COMPARING THE REACTIONS OF ZOO VISITORS TO IMMERSIVE AND NON-IMMERSIVE EXHIBIT EXPERIENCES

By

Theresa Herendeen

August 2017

Director of Thesis: Hans Vogelsong, PhD

Major Department: Recreation and Leisure Studies

There are many people who visit zoos every year - over 183 million according to the Association of Zoos and Aquariums (2017). These visitors may have different motivations and goals for their visits. However, any zoo they visit will find that the zoo facility and staff have the same main goals: recreation, conservation, and education. Understanding how to effectively promote these areas to visitors is important for a zoo's continued success. One of the biggest attraction of zoos includes their animal exhibits. These exhibits may evoke emotional reactions (affective reactions), inspire learning and education to occur (cognitive reactions), and a sense of connection to the environment from the visitors. These reactions can be used by zoo staff to achieve their goals. However, with the diverse visitor population that zoos often encounter, understanding effective methods to communicate with as many people as possible is essential. Many zoos provide a variety of different exhibit experiences. Some of the exhibits include opportunities for visitors to participate in unique experiences that can enhance their different experiences. The purpose of this study was to examine how different exhibit settings encourage different reactions within adult visitors.

COMPARING THE REACTIONS OF ZOO VISITORS TO IMMERSIVE AND NON-IMMERSIVE EXHIBIT EXPERIENCS

A Thesis

Presented to The Faculty of the Department of Recreation and Leisure Studies

East Carolina University

In Partial Fulfillment of the Requirements for the Degree of:

M.S. IN RECREATION SERVICES AND INTERVENTIONS

Concentration: Recreation and Park Administration

by

Theresa Claire Herendeen

August , 2017

COMPARING THE IMMERSIVE AND NON-IMMERSIVE EXHIBIT EXPERIENCE OF ZOO VISITORS

by

Theresa Herendeen

APPROVED BY:

DIRECTOR OF THESIS: _____
Hans G. Vogelsong, Ph.D.

COMMITTEE MEMBER: _____
Clifton E. Watts Jr., Ph.D.

COMMITTEE MEMBER: _____
Paige P. Viren, Ph.D.

COMMITTEE MEMBER: _____
Corinne J. Kendall, Ph.D.

CHAIR OF THE DEPARTMENT
OF RECREATION AND LEISURE STUDIES: _____
Edwin Gómez, Ph.D.

DEAN OF THE
GRADUATE SCHOOL: _____
Paul J. Gemperline, Ph.D.

ACKNOWLEDGEMENTS

I cannot begin to thank my thesis committee for their continued support and encouragement while I completed this thesis: Dr. Hans Vogelsong, my committee chair; Dr. Corinne Kendall, who works with the NC Zoo; Dr. Paige Viren; and Dr. Clifton Watts. I am very grateful for the guidance and learning opportunities that were provided by my committee. I especially would like to thank Dr. Kendall, as she assisting me in obtaining approval from the NC Zoo to complete the research, participating on my committee, and for offering invaluable guidance throughout the project.

The completion of this project would not be possible without the support that the North Carolina Zoo provided as the site location of my study. Being able to survey the visitors of such a large zoo allowed me to complete my study. You have my sincere thanks for allowing me to work with your facility and its visitors.

I would also like to recognize the classmates who assisted me specifically with different aspects of the gathering of research or the entering of data: Andrew Frost; Stephanie Warrick; and Daniel Pilgreen. Without your kind assistance, gathering surveys or inputting the data from the numerous surveys collected would have been significantly more difficult.

Finally, I would like to thank all my family and friends for their support as I completed this project.

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

Over time, zoos and aquariums have been attractions that welcome large numbers of visitors throughout the world. The value of these zoos to zoo visitors has been a source of inquiry for researchers. Although there can be many different facilities, animals, and experiences offered by zoos, there are some commonalities throughout zoos.

Conservation is one of the main goals for zoo facilities. Gusset and Dick (2011) studied the global effect of zoos and aquariums on conservation efforts and visitor numbers. Data were gathered from 12 national and regional zoo and aquarium associations throughout the world. The results showed that more than 700 million people visited zoos and aquariums worldwide annually and $350 million (U.S.) dollars are spent on conservation each year by these facilities. The authors concluded that zoos and aquariums have an important role in wildlife conservation and environmental education.

Understanding the demographics of the different people who comprised the groups that visit zoos and aquariums is difficult due to the millions of annual visitors. However, as zoos began to embrace knowledge about the diversity of their visitors, the zoo facilities and staff were able to provide many different avenues for education (Cove & Byrne, 2014) and recreation (Gusset & Dick, 2011) to appeal to as many visitors as possible. While the missions of zoos and aquariums focused on conservation and education (Patrick, Matthews, Ayers & Tunnicliffe, 2007), these facilities were also seen as key locations for entertainment (Carr & Cohen, 2011) and recreation (Andersen, Kelling, Pressley-Keough, Bloodsmith, & Maple, 2003). Visitors were often motivated to visit due to the potential for entertaining experiences (Carr & Cohen, 2011) but visitor motivation was especially likely to shape the educational experiences and learning potential of visitors (Schultz & Joorden, 2014).

Visitors can be motivated to go to zoos for a variety of reasons. Sickler and Fraser (2009) noted that visitors commonly had a desire to have enjoyable experiences despite also having specific motivations related to conservation, education, or personal expectations. A challenge for many zoos is meeting the desires and motives for large, diverse populations (Sickler & Fraser, 2009). This requires zoo personnel to provide facilities and experiences that foster an environment that appeals to the many needs of an audience that differs by age, social strata, size, and composition.

For example, families (that were often accompanied by children) are frequent zoo visitors, which makes it important to understand how people who visited with their families were affected and differed from visitors without families. Understanding these differences within segments of visitors allows zoo and aquarium personnel to create opportunities for families to bond and enjoy their time at the facility (Therkelsen & Lottrup, 2015) while not detracting from visitors who are not accompanied by children. An experience common to visitors of all ages is the possibility of seeing wild animals up close (Moss & Esson, 2010).

Moss and Esson (2000) noted that many visitors favored mammals, but they could also be affected by other aspects of the animals, like size. Other studies found that visitors often formed positive emotions and dispositions towards animals and nature after visiting live animal exhibits (Powell & Bullock, 2014). As viewing live animals is one of the main draws and sources of enjoyment experienced across subsets of visitors, zoo facilities place a lot of emphasis on designing these exhibits, while appealing to different needs and motives of visitors.

Animal exhibits are only one of the features of zoos that affect visitors. Zoo facilities should develop their exhibits in order to achieve the purposes of the exhibits. According to Kelling, Gaalema, and Kelling (2014), there were five main goals of zoo exhibits that included

recreation, educations, animal welfare, and research. The goals had to be achieved while being usable for visitors, zoo staff, and the animals. Many zoos place an emphasis on the animal welfare aspect of exhibits which has led to the change of exhibits. In the past, exhibits were often barren but over time, animal exhibits have evolved to become the current, most popular style known as the third - generation exhibit design (Moss, Esson & Francis, 2010). The third - generation exhibit design is the most modern method of zoo exhibits that utilizes enclosures to reflect the animals' natural habitats and immersive exhibit experiences. This type of exhibit design affects both the exhibits design outside and inside the animals' enclosures (Kelling, Gaalema, & Kelling, 2014).

Across exhibit types, the main method of communication that zoo facilities and staff had with their visitors, whether it is directional or educational, was through the usage of signs (Roe, McConney & Mansfield, 2015). Educational signs offer a method to actively teach visitors without the use of staff. Other methods used to impart knowledge use staff stationed to give interpretive presentations (Perdue, Stoinski, & Maple, 2012), opportunities to observe animal training sessions (Anderson, Kelling, Pressley-Keough, Bloodsmith, & Maple, 2003), and the use of educational videos (Perdue, Stoinski, & Maple, 2012). These supplementary teaching methods encourage visitors to remain in exhibits longer and learn more. The combination of these methods may also reinforce or appeal to pro-environmental attitudes.

Smith, Weiler, Smith and van Djik (2012) found that visitors who encountered educational and conservation messages also preferred to see pro-wildlife examples of consumerism (e.g. recycling) within zoo facilities. These visitors also expected to find opportunities to donate to conservation efforts within exhibits. Both factors were seen as part of the pro-conservation messages that visitors expected from zoos.

Visitors often have a basic interest and understanding of animal related topics and conservation before visiting a zoo facility (Cove & Byrne, 2014). A visit to zoos and aquariums can also lead to significant changes in visitors' level of knowledge and interest in wildlife and environmental topics (Falk & Adelman, 2003). The presence of interpretive activities and guides throughout zoos and aquariums may increase the level of conservation and biology-related learning that take place with children (Jensen, 2014). Randler, Baumgartner, Eisele, and Kienzle (2007) found that not only could guides assist in the level of learning that took place for children, but structural education programs (e.g., workstations) were also significantly beneficial cognitively and affectively for children.

Zoos and aquariums can affect people of all ages both cognitively and emotionally. The cognitive domain includes increasing knowledge, understanding, and awareness; while the emotional or affective domain includes the promotion of emotional connections to the wildlife represented at the zoos and aquariums (Luebke & Matiasek, 2013). Skibbins and Powell (2013) identified the connections that visitors create with animals within the zoo could potentially lead to visitors becoming predisposed to pro-conservation messages.

Study Objective

This study was exploratory in nature and largely focused on the relationships between visitors and their experiences. The research conducted was focused predominantly on the cognitive and affective responses of visitors from their zoo experience. The essential goal of the study was to gain knowledge of the subjective learning processes of the visitors.

Some of the overall benefits from this study included increasing the knowledge on how immersive exhibit experiences may affect visitor's experiences in comparison to the non-immersive exhibit experience. Potential findings from this study could be used to assist in

developing future exhibits by comparing the immersive and the non-immersive experiences within the exhibit. This study focused specifically on the reactions of visitors, which included environmental connectedness, cognitive, and affective reactions.

The results could be used by zoo managers to gather support for the development of future exhibit designs. Specifically, this research was designed to assist the NC Zoo in understanding if the immersive Zoofari experience about the Watani Grasslands differed from a non-immersive exhibit about these same grasslands.

BACKGROUND

The study was modeled after a research article completed by Luebke and Matiasek (2013). The study occurred in the Brookfield Zoo, Chicago and focused on four exhibits within the zoo. The purpose of the study was to explore the nature of the relationship between visitors' predispositions and their affective and cognitive reactions to different animal exhibits. There were Likert scale questions to investigate visitors' overall reactions. The authors of this study found that the emotional responses visitors had toward viewing animal exhibits were important experiences, as well as, the introspective and reflective opportunities. Some of the implications of the findings discussed by the authors included the importance of providing fun, meaningful learning experiences for visitors (Luebke & Matiasek, 2013).

The study by Luebke and Matiasek (2013) was adapted for this study to focus on cognitive, affective, and environmental connectedness in the non-immersive and immersive settings at the NC Zoo. While Luebke and Matiasek included research concerning predispositions of visitors, the current study used select survey questions added from a study completed by Powell & Bullock (2014) that measured what was titled 'Conservation Mindedness. These questions were added with the intent of measuring the environmental connectedness.

HYPOTHESES

Based from previous research, the following hypotheses were proposed:

H_1: Adult visitors' environmental connectedness is positively related to the cognitive reactions that they experience within different zoo exhibits.

H_2: Adult visitors' environmental connectedness is positively related to their affective reactions that they experience within different zoo exhibits.

H_3: Visitors of the immersive (Zoofari) exhibit experience will have higher levels of cognitive reactions than the non-immersive experience group.

H_4: Visitors of the immersive (Zoofari) exhibit experience will have higher levels of affective reactions than the non-immersive experience group.

METHODOLOGY

Study Location

The study occurred at the North Carolina Zoological Park in Asheboro, North Carolina. The North Carolina Zoo is located south of Asheboro, North Carolina and is a member of the Association of Zoos and Aquariums. The zoo consists of 2,200 acres and 500 of those acres had been developed into the large habitats. Those habitats were based on the animals' natural habitats and were considered to be the largest in the United States (NC Zoo, 2016).

The study focused on one exhibit that offered two different opportunities for visitors to experience. The exhibit was selected at the time, due to a new implementation of the immersive exhibit experience called Zoofari. In this immersive experience, visitors were driven through the Watani Grasslands exhibit. The Watani Grasslands is an outdoor exhibit that has African Elephants, Bongo, Common Waterbuck, Greater Kudu, Nile Lechwe, Ostrich, Sitatunga, Southern White Rhino, and Thomson's Gazelle (NC Zoo, 2016).

This exhibit gained a new immersive experience in May 2016 for the visitors known as Zoofari. The Zoofari experience was designed as a tour offered twice a day on Thursday through Sunday with tours beginning at 11:00 AM and 12:00 PM (which were times with high visitor traffic) and lasting for approximately 45 minutes. The cost was twenty dollars per person and the tickets were first-come, first-served. While the weather could affect the availability of this experience, it was not an issue during the data collection period. The ride consisted of an open-air vehicle tour (adapted from a bus) of the 37-acre exhibit with a zoo keeper to provide information concerning the nine species within the exhibit including antelope, greater kudus, ostriches, rhinoceroses, and gazelles. Visitors' even had the chance to see a unique view of the

elephants' enclosure that was not available to visitors from the non-immersive view point (NC Zoo, 2016).

Sample

The study used a cluster sampling method from the adult visitors of the North Carolina Zoo who went through the Watani Grasslands exhibit. The sampling was divided by the days that the surveys were gathered. Participation in the study was on a voluntary basis and the participants were free to stop participating at their convenience. The sample included only adult participants (18 years old or older). No identification was required to complete the survey to prove age.

Exhibit visitors were approached at the different entrances and exits to the different viewing platforms of the exhibit. The surveys were distributed sixteen different days throughout the period of June 2016 until August 2016. The days that the surveys were distributed were chosen randomly. A cluster sampling method was used to gather data from the Watani Grasslands visitors. Each day that data were gathered, the researchers attempted to gather as many surveys as possible in order to reflect as many visitors as possible. This resulted in each day that data were gathered becoming the clusters of the population. Surveys were only gathered on the days that Zoofari was offered (Thursday-Sunday).

During the days that data collection occurred, the surveys were distributed from the beginning of the Zoofari experience (11:00 AM) until 4:00 PM, which was an hour before the zoo closed to the public. Surveys were gathered from the Zoofari experience groups upon disembarking the bus. Otherwise, surveys were gathered from the non-immersive exhibit areas. There were random rest periods for the researcher and research assistant that varied each day to ensure that data were collected randomly throughout each day.

Instrumentation

A quantitative questionnaire was used to gather visitor's reactions as they exited the exhibit and Zoofari experiences. The questionnaire was based off select questions from a questionnaire developed in a study completed by Luebke and Matiasek (2013) and from a survey from a study completed by Powell and Bullock (2014). Questions to gather personal, demographic-based information were included at the end of the survey (e.g. age) due to the survey being three pages long. The goal was to encourage the likelihood of the survey being completed despite the length of the survey by having the "easy" questions at the end. There were 22 Likert scale-based questions that pertained to the visitors' exhibit experiences and reactions. The areas the questionnaire covered included: environmental connectedness, cognitive reactions, and affective reactions. Additional questions were added by the request of the NC Zoo specifically (See Appendix B for the questionnaires).

Different questionnaires were distributed to the different exhibit experiences. When feasible, questions were used verbatim from past studies; however, there were some adaptations to allow for questions specific to the exhibit experience. Often, the questions between the two surveys were the same. The 14th question on the surveys is an example of the differences in the structure of the same question. In the non-immersive survey, the question was "Visiting the exhibit has made me more concerned about the well-being of wildlife" and the immersive survey's question was phrased as "Participating in the Zoofari experience has made me more concerned about the well-being of wildlife" with both aiming the gather similar information from the visitors of each experience.

Likert Scale Question Development

Of the 22 Likert Scale questions, 19 questions were based on the Luebke and Matiasek (2013) study, two questions were from the Powell and Bullock (2014) study, and one question was added at the request of the North Carolina Zoo. The two questions "As a result of visiting the exhibit, I am more likely to support the zoo or another conservation organization" and "As a result of visiting the exhibit, I intend to change some of my daily activities (recycle more, reduce energy usage, buy more earth-friendly products, etc.)" were specifically from the 2014 Powell and Bullock study. The question "North Caroline Zoo helps to save animals in the wild" was requested by the NC Zoo. The remaining questions were from the 2013 study from Luebke and Matiasek.

The study completed by Luebke and Matiasek measured variables (e.g. introspection, reflection, predisposition) that were not included in the NC Zoo study, but some of the questions that measured those variables were still included within the adapted study. This was due to the questions reflecting one of the three domains being measured. The variables from the studies were expected to fall within the domains that would reflect the domains that they presented in from their original studies with a few exceptions. For a detailed list of variables and expected domains, see Appendix F.

Questions that were used from the Powell and Bullock (2014) study measured environmental connectedness. These environmental connectedness questions supplemented the Luebke and Matiasek (2013) study questions, which measured cognitive and affective domains. The questions that were included from the Powell and Bullock (2014) study were adapted from a conservation mindedness factor of the study. The factor loads for the two questions from the 2014 study were both high (see Appendix G for a list of the original studies' reliability scores).

Procedure

The participants were asked to complete the surveys to the extent that they desired after viewing the non-immersive exhibit or participating in the immersive Zoofari experience. The questionnaire began with Likert Scale questions and then two short-answer questions to determine their experiences within the exhibit or during Zoofari. After these questions, the participants were asked questions on basic demographics, and questions about their experiences with the NC Zoo and other zoos and aquariums to gain a basis of their involvement with zoos and aquariums.

Analysis of Data

For H_1 (Adult visitors' environmental connectedness is positively related to their affective reactions that they experience within different zoo exhibits) and H_2 (Adult visitors' environmental connectedness is positively related to their affective reactions that they experience within different zoo exhibits), Pearson's *r* test was used to analyze the data. Pearson's *r* test is a product moment correlation coefficient used to analyze the strength of the relationship between visitors' environmental connectedness and their cognitive reactions (H_1) and visitors' affective reactions (H_2).

For H_3 (visitors of the immersive (Zoofari) exhibit experience will have higher levels of cognitive reactions then the visitors non-immersive experience group) and H_4 (visitors of the immersive (Zoofari) exhibit experience will have higher levels of affective reactions then the non-immersive experience group) used independent 't'-tests analyze the data. Independent 't'-tests are a parametric test that compares two independent groups to find statistically significant differences in the means of the groups. The independent 't'-test compared the visitors' reactions

to immersive exhibit experiences within an exhibit to the average, non-immersive exhibit experiences of visitors.

The demographic information will have several tests conducted on the data, including the standard frequency tests. A series of Chi – square, independent 't' tests, Pearson's correlation tests will also be conducted on the data in order to identify significant results of the demographic information gathered from the Watani Grasslands' visitors.

RESULTS

Demographic Information

The following includes the results from the demographic questions that were asked of the survey participants. All surveys that were completed by someone younger than 18 years old were excluded from the data. Below each graph is a summary of the results for each demographic question. Missing data was excluded from the tables (Tables 1 – 8).

Table 1

Age of Watani Grasslands Visitors

Options			
Range of Years Born	Years Old	*n*	Valid Percent
1940-1949	68 – 77	10	3.5%
1950-1959	58 – 67	28	9.8%
1960-1969	48 – 57	44	15.9%
1970-1979	38 – 47	57	19.9%
1980-1989	28 – 37	73	25.5%
1990-1999	18 – 27	74	25.9%
Missing		81	
Valid Total (no missing)		286	100.0%

Note. Participants were asked to provide the year that they were born in on the survey. For convenience, the years were placed into ten-year ranges. The year 1999 was included in the range for the sake of uniformity of the ranges only.

Of the 367 people who participated in the immersive and non-immersive surveys, the highest number of participants were born between the years 1990 and 1999 (n = 74). This indicated that the largest portion of visitors were in their early to late twenties. This was followed by respondents who reported that they were born between 1980 and 1989 (25.5%). Relatively few respondents (13.3%) indicated that they were born before 1960. Surprisingly, 81 participants did not indicate when they were born in. These results are summarized in Table 1.

Table 2

Gender of Watani Grasslands Visitors

Options	*n*	Valid Percent
Male	100	32.8%
Female	205	67.2%
Missing	62	
Valid Total (no missing)	305	100.0%

Another question asked what the gender of the participant. Table 2 highlights the results. Of the respondents, females (*n* = 205) participated in the survey the most. The number of female participants is more than doubled the number of male participants (*n* = 100). The number of survey participants who did not answer this question (*n* = 62) was less than the number of participants who did not answer what age they were (*n* = 81).

Table 3

Race of Watani Grasslands Visitors

Options	*n*	Valid Percent
White	237	79.3%
Black	42	14.0%
American Indian	2	.7%
Asian	1	.3%
Other	17	5.7%
Missing	68	
Valid Total (no missing)	299	100.0%

The participants could choose from five different race options to describe themselves, including an "other" option. The races that were represented the lowest included Asian (*n* = 1) and American Indian (*n* = 2). The race that was represented by more than half the completed

surveys was White (*n* = 237). Of respondents, 68 did not answer this question. These results are summarized in Table 3.

Table 4

Education Levels of Watani Grasslands Exhibit Visitors

Options	*n*	Valid Percent
Less than High School or High School	53	18.2%
Some College	94	32.2%
Bachelor's Degree or Post Graduate Work	145	49.7%
Missing	75	
Valid Total (no missing)	292	100.0%

To determine the level of education, a question asked the participants to identify their highest level of education that was applicable to them. Table 4 summarizes the results. Of the 367 surveys completed, almost 50% of the participants either had some college level education (*n* = 94) or a Bachelor's degree (*n* = 87). The lowest number of participants identified as having less than high school level education (*n* = 4). There were 75 respondents who did not answer this question.

Table 5

Visitors' Last Visit to the Zoo

Options	*n*	Valid Percent
First - time	69	22.8%
Within the last 12 months	69	22.8%
1-3 years ago	73	24.2%
5-10 years ago	55	18.2%
More than 10 years ago	36	11.9%
Missing	65	
Valid Total (no missing)	302	100.0%

The number of responses for each category were relatively evenly spread across the options. The highest number of participants identified their last visit as being 1-3 years ago (n = 73). First - time visit and Within the last 12 months were the next highest categories and both had the same number of responses (n = 69). There were only 11.9% of participants who identified their last visit as being more than 10 years ago (n = 37). There were 65 participants who did not answer this question. These results are all summarized in Table 5.

Table 6

Number of Visits to Conservation Locations in the Last 12 Months

Specified Location (s)	Options	*n*	Valid Percent
Zoos Only			
	Once	213	71.0%
	2-3 times	65	21.7%
	4 or more times	22	7.3%
	Missing	67	
	Valid Total (no missing)	300	100.0%
Zoos and Aquariums			
	Once	122	40.7%
	2-3 times	131	43.7%
	4 or more times	47	15.7%
	Missing	67	
	Valid Total (no missing)	300	100.0%

Note: This table combines two questions that were asked individually on the survey.

Another question asked respondents about how frequently they visit zoos and aquariums in general. Table 6 highlights their responses. The number of visitors who visited the zoo for the first time in 12 months (n = 213) was more than three times the number of visitors who had visited two to three times (n = 65). The lowest number of visitors claimed to have visited four or more times (n = 22). There were 67 respondents who did not answer this question.

The number of visitors who visited the zoo and aquariums for the first time in 12 months (n = 122) was slightly less than the number of visitors who visited two or three times (n = 131). More than half of the participants visited a zoo or aquarium two or three times or more in the last year (n = 178) with a quarter of that group attending four or more times (n = 47). Sixty - seven respondents who did not answer this question. Table 6 summarizes these results.

Table 7

Membership Status of Watani Grasslands Visitors

Options	*n*	Valid Percent
Yes	54	18.0%
No	246	82.0%
Missing	67	
Valid Total (no missing)	300	100.0%

To determine the membership status, participants were asked to choose "Yes" or "No" in regards to if they had a zoo membership. Table 7 summarizes the results. More than 80% of visitors stated that they were not zoo members (n = 246). There were more participants who did not answer the question (n = 67) than participants who had memberships (n = 54).

Table 8

Surveys Collected from Each Exhibit Type

Exhibit Type Options	*n*	Valid Percent
Non-Immersive/Exhibit	242	65.9%
Immersive/Zoofari	125	34.1%
Missing	0	
Valid Total (no missing)	367	100.0%

A total of 242 surveys were collected from the non-immersive exhibit area of the Watani Grasslands exhibit. There was a total of 125 surveys collected from the immersive Zoofari experience of the same exhibit. Table 8 summarizes the number of surveys collected.

Independent T-Test

To determine whether or not there were visitation patterns or demographic differences between general Watani non-immersive exhibit visitors and visitors who participated in the more immersive Zoofari experience, a series of independent 't'-tests and Chi-square analyses were

completed on all of the above variables to determine whether or not both sets of visitors had similar characteristics. The only significant difference found between the two visitor groups was that Zoofari visitors were on average in their early-forties and older *(M* = 43 years; *SD* = 15.27) than Watani visitors that experienced the non-immersive experience only who were in their late-thirties on average (*M* = 38 years; *SD* = 13.24) (*t* = 3.10, *p* = .01).

Domain Correlations

The environmental connectedness, cognitive, and affective domains were run in a Pearson's correlation with the demographic variables. The demographic variables that were run included the questions concerning age, gender, race, education level, last recent visit, how many times the visitor had visited a zoo in the past 12 months, how many times the visitor had visited zoos or aquariums in general in the last 12 months, and membership status. Excluding the two variables listed in Table 9 and Table 10, there were no significant results.

Table 9

Cognitive Domain & Education Level Variable Correlation

Measure	1	2	*N*	*SD*
(1) Cognitive Domain	—	.-.16**	336	1.02
(2) Education Level		—	292	.76

**. Correlation is significant at the .01 level (2-tailed)

The correlation between the cognitive domain and the demographic variable concerning the education level of the participant is summarized in Table 9. It was found that there was a significant negative correlation between the cognitive domain and education level of the visitors (*r* = -.16; *p* = .01).

Table 10

Environmental Connectedness & Number of Zoo Visits Variable Correlation

Measure	1	2	*N*	*SD*
(1) Environmental Connectedness Domain	—	.12**	357	1.13
(2) Number of Zoo Visits in Last 12 Months		—	300	.45

**. Correlation is significant at the .01 level (2-tailed)

Table 10 summarizes the correlation between the environmental connectedness domain and the demographic variable concerning the number of zoo visits in the last 12 months. There was also a significant positive correlation found between the environmental connectedness domain and the number of times a visitor has visited the zoo in the last 12 months (r = .12; p = .04).

Factor Analysis

A factor analysis was used to identify which variables reflected the domains of cognitive, affective, and environmental connectedness. While evaluating the loadings of the factors, a minimum of a .5 loading was required for the items to be considered as a part of the data. All the variables scored this minimum loading or higher within their factors.

The factor under which variables were categorized was interpreted by assessing which of the three factors had the highest loading. For example, for the variable "I discussed the information in the displays and signs with my companions" had three different factor loadings. The second - factor loading was interpreted as being the highest scoring factor and the factor that the variable was a part of (factor one = .46; factor two = .50; factor three = .31) (See Table 11).

For the instances when there were cross-loadings among the variables, the item's Cronbach's Alpha's score if the item was deleted was evaluated. It was determined that the variables that had cross-loadings would not increase the Alpha score unless removed or they would have minimal impact. Due to there being little to no positive effect on the reliability of the scale when considering cross-loaded items, these items remained within the scales. The following table includes the Likert scale questions that were included in each new category.

Table 11

Factor Loadings and Communalities of Survey Questions

Items	Loadings Factor:			Comm-unality
	1	2	3	
Some beliefs I had about animals became more pro-conservation after visiting this exhibit	.84			.82
As a result of visiting the exhibit, I intend to change some of my daily activities (recycle more, reduce energy usage, buy more earth-friendly products, etc)	.80		.32	.75
The exhibit made wildlife conservation issues more meaningful to me	.76	.39		.81
As a result of visiting the exhibit, I am more likely to support the zoo or another conservation organization	.75		.31	.69
Visiting the exhibit has made me more concerned about the well-being of wildlife	.70	.46		.76
I have a greater sense of connection with nature as a result of visiting this exhibit	.68	.49		.76
Visiting the exhibit expanded my interests in animals	.66	.53		.76
I found myself reflecting on new ideas about animals and their environments	.61	.49		.65
The exhibit inspired me to wonder about the thoughts and feelings of the animals I saw	.61	.49		.76
North Carolina Zoo helps to save animals in the wild	.53	.34		.41
It was entertaining to watch the animals		.84		.81
I had fun during this experience		.83		.76
I was excited to see real animals		.82		.73
I found the exhibit theme interesting		.77		.73
I enjoy spending my leisure time watching or observing animals		.72		.62
I was able to relax and unwind from my daily routine	.43	.63		.60
The exhibit was engaging for children		.54	.40	.54
I experienced a feeling of connectedness to nature	.51	.53	.37	.68
I discussed the information in the displays and signs with my companions	.46	.50	.31	.55
I am confident teaching others about environmental issues			.79	.69
I often think about whether or not my actions harm the natural world	.35		.71	.63
I lead a balanced life when it comes to my environmental impact	.35		.68	.64
Eigenvalue	12.26	1.75	1.02	
% of Total Variance	55.76	7.95	4.64	
Total Variance	55.76	63.67	68.31	

Factor 1 is comprised of the variables that are considered a part of the cognitive domain. Factor 2 is comprised of the variables that are considered a part of the affective domain. Factor 3 is comprised of the variables that are considered a part of the environmental connectedness domain. The communalities were high for all the values excluding the "North Carolina Zoo helps to save animals in the wild" (communality = .41). These results are summarized in Table 11.

Scale Reliability

Using principal component factor analysis, three scales were identified and were labeled environmental connectedness scale, cognitive scale, and affective scale. These scales were used to test hypotheses one and two to measure the relationship between environmental connectedness and the cognitive and affective reactions of the zoo visitors.

All items within the three scales required the survey participants to rate the level that they agreed with each statement by using the same rating system. The possible answer choices were: "1" = Strongly Disagree; "2" = Disagree; "3" = Slightly Disagree; "4" = Neutral; "5" = Slightly Agree; "6" = Agree; "7" = Strongly Agree.

The following tables represent the reported statistics for each of the three scales. Each table will include the scale's reported total Cronbach's Alpha, mean, standard deviation, the number of respondents, and Cronbach's Alpha if the item was deleted from the total scale.

Table 12

Reliability of the Environmental Connectedness Scale

Variable	*M*	*SD*	*n*	Alpha if item deleted
I am confident teaching others about environmental issues	4.92	1.58	357	.71
I often think about whether or not my actions harm the natural world	5.59	1.34	357	.65
I lead a balanced life when it comes to my environmental impact	5.36	1.22	357	.63

Cronbach's Alpha's (Total Scale) = .77

Table 12 summarizes the reliability of the environmental connectedness scale. The Cronbach's Alpha's total scale is an acceptable reliability (α = .77) for the scale measuring the environmental connectedness of zoo visitors. Deleting any item on the scale would not improve the scale so all items remained on the scale.

Table 13

Reliability of the Cognitive Scale

Variable	*M*	*SD*	*n*	Alpha if item deleted
I found myself reflecting on new ideas about animals and their environment	5.76	1.30	336	.95
Visiting the exhibit has made me more concerned about the well-being of wildlife	5.93	1.19	336	.94
The exhibit inspired me to wonder about the thoughts and feelings of the animals I saw	5.92	1.18	336	.94
I have a greater sense of connection with nature as a result of visiting this exhibit	5.85	1.23	336	.94
Visiting the exhibit expanded my interests in animals	5.96	1.21	336	.94
The exhibit made wildlife conservation issues more meaningful to me	5.79	1.27	336	.94
North Carolina Zoo helps to save animals in the wild	6.32	.99	336	.95
Some beliefs I had about animals became more pro-conservation after visiting this exhibit	5.60	1.34	336	.94
As a result of visiting the exhibit, I am more likely to support the zoo or another conservation organization	5.78	1.25	336	.94
As a result of visiting the exhibit, I intend to change some of my daily activities (recycle more, reduce energy usage, buy more earth-friendly products, etc)	5.45	1.35	336	.94

Cronbach's Alpha's (Total Scale) = .95

The reliability of the cognitive scale is summarized in Table 13. The Cronbach's Alpha's total scale is an acceptable reliability (α = .95) for the scale measuring the cognitive reactions of zoo visitors. Deleting any item on the scale would not improve the scale so all items remained on the scale.

Table 14

Reliability of the Affective Scale

Variable	*M*	*SD*	*n*	Alpha if item deleted
I enjoy spending my leisure time watching or observing animals	6.47	.92	341	.91
I was excited to see real animals	6.68	.79	341	.91
It was entertaining to watch the animals	6.56	.85	341	.90
The exhibit was engaging for children	6.06	1.23	341	.91
I experienced a feeling of connectedness to nature	6.09	1.08	341	.90
I was able to relax and unwind from my daily routine	6.16	1.17	341	.91
I found the exhibit theme interesting	6.29	1.01	341	.90
I discussed the information in the displays and signs with my companions	5.82	1.33	341	.92
I had fun during this experience	6.57	.86	341	.90

Cronbach's Alpha's (Total Scale) = .92

Table 14 summarizes the reliability for the affective domain. The Cronbach's Alpha's total scale is an acceptable reliability ($\alpha = .92$) for the scale measuring the affective reactions of zoo visitors. Deleting any item on the scale would not improve the scale so all items remained on the scale.

Results for Hypothesis 1

H_1: Adult visitors' environmental connectedness is positively related to the cognitive reactions that they experience within different zoo exhibits.

After creating scales for environmental connectedness (Table 12) and cognitive reactions (Table13), Pearson's correlation was run to find the correlation between the environmental connectedness and cognitive reaction scales (Table 15).

Table 15

Correlation between Environmental Connectedness and Cognitive Domains

Measure	1	2	*n*	*SD*
(1) Environmental Connectedness	—	.63**	15.87	3.36
(2) Cognitive		—	58.36	10.21

**. Correlation is significant at the .01 level (2-tailed)

The correlation between the two domains of environmental connectedness and cognitive are summarized in Table 15. The analysis supported hypothesis one and indicated that there was a strong positive correlation ($r = .63$, $p = .01$) between environmental connectedness scale and the cognitive scale.

Results for Hypothesis 2

H_2: Adult visitors' environmental connectedness is positively related to their affective reactions that they experience within different zoo exhibits.

After creating scales for environmental connectedness (Table12) and affective reactions (Table14), Pearson's correlation was run to find the correlation between the environmental connectedness and affective scales.

Table 16

Correlation between Environmental Connectedness and Affective Domain

Measure	1	2	*N*	*SD*
(1) Environmental Connectedness	—	.58**	15.87	3.39
(2) Affective		—	56.70	7.25

**. Correlation is significant at the .01 level (2-tailed)

The analysis supported hypothesis two and indicated that there was a strong positive correlation (r = .58, p = .01) between environmental connectedness scale and the affective scale (Table 16).

Result for Hypothesis 3

H_3: Visitors of the immersive (Zoofari) exhibit experience will have higher levels of cognitive reactions then the visitors non-immersive experience group.

Table 17

T-Test Result Comparing Exhibit Experiences of the Cognitive Domain

Domain	Non-Immersive		Zoofari		*t*	Sig.
	M	*SD*	*M*	*SD*		
Cognitive	5.88	1.07	5.74	.90	1.23	.22

When comparing the non-immersive and the immersive (Zoofari) experiences, the independent 't'-test found there to be no significant differences between the cognitive reactions of the visitors ($p = .22$) (Table 17). The average responses between the non-immersive visitors ($M = 5.88$; $SD = 1.07$) and the immersive visitors ($M = 5.74$; $SD = .90$) were both rated very high on the possible 7-point scale that made up the answer choices. The averages were very close to one another with less than a .2 difference.

Result for Hypothesis 4

H_4: Visitors of the immersive (Zoofari) exhibit experience will have higher levels of affective reactions then the non-immersive experience group.

Table 18

T-Test Results Comparing Exhibit Experiences of the Affective Domain

Domain	Non-Immersive		Immersive		*t*	Sig.
	M	*SD*	*M*	*SD*		
Affective	6.34	.79	6.22	.84	1.37	.17

When comparing the non-immersive and the immersive (Zoofari) exhibit experiences, there were no significant differences found in the affective responses of the participants *(p* = .17) (Table 18). These results supported rejecting hypothesis four. The average responses between the non-immersive visitors (*M* = 6.34; *SD* = .79) and the immersive visitors (*M* = 6.22; *SD* = .84) were both rated very high on the possible 7 - point scale that made up the answer choices. The averages responses were very close to one another with less than a .2-point difference.

DISCUSSION

The expected results included the positive correlations found between environmental connectedness and both the cognitive and affective domains. These findings support hypotheses one and two, which collectively state that as environmental connectedness reactions increase, so do the cognitive and affective reactions. The unexpected results were the lack of significant differences between the non-immersive and the immersive exhibit experiences in the cognitive and the affective domains. This was unexpected due to the amount of literature that supported hypotheses three and four with the speculations that the immersive experiences would result in higher cognitive and affective reactions (Luebke & Matiasek, 2013; Marseille, Birgit, & van den Brink, 2012; Jacobs 2009; Carr & Cohen, 2015; Berenguer 2007; Powell & Bullock, 2014; Hacker & Miller, 2016; and Sickler & Fraser, 2009). The following sections include a discussion of why these results may have occurred.

Demographic Information

The demographic information of the Watani Grasslands' visitors was analyzed using Chi-square, independent 't' test, Pearson's correlations, and the standard frequencies tests. The highest responses from each demographic question are as follows: 25.9% of participants were between the ages of 19 and 27 years old; 67.2% of participants were female; 79.3% of participants were white; and 49.7% stated that their highest education level was a bachelor's degree or post graduate work. When an independent 't' -test was conducted on the demographic information to search for any significant difference between non-immersive and immersive exhibit visitors and found that age was the only significant difference (p = .01). The immersive, Zoofari, participants were found to be significantly older (M = 43 years; SD = 15.27) than the non-immersive exhibit visitors (M = 38 years; SD = 13.24). A Pearson's correlation was

conducted on the demographic information with the environmental connectedness, cognitive, and affective domains and found two significant correlations. A significant negative correlation between the cognitive domain and the education level was observed (r = -.16; p = .01). The second was a significant correlation between the environmental connectedness domain and the number of times a visitor has been to the zoo in the last 12 months (r = .12; p = .05).

In an effort to see if there were any significant differences in the demographic information between the non-immersive and immersive visitor groups, an independent 't'-test was conducted. The sole variable that was found to have any significance was the age variable (p = .01). The immersive Zoofari experience was found to have participants with the average age of 43 (SD = 15.27) and older than the non-immersive experience visitor, who is 38 years old on average (SD = 13.24). This could be due to various factors.

First, the Zoofari experience has a fee of twenty dollars per person. This additional fee may be less of a deterrent to older visitors who may have more disposable income. Second, the NC Zoo is one of the largest zoos in the nation and has a total of five miles' worth of walking trails throughout the park. With the large amount of walking typically required for a zoo visit, the opportunity that Zoofari offers for visitors to enjoy the largest exhibit seated and in the shade of an open-air bus might appeal to the older visitors for the convenience of taking a break while still enjoying the large Watani Grasslands exhibit. Additionally, a study conducted by Roe and McConney (2015) found that visitors are drawn to new live-animal experiences within exhibits. In May 2016, the zoo provides a live-animal experience with the new Zoofari exhibit. The exhibit may draw older visitors who have previously visited the zoo and exhibit, and the new experience with live animals offered something different from past visits.

A Pearson's correlation was run on the demographic information to see if there were any significant correlations with the environmental connectedness, cognitive, and affective domains. There were two areas that were found to have significant correlations. First, there was a significant negative correlation between the education level of the visitor and the cognitive reaction domain (r = -.16; p = .01). This may be due to visitors with higher levels of education being aware of most of the information prior to the zoo visits, which could impact the cognitive reactions for this subgroup. Cove and Byrne (2015) discuss how most zoo visitors arrive at zoos with a basic understanding of animals and related biology topics, although they can often become confused with more complex information. It could be speculated that the variety and level of complexity of information that is provided by the zoo may not be as detailed as what highly educated visitors find prior to a zoo visit. Zoos must provide information that a majority of their visitors are able to interpret, regardless of the age, knowledge level, or education level of visitors. If there is an expectation that many of the visitors may become confused with more complex topics as Cove and Byrne (2015) found, then zoos may not offer complex topics even though some of their visitors would benefit more from it.

The second significant correlation that was found was a positive correlation between the environmental connectedness domain and the number of times a visitor had visited a zoo in the past 12 months (r = .118; p = .05). This may due to the visitors who have higher levels of environmental connectedness desiring to visit the zoo more often than visitors who do not have as high a connection. Clayton, Fraser, and Burgess (2011) discuss how zoos assist in developing visitors' environmental identity that could be part of why visitors who go to the zoo more often have an increase in their environmental connectedness. Another aspect to consider is that zoos have more megafauna for visitors to view than some aquariums. Visitors are often drawn to

megafauna, especially large vertebrates (Simberloff, 1998) especially when they are also attractive mammals (Marseille, Birgit, & van den Brink, 2012). Zoos have a plethora of large mammals, whereas aquariums may be more limited in their variety of large mammals available. That is not to say that other species are able to be flagship species that draw the attention of visitors (Moss & Esson, 2010). This correlation could also be due to the proximity of zoos to individuals in comparison to aquariums. Zoos may be more accessible to some individuals depending on their locations and may be able to visit more often and spend their time exploring the zoo and forming environmental connections.

Hypotheses

This study had four hypotheses that speculated about the non-immersive and immersive experiences of zoo exhibit visitors, as well as, their reactions in the environmental connectedness, cognitive, and affective domains. There were significant results found for the first two hypotheses that investigated the correlation of visitors' reactions of environmental connectedness and the cognitive (H_1) and affective (H_2) reactions. The results found positive significant correlations that suggest that as visitors increase their cognitive and affective reactions within the exhibit, their environmental connectedness reactions will also increase. For the last two hypotheses, there were no significant results. These two hypotheses focused on the immersive exhibit experiences yielding higher cognitive (H_3) and affective (H_4) reactions in the visitors than the non-immersive experiences, but a significant difference in visitors to the immersive and non-immersive exhibit experiences was not found.

Zoos are widely considered to be locations for conservation, environmental education, and recreation. As one of the remaining modern locations for the public to interact with a wide variety of wildlife, especially animals (Marseille, Birgit, & van den Brink, 2012), zoos are able

to offer a unique experience that is considered to have multiple layers of experiences and reactions for visitors (Vernon & Boyles, 2008). This study focused on three types of visitors' reactions that literature often discussed: environmental connectedness, cognitive reactions, and affective These reactions are considered encompassing categories for many reactions visitors have and are often noted as affecting the one another.

Overall, animals are considered to be one of the main attractions within any exhibit in a zoo. Certain animals are considered to have a higher attracting power than others and these animals are known as flagship species. Megafauna are typical flagship species and the Watani Grassland exhibit housed multiple rhinos are large enough to be considered a part of this group. In research conducted by Marseille, Birgit, & van den Brink (2012) large, attractive mammals have an easier time attracting visitors and causing memorable reactions within visitors, which is advantageous to conservation efforts (Moss & Esson, 2010). If rhinos are considered to be a flagship species within the exhibit it should also be considered that the Watani Grasslands exhibit also hosts other animals that could be considered attractive even if they are not as large. Having both flagship species and other attractive species can assist in encouraging the visitors to have cognitive reactions, affective reactions, and connectedness to the environment due to these animals being particularly memorable (Marseille, Birgit, & van den Brink, 2012).

The results provide support for hypothesis one, as there was a significant positive correlation between the environmental connectedness reactions and the cognitive reactions of the exhibit visitors. Two of the primary goals of zoos are education and environmental conservation. Zoos hope to educate the public to increase their knowledge and connection to the environment as a part of their conservation goals. Visitors may arrive at the zoo with expectations for experiences that are based on the animals and the environment, as well as, experiences that will

allow them to learn or other cognitive reactions. They may arrive already having a certain level of environmental connectedness established, which could grow as they learn new facts regarding the environment and wildlife while at the zoo.

The results suggest that when visitors are able to achieve environmental connectedness, they are also able to achieve a sense of higher cognitive reactions. This may be due to the learning goals that many visitors have (Roe & McConney, 2014 & Falk, 2005) and the desire to have cognitive reactions occur. While the instrument did not include a pre- and post- test to measure the level of cognitive reactions that occurred, the visitors reported that they had correlating levels of cognitive reactions and environmental connectedness. Zoos offer a plethora of different experiences that allow for cognitive reactions to occur in the diverse population of zoo visitors (AZA, 2017). Of these experiences, most could be linked back to a popular learning style found within zoos. The free choice learning style that is utilized by zoos may have encouraged visitors to feel that they achieved cognitive reactions from their experiences. With the free choice learning experiences, visitors are able to choose what they want to learn about (Moss & Esson, 2010). This learning style is considered effective in education related to the environment (Heimlich & Horr, 2010) and may have something to do with the positive correlation between cognitive reactions and environmental connectedness that the visitors felt they experienced due to participating in experiences that interested them. The results support accepting hypothesis two, as there was a significant positive correlation between the environmental connectedness reactions and the affective reactions of the exhibit visitors. One of the most difficult aspects of the affective reaction is the complexity for each individual for what causes them to react and how. Added in, is the goal to encourage specific emotional responses within the visitors to achieve zoo's goals. The instrumentation did not use a pre- and post- test in

order to measure the level of affective reactions that occurred within the visitors, but relied on self – reported levels of the reactions. It could be speculated that the reported higher levels of affective reactions that correlate with high reported environmental connectedness may be linked to empathy that occurs with visitors. Research conducted by Berenguer (2007) suggests that people with higher levels of empathy towards something within the environment are more likely to have higher levels of environmental connectedness. This connection between affective reactions, such as empathy, and environmental connectedness led to environmental conservation organization like zoos to attempt to facilitate these reactions among their visitors (Clayton, Fraser, & Saunders, 2008). Within the Watani Grasslands exhibit, there are multiple ways in which the visitor may have an emotional reaction. This includes being able to learn from the exhibit both with the immersive and non-immersive experiences, their interactions with the animals, and their social experiences within the exhibit.

The results support rejecting hypothesis three. The overall results of the domain showed no significant differences between the cognitive reactions of the non-immersive and immersive zoo visitors. These results were unexpected as a majority of existing literature argues that immersive exhibit experience encourage cognitive reactions among visitors. However, there is some literature that states otherwise. Dancstep, Gutwill, and Sindorf (2015) completed a study within a museum that compared an immersive exhibit experience with a non-immersive tabletop experience. They found that there were greater cognitive reactions from the non-immersive experience. While the study did take place in a museum, the experiences have similarities due to most of the non-immersive learning in the Watani Grasslands' non-immersive experience being from signage, which is comparable to the tabletop learning that occurred in the museum.

The results support rejecting hypothesis four. The overall results of the domain showed no significant differences between the affective reactions of the non-immersive and immersive zoo visitors. Zoofari is an immersive experience that does not allow for as much socialization with other people as the non-immersive exhibit experience might. Sickler & Fraser (2009) investigated adults' enjoyment within zoos. The findings focused strongly around the social opportunities available to friends and families as being key to the level of enjoyment within the visitor. Perhaps the non-immersive experience gained higher significant scores since the option to socialize was not as limited as it was on Zoofari.

Some factors to consider with the results of both hypotheses three and four are that, despite the findings not supporting these hypotheses, the average responses of the visitors from both the immersive and the non-immersive experiences were closely rated and high. This could suggest that NC Zoo was offering a positive experience for many of the visitors from both experiences. A difference between non-immersive and immersive experiences might focus on the expectations and satisfaction of those expectations for the visitors. As discussed in a study completed by Geissler and Rucks (2011) that takes place in a theme park, meeting the expectations of the visitors is highly important to the level of satisfaction. For the non-immersive exhibit experience, the visitors might have had expectations that were closer to what their experience in the exhibit was. With the non-immersive experience, since the Zoofari experience was new, the visitors may have had unrealistic expectations and had not been as satisfied with the experience due to different expectations. This may be a reason the findings do not reflect the literature.

Limitations

When considering this research, several limitations need to be considered. The generalizability of this research is limited due to it taking place within one specific zoo and the immersive and non-immersive experiences of one specific exhibit. Another limitation to consider is that the immersive Zoofari experience was offered on certain days of the week during a certain time frame, which may limit how representative the overall findings and demographics are the average zoo visitor. Also, there were a limited number of researchers available to collect data and so either the surveys were collected from the immersive experiences or the non-immersive experiences at a given time.

A major consideration to have with this research is the lack of a pre- and post-test that would have reflected the change in the visitors' reactions within the various domains. The instrument relies on the visitors' perception of the effects of the exhibit experience afterward. The domain scales, while they had high levels of reliability, may not be measuring what the NC Zoo, specifically, is trying to accomplish with those domains. The instrument may have benefited from being presented in a test format to measure the reactions more objectively than the self - reported style allowed. This is especially true with the cognitive domain, as many of the visitors may have felt that they learned the topics but they may not have understood as thoroughly as they believed or as much as the zoo would prefer.

Recommendations for Practice

Some of the implications of the results of this study included adding to the body of literature that supports the connection between environmental connectedness and cognitive and affective reactions within visitors from the interpretation of hypotheses one and two. The third and fourth hypotheses may not have had the anticipated results, but the findings brought

attention to the importance of the effectiveness of the non-immersive exhibit experiences. Previous literature discussed the importance of tabletop displays to cognitive reactions in comparison to immersive experiences (Dancstep, Gutwill, & Sindorf, 2015) as well as how 95% of zoo visitors read a sign during their time at the zoo (Roe, McConney, & Mansfield, 2015) serves as a reminder that although immersive exhibit experiences are gaining popularity, these methods are not the only way that zoos communicate their conservation information with visitors. Immersive experiences may also not appeal to every zoo visitor due to different motivations, learning styles, or goals.

The results of the negative significant correlation between education levels and cognitive reactions among the visitors provides an opportunity to consider developing a method to offer some more complex topics to appeal to visitors who may have a higher understanding of related zoo topics. This has to be handled carefully as it is possible for topics to be come too complex and therefore confusing to visitors. However, it is important for the zoo to consider how they meet the needs of visitors with higher learning objectives.

The following includes specific recommendations of practice based on the results of this study:

- Utilize experiences that induce cognitive and affective reactions within visitors to encourage environmental connectedness within visitors.
- Offer educational opportunities that would appeal to visitors with higher education levels that may enter the zoo with an above standard knowledge of biology and wildlife related topics to encourage higher cognitive reactions within them.

- Provide a variety of signage and tabletop experiences to appeal to the visitors that may prefer those experiences or those that might not be able to participate in the immersive exhibit experience.
- Consider advertising the immersive Zoofari experience specifically to older adults.

Future Research

Further research should factor in measures to consider how different visitor motivations could affect the immersive and the non-immersive exhibit experiences of visitors. Existing literature argues that the various motivations that drive a visitor to go to a zoo are a key factor to consider while designing and developing exhibits. For example, investigating the level of knowledge that visitors enter an exhibit wanting to learn and comparing highly education-motivated visitors learn within an exhibit to less education- motivated visitors may assist in gauging how both types of visitors learn. This could assist zoo staff in providing both types of experiences to help the differently motivated visitors learn.

Research into not only the motivations but the expectations of an experience for both immersive and non-immersive exhibit experiences could assist in furthering the research in this study. In the case of hypothesis three and hypothesis four, there could be factors that were not accounted for in the motivation and expectations area of the visitors' experiences that may have affected their responses. By investigating both these areas, zoo facilities would be able to create programs and experiences around the expectations of visitors.

As part of the study focused on the cognitive domain of visitors' experiences within a zoo, future research could consider looking into the starting knowledge level of visitors when it comes to wildlife related topics. Specifically, research could look into the starting knowledge level of visitors who are willing to participate in additional immersive experiences such as the

Zoofari experience in comparison to the visitors who seek to participate in solely the non-immersive experiences. If the starting knowledge levels of the two groups are significantly different, zoo facilities may need to consider offering more complex topics in their immersive experiences.

Finally, future research could include investigating the experience of first time zoo visitors to second or third time visitors to see what they prioritize. This could assist in identifying experiences that visitors enjoy multiple experiences with or how conservation messages are affecting the visitors. It could also identify what encourages visitors to visit the location again.

CONCLUSION

In conclusion to this study, the environmental reactions that visitors had within the Watani Grasslands experience positively correlated with both the cognitive reactions and the affective reactions. This finding was consistent with hypothesis one and hypothesis two. The findings for hypothesis three and hypothesis four were not supported by the findings of this research. The NC Zoo had visitors that reacted similarly to both the immersive and the non-immersive experiences offered for the Watani Grasslands exhibit. However, there were significantly higher cognitive and affective reactions in the non-immersive exhibit experience rather than in the immersive experiences as hypothesized. While these findings were unexpected, it could be speculated that due to the close means for both the immersive and the non-immersive experiences. The high ratings imply that, overall, the visitors had high opinions of their experiences in both settings but factors that were not adequately measured by the instrument may have affected the results. Despite the unexpected results, zoo facilities could consider the importance that the non-immersive exhibit experiences have for visitors. Immersive experiences may be a growing exhibit development but those experiences may not be the most effective for cognitive and affective reactions among every zoo visitor.

REFERENCES

Anderson, U., Kelling, A., Pressley-Keough, R., Bloodsmith, M., & Maple, T. (2003). Enhancing the zoo visitor's experience by public animal training and oral interpretation at an otter exhibit. *Environment and Behavior*, *35*, 826-841.

Association of Zoos and Aquariums. (2017). Retrieved from https://www.aza.org/

Carr, N. & Cohen, S. (2011) The public face of zoos: Images of entertainment, education and conservation. *Anthrozoös*, *24*(2),175-89.

Cove, T., & Byrne, J. (2014). Do zoo visitors need zoology knowledge to understand conservation messages? An exploration of the public understanding of animal biology and of the conservation of biodiversity in a zoo setting. *International Journal of Science Education, Part B: Communication and Public Engagement*, *4*(4), 323-342.

Gusset, M., & Dick, G. (2011). The global reach of zoos and aquariums in visitor numbers and conservation expenditures. *Zoo Biology*, *30*, 566-569.

Jensen, E. (2015) Evaluating children's conservation biology learning at the zoo. *Conservation Biology*, *28*(4), 1004-11.

Kelling, N., Gaalema, D., & Kelling, A. (2014). A modified operational sequence methodology for zoo exhibit design and renovation: Conceptualizing animals, staff, and visitors as interdependent coworkers. *Zoo Biology*, *33*(4), 336-348.

Luebke, J. & Matiasek, J. (2013). An exploratory study of zoo visitors' exhibit experience and reactions. *Zoo Biology*, *32*, 407-416.

Moss, A., Esson, M., & Francis, D. (2010). Evaluation of a third-generation zoo exhibit in relation to visitor behavior and interpretation use. *Journal of Interpretation Research*, *15*(2), 11-28.

Moss, A. & Esson, M. (2010). Visitor interest in zoo animals and the implications for collection planning and zoo education programmes. *Zoo Biology*, *29*(6), 715-31.

North Carolina Zoo (NC Zoo). (2016). Web. http://www.nczoo.org/

Patrick, P., Matthews, C., Ayers, D., & Tunnicliffe, S. (2007). Conservation and education: Prominent themes in zoo mission statements. *The Journal of Environmental Education*, *38*(3), 53-59.

Perdue, B., Stoinski, T., & Maple, T. (2012). Using technology to educate zoo visitors about conservation. *Visitor Studies*, *15*(1), 16-27.

Powell, D. & Bullock, E. (2014). Evaluation of factors affecting emotional responses in zoo visitors and impact of emotion on conservation mindedness. *Anthrozoös A multidisciplinary journal of the interactions of people and animals*, *27*(3), 389-405.

Randler, C., Baumgartner, S., Eisele, H., & Kienzle, W. (2007). Learning at workstations in the zoo: A controlled evaluation of cognitive and affective outcomes. *Visitor Studies*, *10*(2), 205-216

Roe, K. & McConney, A. (2015). Do visitors come to learn? An internationally comparative, mixed methods study. *Environmental Education Research*, *21*(6), 865-884.

Ross, S. & Gillespie, K. (2008). Influences on visitor behavior at a modern immersive zoo exhibit. *Zoo Biology, 28*(5), 462-472.

Schultz, J., & Joordens, S. (2014). The effect of visitor motivation on the success of environmental education at the Toronto Zoo. *Environmental Education Research, 20*(6), 753-75.

Schultz, P. (2002). Inclusion with nature: Understanding the psychology of human-nature interactions. In p. Schmuck & P. W. Schultz (Eds.), *The Psychology of Sustainable Development.* Boston: Kluwer Academic Publishers

Sickler, J. & Fraser, J. (2009). Enjoyment in zoos. *Leisure Studies*, *28*(3), 313-331.

Simberloff, D. (1998). Flagships, umbrellas, and keystones: Is single-species management passé in the landscape era? *Biological Conservation, 83*(3), 247-257.

Skibins, J. & Powell, R. (2013). Conservation caring: Measuring the influence of zoo visitor's connection to wildlife on pro-conservation behaviors. *Zoo Biology, 32*, 528-540.

Smith, L., Weller, B., Smith, A., & van Dijk, P. (2012). Applying visitor preference criteria to choose pro-wildlife behaviors to ask of zoo visitors. *Curator the Museum Journal, 55*(4), 453- 466.

Therkelsen, A. & Lottrup, M. (2015). Being together at the zoo: zoo experiences among families with children. *Leisure Studies*, *34*(3), 354-371.

EXTENDED LITERATURE REVIEW REFERENCES

Anderson, U., Kelling, A., Pressley-Keough, R., Bloodsmith, M., & Maple, T. (2003). Enhancing the zoo visitor's experience by public animal training and oral interpretation at an otter exhibit. *Environment and Behavior, 35,* 826-841.

Association of Zoos and Aquariums. (2017). Retrieved from https://www.aza.org/

Ballantyne, R., Packer, J., Hughes, K., & Dierking, L. (2007). Conservation learning in wildlife tourism settings: Lessons from research in zoos and aquariums. *Environmental Education Research, 13*(3), 367-383.

Bitgood, S., Patterson, D., & Benefield, A. (1988) Exhibit design and visitor behavior: Empirical relationships. *Environment and Behavior, 20*(88), 474-491.

Beery, T. & Wolf-Watz, D. (2014) Nature to place: Rethinking the environmental connectedness perspective. *Journal of Environmental Psychology, 40,* 198-205.

Berenguer, J. (2007), The effect of empathy in proenvironmental attitudes and behaviors. *Environment and Behaviors, 39*(2), 269-283.

Bruni, C., Fraser, J., & Schultz P. (2008). The value of zoo experiences for connecting people with nature. *Visitor Studies, 11*(2), 139-150.

Carr, N. & Cohen, S. (2011) The public face of zoos: Images of entertainment, education and conservation. *Anthrozoös, 24*(2),175-89.

Chin, S, & Gussett, M. (2016). World Association of Zoos and Aquariums. Retrieved from http://www.waza.org/en/site/conservation/zoo-design.

Clayton, S., Fraser, J., & Saunders, C. (2008). Zoo experiences: Conversations, connections, and concern for animals. *Zoo Biology, 28*(5), 377-397.

Clayton, S., Fraser, J., & Burgess, C. (2011). The role of zoos in fostering environmental identity. *Ecopsychology, 3*(2), 87-96.

Cove, T., & Byrne, J. (2014). Do zoo visitors need zoology knowledge to understand conservation messages? An exploration of the public understanding of animal biology and of the conservation of biodiversity in a zoo setting. *International Journal of Science Education, Part B: Communication and Public Engagement, 4*(4), 323-342.

Dancstep, T., Gutwill, J., & Sindorf, L. (2015). Comparing the visitor experience at immersive and tabletop exhibits. *Curator: The Museum Journal, 58*(4), 401-422.

Falk, J. & Adelman, L. (2003). Investigating the impact of prior knowledge and interest on aquarium visitor learning. *Journal of Research in Science Teaching, 40*(2), 163-176.

Falk, J. (2005). Free-choice environmental learning: Framing the discussion. *Environmental Education Research, 11*(3), 265-280.

Falk, J. (2006). The impact of visitor motivation on learning: Using identity as a construct to understand the visitor experience. *Curator, 49*(1), 15-166.

Geissler, C. & Rucks, T. (2011). The overall theme park experience: A visitor satisfaction tracking study. *Journal of Vacation Marketing, (17)*2, 127-138.

Gusset, M., & Dick, G. (2011). The global reach of zoos and aquariums in visitor numbers and conservation expenditures. *Zoo Biology, 30,* 566-569.

Hacker, C. & Miller L. (2016). Zoo visitor perceptions, attitudes, and conservation intent after viewing African elephants at the Sand Diego Zoo Safari Park. *Zoo Biology, 35*(4), 355-361.

Hallman, B. & Benbow, S. (2007). Family leisure, family photography and zoos: Exploring the emotional geographies of families. *Social and Cultural Geography, 8*(6), 871-888.

Heimlich, J. & Horr, E. (2010). Adult learning in free-choice, environmental settings: What makes it different? *New Directions for Adult and Continued Education, 2010(*127), 57-66.

Jacobs, M. (2009) Why do we like or dislike animals? *Human Dimensions of Wildlife, 14*(1), 1-11.

Kelling, N., Gaalema, D., & Kelling, A. (2014). A modified operational sequence methodology for zoo exhibit design and renovation: Conceptualizing animals, staff, and visitors as interdependent coworkers. *Zoo Biology, 33*(4), 336-348.

Larsen, J. (2002). To label or not- Visitors win; new life for an immersion exhibit. *Visitor Studies,* 11-16.

Luebke, J. & Matiasek, J. (2013). An exploratory study of zoo visitors' exhibit experience and reactions. *Zoo Biology, 32,* 407-416.

Marseille, M., Birgit H., & van den Brink, M. (2012). Experiencing polar bears in the zoo: Feelings and cognitions in relation to a visitor's conservation attitude. *Human Dimensions of Wildlife, 12*(1), 29-43.

Morgan, J. & Hodgkinson, M. (1999) The motivation and social orientation of visitors attending a contemporary zoological park. *Environment and Behavior, 31*(2), 227-239.

Moss, A., Esson, M., & Francis, D. (2010). Evaluation of a third-Generation zoo exhibit in relation to visitor behavior and interpretation use. *Journal of Interpretation Research, 15*(2), 11-28.

Moss, A. & Esson, M. (2010). Visitor interest in zoo animals and the implications for collection planning and zoo education programmes. *Zoo Biology, 29*(6), 715-31.

Moss, A., Francis, D., & Esson, M. (2008). The relationship between viewing area size and visitor behavior in an immersive Asian Elephant exhibit. *Visitor Studies, 11*(1), 26-40.

Nuttall, D. (2007). An animal-as-client (AAC) theory for zoo exhibit design. *Landscape Research, 29*(1), 75-96.

Packer, J. (2006). Learning for fun: The unique contribution of educational leisure experiences. *Curator, 49*(3), 329-344.

Patrick, P., Matthews, C., Ayers, D., & Tunnicliffe, S. (2007). Conservation and education: Prominent themes in zoo mission statements. *The Journal of Environmental Education, 38*(3), 53-59.

Perdue, B., Stoinski, T., & Maple, T. (2012). Using technology to educate zoo visitors about conservation. *Visitor Studies, 15*(1), 16-27.

Powell, D. & Bullock, E. (2014). Evaluation of factors affecting emotional responses in zoo visitors and impact of emotion on conservation mindedness. *Anthrozoös A multidisciplinary journal of the interactions of people and animals, 27*(3), 389-405.

Puan, C. & Zakaria, M. (2007). Perception of visitors towards the role of zoos: A Malaysian perspective. *International Zoo Yearbook, 41*(1), 226-232.

Randler, C., Baumgartner, S., Eisele, H., & Kienzle, W. (2007). Learning at workstations in the zoo: A controlled evaluation of cognitive and affective outcomes. *Visitor Studies, 10*(2), 205-216.

Reade, L. & Waran, N. (1996). The modern zoo: How do people perceive zoo animals? *Applied Animal Behavior Science, 47*(1-2), 109-118.

Roe, K. & McConney, A. (2015). Do visitors come to learn? An internationally comparative, mixed methods study. *Environmental Education Research, 21*(6), 865-884.

Roe, K., McConney, A., & Mansfield, C. (2015). How do zoos 'talk' to their general visitors? Do visitors 'listen'? A mixed method investigation of the communication between modern zoos and their general visitors. *Australian Journal of Environmental Education, 30*(2), 167-186.

Roe, K., McConney, A., & Mansfield, C. (2015). The role of zoos in modern society- A comparison of zoos' reported priorities and what visitors believe they should be. *Anthrozoös, 27*(4), 529-541.

Ross, S. & Gillespie, K. (2008). Influences on visitor behavior at a modern immersive zoo exhibit. *Zoo Biology, 28*(5), 462-472.

Schultz, J., & Joordens, S. (2014). The effect of visitor motivation on the success of environmental education at the Toronto Zoo. *Environmental Education Research, 20*(6), 753-75.

Schultz, P. (2000). Empathizing with nature: The effects of perspective taking on concern for environmental issues. *Social Issues, 56*(3), 391-406.

Schultz, P. (2002). Inclusion with nature: Understanding the psychology of human-nature interactions. In p. Schmuck & P. W. Schultz (Eds.), *The Psychology of Sustainable Development.* Boston: Kluwer Academic Publishers

Serrell, B. (1981). The role of zoological parks and aquariums in environmental education. *The Journal of Environmental Education, 12*(3), 41-42.

Sickler, J. & Fraser, J. (2009). Enjoyment in zoos. *Leisure Studies, 28*(3), 313-331.

Simberloff, D. (1998). Flagships, umbrellas, and keystones: Is single-species management passé in the landscape era? *Biological Conservation, 83*(3), 247-257.

Skibins, J. & Powell, R. (2013). Conservation caring: Measuring the influence of zoo visitor's connection to wildlife on pro-conservation behaviors. *Zoo Biology, 32*, 528-540.

Smith, L. & Broad, S. (2008). Do visitors attend to conservation messages? A case study of an elephant exhibit. *Tourism Review International, 11*(1), 225-235.

Smith, L., Weller, B., Smith, A., & van Dijk, P. (2012). Applying visitor preference criteria to choose pro-wildlife behaviors to ask of zoo visitors. *Curator the Museum Journal, 55*(4), 453- 466.

Therkelsen, A. & Lottrup, M. (2015). Being together at the zoo: zoo experiences among families with children. *Leisure Studies, 34*(3), 354-371.

Turley, S. (2010). Children and the demand for recreational experiences: the case of zoos. *Leisure Studies, 20*(1), 1-18.

Vernon, C. & Boyle, P. (2008). Understanding the impact of a zoo or aquarium visit. *Connect,* 7-9.

Woods, B. (1998). Animals on display: Principles for interpreting captive wildlife. *The Journal of Tourism Studies, 9*(1), 28-39.

APPENDIX A: EXTENDED LITERATURE REVIEW

General Information

Overview

There are zoos found throughout the world and they have over 700 million visitors annually (Gusset & Dick, 2011). In America alone, there have been over 183 million annual visitors according to the Association of Zoos & Aquariums (AZA) (AZA, 2017). These visitors are made up of women, in the age range of 25-35 years old, and every two out of three adults are accompanied by a child (or children) when visiting a zoo (AZA, 2017). Zoos are often perceived to be popular locations to take children for recreational purposes (Turley, 2010) whether it is with a school group, family, or friends' outing.

The main purpose of zoos typically includes conservation, education, and recreation. Carr and Cohen (2014) found that the public generally perceives zoos to be predominant places of entertainment and recreation for themselves as visitors. In a study comparing over 135 different zoos' mission statements, some of the most common themes included conservation and the education of the public within them (Patrick, Matthews, Ayers, & Tunnicliff, 2007).

Roles of Zoos

Zoos have many different roles that they can take on as a part of their mission. Some of the most common roles that zoos are perceived to have includes: research, conservation, public education, and recreation (Roe, McConney, & Mansfield, 2015). In fact, in a study on the global effect of zoos and aquariums, Gusset & Dick (2011) found that the world's zoos and aquariums spend a cumulative amount of $350 million (U.S.) dollars on conservation each year. This demonstrates the importance that these facilities hold as centers for conservation. The public, on the other hand, may view zoos as having other roles as more or equally important as conservation.

The mission of zoos ties into the roles that they take up. They often hold multiple roles, such as educators, conservationist, entertainment, or as a business. A widely accepted best practice for zoos facilities is the prioritization of their roles. Something to consider when discerning which roles are the most important for a zoo is whether or not the perceived views and expectations of the public and the perceived views of zoo personnel are comparable to one another. Zoo facilitators strive to ensure they offer specific experiences when visitors may or may not be expecting that type of experience. Roe, McConney, & Mansfield (2015) completed a global study to discern the perceived roles of zoos from both the publics' and the zoo facilitators' perspective. Their results revealed that zoo facilitators and visitors both highly prioritize educational experiences. Specifically, the study found that 80% of the visitors wanted to learn about ways they could support conservation efforts from their homes. Visitors do not prioritize relaxing opportunities as highly as zoos facilitators. However, visitors prioritize the opportunities to view endemic animals (animals from a specific geographic location) more than zoo facilitators do. This research brought attention to not only the matching priorities of zoos and visitors but it also found the discrepancies between what is expected of visitors by the zoo and of zoos by visitors. Education is well known as a part of the expected experiences at a zoo facility and visitors specifically want education opportunities to occur (Vernon & Boyle, 2008).

The education found within zoos often focuses on educating the public concerning conservation and environmental issues (Ballantyne, Packer, Hughes, & Dierking, 2007; Clayton, Fraser, Burgess, 2011; Serrell, 1981). This makes sense as zoos are often considered to be one of the few remaining opportunities for people to connect with nature in the modern world (Hacker & Miller, 2016). The educational opportunities along with the experiences of viewing and interacting with animals at zoos create affective and cognitive reactions within visitors that

can help them to develop a connection to the animals they are viewing (Marseille, Birgit, van den Brink, 2012). In recent years, it has become even more pressing for zoos to educate the public concerning conservation due to the increased number of threatened and endangered animals (Ballantyne, Packer, Hughes, & Dierking, 2007). It is common among for zoo visitors to be unaware of the level of threatened and endangered species there are, which emphasizes the importance of the educational experiences within zoos (Serrell, 1981). However, it is key to note that visitors expect the educational experiences to occur during the recreational opportunities within zoos (Roe, McConney, & Mansfield, 2015). The allure of zoos to many visitors may be focused on recreation but this does not mean that the other roles of zoos are not being achieved during the visitors' recreation. Zoos have a very important role in the education of the public concerning conservation and the environment (Gusset & Dick, 2011) with the variety of the roles that are offered being the basis of their popularity (Woods, 1998). One of the most important roles of a zoo could be considered to be the education one. The education that is offered by zoos is affective because it occurs during recreation as free choice learning (Clayton, Fraser, & Saunders, 2008). Free choice learning that is encouraged to occur organically during the recreation and entertainment of the zoo visit helps the visitors develop positive experiences associated with what they learn while at the zoo (Clayton, Fraser, & Saunders, 2008).

According to Hallman & Benbow (2007), many visitors are a part of groups that include children, and one reason this occurs is because zoos are seen as "family leisure" locations (p.876), as well as, locations to be social (Therkelsen & Lottrup, 2015). Children can play an important role in the demand for recreational activities. In one study, Turley (2010) investigates this demand specifically within zoos and finds that children are a key factor in determining which recreational activities groups may participate in. Since zoos have a positive family-

oriented perception, many groups with children are likely to visit for many recreational opportunities (Turley, 2010).

When the public visit zoos, they have certain expectations for their visit. For any public facility, being able to reach the expectations of visitors is important for the level of satisfaction their visitors have from their experience. In a study completed within a theme park over the course of ten years, Geissler & Rucks (2011) investigated the aspects of the visitors' experiences that affected their level of satisfaction. The study focused on the satisfaction of the overall experience and found that the factors that most often affected visitors' satisfaction were the overall value, park food, park atmosphere, and cleanliness. The researchers discussed the level of visitor satisfaction with the admission cost could be predicted by the general enjoyment, customer expectations and experience, and perception of price and value. The role of expectations prior to the experiences was key to the level of satisfaction the visitors reported. Zoos staff can utilize this knowledge to assist with advertisement and park planning so as to maximize the satisfaction for their visitors.

Experiences within the Zoo

General

Visitors are motivated to go to zoos for many different reasons. Roe, McConney, & Mansfield (2015) discussed the link between the research of Falk's (2006) and Vernon & Boyles' (2008) pertaining to the identity-related motivations of visitors. The five identities of visitors were: explorers, experience seekers, facilitators, professional hobbyist, and spiritual hobbyist by Falk (2006). Later, this was expanded in Vernon & Boyles' (2008) study which identified that visitors usually had one main drive behind their motivation to visit the zoo, although the majority of visitors identified multiple identity-related drivers to contribute to their motivation. This led

to the proposal that a multiple layered experience would be key in providing for many of the different motivations of zoo visitors.

Identifying the dominant motivation of visitors will help facilitators to provide exhibit opportunities that will appeal to the different visitor identities. In a 2014 mixed methods study, Roe & McConney investigated the motivation of zoo visitors. In accord with Vernon & Boyle's (2008) theory that visitors had one dominant motivation, Roe & McConney found that the potential entertainment and recreational aspects predominantly drove zoo visitors. However, over 70% of visitors desired educational experiences while at the zoo. This reinforces that visitors want multiple layered experiences in order to meet their desires for varied experiences.

According to the AZA, every two of three adults are accompanied by a child. According to Turley (2010), recreational opportunities for families are specifically affected by the presence of a child, which leads them to choose locations they perceive as family friendly. Zoos, specifically, are seen as social places that are family friendly. A study by Therkelsen and Lottrup (2015) investigated the different experiences that members of the same family have (between children and parents). The results found that children predominantly focused on the sensory activities throughout the zoo and then on their experiences with their families. Parents, on the other hand, focused more on the social bonding aspects of the visit than on the educational and entertainment experiences of the zoo. Despite the somewhat different focuses the parents and the children had on their time at the zoo, it was concluded that the variety of activities that were provided allowed for the families to bond and experience few conflicts amongst themselves while at the zoo. It is thus important for zoos to provide multiple types of experiences for the variety of visitors they have.

The multiple roles that zoos serve must be developed in order to allow for multiple groups to be served simultaneously. The three groups that were the main concern of zoo facilities included visitors, zoo staff, and the zoo animals (Nuttall, 2007). These groups are considered while developing the design and the intended experiences within the zoos. For example, the exhibit layout within the zoos must factor in the animal's comfort, health and possible visibility to the visitor. The exhibit also needs to have well-designed viewing areas and learning opportunities for multiple visitors. While zoo animals and visitors are active and engaged, the zoo staff are required to care for the grounds, animals, and facilities during visitor's hours and after. With the variety of factors to consider, a misjudgment in one area can have unforeseen effects on the other groups. Reade and Waran's (1996) study of how people perceive zoo animals enforces the importance of the presentation of the exhibit and animals to the publics' view. They found that people's perception of the animals within zoos to be significantly more positive than when people were approached outside the zoo. This was believed to be due to the visual cues that the visitors were able to take from the exhibits and the animals. Chin and Gusset (2016) also discussed the importance of considering all the management from behind-the scenes that goes into zoo designs since zoo experiences are more than just a provided area that allows people to view an animal.

Zoos have the defining feature of providing opportunities for visitors to view living animals that separate them from other experiences (Chin & Gussett, 2016). However, how do the visitors gain all the interesting facts and figures about the animals that they visit? Roe, McConney, & Mansfield (2015) investigated how zoos communicate with their average visitor. The traditional approach for providing information to visitors is through signage. Through the decades, this has changed to include other communitive opportunities that utilize creative,

interactive, and educational experiences (Smith & Broad, 2008). In Roe, McConney, & Mansfield's (2015) study, they investigated the education-related communication methods of 176 zoos from 50 countries through an online survey. The highest used method of educational communication was signage at 97 percent. However, they proposed that modern educational communication was more efficient by providing "multiple layers of education and experience" (Roe, McConney, & Mansfield, 2015, p181) that was suggested by Vernon and Boyle (2008). Ross & Gillespie (2008) note that visitors without children tend to spend more time reviewing the information on the signs than the visitors that had children with them.

The design of zoos has often utilized the charismatic megafauna to connect with visitors (Skibins & Powell, 2013). These animals are known as flagship species because they draw interest and concern of the public. They are usually used to promote conservation campaigns due to these attributes (Simberloff, 1998). Skibins and Powell (2013) investigated two different objectives of the zoo visitor experience: the relationship visitors developed with different species and if visitors show pro-conservative behaviors after their visit. The authors developed a scale using the Value Belief Norm (VBM) Theory to qualify Conservation Caring in order to measure the first objective. The second objective was measured using pre- and post-tests of before and after exhibit experiences. Conservation Caring was found to be a valid scale that revealed it was a high predictor of behaviors that are species related but a weak predictor of behaviors that are biodiversity related. For the second objective, the results show that zoos assist in creating a connection between the visitor and wildlife that results in pro-conservation behaviors. It also revealed that there was a wide variety with the types of animals that visitors connect with, thus zoos may be able to broaden the species they use as flagships.

Exhibit Design

The design of zoos and their exhibits is a multivariable issue that requires consideration of the audience, animal charges, employees, environment, and many other areas. Each of these areas can affect one another, therefore special consideration is necessary to ensure zoos are adequate for all users. Kelling, Gaalema, & Kelling (2014) discuss how the zoo design industry has changed since 1987 when the entirety of the zoo design industry was valued at twenty million dollars compared to the current industry for zoo design, which is doubled that amount.

To be fair, the styles in which zoo exhibits have been modeled have changed drastically over the last 100 years to incorporate more elaborate exhibit designs than in the past. Moss, Esson, & Francis (2010) evaluated the differences between the three generations of zoo exhibits and compared them to how visitors behave within and interpret them. The style of the first generation exhibits that zoos incorporate were barred, with a solitary animal, and had deep pits to act as animal containment. The second generation of exhibit styles utilized some "decorations" within the space with the animal, had structures made of concrete and other unnatural materials, used water moats for animal containment, and was designed with more consideration to the animal's welfare. This generation is still used relatively often. The third and most recent generation has the most consideration to the animal's welfare within the design. The animals are grouped by species, includes organic, natural material from the animals' indigenous habitats, and utilizes concealed barriers between the animals and the visitors. This last generation is considered to be more immersive than the previous generations due to the experiences that allows for people to view animals differently than the other generations. In 2008, Moss, Francis, & Esson discussed how immersive exhibit experiences focused more on the visitor's experiences than the animals. That is not to say that the animal's experience and comfort are not considered,

but more to describe the changes within the exhibit that are incorporated for the visitors' benefits.

The different exhibits found throughout zoos usually have different names given to them. Moss, Esson, & Francis (2010) found that visitors expect to see whatever is stated within the title. For example, when visitors went to the "Realm of the Red Ape" exhibit, they assumed that it contained red apes. They did not associate red apes with orangutans, which was intended. This reflects the importance of every aspect of the exhibit designs for zoo visitors' experiences. The study also revealed that it is highly important for educational exhibit experiences to have both high attracting power and high holding times. This means that the experience is attractive enough to catch visitors interest and is compelling enough to encourage the visitors to linger at the experience. Understanding how the experiences within exhibits perform allows zoos to recognize and rectify issues with those experiences. As described in the study, some of the experiences had low attraction power and holding times. Both factors were significantly increased once brightly colored signs were added that advertised the experience offered more effectively.

An exhibit's purpose is to attract and hold the visitor's interest. This ability can reflect the visitor's level of knowledge concerning the animal and information that is gained from the provided educational opportunities within the exhibit. By investigating how effectively three different educational techniques influenced visitor's behaviors and knowledge levels, Perdue, Stoinski, & Maple (2012) were able to determine which were the most effective. The investigated educational exhibit conditions included exhibits with: live presentations, video presentations, or no presentation. Both stay time data and surveys were collected from the visitors. It was found that people spent significantly longer within exhibits that had videos or

live presentations occurring. These groups also tested significantly better on questions based on the (same) knowledge that was provided in each learning environment. These results were comparable to ones from a similar study completed by Anderson, Kelling, Pressley-Keough, Bloodsmith, & Maple (2003) that focused on the effects of public animal training and oral presentations. This study had four different exhibit education conditions that comprised of passive viewing (no additional materials or education opportunities added to the exhibit other than what was already provided), interpretation-only sessions, public animal training sessions, and public animal training with interpretative sessions. Visitors reported the highest stay time, positive experiences, training perceptions, and staff and exhibit-size assessments from the public animal training sessions with and without interpretation. Out of 176 zoos across the world, more than 70% report utilizing their personnel as a method to educate zoo visitors (Roe, McConney, & Mansfield, 2015). These studies give evidence of the benefit of zoos providing multiple experiences and to attract visitors through multilayered experiences.

Immersive Exhibit Experiences

The third - generation of exhibit designs are often considered to be immersive and seen as favorable for both the visitors and the animals (Moss, Esson, & Francis, 2010). That leads to the question of what exactly constitutes as an immersive exhibit. An immersive design is generally regarded as an exhibit that allows visitors to feel they are a part of the animals' habitats and enclosure (Roe, McConney, & Mansfield, 2015), and creates a blend of entertainment and education (Ross & Gillespie, 2008). This is achieved through the use of plant and animal displays, background sounds, special effects, and sensory stimulations (Roe, McConney, Mansfield, 2015). There are many different methods and techniques that can be used to provide an immersive exhibit experience which ranges from providing multiple small viewing areas to

walking through exhibits' habitats without barriers between the visitors and the animals (Moss, Esson, & Francis, 2010). A study completed by Ross & Gillespie (2008) investigated the experiences of visitors in a new immersive exhibit that simulated a safari ride through Africa. The research found that there was a positive relationship between attracting power and holding power for the animal exhibits that included interpretive opportunities. Also, the educational opportunities that were located away from animal exhibits had the highest attraction and holding powers. This is believed to be due to the interactive nature of those exhibit activities. Additionally, visitors spent the most time in the crocodile and the hippopotamus exhibits that had unique soft flooring which imitated the natural environment of these animals. The immersive and interactive elements encouraged the visitors to stay longer in the exhibit to be able to interact with these educational experiences.

Literature on the effects of immersive exhibits as educational venues tends to focus on the benefits of these experiences for visitors. However, Dancstep, Gutwill, and Sindorf (2015) investigated the visitor experiences of two different types of exhibits that held the same information and visitors' rates within a museum setting. Tabletop exhibit experiences and immersive exhibit experiences of visitors were compared by recording data through sixty randomly selected families that were videotaped, interviewed, and surveyed (with a follow-up survey sent to them). The data implied that immersive and tabletop exhibit experiences had different strengths to them. Immersive exhibits typically resulted in visitors reporting on the socio-emotional factors that made them feel connected to the exhibit. The tabletop exhibit visitors reported more intellectual engagement than those at the immersive exhibits. The study supports the view of immersive exhibit experiences being more engaging and fun for visitors but also that tabletop experiences encouraged more engagement cognitively. This finding is

discussed by the authors as being the opposite of what they expected but that it supports Michael Chabon's suggestion of "immersivity not being our most potent educational tool" available (p.401). While these findings may not be specifically within a zoo setting, zoos also utilize tabletop signs and immersive experiences within their exhibits, and thus findings may be relevant for zoos.

Effect of Zoo Visits

General

It's clear that zoos serve many different purposes for the multiple audiences they are confronted with (Puan & Zakaria, 2007; Roe, McConney, & Mansfield, 2015; Clayton, Fraser, Burgess, 2011; Ballantyne, Packer, Hughes, & Dierking, 2007; Serrell, 1981; Marseille, Birgit, van den Brink, 2012: Gusset, Dick, 2011; & Clayton, Fraser, & Saunders 2008). Effectively communicating with the variety of visitors is often achieved by zoos using multiple mediums to connect with and gain visitors interest (Falk, 2006; Smith & Broad, 2008; Falk, 2005; Roe, McConney, & Mansfield, 2015; Ross, Gillespie, 2008; Roe & McConney, 2014; & Larsen, 2002). What do visitors take away from these carefully planned exhibits? There are three broad themes that have been observed throughout the literature concerning the experiences visitors have at zoos: cognitive experiences, affective experiences, and environmental connecting experiences. These categories encompass areas that help organize the various effects of a visitor’s zoo experience and are often intertwined with and affect one another.

Cognitive

Some of the many effects that a zoo can have on visitors can be classified as cognitive reactions. The cognitive reactions that visitors have includes increased knowledge, understanding, and awareness concerning the information zoos provide (Carr & Cohen, 2011 & Luebke & Matiasek, 2013). Within the cognitive reactions, there are two sub components known as factual and evaluation (Marseille, Bright, van den Brink, 2012). The factual component is the knowledge aspect of a cognitive reaction and the evaluation component is the value orientation portion. Cognitive reactions can affect, as well as, be affected by the affective (emotional) reactions (Jacobs, 2009) and environmental connectedness (Bruni, Fraser, & Schultz, 2008).

Zoos achieve cognitive reactions from visitors through many different methods. A study completed by Roe & McConney (2015) that assessed 540 visitor interviews determined that 72% of visitors went to a zoo for the educational opportunities and with learning-based goals. The researchers also found that visitors' often desired to see new and unique live animals for their learning opportunities rather than ones they are more familiar with. Although zoos want visitors to enjoy viewing the animals they have, they need to carefully design their exhibits in order to bring attention to the learning opportunities around the visitors' experiences in addition to the animals.

Visitors often go to zoos to be able to view animals. However, are there specific animals that have a larger pull with the visitors? Moss & Esson (2010) discussed how both emotional affinity and personal interest makes promoting learning easier and investigated how the attractiveness of animals affects the learning process of visitors. They observed the reactions of visitors to 40 different species. The attractiveness of the animal species was determined to be

highly related to the interest levels and learning potential of visitors. There were several factors that were found to have a significant effect on the level of interest that visitors had in them. These features include: whether the species was a flagship species, the level of animal activity within the exhibit, and body size. However, the biggest determinant of interest was the taxonomic grouping of the animal. Mammals were determined to have the highest rates of interest.

Different animals have different levels of attractiveness to different visitors. Marseille, Birgit, & van den Brink (2012) investigated the experiences visitors have within polar bears' exhibits specifically. They found that visitors who had an ecological experience within the exhibit had the strongest conservation attitude afterwards. The visitors who were determined to be "indifferent" had the weakest conservation attitude. The researchers believed that this was due to the concern that was either already within the visitors or developed due to the experience within the polar bear exhibit. Polar bears, as large mammals and often a flagship species, are seen as attractive to visitors and might have an easier time drawing visitors and invoking certain reactions than other species. However, understanding what causes which reactions helps zoo personnel to create educational and meaningful exhibits.

There is a gargantuan amount of information on the various animals found within zoos. Zoos have to consider how knowledgeable their visitors are when providing information on the wildlife and conservation-related issues they present to their visitors. They want to ensure that the information is interesting and understandable to as many visitors as possible. This can be difficult with the diversity of their visitor populations. A study completed in 2014 investigated the expected level of understanding of animal biology for the average zoo visitor and what information should be provided in exhibits (Cove & Byrne). Visitors were found to have a firm

understanding of specific topics concerning animal biology. Misconceptions and misunderstanding arose as the topic became more complex suggesting that they should be avoided for exhibit displays. These findings were reflected in a modified version of Tunnecliffe's 1999 Conservation Triangle. Overall, the zoo visitors were considered fairly well informed on the effect that humanity has on the natural world.

Part of the success of the education and cognitive reactions of visitors within zoos is due to the amount of free learning that occurs. Free choice learning is when the learner can have some form of control over whether they participate in the educational experiences or not (Falk, 2005) which leads to the tendency to participate in the learning activities that already interest them (Cove & Byrne, 2014). Education within zoos is often considered to be under the free-choice category due to visitors being able to choose what, when, and how they learn as they explore the exhibits and displays (Moss & Esson, 2010). This approach to learning allows for the visitors to construct their own experiences and learning that can help them achieve their personal goals for their visits (Clayton, Fraser, & Saunders, 2008). In regards to environmental topics, free choice learning helps to develop lifelong learning and predispositions to learning about the environment (Heimlich & Horr, 2010). Most zoos rely on this method for of education for their visitors' recreation based free-choice learning experiences.

Affective

The reactions visitors have can be effected by multiple aspects of the zoos they visit. Affective reactions are the emotional connections that are formed with the animals or the wildlife (Luebke & Matiasek, 2013). Some of the key impacts to cause these experiences are the exhibits, enclosures, the distance of the animals, the behavioral activity of the animals, and the animal visibility (Bitgood, Patterson, & Benefield, 1988; Powell & Bullock, 2015; & Luebke &

Matiasek, 2013). Positive experiences can be formed through those interactions which promote empathy and educational experiences with the animals and lead to visitors connecting with the animals in a manner that allows for conservation-related desires to form (Clayton, Fraser, & Saunders, 2008). Zoos are able to provide visitors with an opportunity to interact with wildlife both emotionally and physically that can encourage them to absorb the conservation messages that zoos are trying to instill within their visitors. Using affective methods to connect with visitors can be very effective for zoos in communicating conservation messages to them (Carr & Cohen, 2015).

In a study performed by Berenguer (2007), the relationship between the level of empathy for a natural object (e.g. a tree or bird) and the resulting behaviors and attitudes towards the environment were studied. The results implied that the participants who showed a high level of empathy also showed high levels of environmental behaviors and attitudes. The results also indicated that facilitating empathy for a natural object had a moderate effect on the willingness of the participant to act in pro-conservational ways. This was simulated through having the participants focus on the natural object's feelings and experiences and then compare it with their own. The results coincided with the widely-accepted view that "most global conservation organizations are now working to promote increased empathy among groups whose actions have impact on conservation action" (Clayton, Fraser, & Burgess, 2011, p.87). As zoos are accepted as locations for conservation, among other roles, most can be assumed to use these tactics for connecting with visitors.

Using the affective reactions of zoo visitors to connect with wildlife has been increasingly researched for the validity of its success and the resulting literature implies that the emotional experiences are key factors to learning and pro-conservation reactions and beliefs.

Powell & Bullock (2014) researched the emotional reactions of zoo visitors in three different carnivorous animals' exhibits (tigers, African wild dogs, and spotted hyenas) in regards to several factors. These factors included: factors that affect the emotional experiences, visitor's predispositions towards the environment, and their self-reported level of conservation mindedness. The different animal exhibits were observed under two conditions consisting of a baseline condition and a condition that stimulated natural behaviors within the animals. Visitors reported that the stimulated behavior made their experiences feel up close and affected the strength of positive emotional experiences at the exhibit. The emotional responses within the visitors were significantly affected by the extent of eye contact that visitors had with the animals. There was a significant correlation between visitors' predispositions towards nature and their emotional responses. Significantly stronger reports of conservation mindedness were also reported from the visitors who had high predispositions towards wildlife. The results of Powell & Bullock's (2014) study supported the claim that experiences that promote emotions (e.g. happiness, amusement, or sadness) were key factors for zoos to consider when developing and designing the experiences they offer for visitors.

Hacker and Miller (2016) investigated visitors' experiences within an herbivorous animal's, the African elephant, exhibit. The research focused on the attitudes of the visitors, but the authors discussed how emotions likely had unconsciously affected the visitors' judgement and perceptions of the animals. Viewing the elephants was speculated to have resulted in strong emotions due to the distinctive characteristics such as size, features, and similarity to humans in their intelligence, familial habits, and emotional states. Hacker and Miller discuss how the quickest manner for human attitudes to change is through affective judgments. Specifically, visitors could have the opportunity to be positively affected by pro-conservation messages within

zoos that occur through interacting with the elephants and other animals within zoos and forming affective bonds with them (Hacker & Miller, 2016).

Affective reactions can encompass numerous emotional attitudes and behaviors. Many of these are beneficial to creating connections between the visitors and the animals to enhance the pro-conservation message that zoos promote to their visitors. These tactics entwine with the cognitive reactions and the environmental connection reactions. However, a different aspect to consider is the affective reactions' ties to the recreational side of the zoo experience- the fun and enjoyment that they receive throughout their visit. Sickler & Fraser (2009) investigated the average adult zoo visitor's experiences concerning the enjoyment that visitors feel within zoos and how they define it. The researchers discussed how enjoyment is often considered to be a key, distinct experience that is extremely important and should be considered separately from other affective reactions. This is due to people enjoying different things, for example, some people find it fun to learn and others do not (Packer, 2006). There were four distinct perceptions that Sickler and Fraser were able to identify for what enjoyment means for an adult zoo visitor. The first perspective was defined by the social experiences within a family group. Specifically, from the adults observing the children's' experiences and deriving enjoyment from them. The second perspective, like the first, finds enjoyment within family experiences, the two differences are they do not greatly enjoy experiences related to animals in the exhibit, especially sensory experiences, or entertainment from the animals. Additionally, they find greater enjoyment in the cognitive experience that allow them to learn from. Both perspectives find a large amount of their enjoyment within their family's experiences. The third perspective focuses on being able to see animals as the source of their enjoyment. The last perspective found the source of their enjoyment to be from experiences with friends, rather than with animals or family. The strong

role of children's enjoyment in two of the perspectives reflect the importance of the broad exhibit experiences and opportunities within the zoo for any age group for visitors to enjoy. Enjoyable experiences often add to a positive emotional experience and positive experiences encourage visitors to learn more about animals as well as to be emotionally connected with the animals (Clayton, Fraser, & Saunders, 2008).

Different affective reactions can be found throughout a zoo experience. These emotions can result in pro-conservation messages becoming more significant to the visitor or it may add to the enjoyment of the recreational activity and lead to repeated visits. Either way, the affective reaction of visitors can assist in the goals and missions of zoos when they are planned for and encouraged.

Environmental Connectedness

Zoos strive to help conservation efforts as much as possible. One of the methods they achieve this is by encouraging environmental connectedness within visitors in hopes that it will lead to increased pro-conservation attitudes and behaviors. Environmental connectedness can be achieved through multiple methods and often incorporates cognitive and affective reactions as a part of the experiences provided within zoos. These experiences help to enforce conservation messages within visitors to a degree that the visitors may practice the actions in their daily lives.

As with the other predominant themes of cognitive and affective reactions, environmental connectedness is interwoven within the other reactions. In fact, Beery & Wolf-Watz (2014) stated that environmental connectedness is a term that came about to represent the pro-environmental behaviors and awareness that comes from "affective, cognitive, and/or physical human relationship with nature by using terms such as affinity, biophilia, commitment, ecological self, identity, inclusion, relatedness, and sensitivity" (p.189) reflecting how

interwoven the reactions of zoos visitors are. This is assumed to be due to one of the main goals of zoos focusing on conservation (Patrick, Matthews, Ayers, & Tunnicliffe, 2007) and results in the other reactions becoming utilized to further this goal. Another, simpler definition of environmental connectedness is an explanation by Shultz (2002) that refers to it as the level that an individual believes they are a part of nature.

Zoos can help bring light to important conservation information for visitors that may shock them and encourage them to adopt pro-conservation behaviors. Serrell (1981) discussed how a visitor had "never realized there were so *many* endangered species" throughout the exhibits they visited (p.42). The different designs of the knowledge presented in the exhibits may have affected what the visitors learned, but overall, visitors were able to comprehend the main message of that a large number of animals were endangered. Zoos strive to make these connections between visitors and conservation and environmental knowledge.

Environmental connectedness can occur through many different avenues and it is often identified by various titles. In 2011, Clayton, Fraser, & Burgess conducted a field study that investigated the environmental identity (also known as environmental connectedness) of visitors with animals and perceived personal similarity to the animals to see if there was a connection with environmental concern and interest. The study surveyed 1,514 adult visitors and observed 265 different visitors. The study found that there was a correlation between the two factors. Different exhibits gain different reactions of visitors. Exhibits that encouraged the most inspiration to assist animals were ones that made comparisons to humans. This was speculated to be due to the empathetic response that it encourages. These results are similar to the study conducted by Schultz (2000) who found that participants who were requested to try and empathize with a bird that had to deal with the effects of pollution had higher environmental

concern (or connectedness) than those who had not been instructed to try and perceive how the bird would feel. This relationship between environmental connection allows for conservation messages to become more developed due to the empathy the visitors obtained through connecting human and animal experiences (Clayton, Fraser, & Burgess, 2011).

While research has shown that environmental connectedness occurs within zoos, the type of specific environmental connection within visitors is something to consider. Bruni, Fraser, & Schultz (2008) investigated the impact of zoos on visitors' environmental connectedness. The study used a scale measuring the explicit and implicit "self-nature" connections. A total of three zoos had data collected from 242 zoo visitors. While there were no changes in the level of explicit connectedness reported by zoo visitors, the findings did suggest an increase in implicit connectedness from zoo experiences. There was not a particular aspect of any zoo that was identified to moderate this effect. So, while the experience of becoming increasingly connected with nature may not be immediately identifiable to the visitor, the visitors are still experiencing increased level of environmental connectedness due to zoos.

APPENDIX B: NON-IMMERSIVE AND IMMERSIVE QUESTIONNAIRES

Non-Immersive Survey

Exhibit
Date:
Time:

You are being invited to participate in the research study titled *Comparing Immersive and Non-Immersive Exhibit Experiences in Zoos* today. This study is being conducted by Theresa Herendeen who is a Graduate student at East Carolina University in the Recreation and Service Intervention department. The goal of this study is to gather data on what adult zoo visitors gain from different types of exhibit experiences. This study is taking place in the North Carolina Zoo's Watani Grasslands exhibit. On average, completing the survey will require 7 to 10 minutes. The survey is anonymous, so please do not write your name anywhere on the survey. Your participation in the research is **voluntary**. You may choose not to answer any or all questions, and you may stop at any time. There is **no penalty for not taking part** in this research study. Please email Theresa Herendeen at herendeent12@students.ecu.edu for any research related questions or the Office of Research Integrity & Compliance (ORIC) at 252-744-2914 for questions about your rights as a research participant.

Circle the coinciding answer that best represents your opinions and experiences.

Statement	1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Neutral	5 Slightly Agree	6 Agree	7 Strongly Agree
I enjoy spending my leisure time watching or observing animals	1	2	3	4	5	6	7
I am confident teaching others about environmental issues	1	2	3	4	5	6	7
I often think about whether or not my actions harm the natural world	1	2	3	4	5	6	7
I lead a balanced life when it comes to my environmental impact	1	2	3	4	5	6	7
I was excited to see real animals	1	2	3	4	5	6	7
It was entertaining to watch the animals	1	2	3	4	5	6	7
The exhibit was engaging for children	1	2	3	4	5	6	7
I experienced a feeling of connectedness to nature	1	2	3	4	5	6	7
I was able to relax and unwind from my daily routine	1	2	3	4	5	6	7
I found the exhibit theme interesting	1	2	3	4	5	6	7
I found myself reflecting on new ideas about animals and their environments	1	2	3	4	5	6	7
I discussed the information in the displays and signs with my companions	1	2	3	4	5	6	7
I had fun during this experience	1	2	3	4	5	6	7

Exhibit
Date:
Time:

Visiting the exhibit has made me more concerned about the well-being of wildlife	1	2	3	4	5	6	7
The exhibit inspired me to wonder about the thoughts and feelings of the animals I saw	1	2	3	4	5	6	7
I have a greater sense of connection with nature as a result of visiting this exhibit	1	2	3	4	5	6	7
Visiting the exhibit expanded my interests in animals	1	2	3	4	5	6	7
The exhibit made wildlife conservation issues more meaningful to me	1	2	3	4	5	6	7
North Carolina Zoo helps to save animals in the wild	1	2	3	4	5	6	7
Some beliefs I had about animals became more pro-conservation after visiting this exhibit	1	2	3	4	5	6	7
As a result of visiting the exhibit, I am more likely to support the zoo or another conservation organization	1	2	3	4	5	6	7
As a result of visiting the exhibit, I intend to change some of my daily activities (recycle more, reduce energy usage, buy more earth-friendly products, etc)	1	2	3	4	5	6	7

Please describe a specific way that the North Carolina Zoo is helping to save animals in the wild that you learned about while at the Watani Grasslands exhibit.

What animals did you see in the Watani Grasslands exhibit today? Please write down as many as you can remember.

Exhibit
Date:
Time:

Demographic Information

In what year were you born? _____

Select the gender that best applies to you: O Female O Male

Select the race/ethnicity that best applies to you

- o White
- o Black or African American
- o American Indian and Alaska Native
- o Asian
- o Native Hawaiian and Other Pacific Islander
- o Other

Select the education level that best applies to you

- o Less than high school education
- o High school education or equivalent
- o Some college
- o Bachelor's degree
- o Post Graduate work (attending or have finished)

What is your zip code? _____

How recent was your last visit to the zoo?

- o First time
- o Within last 12 months
- o 1-3 years ago
- o 5-10 years ago
- o More than 10 years ago

How many times have you visited a zoo in the last 12 months?

- o Once (today)
- o 2-3 times
- o 4-7 times
- o 7 times or more

How many times have you visited zoos or aquariums in general in the last 12 months?

- o Once (today)
- o 2-3 times
- o 4-7 times
- o 7 times or more

Are you a zoo member? O Yes O No

How long have you been a member of the NC Zoo Society? _____years

Including yourself, how many people are in your group today? _____people

How much time have you spent at the NC Zoo before completing this survey? _____hours

Have you been to see the Watani Grassland exhibit today? O Yes O No

Have you participated in the Zoofari experience previously? O Yes O No

Immersive Survey

Zoofari
Date:
Time:

You are being invited to participate in the research study titled *Comparing Immersive and Non-Immersive Exhibit Experiences in Zoos* today. This study is being conducted by Theresa Herendeen who is a Graduate student at East Carolina University in the Recreation and Service Intervention department. The goal of this study is to gather data on what adult zoo visitors gain from different types of exhibit experiences. This study is taking place in the North Carolina Zoo's Watani Grasslands exhibit. On average, completing the survey will require 7 to 10 minutes. The survey is anonymous, so please do not write your name anywhere on the survey. Your participation in the research is **voluntary**. You may choose not to answer any or all questions, and you may stop at any time. There is **no penalty for not taking part** in this research study. Please email Theresa Herendeen at herendeent12@students.ecu.edu for any research related questions or the Office of Research Integrity & Compliance (ORIC) at 252-744-2914 for questions about your rights as a research participant.

Circle the coinciding answer that best represents your opinions and experiences.

Statement	1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Neutral	5 Slightly Agree	6 Agree	7 Strongly Agree
I enjoy spending my leisure time watching or observing animals	1	2	3	4	5	6	7
I am confident teaching others about environmental issues	1	2	3	4	5	6	7
I often think about whether or not my actions harm the natural world	1	2	3	4	5	6	7
I lead a balanced life when it comes to my environmental impact	1	2	3	4	5	6	7
I was excited to see real animals	1	2	3	4	5	6	7
It was entertaining to watch the animals	1	2	3	4	5	6	7
The experience was engaging for children	1	2	3	4	5	6	7
I experienced a feeling of connectedness to nature	1	2	3	4	5	6	7
I was able to relax and unwind from my daily routine	1	2	3	4	5	6	7
I found Zoofari experience had an interesting theme	1	2	3	4	5	6	7
I found myself reflecting on new ideas about animals and their environments	1	2	3	4	5	6	7
I discussed the information the Zoofari guide provided with my companions	1	2	3	4	5	6	7
I had fun during this experience	1	2	3	4	5	6	7
Participating in the Zoofari experience has made me more	1	2	3	4	5	6	7

Zoofari
Date:
Time:

concerned about the well-being of wildlife							
The experience inspired me to wonder about the thoughts and feelings of the animals I saw	1	2	3	4	5	6	7
I have a greater sense of connection with nature as a result of this experience	1	2	3	4	5	6	7
Participating in the experience expanded my interests in animals	1	2	3	4	5	6	7
The experience made wildlife conservation issues more meaningful to me	1	2	3	4	5	6	7
North Carolina Zoo helps to save animals in the wild	1	2	3	4	5	6	7
Some beliefs I had about animals became more pro-conservation after this experience	1	2	3	4	5	6	7
As a result of participating in the Zoofari experience, I am more likely to support the zoo or another conservation organization	1	2	3	4	5	6	7
As a result of participating in the Zoofari experience, I intend to change some of my daily activities (recycle more, reduce energy usage, buy more earth-friendly products, etc)	1	2	3	4	5	6	7

Please describe a specific way that the North Carolina Zoo is helping to save animals in the wild that you learned about while on the Zoofari experience.

What animals did you see while on Zoofari today? Please write down as many as you can remember.

Zoofari
Date:
Time:

Demographic Information

In what year were you born? _____

Select the gender that best applies to you: O Female O Male

Select the race/ethnicity that best applies to you

- o White
- o Black or African American
- o American Indian and Alaska Native
- o Asian
- o Native Hawaiian and Other Pacific Islander
- o Other

Select the education level that best applies to you

- o Less than high school education
- o High school education or equivalent
- o Some college
- o Bachelor's degree
- o Post Graduate work (attending or have finished)

What is your zip code? _____

How recent was your last visit to the zoo?

- o First time
- o Within last 12 months
- o 1-3 years ago
- o 5-10 years ago
- o More than 10 years ago

How many times have you visited a zoo in the last 12 months?

- o Once (today)
- o 2-3 times
- o 4-7 times
- o 7 times or more

How many times have you visited zoos or aquariums in general in the last 12 months?

- o Once (today)
- o 2-3 times
- o 4-7 times
- o 7 times or more

Are you a zoo member? O Yes O No

How long have you been a member of the NC Zoo Society? _____years

Including yourself, how many people are in your group today? _____people

How much time have you spent at the NC Zoo before completing this survey? _____hours

Have you been to see the Watani Grassland exhibit today? O Yes O No

Have you participated in the Zoofari experience previously? O Yes O No

APPENDIX C: IRB APPROVAL FORM

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** · **www.ecu.edu/irb**

Notification of Exempt Certification

From: Social/Behavioral IRB
To: Theresa Herendeen
CC: Hans Vogelsong
Date: 6/29/2016
Re: UMCIRB 16-001026
Comparing Immersive and Non-Immersive Exhibit Experiences in Zoos

I am pleased to inform you that your research submission has been certified as exempt on 6/28/2016. This study is eligible for Exempt Certification under category #2.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

The UMCIRB office will hold your exemption application for a period of five years from the date of this letter. If you wish to continue this protocol beyond this period, you will need to submit an Exemption Certification request at least 30 days before the end of the five year period.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418
IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418

APPENDIX D: RELEVANT TERMS

Cognitive Reactions

The understanding and increased knowledge concerning conservation, animals, and environmental issues (Luebke & Matiasek, 2013) that occur due to the exhibit.

Affective Reactions

The emotional reactions and feelings of connection to animals or the environment that occur due to the exhibit (Luebke & Matiasek, 2013).

Environmental Connectedness

Environmental connectedness referred to the level that individuals feel that they a part of nature, or connected to nature (Shultz, 2002) that occurs due to the exhibit.

Immersive Experience

Immersive experiences incorporated the use a variety of elements that combined entertainment, education (Ross & Gillespie, 2008), and the perceptive of being a part of the animal's habitat to visitors (Roe, McConney, & Mansfield, 2015).

Non-Immersive Experience

Non-immersive experiences do not include the same levels of stimulation as immersive experiences and might not have held the interest of visitors as long as immersive experiences (Dancstep, Gutwill, & Sindorf, 2015). Specifically, for this study, the non-immersive experience consists of the experience found in the zoo, that involves looking into the animals' habitats, that is available every day to all visitors with no additional fees.

APPENDIX E: LIST OF LIKERT SCALE SURVEY QUESTIONS

Non-Immersive Survey Questions

1. I enjoy spending my leisure time watching or observing animals
2. I am confident teaching others about environmental issues
3. I often think about whether or not my actions harm the natural world
4. I lead a balanced life when it comes to my environmental impact
5. I was excited to see real animals
6. It was entertaining to watch the animals
7. The exhibit was engaging for children
8. I experienced a feeling of connectedness to nature
9. I was able to relax and unwind from my daily routine
10. I found the exhibit theme interesting
11. I found myself reflecting on new ideas about animals and their environments
12. I discussed the information in the displays and signs with my companions
13. I had fun during this experience
14. Visiting the exhibit has made me more concerned about the well-being of wildlife
15. The exhibit inspired me to wonder about the thoughts and feelings of the animals I saw
16. I have a greater sense of connection with nature as a result of visiting this exhibit
17. Visiting the exhibit expanded my interests in animals
18. The exhibit made wildlife conservation issues more meaningful to me
19. North Carolina Zoo helps to save animals in the wild
20. Some beliefs I had about animals became more pro-conservation after visiting this exhibit
21. As a result of visiting the exhibit, I am more likely to support the zoo or another conservation organization
22. As a result of visiting the exhibit, I intend to change some of my daily activities (recycle more, reduce energy usage, buy more earth-friendly products, etc.)

Immersive Survey Questions

1. I enjoy spending my leisure time watching or observing animals
2. I am confident teaching others about environmental issues
3. I often think about whether or not my actions harm the natural world
4. I lead a balanced life when it comes to my environmental impact
5. I was excited to see real animals
6. It was entertaining to watch the animals
7. The experience was engaging for children
8. I experienced a feeling of connectedness to nature
9. I was able to relax and unwind from my daily routine
10. I found Zoofari experience had an interesting theme
11. I found myself reflecting on new ideas about animals and their environments
12. I discussed the information the Zoofari guide provided with my companions
13. I had fun during this experience
14. Participating in the Zoofari experience has made me more concerned about the well-being of wildlife
15. The experience inspired me to wonder about the thoughts and feelings of the animals I saw
16. I have a greater sense of connection with nature as a result of this experience
17. Participating in the experience expanded my interests in animals
18. The experience made wildlife conservation issues more meaningful to me
19. North Carolina Zoo helps to save animals in the wild
20. Some beliefs I had about animals became more pro-conservation after this experience
21. As a result of participating in the Zoofari experience, I am more likely to support the zoo or another conservation organization
22. As a result of participating in the Zoofari experience, I intend to change some of my daily activities (recycle more, reduce energy usage, buy more earth-friendly products, etc.)

APPENDIX F: LIST OF EXPECTED VARIABLES WITHIN DOMAINS

Expected Variables per Domain Table

Table 19

List of Expected Variables per Domain

Domain	Variables
Environmental Connectedness Variables	I lead a balanced life when it comes to my environmental impact
	I experienced a feeling of connectedness to nature
	Visiting the exhibit expanded my interests in animals
	The exhibit made conservation issues more meaningful to me
	Some beliefs I had about animals became more pro-conservation after visiting the exhibit
	As a result of the exhibit, I am more likely to support the zoo or another conservation
	As a result of visiting the exhibit, I intend to change some of my daily activities (recycle
Cognitive Domain Variables	I am confident teaching others about environmental issues
	I often think about whether or not my actions harm the natural world
	I found the exhibit theme interesting
	I found myself reflecting on new ideas about animals and their environment
	I discussed the information in the displays and signs with my companions
Affective Domain Variables	I enjoy spending my leisure time watching or observing animals
	I was excited to see real animals
	It was entertaining to watch the animals
	The exhibit was engaging for children
	I was able to relax and unwind from my daily routine
	I had fun during this experience
	Visiting the exhibit has made me more concerned about the well-being of wildlife
	The exhibit inspired me to wonder about the thoughts and feelings of the animals I saw
	I have a greater sense of connection with nature as a result of visiting this exhibit

APPENDIX G: RELIABILITY OF FACTORS OF THE ORIGINAL STUDIES

Reliability of Original Studies' Variables

The following lists the reliability of the variables from the original study for the 2013 Luebke and Matiasek study. There were some variables that were not included in the NC Zoo study from the original main study and are not included in the following table (Table 20) that presents the reliability results. There were also some variables that were reworded to the instrument. The original study utilized a seven-point scale (7 = very much so; 4 = somewhat; 1 = not at all).

Table 20

Variables' Reliability from Main Original Study (N = 554)

Item	*M*	*SD*	Alpha
Personal predispositions			.83
I enjoy spending my leisure time watching or observing animals	5.61	1.33	
I am confident teaching others about environmental issues	4.53	1.76	
I often think about whether or not my actions harm the natural world	5.30	1.47	
I lead a balanced life when it comes to my environmental impact	5.01	1.37	
Emotional responses			.77
I was excited to see real animals	6.25	1.11	
It was entertaining to watch the animals	5.99	1.22	
The exhibit was engaging for children	5.69	1.36	
Introspection and reflection			.78
I experienced a feeling of connectedness to nature	4.24	2.02	
I was able to relax and unwind from my daily routine	5.82	1.32	
I found the exhibit theme interesting	5.19	1.45	
I found myself reflecting on new ideas about animals and their environments	4.82	1.65	
Cognitive engagement			.71
I discussed the information in the displays and signs with my companions	4.84	1.85	
Impact on enjoyment/fun			.84
I had fun during this experience	6.20	1.02	
Impact on the affective reactions			.86
Visiting the exhibit has made me more concerned about the well-being of wildlife	5.29	1.58	
The exhibit inspired me to wonder about the thoughts and feelings of the animals I saw	5.12	1.71	
I have a greater sense of connection with nature as a result of visiting this exhibit	4.99	1.64	
Impact on cognitive reactions			.78
Visiting the exhibit expanded my interests in animals	5.42	1.45	
The exhibit made wildlife conservation issues more meaningful to me	5.36	1.49	
Some beliefs I had about animals became more pro-conservation after visiting this exhibit	2.84	1.95	

Note. These questions are adapted from the study performed by Luebke and Matiasek (2013). The original components of the study may have included other variables that were not applicable to the NC Zoo study.

Reliability of Supplemental Study Variables

The following lists the variables from the Powell and Bullock (2014) study that were used to supplement the environmental connectedness domain of the NC Zoo study. There were some variables that were not included in the NC Zoo study from the original supplemental study and are not included in the following table (Table 21) that presents the reliability results. There were also some variables that were reworded to the instrument. The original study utilized a seven-point scale (7 = very much so; 4 = somewhat; 1 = not at all).

Table 21

Variables' Reliability from Original Supplemental Study

Item	Alpha
Conservation Mindedness	.91
As a result of visiting the exhibit, I am more likely to support the zoo or another conservation organization	
As a result of visiting the exhibit, I intend to change some of my daily activities (recycle more, reduce energy usage, buy more earth-friendly products, etc.)	

Note. These variables were adapted from a study completed by Powell and Bullock (2014) to supplement the Luebke and Matiasek (2013) studies' variables. The original component included other variables not applicable to the NC Zoo study.

APPENDIX H: INDEPENDENT T – TESTS RESULTS PER INDIVIDUAL VARIABLE

Table 22

T - Test Results Comparing Exhibit Experiences of the Cognitive Variables

Variable	Non-Immersive		Zoofari		*t*	Sig.
	M	*SD*	*M*	*SD*		
The exhibit inspired me to wonder about the thoughts and feelings of the animals I saw	6.08	1.17	5.61	1.11	3.63	.00
As a result of visiting the exhibit, I intend to change some of my daily activities (recycle more, reduce energy usage, buy more earth-friendly products, etc.)	5.55	1.38	5.23	1.31	2.12	.04
I found myself reflecting on new ideas about animals and their environment	5.84	1.34	5.62	1.14	1.51	.13
Some beliefs I had about animals became more pro-conservation after visiting this exhibit	5.67	1.34	5.47	1.31	1.34	.18
Visiting the exhibit expanded my interests in animals	6.03	1.25	5.86	1.11	1.25	.21
As a result of visiting the exhibit, I am more likely to support the zoo or another conservation organization	5.81	1.27	5.74	1.17	.52	.61
I have a greater sense of connection with nature as a result of visiting this exhibit	5.87	1.29	5.82	1.06	.32	.75
The exhibit made wildlife conservation issues more meaningful to me	5.81	1.36	5.79	1.09	.16	.87
Visiting the exhibit has made me more concerned about the well-being of wildlife	5.93	1.28	5.95	1.00	-.14	.89
North Carolina Zoo helps to save animals in the wild	6.33	1.00	6.33	.96	-.01	1.00
Cognitive Scale Total Domain Score	5.88	1.07	5.74	.90	1.23	.22

Table 23

T - Test Results Comparing Exhibit Experiences of the Affective Variables

Variable	Non-Immersive		Zoofari		*t*	Sig.
	M	*SD*	*M*	*SD*		
I enjoy spending my leisure time watching or observing animals	6.59	.79	6.22	1.05	3.42	.01
I discussed the information in the displays and signs with my companions	5.96	1.34	5.58	1.27	2.61	.01
I had fun during this experience	6.66	.72	6.36	1.06	2.79	.01
I was able to relax and unwind from my daily routine	6.20	1.17	6.07	1.17	1.03	.31
It was entertaining to watch the animals	6.60	.79	6.51	.94	1.00	.32
I found the exhibit theme interesting	6.31	.99	6.20	1.09	.97	.33
I experienced a feeling of connectedness to nature	6.12	1.12	6.02	.98	.88	.38
The exhibit was engaging for children	6.04	1.27	6.10	1.13	-.43	.67
I was excited to see real animals	6.66	.81	6.67	.81	-.09	.93
Affective Scale Total Domain Score	6.34	.79	6.22	.84	1.37	.17