its infancy (Swanagan, 2000). While a majority of the studies investigated public perception of animals, few paid little attention to overall conservation messages conveyed in most zoos (Dierking, et al., 2002). Additionally very few studies have investigated the overall impact of a visit or visits to an individual institution and across AZA institutions. A 1991 study also stated the need for research that would document the impact of visits to zoos and aquariums on visitors’ conservation knowledge, attitudes, awareness, affect, and behavior (Churchman & Marcoulides, 1991).

To address this deficit of information, the AZA Conservation Education Committee assembled a national advisory group to launch a research program involving multiple AZA accredited institutions. In 2001, AZA initiated its first research project “Assessing the Impact of a Visit to a Zoo or Aquarium”. This key, multi-year research initiative was designed to assess the conservation impact of a zoo or aquarium visit on adults. Initially called the Multi-Institutional Research Project (MIRP), it began with a thorough literature search to review and summarize what was already known about the impact of zoo and aquarium visits (Dierking et al., 2002). One key finding revealed that

a majority of zoo studies had investigated the perceptions the public has of animals. Even though many of these same studies cited the potential for zoos to positively influence their visitors' conservation knowledge, affect, attitude, and behavior, these claims were not substantiated or validated by actual research (Dierking, et al., 2002). Action items called for upon conclusion of Phase 1 of AZA's research were dissemination of results, development of research plans for studying the impact of zoo on conservation-related attitudes and behavior and creation and implementation of a standardized conservation assessment tool (Falk, et al., 2009).

Next, a series of public forums included zoo and aquarium professionals from across the country in the discussion of how people learn in free-choice settings and how aquariums and zoos contribute to visitors' knowledge of, feelings for, and behavior toward animals and conservation. Drawing on feedback from these meetings, Institute for Learning Innovation (ILI) researchers developed a series of studies to better understand visitors' in-coming motivations, interests, and knowledge; to directly measure changes in visitor learning and attitudes toward wildlife and conservation; and to analyze how the findings can be used to enhance zoo and aquarium effectiveness. An initial study examined audience perceptions of zoos and aquariums and the various ways that audiences value zoos and aquariums (Fraser & Sickler, 2008b). A baseline assessment of public perceptions assessed via nationwide surveys was given to targeted audiences including teachers, parents, volunteers, and the general public (Fraser & Sickler, 2008). Six value themes were revealed. Theme One addressed zoos as a source of environmental information and action messaging; and revealed that the public and parents especially value zoos and aquariums as places to educate individuals about

animals and habitats, and as playing an important role in worldwide conservation efforts to preserve species. Educators especially value them as places for educating students about animals and habitats and as an important source for wildlife conservation and protection. Theme Two addressed the connection to personal, moral, family values, traditions and faith; and revealed that the public and parents value them as places to appreciate living animals and that nature experiences are an important part of childhood. Theme Three addressed interpersonal bonding and social capital; and revealed that the public and parents valued them as places to spend time with friends and family in a nature setting and also as places to discover new things together. Theme Four addressed connection with nature and animals; and revealed that all groups have positive opinions about the role of zoos and aquariums in facilitating a connection with nature and animals. This was one of the most strongly associated values in the study. It was more focused on the tangible aspects of experiencing nature, and all three panels found nature experiences to be a crucial part of childhood, which suggests the usefulness of zoos and aquariums. Theme Five addressed the value of teaching, learning; and revealed that educators, in particular, value them as places for educating students about animals and habitats and that zoos provide fun, field trip experiences. Theme Six addressed the moral critique of zoos/aquariums: and was designed to assess the prevalence of anti-zoo sentiments raised by those who oppose zoos and aquariums. Regarding the moral character of zoos and aquariums, all panels had positive opinions and the majority of the public disagrees with anti-zoo/anti-aquarium arguments.

Next an “evaluation toolbox” was created to measure changes in visitor learning and attitudes toward wildlife and conservation. It consisted of four evaluation tools.

Tool #1: Motivational Categories of Visitors sought to answer the question “why visitors come?” Tool #2: Personal Meaning Mapping sought to answer “what understandings do visitors bring with them?” Tool #3: Reflective Tracking sought to answer “what do visitors do while at our zoo or aquarium?” Tool #4: Conservation Attitudes sought to answer “do visitors attitudes towards conservation change?”

Completed in 2006, Phase 2 of the MIRP produced the publication “Why Zoos and Aquariums Matter” that confirmed that zoo and aquarium visits do contribute to positive conservation knowledge, attitudes, and behaviors (Falk, Bronnenkant, Deans, & Heimlich, 2007). Despite the findings of “Why Zoos and Aquariums Matter”, a 2008 study of ninety-four (94) accredited zoos and aquariums indicated that there is still a need to improve both the quality and quantity of data that measures the effectiveness of their impact and mission (Luebke & Grajal, 2008). Overall 52.1% of zoos and aquariums stated that visitor research data is “greatly needed” and 40.6% indicated it was “somewhat needed” as indicated by Table 5.

Table 5: Need to improve the quality and or quantity of data concerning the effectiveness or impact of the organizations mission

Frequency of visitor research	Greatly needed	Somewhat needed	Only slightly needed	Not at all needed	Average rating *
Regular basis	30.3%	57.6%	9.1%	3.0%	3.15
Occasionally for special projects or events	72.0%	28.0%	0.0%	0.0%	3.72
Rarely for special projects or events	57.9%	31.6%	10.5%	0.0%	3.47
No visitor research in last five years	62.5%	31.3%	6.3%	0.0%	3.56
Overall	52.1%	40.6%	6.3%	1.0%	3.44

\* Scale: 4=greatly; 3=somewhat; 2=only slightly; 1=not at all needed

(Luebke & Grajal, 2008)

## Motivations of Zoo Visitors

Visitor demographics by themselves are not helpful in indicating the knowledge and attitudes that visitors bring with them during a visit and how they might change afterwards (Vernon & Boyle, 2008). Research by Falk (Falk, 2005) found that the motivations individuals have for visiting free-choice learning institutions appear to be identity related. Personal identity is defined as the cluster of knowledge, characteristics and past experiences or activities brought with the visitor (Bell, et al., 2009). Falk proposed clustering visitors' identity related motivations into five categories: experience seekers; professional/hobbyists; spiritual pilgrims, facilitators; and explorers. Further explanation is given in table 6.

Table 6: Categories of visitor identity related motivations

Selves			
Dimension	Motivational Self	Definition	Example
Community	Experience Seeker	Visiting the area as a tourist or values the institution as a part of the community	It is one of the best places to visit around here
Professional/ Hobby	Professional/Hobbyist	Visit is a result of professional or hobby interests; environmentally aware	I like to study wildlife
Spiritual	Spiritual Pilgrim	Visit is a physical, visual or mental Zen-like experience, or it has religious meaning	I feel at peace in these surroundings
Social	Facilitator	Children or other adults are the focus of visit	This is a good way for my family/friends to share quality time
Individual	Explorer	Visit is designed to satisfy individual interests	I like to watch the animals

(Fraser & Sickler, 2008a)

Identities such as these may be drivers for what visitors do and learn in designed settings (Falk, Heimlich, & Bronnenkant, 2008).

## **Implications for Zoos**

Mass visitation to zoos makes them excellent institutions to increase public awareness of the irreplaceable values of nature (IUDZG/CBSG, 1993). Education is therefore an essential conservation task of zoos. Crafting educational messages in zoos is a difficult task because visitors encompass a wide variety of demographics and come for different reasons (Karen Povey & Rios, 2002). The zoo public is not only large in number but also broad in its composition, including all levels and sectors of society. As a result, informal zoo education should be directed towards widely diverse groups, not exclusively towards children. In contrast, formal education should be directed towards the array of educational institutions that take advantage of zoo facilities to satisfy their curricular needs (IUDZG/CBSG, 1993). Zoos must consider what messages are most appropriate and effective and then find ways to direct these messages to their audiences. Rather than aiming for visitor understanding of complex environmental issues, which is virtually impossible when a visit lasts for a couple of hours, the goal of zoos should be to instill a sense of appreciation and stewardship for animals and the environment (Povey & Rios, 2002).

## **Learning**

*“Acts of conservation without the requisite desires and skill are futile. To create these desires and skills, and the community motive, is the task of education.” (Aldo Leopold, 1944)*

Virtually all people develop skills, interest and knowledge relevant to science (Bell, et al., 2009) and this learning differs as development, maturity and life unfolds. At birth children begin to build their basis for learning science. Through their

experimentation with objects, they develop a sense of the natural world. By the end of their second year, they have acquired a remarkable amount of knowledge about their physical world (Cohen & Cashon, 2006).

As they become more mobile and begin talking, their opportunities for science learning increase. Informal, spontaneous discoveries; such as watching lightning bugs, are supplemented by programmed learning opportunities; such as visits to a zoo or museum or participating in science related activities at day care ("National Research Council," 2009). These impromptu discoveries lead to the development of science concepts and are enhanced by the expanding reasoning skills of the child (Halford & Andrews, 2006). According to the National Research Council ("National Research Council," 2007), by the time a child enters a formal school environment they not only have a notable range of cognitive skills but also an extensive body of knowledge related to the natural world. It is also expected that they use places outside the formal class to acquire science information (Korpan, Bisanz, Bisanz, & Lynch, 1998). These non-formal activities continue throughout both formal schooling years as well as later in life.

Adolescence is an impressionable period when individuals are most open to social forces and socialization influences and when their values and worldviews undergo significant formation (Alwin & McCammon, 2003). As they transition into adolescence, young people tend to pursue activities independent of adults (Falk & Dierking, 2002). Teens spend less time with parents and more time with their peers or alone. Despite changes in these relationships many teens continue to engage in activities outside school that involve learning ("National Research Council," 2009) and for those who have strong personal interests in science informal settings continue to provide

learning opportunities. Identities formed in adolescence are likely to inform values, attitudes, and behaviors throughout life (Flanagan, 2004).

As adults they usually set aside a reasonable amount of time for leisure, (Barron, 2006) and hobbies related to science are apt to continue with self-directed learning. Additionally science learning may also be influenced by needs of their school-aged children or late in their lives by their own personal interests.

Finally even though the nature and degree of science learning varies considerably from one life stage to another, most people develop knowledge from birth and continually expand on it throughout their lives. As Falk and Dierking (2000, p. 136) note, “People learn through a constant process of relating past experiences to the present, connecting what is happening in the present to what has happened in the past. Learning is a dialogue between the individual and his or her social/cultural and physical environment; learning is a contextually driven effort to make meaning in order to survive and prosper in the world.” Simply stated, all learning is highly personal and closely related to the situation in which learning is occurring.

## **Teens**

A 1992 national study of youth public opinion discovered the environment was a top priority for the majority of the 880 11 to 18-yearolds surveyed (Koenenn, 1992). Despite growing environmental concerns among adolescents, little is known about shifts in young people’s environmental attitudes, beliefs, or behaviors and conversely adolescents’ views have been largely ignored in studies of public opinion (Wray-Lake, et al., 2010). Despite the deficiency of previous research, two reasons identify the need for paying close attention to U.S. adolescents’ views (Wray-Lake, et al., 2010). First, the

theory of generational replacement argues that changes in adolescents' attitudes are important markers of long-term social change. The theory of generational replacement states that older generations, with their own broad shared ideals, will be replaced by their children and their children's children who will have their own, and frequently, a different idea of what is socially acceptable. And second, young people's environmental concerns also deserve attention due to many examples focusing on youth as active agents in protecting the environment. Hundreds of youth-oriented environmental organizations exist in the United States and globally, many of which were initiated by youth (Sirianni, 2006). Instances of young people's effective environmental efforts suggest that at least some youth take environmental issues seriously and these concerns lead to action.

As they age, today's adolescents will become national or even global leaders with responsibility for environmental stewardship and sustainability. Researchers must care about young people's environmental attitudes, beliefs, and behaviors, as they are likely to be carried into adulthood, communicated to offspring, and expressed in leadership decisions as younger generations replace their elders as society's leaders (Carpini, 2006).

It has been accepted that the basis for many environmental problems and issues is irresponsible environmental behavior. One of the most important influences on behavior is attitude (C. E. Ramsey & Rickson, 1976). Young people's environmental attitudes are important because they will be affected by and will serve to provide solutions to environmental problems arising from present-day actions. As future consumers, scientists, voters, and policymakers today's youth will be responsible for repairing the environment. According to Bryant and Hungerford (1977) young people's attitudes toward the environment begin to develop at a very early age. By the time they reach

adolescence, many have acquired some level of environmental understanding of issues such as ecology, technology, and economics and can formulate their own views on how each influence environmental concerns and policy (Bryant & Hungerford, 1977; C. E. Ramsey & Rickson, 1976).

Some researchers assume that increased knowledge about the environment promotes positive attitudes (Arcury, 1990). Other research indicates that junior high and high school students exposed to environmental classes or programs demonstrated an increase in responsible environmental behavior and an increased awareness of environmental issues (J. M. Ramsey, 1993). Likewise, Kellert reported that 8th to 11th grade students appear to be the most appropriate audience for fostering ethical and ecological appreciation of the natural world (S. R. Kellert, 1985). In contrast, Newhouse stated that environmental attitudes are most likely formed as a result of life experiences rather than exposure to any specific course or program (Newhouse, 1991). Therefore, it appears that exposure to environmental education programs, whether formal or free-choice, for school-age students is crucial.

### **Formal Education**

Formal education refers to learning that occurs inside a classroom or educational institution and informal education refers to learning that occurs outside the confines of a classroom or educational institution (Bell, et al., 2009). Other characteristics of formal education are: it is place-bound; typically the setting is a classroom or a lecture hall; learning is facilitated by an professional educator or teacher; learning goals are driven by the needs of the individual teacher, school or school district in order to meet some pre-set curriculum; and learning occurs in a systematic, orderly fashion on a on-going basis.

However the average U.S. citizen spends only 3% of his or her time in school over the course of their lifetime (Falk & Dierking, 2002).

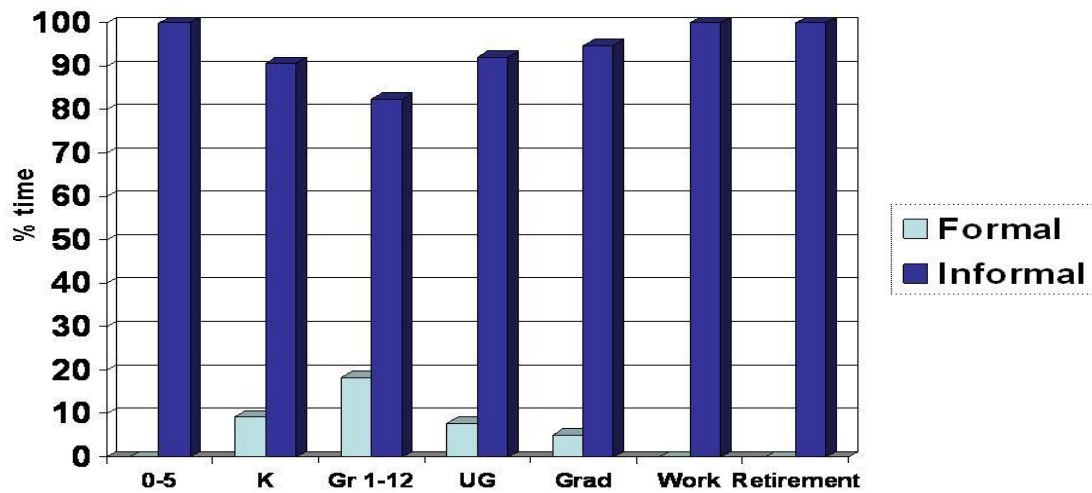
### **Informal Education**

Learning about the environment is not static. Evidence shows that non-traditional formats and informal venues for child learning are increasing in importance (Coyle, 2005). The National Science Teachers' Association (NSTA) cites that informal education is often the only means for continuing science learning in the general public beyond the school years. To that end the NSTA supports and advocates informal science education. In their 1999 position statement they cite "the impact of informal experiences extends to the affective, cognitive, and social realms" (NSTA, 1999). Reinforcing the importance of these three factors R. C. Webb (2000) states that researchers using informal learning settings must be aware of the feeling (aspect) component of the experience, not just the informational (cognitive) one. Ballantyne and Packer (2005) suggest learners spend only a short period of time engaged in the learning experience in informal educational settings, but that these experiences can have significant influence on their attitudes and behavior. In general, the goals of informal learning are wider-ranging than those of formal learning they are however more consistent with the aims of environmental education (Schauble, Beane, Coates, Martin, & Sterling, 1996).

Informal education communities encompass a wide range of learning outcomes. The idea of life-long, life-wide and life-deep learning has influenced efforts to develop the notions of learning by incorporating how people learn over the course of their lives, across social settings and in relation to prevailing cultural influences (Banks, et al., 2007). According to the NRC, (2009) life-long learning is the acquisition of

competencies and attitudes over a lifespan and it also recognizes that at different life states both developmental needs and interests of the learner will vary. Learners seek out and acquire information based on their interests and needs. Life-wide learning occurs as people interact in social settings and activities ranging from classrooms, communities, informal education venues or families. Life-deep learning builds beliefs, ideologies and values that are attained through everyday life and interactions in communities and society in general. This reflects the moral, ethical, religious and social values of learners. Figure 2 shows the amount of time spent in formal and informal learning environments in relation to both lifelong and life-wide learning.

Figure 2: Lifelong and Life-wide Learning



(Bell, et al., 2009)

Informal education venues use designed settings, spaces intentionally designed for learning about science and the physical and natural world. Examples are museums, science centers, botanical gardens, zoos and aquariums. Individual learners and groups play an important role in determining their own learner outcomes (Moussouri, 2002) and control their learning agenda. According to the NRC (2009), characteristics of learning in designed settings reflects the goals of the organizations' designers and educators; learning tends to be more fluid and sporadic; learning is more episodic rather than continuous and the space is navigated freely by the learner.

Informal educational surroundings provide opportunities for the encouragement of environmentally sustainable attitudes and behaviors that are infrequently possible in formal education settings. Worldwide, most environmental learning is not attained in school but through informal, free-choice experiences since citizens need to continually access and evaluate materials from a variety of sources in order to update their knowledge and understanding of rapidly changing environmental issues.

### **Free-Choice Learning**

Contemporary views of learning as an active, constructive process have drawn increased attention to learners' motivations, prior experiences, knowledge and cultural identity ("National Research Council," 2007). Within the past few decades, there has been growing awareness of free-choice learning. While formal education uses a top-down, institution-driven approach to learning, free-choice learning employs a bottom-up, individual-driven approach to learning. It recognizes the uniqueness of learning and is non-sequential, self-paced and voluntary. Ballantyne and Packer (2002) state that learning in a free-choice setting is primarily socially mediated and is motivated by the

needs and interests of the learner. Visitors may come alone, or in small or family groups of mixed genders, ages and subject knowledge, with different learning styles and prior learning experiences. Kola-Olusanya adds that free-choice learning is not developed as part of ongoing formal environmental education curriculum (Kola-Olusanya, 2005). Free-choice learning in general occurs outside school and in settings such as national parks, nature centers, natural history museums, zoos and aquariums (Falk, 2005) and these sites can be viewed as part of a nation's infrastructure for environmental education. Most free-choice learning experiences involve carefully crafted messaging developed with specific educational goals in mind (Falk & Dierking, 2000). Zoos, as free-choice learning sectors, offer visitors opportunities to set their own learning agendas while navigating through contextually rich environments. Zoos frequently allude to the value of their exhibits in terms of power on visitor behavior (Zucker, 1995). Though recent research in the United States has focused on gaining a better understanding of the educational impact of zoos and aquariums on the general public, particularly with regard to conservation behavior change (Falk, 2005).

Falk's Contextual Model of Learning (2000) provides a framework for organizing information on learning and in particular for organizing the complexities of learning within free-choice settings. The Contextual Model of Learning contends that learning is the process/product of the interactions between an individual's personal, socio-cultural, and physical contexts over time. Personal context is the sum total of personal and genetic history that an individual carries with him/her into a learning situation. Socio-cultural context is the product of a person's cultural and social relationships. Physical context refers to the interactions of an individual in the physical learning environment. Twelve

key factors emerged as influential for learning experiences (Falk & Storksdieck, 2005).

These 12 factors are

1. Visit motivation and expectations
2. Prior knowledge
3. Prior experiences
4. Prior interests
5. Choice and control
6. Within group social mediation
7. Mediation by others outside the immediate social group
8. Advance organizers
9. Orientation to the physical space
10. Architecture and large-scale environment
11. Design and exposure to exhibits and programs
12. Subsequent reinforcing events and experiences outside the museum.

### **Oklahoma City Zoo's Role in Learning**

As they take on more of an education focus educational expenditures by museums, zoos, aquariums, and nature centers has increased (Coyle, 2005). The Oklahoma City Zoo (OKC Zoo) is no exception. Table 7 shows the education department budget over the last five years which is inclusive of both the operating budget and all salaries.

Table 7: Annual Oklahoma City Zoo Education Department Budget

Year	Budget
2006	\$573,130
2007	\$642,494
2008	\$679,680
2009	\$720,758
2010	\$699,973
2011	\$763,111

(Campbell, 2011)

The OKC Zoo serves as an informal setting for both formal and free-choice learning opportunities. The zoo's mission statement states that the "Oklahoma City Zoological Park shall contribute to an understanding and preservation of the earth's natural resources. Its foundation rests on four pillars: recreation, education, conservation and research" ("Oklahoma City Zoo," 2009). The zoo's education department was funded and staffed by professional educators in 1998 in order to support, enhance and fulfill the zoo's mission statement. Recently, however a combination of factors led zoo educators to set another goal. With increased emphasis being placed on state testing and teacher feedback as to their administrators questioning the value of zoo classes, zoo education curriculum was aligned to meet the Oklahoma State Department of Education Priority Academic Student Skills (PASS) objectives ("Oklahoma City Zoo Education Department," 2009). The zoo offers a total of 16 formal conservation education classes for kindergarten through 12<sup>th</sup> grade students. They not only fulfill pre-determined Oklahoma state requirements but also are taught in a classroom inside the Rosser Conservation Education

Center and are initiated by the teacher's need and for a specific program. Likewise they are time bound; with preK-1st programs lasting 30 minutes, 2nd-6th grade programs lasting 45 minutes and 7th-12th grade programs lasting one hour. Comparable to formal education and learning, these programs utilize a top-down approach.

Free-choice learning occurs on zoo grounds via several methods. Zoo volunteers, trained as interpreters, provide daily animal chats. Zoo keepers facilitate keeper talks during regularly scheduled animal feedings. The zoo's sea lion show and tram ride also provide conservation messaging. Interpretive graphics offer an opportunity for free-choice learning. Figure 3 shows the spectrum of informal to formal learning and by offering both set curriculum classes and free-choice experiences the OKC Zoo falls within the spectrum.

Figure 3: Informal to formal learning spectrum



(Ellis, 1993)

The number of visitors to the OKC Zoo in 2009 was 765,890 (Foltz, 2010). Due to the Zoo's age range for admission, it is not apparent how many of the 432,425 visitors, ages 12-64 years, actually fell in the targeted age range that this study will utilize. During the same time, the number of students participating in formal classes through the education department was 34,311. By integrating free-choice and formal environmental learning experiences, individuals are equipped with information to not only adopt sustainable attitudes and behaviors, but to also continue exploring and developing their relationship with the environment throughout their lifetimes (Ballantyne & Packer, 2005).

### **Role of Affect / Emotions in Learning**

Attitude and behavior change are important outcomes of a free-choice learning experience; however they need to be understood in a broader range that includes knowledge, skills, aesthetic responses, and emotions (Hooper-Greenhill, 2004). Zoos can be ideal sites for developing emotional ties to wildlife and fostering an appreciation for the natural worlds as they offer a variety of opportunities to engage in free-choice learning experiences (Kola-Olusanya, 2005). Changes in attitudes and values may involve changes in feelings about the environment in general, about a particular species, interactions with other people or a sense of one's place in the world (Hooper-Greenhill, 2004). Zoos provide experiences with animals that result in compelling visitor experiences that attract, build and maintain personal connections regardless of visitor motivations, thus helping them learn and reflect on their own relationships with nature (Povey & Winsten, 2003). Palmberg and Kuru found that children's involvement in informal environmental education programs, including field trips, contributed to their

development of empathetic relationship with nature, knowledge and values concerning protection of nature and to development of responsible actions (Palmberg & Kuru, 2000).

Research has shown that attitudes are not only shaped by cognitive factors (knowledge acquisition) but also through affective factors (emotions or feelings) (Ballantyne & Packer, 2005; Hungerford & Volk, 1993; Pooley & O'Connor, 2000). Emotions play a significant role in developing environmental attitudes (Iozzi, 1989). According to Webb “an important implication of the new understanding of affect is that we must accept that we often respond to things because of how we feel about them rather than because of what they are” (R. C. Webb, 2000).

Povey and Rios (2002) assert that informal learning centers, like zoos, are ideal venues for generating emotional ties to wildlife and the environment. Zoos shape development of environmental attitudes by providing unique visitor experiences that allow for emotional connections. Ballantyne and Packer (2005) add that free-choice learning contexts are suited to influence environmental attitudes and behavior using appeals to emotion. Another report found that visitors to free-choice settings reported that challenges to their personal attitudes were accompanied by some level of emotional involvement (Jan Packer, 2004). Zoo education is progressing accordingly; it's not only about action through learning, more and more educators are discovering the impact of emotions and in sustaining deep learning and creating memorable experiences (Silva, 2008).

Emotions play an important role in the human experience and can lead to changes in the way people think and feel and are also important in forming memories (Smith, Weiler, & Ham, 2008). Though zoos create and provide experiences that evoke

emotional responses, researchers have not investigated the impact of emotional arousal on visitors' memories, knowledge, attitudes and behaviors.

The majority of zoos offer a variety of formal classes; however, the general visitor receives educational messages primarily through its exhibits (Povey & Rios, 2002). Zoos spend millions of dollars yearly to build natural exhibits that help educate visitors. Not only do they provide knowledge-based information but more recently they have focused on conservation issues that the public is encouraged to support (Swanagan, 2000). In a related study, Ogden and Lindburg found that visitors report increased interest in conservation after visiting such exhibits (Ogden & Lindburg, 1991) and that zoos often refer to value of their exhibits in terms of influence on visitor behavior (Zucker, 1995). However despite new design efforts, zoo exhibits are still problematic with regard to influencing zoo visitors' attitudes. They lack the human element, which is essential in interacting and communicating with visitors based on their interests and needs (Karen Povey & Rios, 2002).

### **Interpretation**

Interpretation is a term used loosely in the zoo field, generally referring to any type of personally delivered program (Visscher, et al., 2009). The concept of interpretation is more commonly applied in a range of informal education programs designed to provide meaning related to natural, cultural, historic, or environmental resources. However, it is much more than delivering facts to an audience. Unlike fact-only lectures, interpretation is a specific approach to communication that appeals to both the affective and cognitive domains of visitors (Ames, Franco, & Frye, 1992). Participants whose emotions and senses are engaged in an interpretive presentation are

more likely to become more interested, learn more and have prior knowledge enhanced (Beck & Cable, 1998; Brochu & Merriman, 2002; Knudson, Cable, & Beck, 2003). First developed by Freeman Tilden in 1957 (Tilden, 1977), six interpretive principles were identified and have more recently been paraphrased by Beck and Cable (2002).

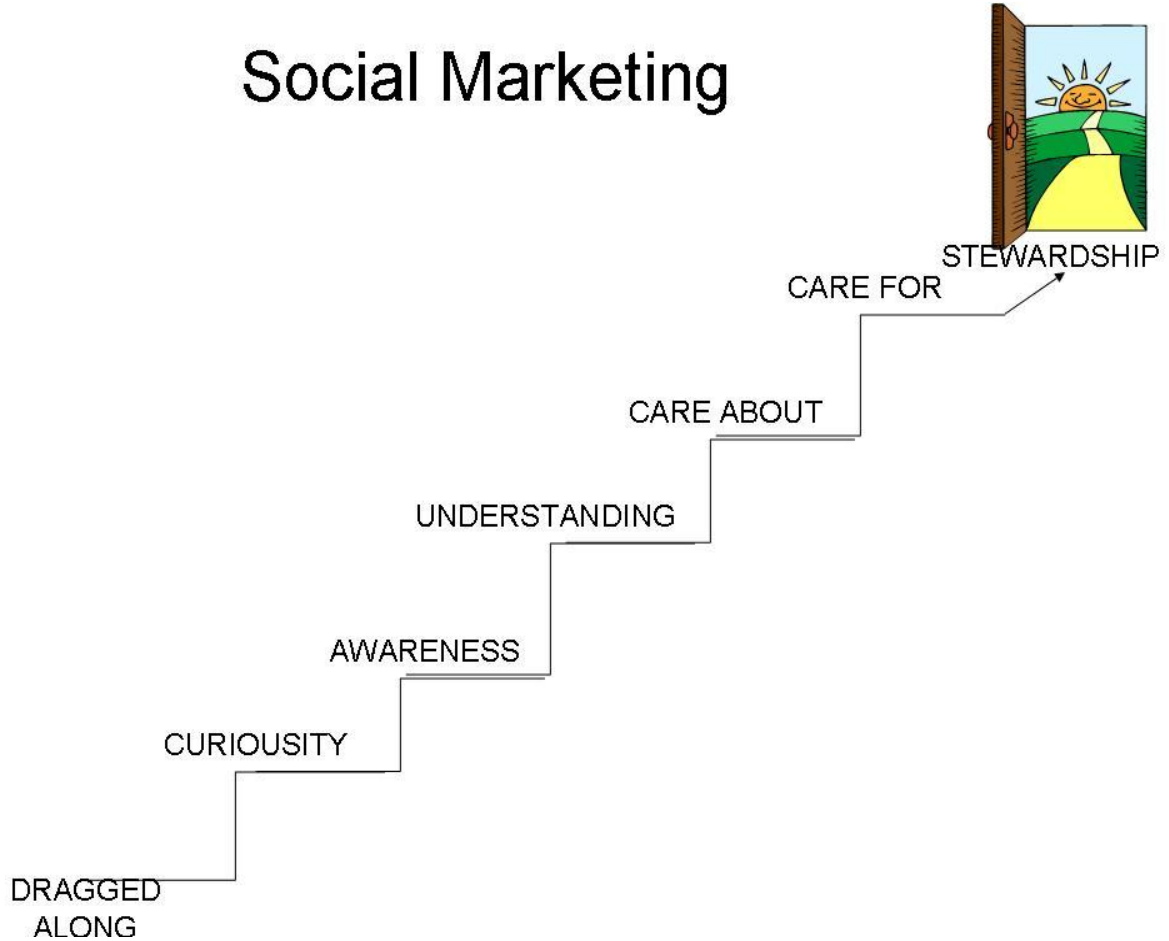
Interpretation: 1. Must relate to the visitor and to the resource. 2. Reveal deeper meanings. 3. Is an art and should inform, entertain, and enlighten. 4. Should provoke and inspire an audience. 5. Must represent a whole theme and address the whole person. 6. Is uniquely different children and adults.

Meaning-making has become so central to learning in informal environments that it is sometimes regarded as the essential learning behavior (Silverman, 1995). Personal meaning, Tilden's principle 1 and 2, can be constructed by linking tangible, or cognitive, concepts; such as animals, exhibits, or biofacts, to intangible concepts. Intangible, or affective, concepts such as survival, freedom, or shelter, provide visitors with an opportunity to find personal meaning and value in the target resource; and as a result may be compelled to care for and promote the resource itself (Tardona, 2005). Personal relevance is a general foundation for affect because as visitors stay engaged longer with the resource they tend elaborate on what they've learned (R. C. Webb, 2000). An interpretive principle such as provocation, revelation, and theme development may be used more universally to make the most of the effectiveness of an institution's programming (Visscher, et al., 2009).

As conservation organizations, zoos continually seek to ensure that their visitors' construction and interpretation of their zoo experience are directed toward behavioral change. Environmental educators and interpreters have adapted the social marketing

concept to encourage stewardship of natural and cultural resources by influencing visitor attitudes, beliefs and behaviors (Merriman & Brochu, 2005). Social marketing is "the application of commercial marketing technologies to the analysis, planning, execution, and evaluation of programs designed to influence the voluntary behavior of target audiences in order to improve their personal welfare and that of their society" (Andreasen, 1995). Several notable social marketing campaigns include "Click it or Ticket" aimed at increasing seat belt use, "Truth" aimed at decreasing the number of cigarette smokers, "Above the Influence" aimed at reducing drug and alcohol use, "You Dump it, You Drink It" aimed at proper disposal of used automobile oil and "Only You Can Prevent Forest Fires" aimed at reducing the number of forest fires started by careless visitors. Goals and objectives for interpretive programs include helping people connect with resources and become interested in being stewards. Figure 4 illustrates the interpretive social marketing construct as it relates to the various levels a visitor may bring with them or encounter during a visit. Through interpretive opportunities, the continuum provides a platform for visitor growth and transformation. Regardless of where a visitor may be positioned within the continuum, they may be moved along by the use of interpretive encounters and opportunities. The ultimate goal is to get visitors to change their behaviors in order to improve their personal welfare and that of society. Once behavior change is attained visitors have reached the stewardship level.

Figure 4: Social Marketing Continuum



(Brochu & Merriman, 2006)

Some environmental educators, such as zoo educators in the United States, have embraced social marketing, seeing opportunities for combining social marketing strategies for short-term, specific behavior changes with environmental education strategies for longer-term, and for more general attitudinal and behavioral outcomes (Heimlich & Ardoin, 2008). Webb states that successful interpretation at zoos provides visitors with a wide range of perspectives needed to construct a more cohesive viewpoint of wildlife (L. Webb, 2006). Information should not only focus on the animal itself but also show relevance to other animals, mankind and nature by stimulating visitors' minds,

evoking emotion, encouraging empathy and provoking action. To that end, AZA has addressed interpretation in its 2010 accreditation standards. As stated in Section 4.3., page 13, Evaluation/Interpretation standards and policies ("Association of Zoos and Aquariums,") "4.3.1. Exhibits, interpretive programs and other education programs should be evaluated on a regular basis for effectiveness and content. Evaluations should assess more than participant satisfaction, they should measure program impact (including impact on conservation-related knowledge, attitudes/affect, and behavior). Results should be used to improve the existing programs and to create new programs. Section 4.3.2. states that "institutions should have a thorough understanding of the needs of its audiences and provide programs to meet these needs. Education to a wide-variety of audiences can be accomplished through a variety of programming methods. Institutions do not need to reach all audiences equally, nor will all programming methods be used equally. However programming should clearly address cognitive, affective, and behavior outcomes."

## CHAPTER III

### METHODOLOGY

#### **Introduction**

Zoos can uniquely combine their three major conservation tasks of environmental education, research, and species and habitat conservation. Given the vast number of zoo visitors from a diverse range of backgrounds and socioeconomic groups, zoos are ideally situated to increase public awareness regarding conservation. Going to accredited zoos and aquariums does have a significant impact on what adult visitors know and understand about conservation (Falk, et al., 2009). Limited studies and anecdotal evidence support this conclusion. However much of the research was limited in scope, could not be applied to zoos and aquariums in general, did not demonstrate actual changes in conservation understanding and did not apply to the teenage zoo visitor.

The OKC Zoo serves as an informal setting for both free-choice and formal learning opportunities. Whether students visit the zoo on a field trip or attend classes taught by a zoo educator, they were still being exposed to conservation messages.

The goal of this study was to determine if a zoo visit influences teen visitors' attitudes towards conservation. Affective outcomes of formal vs. free-choice learning experiences were measured via the conservation attitudes survey of the MIRP study.

The research questions on which this study is based were:

1. Does a visit to the zoo affect conservation attitudes?

2. Does learning method (free-choice vs. formal) affect conservation attitudes?

Finally, the hypotheses of this study were:

1. There is no difference in conservation attitudes within groups as measured by the conservation attitude survey.
2. There is no difference in conservation attitudes as measured by the conservation attitude survey between groups participating in two different programs.

### **Statement of Research Design**

A criterion-group design was selected due to the fact that subjects surveyed represent one or another population of interest. Subjects were divided into two distinct groups based on an individual difference variable and then compared on one measure which was related to group membership. The single independent variable was student learning experience -- either formal or free-choice. The dependent variable was the students self-reported conservation attitudes.

Only retrospective pre/post test survey methods were utilized. Traditional pre/post survey methods are designed to measure changes in participant knowledge, attitudes or behaviors and lend credibility to results due to rigorousness (Griner-Hill & Betz, 2005). However, criticisms of the traditional pre/post designs stated that they were likely to underestimate the effect on participants due to response shift bias (Howard & Dailey, 1979). Response shift bias is described as a “change in the participant’s metric for answering questions from the pre test to the post test due to a new understanding of a concept being taught” (Klatt & Taylor-Powell, 2005). This also poses a threat to validity. As a result, this study only employed retrospective pre/post test survey methods. This method is used to evaluate participant’s perceived change due to program or field trip

attendance. By testing what participants believe after a program or field trip is completed, their standard of assessing their changes in knowledge, skills or attitudes is consistent and therefore not subject to response shift bias (Davis, 2003; Rockwell & Kohn, 1989). However, there are four identified threats to validity with this design.

- 1) Recall – participants’ inability to recall attitudes and behaviors held in the past.
- 2) Social desirability – participants feel the need for to report change or inflate perceived improvement on items that are personally important to them.
- 3) Effort justification bias – participants subconsciously report improvement to justify their time, energy and involvement.
- 4) Cognitive dissonance – participants report improvement, even if it did not occur, to meet their own expectation that they should have changed.

Retrospective pre/post survey methods reduce response shift bias because it accounts for changes in the learner’s knowledge due to participation and allows them to assess what they did or did not know at the program outset (Rockwell & Kohn, 1989). Accuracy of results is improved because participants can reflect on what they learned (Davis, 2003). Additionally retrospective pre/post test models should use realistic indicators rather than ask for recall of factual information (Diamond, 1999). Instead, questions should ask about the subject’s experiences or attitudes toward the information conveyed by the exhibit. Lastly, the AZA MIRP study for which this study was based on stated “this type of post-only, retrospective pre-measure has been shown to be more reliable than traditional pre/post measures for assessing attitudes” (Falk, et al., 2009) .

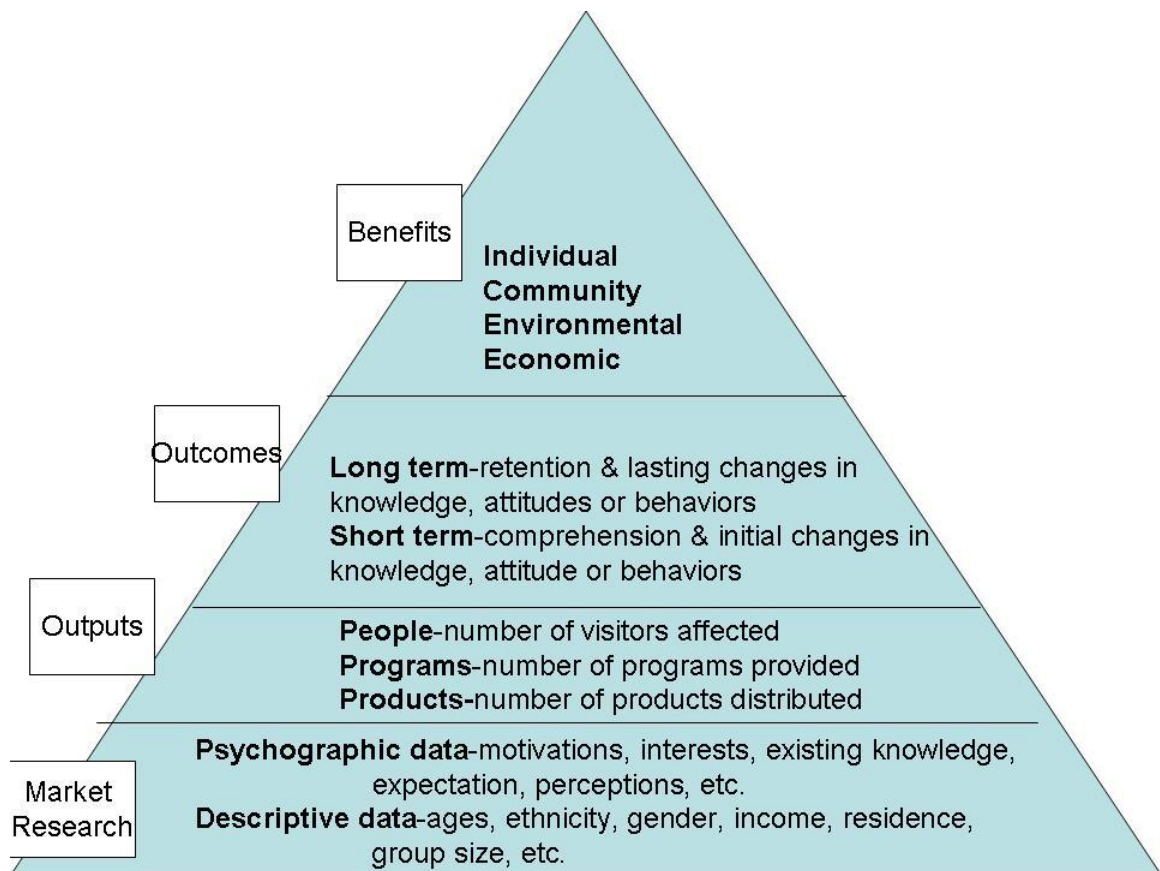
### **Instrument Selection**

Informing the selection of the instrument for this study was the Visitor Centered

Evaluation Hierarchy (VCEH) model (Wells & Butler, 2004). The VCEH is a diagnostic research tool which aids in selecting the most appropriate approach for gathering data.

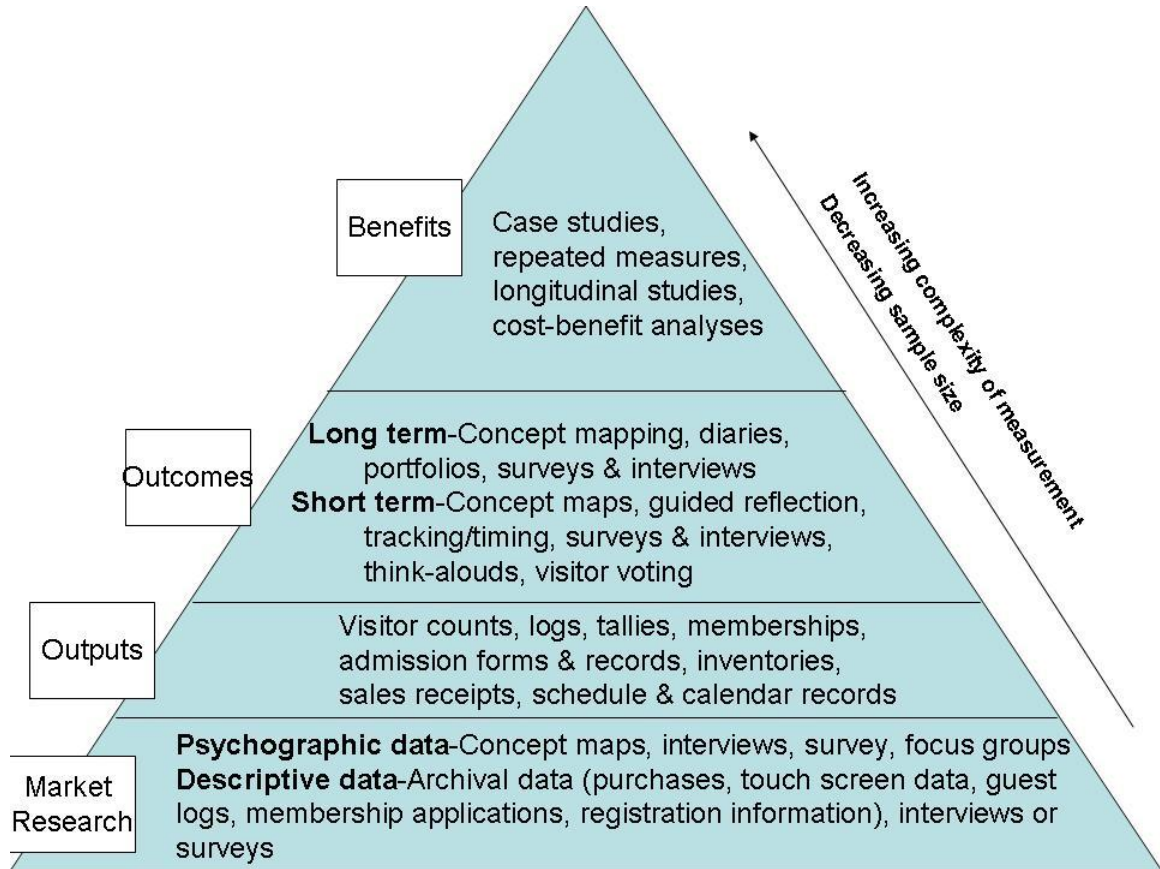
The VCEH model pyramid is divided into the following tiers: benefits, outcomes, outputs and marketing research. In Figure 5 each tier describes what the researcher wishes to assess while Figure 6 shows the tools best suited for the applicable hierarchy.

Figure 5: Visitor-Centered Evaluation Hierarchy



(Wells & Butler, 2004)

Figure 6: Possible Tools for Evaluation Hierarchy



(Wells & Butler, 2004)

This study focused on attitudes which are listed as short-term outcomes on the VCEH model. Demographics were collected and frequencies were utilized to describe the sample populations. Demographic questions included: age, gender, race, ethnicity, frequency of zoo visitation, and prior participation in a zoo education class. Studies indicate that an individual's prior interest and involvement in conservation may serve as a better predictor of their responses and actions than typical demographic variables (Bell, et al., 2009). As shown in figure 6 above, surveys are listed as one tool that is suited for collecting outcome data. The instrument used for this study was the conservation attitudes survey developed by Joe Heimlich in part by funding from the Institute of

Museum and Library Services Grant #LG-25-05-0102-0 and through funding for the Multi-Institutional Research Project from the National Science Foundation Grant #ESI-0205843.

Completed in 2006, “Assessing the Impact of a Visit to a Zoo or Aquarium” was a multi-year research initiative designed to assess the conservation impact of a zoo or aquarium visit on adults. More than 5,500 adult visitors from twelve AZA institutions varying in size and geographic location participated in the retrospective pre/post study. Four research tools including the conservation attitudes survey were among the outcomes of the study. The conservation attitudes survey scale had a strong reliability co-efficient of 0.842. A confirmatory factor analysis revealed all items loading onto one component and explained 41.45% of the variance (Falk, et al., 2009).

Affective response was assessed by asking teenage zoo visitors to respond to a series of 13 items on a survey (see Appendix A). Each question asked teens to indicate on a seven-point Likert-type scale their level of agreement with the statements that related to their attitudes towards: 1) conservation 2) their ability to effect change and 3) the role played by zoos and aquariums in promoting conservation. Using Microsoft Word 2003 readability statistics revealed the conservation attitudes survey had a Flesch reading ease score of 80.7 and a Flesch-Kincaid U.S. school grade level of 4.3.

### **Study Location**

Opened in 1902, the Oklahoma City Zoo is the oldest zoo in the southwest and is a fully accredited member of the Association of Zoos and Aquariums and the American Association of Museums as both a living museum and a botanical garden ("Oklahoma City Zoo," 2009). Over 2,000 animals, including 54 endangered species, are housed on

the zoo's 110 acres (Henson, 2008). Zoo attendance and age demographics for 2010 were ages 0-2 years=75,882; 3-11 years=289,519; 12-64 years=467,367; and Seniors 65 years and older=12,362 which totaled 845,130 visitors (Foltz, 2010).

## **Subjects**

Participants were randomly selected using cluster sampling techniques. Teen student recruitment occurred during fall 2010. For this study the population was visitors to the Oklahoma City Zoo and the sample were those 14-18 years of age. Samples were further divided into two groups. Group one was visitors who participated in a free-choice learning experience, defined as zoo interactions and experiences occurring within the confines of zoo grounds. This group was obtained via group reservations made through OKC Zoo's guest relations department. Group two were visitors who participated in a formal learning experience, defined as exposure to a conservation education class taught by a zoo educator; and that occurred at the zoo or in a teacher's classroom. This group was obtained via the education registrar as teachers called to schedule classes. All potential participants were told that their participation would be voluntary.

For visitors' age 14-18 years, fall 2010 projected school group reservations was expected to be around 683 and zoo education class registration was 1,453. A sample size of 110 free-choice learning method students was obtained while the sample size for formal learning method students was 365.

## **Preliminary Procedures**

Permission was obtained from the Zoo Director prior to the study. Education naturalists, which are teaching staff, were trained in all aspects of the administration of

the survey. They also received instruction on obtaining legal guardian consent forms and the importance of confidentiality.

For formal learning experience classes, teacher email addresses were obtained from the education registrar. A project explanation letter, legal guardian consent form and student informed consent were emailed to the teacher prior to the actual zoo class for student distribution.

For free-choice learning experiences, teacher email addresses were obtained from guest relations once a reservation was booked. A project explanation letter, legal guardian consent form and student informed consent was emailed to the teacher prior to the actual field trip to the zoo for student distribution. Teachers were asked to reply via email if they intended to participate in the research study. Those indicating their classes would be participating received a research study reminder email a day prior to their field trip. Coordination for the administration of the survey was accomplished at this time too. As teachers prepared to leave the zoo, they called a designated cell phone number and asked that the test administrator go to the bus loading area. Conservation attitudes surveys were administered to students with the completed IRB paperwork.

### **Operational Procedures**

The surveys were administered solely at the end of the students' zoo experience. The survey included thirteen statements about conservation and students answered "How much do you agree with each of the thirteen statements". Students circled a value from 1-7 on a Likert Scale with 1 = strongly disagree to 7 =strongly agree. Students, regardless of zoo learning experience, completed the Likert Scale survey by reflecting on how they felt before their field trip or class and were also asked how they felt after their

field trip or class. “Before” responses were considered their “pre” feelings and the “after” responses were considered their “post” feelings.

Group one was students, age 14-18 years old, who visited the zoo for the sole purpose of a school or class field trip. These free-choice learning students were asked to complete individual retrospective surveys prior to loading their buses to depart from the zoo. Duration of field trip stay time varied and was dependent on both the arrival and departure of students which was dictated by the respective school bus schedules. The lengths of the free-choice learner field trips were not documented. Only student participants who had legal guardian consent form were asked to complete the conservation attitudes survey. Randomization was guaranteed since individual teachers initiated their own field trip group reservation. Confidentiality was guaranteed by instructing students not to place their name on their survey; instead they placed their school initials and month and date of field trip (i.e.: CAHS214) for record keeping purposes.

Group two was students, age 14-18 years old, who engaged in a formal conservation education class. It should be noted that not all formal learning occurred in the zoo’s education building since the zoo has an outreach program which has the capacity to provide formal learning opportunities at the school sites themselves. The class, regardless of location however; was taught by a professional zoo educator. The duration of the education class was approximately one hour. These formal learning group students were asked to complete the retrospective survey immediately following their class. Those participating in the learning experience at the zoo itself attended the class and completed the survey prior to being released to tour and visit zoo grounds. Only

students with signed consent forms were asked to complete the conservation attitudes survey. Randomization was guaranteed since individual teachers initiated the scheduling of zoo classes themselves. Confidentiality was guaranteed since the only information taken by the zoo registrar was the school name and the students' grade level. Additionally students were instructed not to place their name on their survey; instead they used their three initials and birth day and month (i.e.: tmr915) for record keeping purposes.

Refusal and non-participation were possible responses and were documented. Surveys that contained incomplete data or missing values were used. Those having incomplete demographic data, but containing Likert scale values, were utilized for analysis. Surveys that contained missing values such as a missing Likert scale number were utilized too. Missing values were calculated by SPSS and replaced with series mean values.

### **Data Collection**

Completed student surveys were immediately returned to the zoo educator. Electronic data was entered and stored on the principal investigator's (PI) personal home computer in an Excel spread sheet. Original paper surveys were kept on file at PI's residence. All material collected from students will be held securely for five years after the research is completed and will be disposed of by deleting all electronic files and shredding all paper files.

### **Statistical Analysis**

Descriptive statistics included measuring central tendency by calculating mean, median and mode. Variability was measured by calculating standard deviation.

Demographic frequencies were obtained and were used to describe the sample population.

Inferential statistics utilized a paired t-test to answer the research questions. The t-test was selected because the study meets the following data collection requirements:

1) there was one independent variable with two groups 2) subjects appeared in only one of the two groups and 3) the groups of the independent variable differed qualitatively, either as formal learning or free-choice learning. Based on the literature review, previous studies were completed with adults and additionally did not look at types of learning experiences the visitor had; so this study used a non-directional alternative hypothesis and a two-tail significance test. Two hypotheses were:

1. There is no difference in attitudes within groups as measured by the conservation attitude survey.
2. There is no difference in conservation attitudes as measured by the conservation attitude survey between groups participating in two different types of learning experiences.

## CHAPTER IV

### FINDINGS

#### **Introduction**

The purpose of this study was to determine if a zoo visit influenced teen visitors' attitudes towards conservation. Previous nation-wide research had been conducted only on adults and as a result did not look at participation in a zoo education class as a variable. The sample population for this study was visitors 14-18 years of age who engaged in either a field trip (termed free-choice) or zoo education class (termed formal learning experience). Two research questions of this study were (1) did a visit to the zoo affect conservation attitudes? And (2) did learning method (free-choice vs. formal) affect conservation attitudes? Affective outcomes of teen visitors were measured by the conservation attitudes survey of the Visitor Evaluation Toolbox.

Data were analyzed using SPSS version 17.0 software. Coding was reversed for one question which read "There is not much I can do to help nature". A total of 534 surveys were distributed to students' ages 14-18 years who visited the Oklahoma City Zoo. Samples were further divided into two groups. Group one was students who participated in free-choice learning, which was defined as zoo interactions and experiences that occurred within zoo grounds proper. Group two was students who participated in a formal learning experience, which was defined as participation in a

conservation education class taught by a zoo educator; but could occur either at the zoo education building or in a teacher's personal classroom.

Discrepancies in survey responses were found only in group two which represented zoo education class participants. Fifty-two surveys lacked an entire set of Likert scale values (retrospective or present feelings) and five surveys were from students out of the designated age range, therefore they were not included. Of the remaining 477 sample population surveys, response rate among the thirteen Likert scale questions was also inconsistent. Some had incomplete data (N=42), missing values (N=51) or double answers (N=27). Surveys with blank responses to one or more of the demographic questions were labeled incomplete data. Surveys with missing numbers to one or more of the Likert scale questions were labeled missing values. Finally, surveys in which two numbers were circled on the same line were labeled double answers.

Incomplete data surveys did not need to be addressed since they were only missing the students' demographic data. However, both missing values and double answer responses needed to be addressed in order to be utilized for inferential statistics analysis. A common practice regarding treatment of missing values is to replace the missing values with the series means (Sweet & Grace-Martin, 2008). In order to utilize those surveys with a few missing values, the missing values were replaced by the series mean values as calculated by SPSS. Surveys with two answers circled on the same Likert scale question line were addressed by averaging the 2 values and using the rounded down value in SPSS.

### **Demographic Profile**

Demographic survey questions were utilized to create sample populations

profiles. Two questions asked the frequency of visitation to the Oklahoma City Zoo and prior participation in a zoo education class. A third question related to gender. Table 8 provides a summary of these results. A slight majority 50.7% (242) reported they had visited once or twice. With regard to prior exposure to a zoo education class, 73% (348) of the respondents had never taken a zoo education class previously. Gender data revealed that the sample was equally comprised of males and females. Age data revealed that most students were either 15 years old (28.7%) or 16 years old (29.6%). Race of participants revealed that 48.4% were white and 69.4% reported they were not of Hispanic, Latino or Spanish origin.

Table 8: Demographic data for sample population N=477

<b>BEEN TO ZOO BEFORE</b>	<b>FREQUENCY</b>	<b>%</b>
Never	35	7.3
Visited once or twice	242	50.7
Visit often	174	36.5
Blank response	26	2.2
<b>PARTICIPATION IN ZOO EDUCATION CLASS</b>	<b>FREQUENCY</b>	<b>%</b>
Never taken a zoo class	348	73.0
Had taken a zoo class	103	21.6
Blank response	26	5.5
<b>GENDER</b>	<b>FREQUENCY</b>	<b>%</b>
Male	220	46.1
Female	231	48.4
Blank response	26	5.5

Table 8 continued: Demographic data for sample population N=477		
<b>AGE</b>	<b>FREQUENCY</b>	<b>%</b>
14	56	11.7
15	137	28.7
16	141	29.6
17	91	19.1
18	21	4.4
Blank response	31	6.5
<b>RACE</b>	<b>FREQUENCY</b>	<b>%</b>
White	231	48.4
American Indian/Alaska native	36	7.5
Mixed Race	58	12.2
Black, African American, or Negro	27	5.7
Asian American	11	2.3
Some other race	82	17.2
Blank response	32	6.7
<b>ORIGIN</b>	<b>FREQUENCY</b>	<b>%</b>
Not of Hispanic, Latino or Spanish origin	331	69.4
Were of Hispanic, Latino or Spanish origin	113	23.7
Blank response	33	6.9

## Inferential Statistics

Since this study used a criterion-group design it is important to note that results were not interpreted as a causal relationship between the independent and dependent variables. Instead differences between the two groups were interpreted as demonstrating an associative relationship between the independent and dependent variables.

SPSS was used for inferential statistical analysis. A paired t-test was conducted to compare the means of each group in order to answer research question one which asked if a visit to the zoo affects conservation attitudes. Each respondent was asked to indicate their attitudes prior to their trip to the zoo (retrospective response), followed by a response of attitudes presently held. Therefore, “Retrospective” refers to how a student felt before their field trip visit or class and “Present” describes how they felt after their field trip visit or class. Comparing both groups revealed that the mean of their conservation attitudes did positively and significantly increase after their field trip visit or class. Table 9 shows the paired samples statistics while Table 10 shows the significance of the paired samples test.

Table 9: Retrospective vs. present feelings paired samples N=477

	Mean	Std. Deviation	Std. Error Mean
Retrospective (before feeling)	67.965	11.610	0.531
Present (after feeling)	72.345	11.092	0.506

The overall mean increased in a positive direction from 67.965 (retrospective) to 72.345 (present).

Table 10: Paired samples test for significance

	t	df	Sig. (2-tailed)
Retrospective & Present	-11.730	476	p<0.001

The two-tailed probability of this response distribution is <0.001 and  $\alpha$  was set at .05, therefore confirming that the change in conservation attitudes was significant. Paired t-test analysis within the entire sample population confirmed that conservation attitudes did positively and significantly increase as a result of a free-choice zoo field trip visit or education class. Accordingly the null hypothesis related to research question one, which stated there would be no difference in conservation attitudes within groups, was rejected.

To assess whether the groups were similar with regard to their reported feelings, two independent t-tests were conducted. Table 11 shows the analysis of the mean comparison of each group. Table 12 shows the significance of the equality of means. Since these probabilities are greater than 0.05, it can be concluded that the free-choice learners and those in the formal learning setting were similar in conservation attitudes prior to their experience at the zoo.

Table 11: Mean values for overall group

Group	N	Mean	Std. Deviation	Std. Error Mean
Free-choice learners	110	69.463	10.991	1.047
Formal learners	365	70.364	10.494	0.549

Table 12: Significance of equality of means

	t	df	Sig. (2-tailed)
Equal variances assumed	-0.780	473	0.436
Equal variances not assumed	-0.761	173.214	0.448

A second independent t-test was conducted to see if there were differences within the groups' reported retrospective and present attitudes. Table 13 shows the analysis of the mean comparison of retrospective and present responses within each group. Table 14 shows the significance of the equality of means.

Table 13: Mean values of group retrospective vs. present responses

	Group	N	Mean	Std. Deviation	Std. Error Mean
Retrospective answers	Free-choice learners	110	67.363	11.200	1.067
	Formal learners	365	68.147	11.771	0.616
Present Answers	Free-choice learners	110	71.563	11.895	1.134
	Formal learners	365	72.581	10.845	0.567

Table 14: Significance of equality of means

		t	df	Sig. (2-tailed)
Retrospective answers	Equal variances assumed	-0.619	473	0.536
	Equal variances not assumed	-0.635	187.428	0.526
Present answers	Equal variances assumed	-0.843	473	0.399
	Equal variances not assumed	-0.802	167.308	0.423

Both independent t-tests showed that the overall means and retrospective/present means were statistically equal confirming that the visit to the zoo itself was the only factor that affected the change in reported conservation attitudes.

A paired t-test was conducted to address the possibility of differences between the two groups upon arrival at the zoo. Table 15 results show the means of the paired samples by groups. Table 16 shows the significance of the paired samples results.

Table 15: Group means

Group	Answers	N	Mean	Std. Deviation	Std. Error Mean
Free-choice learners	Retrospective	110	67.363	11.200	1.067
	Present	110	71.563	11.895	1.134
Formal learners	Retrospective	365	68.147	11.771	0.616
	Present	365	72.581	10.845	0.567

Table 16: Paired samples test for significance

Group	Answers	t	df	Sig. (2-tailed)
Free-choice learners	Retrospective & present	-6.189	109	p<0.001
Formal learners	Retrospective & present	-9.999	364	p<0.001

The results of table 14 and 15 indicate that both groups' conservation attitudes increased positively and significantly. This analysis demonstrates that the two groups, free-choice learners and formal learners, were similar in conservation attitudes upon arrival at the zoo and upon completion of the zoo visit – although their attitudes toward conservation had increased as measured by this instrument during their visit to the zoo.

Finally, the null hypothesis to research question two, which stated there would be no difference in conservation attitudes between groups' learning methods, was addressed utilizing an independent samples t-test. Since the prior examination had revealed that both groups were similar upon entry to their visit to the zoo and similar upon completion of their visit, it was also demonstrated that both groups had increased in conservation attitude as measured by the research instrument. To ascertain the degree of increase, a “change score” was calculated for each participant: essentially this change score was the post-test score minus the retrospective score for each student.

The independent sample t-test is shown in Table 17 and Table 18, revealing that there is no significant difference between the change scores for those participants in the free choice education experience and those in the formal learning experience. As a result,

hypothesis two was not rejected. Both learning experiences produced a positive and significant change in conservation attitudes, shown to be statistically equal.

Table 17: Independent t-test of change scores

	Group	N	Mean	Std. Deviation	Std. Error Mean
Change scores	Free-choice learners	110	4.200	7.117	0.679
Change scores	Formal learners	365	4.434	8.473	0.443

Table 18: Significance of equality of means of change scores

		t	df	Sig. (2- tailed)
Change scores	Equal variances assumed	-0.263	473	0.792
Change scores	Equal variances not assumed	-0.289	210	0.773

## Summary

Research question one asked: “did a visit to the zoo affect conservation attitudes?” Statistical analysis of responses to the test instrument showed that a visit to the zoo did significantly and positively affect conservation attitudes of teen visitors to the Oklahoma City Zoo. With the total population of 477 participants, the overall mean increased in a positive direction from 67.965 (retrospective) to 72.345 (present).

Research question two asked: “did learning method (free-choice vs. formal) affect conservation attitudes?” Statistical analysis of the responses to the test instrument showed that each group increased significantly and maintained similar means of attitudes

following their respective zoo visits. So the answer to this research question was that both instructional methods positively affected conservation attitudes. However, there was no significant difference between the formal or free-choice instructional methods in changing conservation attitudes among teen visitors to the zoo.

Chapter V includes a discussion and interpretation of the results of this research. It also addresses the challenges and obstacles associated with the teenage population surveying. Lastly, Chapter V also offers a discussion of the implications of the findings for zoos and zoo educators.

## CHAPTER V

### CONCLUSION

#### **Research overview**

The purpose of this study was to measure change in teenage students' conservation attitudes as a result of a visit to the Oklahoma City Zoo. This study further investigated whether learning experience type, free-choice or formal, affected conservation attitudes. The Visitor Centered Evaluation Hierarchy diagnostic tool was used to inform the instrument selection. Since the study assessed short-term outcomes, such as attitudes, a survey was selected for the instrument. The conservation attitudes survey developed by AZA for their 2006 Visitor Impact Study was utilized for this research.

Literature review revealed there was an apparent need for zoos to measure the impact that they have on their visitors. A 2008 study (Luebke and Grajal) reported that 64.9% of zoos occasionally, rarely or never conduct visitor research and that the overwhelming majority of data collected was either demographic information or related to visitor satisfaction. Clearly there was a need for visitor studies that related directly to the zoos' mission performance such as affective reactions as well as cognitive gains. Five percent of zoo visitors in the United States are teenagers, and yet they are the most

neglected age group with respect to zoo planning and programming studies (Wray-Lake, et al., 2010). Likewise, zoos had conducted little research that assessed the impacts of different teaching styles on visitors regarding cognitive or affective changes (Bell, et al., 2009; Visscher, et al., 2009).

### **Research Questions**

The research questions that guided this study were:

1. Does a visit to the zoo affect conservation attitudes?
2. Does learning method (free-choice vs. formal) affect conservation attitudes?

### **Discussion and Interpretation of Results**

Statistical analysis confirmed that conservation attitudes did positively and significantly increase as a result of a free-choice zoo field trip visit or education class. A paired t-test of the total population of 477 students showed the overall mean increased in a positive direction from 67.965 (retrospective feelings) to 72.345 (present feelings). This study used a non-directional alternative hypothesis and a two-tail significance test. With  $\alpha$  set at .05, the two-tailed probability was found to be  $<0.001$ , therefore confirming that conservation attitude change was significant. The null hypothesis to research question one, there would be no difference in conservation attitudes within groups, was rejected.

Two independent t-tests were conducted to assess whether both sample groups were similar with regard to their reported conservation attitude feelings. The first t-test assessed the overall mean of both groups. The two-tailed significance for both groups was  $> 0.05$ , indicating that both the free-choice learners and those in the formal learning setting were similar in conservation attitudes prior to their experience at the zoo. A

second independent t-test was conducted to see if there were differences within the groups' reported retrospective and present attitudes. The two-tailed significance for both groups' retrospective and present feelings was  $> 0.05$ . Both independent t-tests revealed that the overall means and retrospective/present means were statistically equal which confirmed that the zoo visit was the only factor that affected the change in reported conservation attitudes.

Student learning method, free-choice or formal, did not preferentially affect conservation attitudes. A paired t-test confirmed that both groups' attitudes increased positively and significantly. The null hypothesis to research question two, there would be no difference in conservation attitudes between groups' learning methods, was not rejected.

### **Study Challenges**

Obtaining the sample populations in the fall was more challenging than anticipated due to the fact that most schools self schedule for spring. Fewer schools booked field trips thus the sample size was 110 for free-choice learning experience students vs. the 367 sample size for formal learning experience students.

Completing the instrument seemed to be difficult for the students. Initially 534 surveys were administered; however only 477 could be used for data analysis. Surprisingly 100% of the unusable surveys came from the formal learning group. These surveys were deemed unusable due to student's failure to self-report an entire column of Likert scale values, either their retrospective feelings or present feelings. Of the remaining usable surveys there was a high rate of blank responses with regard to their demographic information. When prompted to answer "have you been to the zoo before",

“have you participated in a zoo education class before” and “gender”, 26 surveys had non responses. When prompted about “age”, 31 surveys had non response, the “race” prompt gleaned 32 non responses and “origin” had 33 non responses. The question about “race” seemed to cause an emotional reaction with students. Although given seven choices based on U.S. Census categories, some students attempted to edit these options. For example the prompt read “American Indian/Alaska native” and several students crossed out American Indian and wrote “Indian American” for their race. For the prompt “some other race”, several students wrote “Mexican American” as an edited category. Finally students seemed to be confused as to which race with which to self identify. Thirteen students, 2.7% of the total, circled multiple prompts. Typically they circled “White” and then one or more of the other prompts rather than circling the prompt that read “mixed race”. The layout of the survey may have been a factor in the number of double answers, two circled responses to the exact same question on the exact same line, and also the number of surveys with missing data, a line that had been skipped and thus no number had been circled. Perhaps using a larger font and increasing the spacing between lines would be useful for future surveys with teens. As mentioned previously, 100% of the unusable surveys came from the formal learning group. However, it is important to note that these students all received the zoo education class in a large auditorium setting, per the teachers’ request for more students to attend in the same time frame. Classes ranged in size from 80 to 150 students and it is possible that the students biased each other during the administration of the survey.

## **Further Research**

With regard to formal learning experiences, would a specific zoo class play a role in students' self reported conservation attitudes? In this study all students received a class on endangered species due to the large class size and based on teacher requests. The Oklahoma City Zoo education department also offers high school classes on primate behavior, animal training and zoo design. Surveying affective changes in teen's conservation attitudes after experiencing one of the other classes might yield different results.

In informal learning environments students generally show increased attention, heightened curiosity and a willingness to observe, question and discuss phenomena more so than if they were in a classroom (Abraham-Silver, 2006). She asserts that the interplay between formal and informal learning is a two-way street. The challenge to educators is to find a way to make the most of informal experiences in order to both enhance classroom teaching and to structure field trips so that students get the most out of the experience. Informal venues have long capitalized on the use of discrepant events to peak visitors' curiosity. She further contends that it is critical that informal discrepant events don't stand alone. Discrepant events, both planned and unplanned, occur daily at the zoo. Free-choice learners have the opportunity to participate in daily events such as the sea lion show, riding the tram, zoo keeper facilitated animal feedings, docent touch and ask stations, reading and interacting with graphics and signage. Using interpretive principles, the zoo designs planned discrepant events in order to emphasize conservation education messages. For future zoo research studies it would be logical to include a set of survey questions in which free-choice learners were asked to specify which discrepant

events they encountered and participated in. This would allow for a more in-depth look at potential variables that may be associated with a change in conservation attitudes as a result of a free-choice experience at the zoo.

According to Falk (2005) the term free-choice learning is used to refer to the type of learning that occurs when individuals exercise significant choice and control over their learning. Two notable concerns have been raised about free-choice learning. The first argument is that almost all free-choice learning involves some kind of facilitated instruction. Whether carried out through a conservation organization's website, zoo exhibition, educational television show, popular book on the environment, newspaper article or regional park interpretive program, most free-choice learning experiences involve carefully crafted messages developed with specific educational goals in mind (Falk, 2005). The second argument that has been raised is; how free-choice is free-choice learning? Many teachers leading field trips offer students a choice of assignments to complete. Since student choices are defined by the instructor, and not by the student, and they are obligated to select one choice to satisfy an externally imposed goal (for example, a grade or extra credit) the result, it is argued, is something short of free-choice. Ultimately, what one person sees as free-choice learning situation may be perceived by another person as compulsory; free-choice learning is a psychological construct and thus can not be defined a-contextually (Falk, 2005). Future studies regarding zoo free-choice learning experiences could ask students if they had been assigned a formal task, such as a scavenger hunt or an animal observation, to do while on their field trip. This would allow for a more in-depth look at potential variables that may be associated with a change in conservation attitudes as a result of a free-choice experience at the zoo.

Research by Falk (2005) found that individual's motivations for visiting free-choice learning institutions appear to be identity related. He clustered visitor's motivations into five identity categories: experience seekers; professional/hobbyists; spiritual pilgrims, facilitators; and explorers. These identities may be drivers for what visitors do and learn in designed settings (Falk, et al., 2008). Therefore, it would be worthwhile in future research to utilize surveys, such as tool one from the Visitor Evaluation Toolbox (Falk, et al., 2009), to assess the motivational categories of visitors.

Research has shown, as does this study that a visit to a zoo or aquarium does result in change in attitudes. Yet, these changes can only be partially understood by collecting data immediately after the learning experience, while the visitor is still at the zoo. A longitudinal study would provide a more complete picture, in so doing giving visitors time to make sense of their experience, integrate their learning into their lives, and act upon any new interests or motivations inspired by their visit (Anderson, Storksdieck, & Spock, 2007).

Lastly, if I surveyed teenagers again, I would utilize a true pre/post test. Many students, according to the zoo educator/test administrator's perception, appeared as if they weren't taking the research serious by simply filling in the answers as quickly as possible in order to complete the survey.

### **Implications**

In the last decade, AZA institutions provided school field trips that connected more than 12- million students with the natural world (AZA, 2009a). Research has shown that attitudes are not only shaped by cognitive factors, such as knowledge acquisition, but also through affective factors such as emotions or feelings (Ballantyne &

Packer, 2005; Hungerford & Volk, 1993; Pooley & O'Connor, 2000). This research demonstrated that teenagers had significant positive affective change in conservation attitudes as a result of coming to the zoo. This may well be the first research that specifically addressed teens and the important topic of affective change. As a result, this quantitative research can provide the foundation to inform as well as craft teen zoo educational programs and activities.

According to Swanagan (2000), research on the impact of conservation education messages is still in its infancy. As recently as 2008 ninety-four accredited zoos/aquariums indicated that there was still a need to improve both the quality and quantity of data that measures the effectiveness of their impact and mission (Luebke & Grajal, 2008). My current research was aimed specifically at evaluating the impact of a zoo visit, as measured by change in conservation attitudes, and will contribute to the development of a national AZA database, which in turn will enable AZA-accredited institutions to validate the contribution they are making to public conservation education.

Povey and Rios (2002) assert that while the majority of zoos offer a variety of formal classes; the general visitor receives educational messages primarily through its exhibits. Zoos spend millions of dollars yearly to build natural exhibits that help educate visitors. Not only do they provide cognitive information but also recently have focused on encouraging the public to support conservation issues (Swanagan, 2000). Ogden and Lindburg (1991) found that visitors reported increased interest in conservation after visiting exhibits. Further studies showed that zoos often refer to value of their exhibits in terms of influence on visitor behavior (Zucker, 1995). Research findings from this study substantiate these previous studies. Regardless of the learning method, free-choice or

formal, all students had positive significant changes in conservation attitudes. Free-choice learner group means increased by 4.2 (67.363 before vs. 71.563 after). Formal learner group mean increased by 4.434 (68.147 before vs. 72.581 after). Both yielded a value of  $p < .001$  which was significant.

As called for by the 2010 AZA standards on evaluation and interpretation, evaluations should assess more than participant satisfaction; they should measure program impact on conservation-related knowledge, attitudes/affect, and behavior. Section 4.3.2. calls for “institutions to have a thorough understanding of the needs of its audiences and to provide programs to meet these needs. Education to a wide-variety of audiences can be accomplished through a variety of programming methods.” Results of this study can be used to improve existing zoo programs or to create new programs that address cognitive, affective, and behavior outcomes. Data from this study will also add to the exchange of ideas between zoos and in turn enhance the effectiveness of zoos as networks for conservation education.

Finally, this research confirms findings from the AZA Visitor Impact study that zoos and aquariums are making a positive difference (Falk, et al., 2007). According to the conservation attitude survey conducted among zoo going adults, there was statistical significance in the gain between before and after scores (Falk, et al., 2009). Despite the target population being teenagers, likewise the paired sample means in this study increased overall by 4.38 (67.965 before vs. 72.345 after) and like the Visitor Impact study had a significance of  $p < .001$ .

Implications for the Oklahoma City Zoo are broad. Findings from this study can directly impact OKC Zoo management in the following ways:

1. Validates and lends credibility to the Oklahoma City Zoo's role in environmental education within the local community and state. Learning goes on reciprocally in institutions and at home; and is driven by curiosity, by need or for socio-cultural reasons. It is important to note that environmental learning may occur in any of these educational settings or situations, and that any one of these is unlikely to be sufficient by itself. To maintain an environmentally aware citizenry; it takes an infrastructure to do that. This study yielded quantitative data that supports the idea that free-choice environmental education facilitators, such as the zoo, are a part of the infrastructure for environmental education. This, in turn, encourages formal educators to view the zoo as their partner in the task of education. As a result, more teachers may book either a conservation education class taught by a zoo educator or a craft their own field trip. This allows the zoo to provide more conservation messaging while generating revenue as well.

2. Informs free-choice learning experiences that the zoo develops and implements.

Theoretically, the outcomes of free-choice learning environmental experiences can result in positive, neutral or even negative environmental learning (Falk, 2005). He asserts that which outcome results is partially a function of how the learning experiences are designed and supported. Zoo signage is a multi-departmental endeavor. The education department writes the interpretive text, seeks input and the final approval from zookeepers and curators as to accuracy of content, while the design, production and placement of signs are performed by the graphics department. Future research that focuses on what visitors had encountered during their free-choice visit, will allow the zoo to utilize its resources and talents to further develop those types of experiences or to re-vamp existing experiences that might be ineffective. Zoo docents, trained in interpretive

communication skills, provided over 1,025 volunteer hours in 2010. They were tasked with engaging and interacting with visitors to provide specific conservation messages. Kola-Olusanya (2005) asserts that the heart of free-choice learning in zoos is certain preferred modes for processing information including auditory, kinesthetic, tactile and visual. The data obtained from this research can be used three-fold. It validates the expenditure of money to maintain the docent program, it supports the use of interpretive training for the docent program, and it indicates that the docents themselves might be playing a role in affective changes that occur during free-choice learning experiences. Currently the zoo's sea lion show, tram ride, and zoo keeper led animal feedings also include some conservation messages. However by first knowing that free-choice learning experiences did indeed cause a positive change in conservation attitudes, future research can now be focused on these individual activities. Revising and rewriting of the scripts for these free-choice experiences may result from potential new research findings. Roughly 770,000 visitors came to the OKC Zoo, exclusive of formal education classes, it can be inferred that carefully designed and targeted messages will help further the mission of the zoo.

3. Informs educational classes and experiences that the zoo develops, offers and implements to their teenage demographic. In 2010 roughly 34,000 students, ranging in ages from 2-18, attended a formal education class taught by a professional zoo educator. And due to the admission age range of 12-64, as reported by annual attendance records, is it unknown how many of those 432,425 visitors were teenagers. Zoo learning experiences should connect to students' prior knowledge and experiences, tap into students' interests, and motivate students to learn more about the topics introduced at the

site. Other studies point to the need for more investigations into student perspectives on their learning (Davidson, Passmore, Anderson, 2009). The few existing studies in informal education demonstrate that young children may respond to different aspects of exhibits more than educators may assume, and that teenagers may have developed negative attitudes and expectations of school trips because of their experiences in earlier years. Since both groups of teens did have positive and significant changes in their conservation attitudes, a direct application of this study can lead to further investigation into which programs, activities and offerings were utilized by the teens.

### **Summary**

Zoos recognize that their mission is to conserve wildlife and natural habitats through changing the attitudes of its visitors ((Norton, et al., 1995). Present-day zoos are positioned to shape public opinion and to encourage empathetic attitudes toward wildlife in addition to educating visitors. This study verified that attitudes towards conservation were positively and significantly increased as a result of the zoo visit.

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## APPENDIX A IRB APPROVAL

### Oklahoma State University Institutional Review Board

Date: Friday, July 09, 2010  
IRB Application No GU105  
Proposal Title: Assessment of Change in Conservation Attitudes Through Zoo Education

Reviewed and Expedited  
Processed as:

**Status Recommended by Reviewer(s): Approved Protocol Expires: 7/8/2011**

Principal  
Investigator(s):

Teresa Randall	Lowell Caneday
3601 Mt. Pleasant Dr.	184 Colvin Center
Midwest City, OK 73110	Stillwater, OK 74075

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The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,



Shelia Kennison, Chair  
Institutional Review Board

## APPENDIX B CONSERVATION ATTITUDE SURVEY

Are you here on a field trip? \_\_\_\_\_ Identification code \_\_\_\_\_  
(Use initials of school/group and month and day -- ex: CAHS214)

Are you here for a zoo class? \_\_\_\_\_ Identification code \_\_\_\_\_  
(Use your 3 initials and birth month and day -- ex: tmr915)

### How Much Do You Agree With Each Statement?

Circle a number in each row. Think of how you felt **BEFORE** your visit  
and then rate each sentence as to how you feel **NOW**.

Before my visit								How I feel now								
Strongly Disagree				Neutral			Strongly Agree		Strongly Disagree				Neutral			Strongly Agree
1	2	3	4	5	6	7	Being at the zoo is fun	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	I am part of the problems with nature	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	I am part of the solutions to nature's problems	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	Zoos care about animals	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	Zoos are important for wildlife conservation	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	Animals are amazing	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	We need to help protect animals	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	We need to help protect plants	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	There is a lot I can do to conserve	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	There is not much I can do to help nature	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	Nature helps define America's national heritage & character	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	Nature is a place to renew the human spirit	1	2	3	4	5	6	7		
1	2	3	4	5	6	7	We have the responsibility to leave healthy ecosystems for our families & future generations	1	2	3	4	5	6	7		

Please turn the page over and continue.

The following questions and information assist in the research process. Information gained is not personally identifiable. It does provide a better understanding of who the visitors to the Zoo are.

**Have you been to the Oklahoma City Zoo before this trip? Place a check mark in the appropriate box on the left.**

<input type="checkbox"/>	<b>No</b>
<input type="checkbox"/>	<b>Once or Twice</b>
<input type="checkbox"/>	<b>Visit the Zoo quite often</b>

**Have you taken a zoo education class before at the Oklahoma City Zoo? Place a check mark in the appropriate box on the left.**

<input type="checkbox"/>	<b>No</b>
<input type="checkbox"/>	<b>Yes</b>

**How old are you in years?**

--

**Please indicate whether you are a male or female. Place a check mark in the appropriate box on the left.**

<input type="checkbox"/>	<b>Male</b>
<input type="checkbox"/>	<b>Female</b>

**What is your race? Please circle the best description of your race.**

<b>White</b>	<b>American Indian/Alaska native</b>	<b>Mixed race</b>
<b>Black, African American, or Negro</b>	<b>Asian American</b>	<b>Some other race</b>

**Are you of Hispanic, Latino, or Spanish origin? Place a check mark in the appropriate box on the left.**

<input type="checkbox"/>	<b>No</b>
<input type="checkbox"/>	<b>Yes</b>

Thank you very much for participating in this study.

**APPENDIX C  
ASSENT FORM  
OKLAHOMA STATE UNIVERSITY**

Dear Student,

We are interested in learning about conservation attitudes held by junior high and high school students after they visit a zoo. In order to understand this, we would like you to fill out a survey. Your parent/guardian is aware of this project.

Please understand that you do not have to do this. You do not have to answer any questions that you do not want to. You may stop at any time.

Your name will not be on the survey you fill out. If you have any questions about the survey or what we are doing, please ask us. Thank you for your help.

Sincerely,

Teresa Randall, Director of Education, OKC Zoo  
Doctoral candidate Oklahoma State University

Lowell Caneday, Ph.D.  
Professor Oklahoma State University

I have read this form and agree to help with your project.

---

(your name)

---

(your signature)

---

(date)

**APPENDIX D**  
**INFORMED CONSENT: PARENT/GUARDIAN PERMISSION FORM**

**Project Title:** ASSESSMENT OF CHANGE IN CONSERVATION ATTITUDES  
THROUGH ZOO EDUCATION

**Investigator:**

Teresa Randall, Principal Investigator, Director of Educational Programs, Oklahoma City Zoo, B.S. Agriculture Education, M.S. Environmental Science

**Purpose:**

The purpose of this study is to determine if a visit to the zoo affects teen's attitudes about conservation. It also explores the differences between students who have attended a formal zoo education class and those who have not. Your child was selected as a possible participant because she/he is in the age range I am interested in studying.

**Procedures:**

Your child/student will be asked to complete one survey which will take 5 - 10 minutes at the end of their zoo experience. All data gathering will take place at the zoo, either in the education building or at the zoo's exit gates. Students will be asked on a scale of 1-7 how much they agree or disagree with thirteen statements about zoos, nature and conservation.

**Risks of Participation:**

There are no known risks associated with this project which are greater than those ordinarily encountered in daily life.

**Benefits of Participation:**

It is expected that the Oklahoma City Zoo will learn valuable information that will help them improve zoo learning experiences for teens. This should benefit your child and other children and families that visit the zoo.

**Confidentiality:**

All information will be anonymous as no names will be recorded on the survey. Codes will be used. Students taking a class will be instructed to use their 3 initials and birth day and month (i.e.: tmr915) for record keeping purposes. Students on a zoo field trip will be instructed to place school/organization initials and month and date of field trip (i.e.: CAHS214) for record keeping purposes. Any written results will discuss group findings and will not include information that will identify your child. Records will be stored securely and only researchers and individuals responsible for research oversight will have

access to the records. The OSU IRB has the authority to inspect consent records and data files to assure compliance with approved procedures.

**Compensation:**

There will no compensation to participants or teachers, schools or organizations.

**Contacts:**

If you have any questions about the research or your rights as a participant in this study, please feel free to contact Teresa Randall 405-425-0288 or Dr. Lowell Caneday from Oklahoma State University 405-744-5503. If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or [irb@okstate.edu](mailto:irb@okstate.edu).

**Participant Rights:**

Your child's participation in this project is appreciated and completely voluntary. Your child may choose not to participate at any time without any penalty. Your child's participation may be terminated if they do not fall within the desired age range of 14-18 years.

**Signatures:**

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy of this form has been given to me.

**Parental Signature for Minor:**

I have read and fully understand the consent form. As parent or guardian I authorize \_\_\_\_\_ (print minors name) to participate in the described research.

\_\_\_\_\_  
Parent/Guardian Name (printed)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Parent/Guardian

\_\_\_\_\_  
Date

## **APPENDIX E**

### **PARTICIPANT INFORMATION SHEET**

**Project Title:** ASSESSMENT OF CHANGE IN CONSERVATION ATTITUDES THROUGH ZOO EDUCATION

**Investigator:** Teresa Randall, Director of Education OKC Zoo, Ph.D. candidate OSU

**Purpose:** The purpose of this study is to determine if a visit to the zoo affects junior high and high school students' attitudes about conservation. It also explores the differences between students who have attended a formal zoo education class and those who have not.

**Procedures:** A survey that should take approximately 5-10 minutes to complete will be administered either in the education building or at the exit gates of the zoo.

**Risks of Participation:** There are no known risks associated with this project which are greater than those ordinarily encountered in daily life.

**Benefits:** It is expected that the Oklahoma City Zoo will learn valuable information from that will help them improve zoo learning experiences for children. This should benefit you and other children and families that visit the zoo.

**Confidentiality:** All information will be anonymous as no names will be recorded on the survey. No names will be recorded in the data file. All results will be reported as aggregated data and no individual responses will be reported. The OSU IRB has the authority to inspect consent records and data files to assure compliance with approved procedures.

**Contacts:** If you have any questions about the research or your rights as a participant in this study, please feel free to contact Teresa Randall 405-425-0288 or Dr. Lowell Caneday from Oklahoma State University at Phone 405-744-5503. If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or [irb@okstate.edu](mailto:irb@okstate.edu).

**Participant Rights:** Your participation in this project is appreciated and completely voluntary. You may choose not to participate at any time without any penalty or problem.

**APPENDIX F**  
**TEACHER AND ADMINISTRATOR CONSENT FORM**

My name is Teresa Randall. I am Director of Education for the Oklahoma City Zoo and also a doctoral candidate at Oklahoma State University. I am conducting research to see how a visit to the Zoo affects conservation attitudes. Your students have been selected as participants because they fall in the age range I am interested in studying. Please read this form and contact me with any questions you may have regarding the study.

The purpose of this study is to determine if a visit to the zoo affects high school students' attitudes about conservation. It also explores the differences between students who have attended a formal zoo education class and those who have not.

If you agree that your students may participate in this study, they will be asked to complete a 13 question survey which should take approximately 5-10 minutes total. The survey will be completed in the presence of both the evaluator and the teacher.

The records of this study will be kept private. All survey information will be anonymous as no names will be recorded. Results will be reported as aggregated data and no individual responses will be reported. Consent forms will be kept securely along with results for 5 years after completion of this study.

Your decision to participate in this study will not affect your current or future relations with the Oklahoma City Zoo or Oklahoma State University. If you choose to allow your students to participate, you are free to withdraw your students at any time. Your students may also discontinue participation at any time. If you have any questions, you may contact me directly at 405-425-0288.

Signature of Teacher Participant\_\_\_\_\_ Date \_\_\_\_\_

Signature of School Administrator\_\_\_\_\_ Date \_\_\_\_\_

Signature of Investigator \_\_\_\_\_ Date \_\_\_\_\_

## VITA

Teresa Michelle Randall

Candidate for the Degree of

Doctor of Philosophy

Dissertation: ASSESSMENT OF CHANGE IN CONSERVATION ATTITUDES  
THROUGH ZOO EDUCATION

Major Field: Environmental Science

Biographical:

### Education:

B.S. Agricultural Education, Oklahoma State University, 1983

Completed the requirements for Masters of Science in Environmental Science at Oklahoma State University, Stillwater, Oklahoma in July 2002.

### Experience:

Six years (2005-present) serving as Director of Educational Programs at the Oklahoma City Zoo. Manage all aspects of conservation education department, programs and volunteers. Supervise 6 naturalists, 8 part time educators, 4 graphic artists and 200 volunteers. 2002-2005 grant coordinator for Oklahoma City Community College biotechnology grant. Implemented NSF and NIH outreach grant to Oklahoma City Public School teachers. Concurrently served as adjunct biology 1114 faculty. Hold a valid Oklahoma State Teaching License and have thirteen years experience teaching public high school life sciences (1988-2001).

### Professional Memberships:

Association of Zoos and Aquariums

National Association for Interpretation

National Biology Teachers Association

Oklahoma Science Teachers Association

Oklahoma Association for Environmental Education

Society for Advancement of Chicanos and Native Americans in Science

Name: Teresa M. Randall

Date of Degree: May, 2011

Institution: Oklahoma State University

Location: Stillwater, Oklahoma

Title of Study: ASSESSMENT OF CHANGE IN CONSERVATION ATTITUDES  
THROUGH ZOO EDUCATION

Pages in Study: 99

Candidate for the Degree of Doctor of Philosophy

Major Field: Environmental Science

Scope and Method of Study:

This study was conducted at the Oklahoma City Zoo in fall 2010 and subjects were students' ages 14-18 who either participated in a formal conservation education class led by zoo educators or in a field trip in which they were engaged in free-choice learning. Two research questions were: 1) Does a trip to the zoo affect conservation attitudes and 2) does learning experience, free-choice or formal, affect conservation attitudes?

A criterion group design was used and the instrument used to measure conservation attitudes was Tool 4 from the Visitor Evaluation Toolbox produced by the Association of Zoos and Aquariums MIRP study (Falk, J., Bronnenkant, K., Vernon, C., & Heimlich, J., 2009). Group one (N=110) engaged in a free-choice (field trip only) experience and group two (N=367) engaged in a formal conservation education class. The survey was administered retrospectively to both groups upon completion of their learning experience at the zoo.

Findings and Conclusions:

Statistical analysis was conducted using SPSS 17.0. A paired sample t-test showed the overall mean within both groups increased in a positive direction from 67.965 (retrospective) to 72.345 (present). With and  $\alpha$  set at .05 the two-tailed probability was  $<0.001$ , therefore confirming that the change in conservation attitudes was significant. An independent sample t-test of the change in scores between the groups produced p values of 0.792 and 0.773 and revealed that the change was not significant.

Findings did illustrate that a trip to the zoo did positively and significantly affect conservation attitudes among teens and that the type of learning experience did not significantly affect change in conservation attitude scores.

ADVISER'S APPROVAL: Dr. Lowell Caneday

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