



Engaging Undergraduates in Comparative Psychology: A Case Study

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With many comparative psychologists teaching at small colleges and universities where resources are limited, maintaining a traditional animal laboratory housing rats or pigeons is not realistic for many of these researchers. One way to overcome this lack of overhead costs and extensive lab space, is to forge collaborations with local zoos and aquariums. Zoo and aquarium research projects provide a way to examine a wide range of species, which is an important tenet within the field of comparative psychology. Furthermore, many undergraduates are innately attracted to the prospect of working with exotic animals. Here, we propose utilizing visitor behavior research as a means to provide undergraduates with research experience within the field comparative psychology, as well as expose the general public to animal behavior research.

In Abramson's (2015) recent article, he outlined a *crisis* in comparative psychology. The article discussed several reasons for why comparative psychology is not maintaining the level of growth it once enjoyed. One noted problem was the lack of comparative research opportunities for undergraduates. In a response, Vonk, Hoffmaster, Johnson-Ulrich, and Oriani (2015) explained that many comparative psychologists ultimately end up at teaching colleges where resources are limited. Maintaining a traditional animal laboratory housing rats or pigeons is not realistic at many institutions, especially at small, liberal arts colleges. However, comparative researchers have been creative in finding ways for maintaining a research agenda and providing valuable experiences for undergraduates. For example, Furlong et al. (2015) detail the creation of a dog lab at Illinois Wesleyan University, which has been very attractive to students and community members, alike. Dog labs are gaining popularity with more being formed each year. These labs are an excellent way to provide undergraduates with an opportunity to obtain hands-on research in the field of comparative psychology (Hecht, 2015). Another way to overcome this lack of overhead costs and extensive lab space is to forge collaborations with local zoos and aquariums (Vonk et al., 2015). Zoo and aquarium research projects provide a way to examine a wide range of species, which is an important tenet within the field of *comparative* psychology. Furthermore, many undergraduates are innately attracted to the prospect of working with exotic animals.

However, a collaboration with a zoo or aquarium comes with many challenges. First, research is typically not a priority for these facilities, as they often have many competing day-to-day responsibilities to complete, and therefore not much time is available for behavioral or cognitive research. It also requires much tenacity to nurture relationships with the staff at these facilities. As someone coming from outside of the facility, the researcher must gain the trust of the animal caretakers, the management team, the veterinarian, the research committee, etc. After a solid relationship is formed, there is then the long process of receiving approval for a research project. For example, a recent study with Asian elephants took (LH) two years to receive final approval from the facility's research committee. Once the researcher obtains the approval from a site, the data collection becomes the next obstacle. When working with zoo animals, researchers are limited by the schedule of the animal department. Compared to lab animals, zoo species are more limited in the number of trials an individual may be tested on during one session. For example, it took over eight months to collect

enough data for a study on means-end behavior with just six elephants. At most, 10 trials could be collected for one elephant per day and only a few days per week (not to mention the times a research session was canceled at the last minute for severe weather!). Furthermore, while working with exotic animals such as elephants is very attractive to undergraduates, the number of student research assistants is limited by the number of different people who can access the animals, often due to restrictions in place by the facility. In response to these various limitations to zoo research, we propose utilizing visitor behavior research as a means to provide undergraduates with research experience within the field comparative psychology, as well as expose the general public to animal behavior research.

What is Visitor Behavior?

Visitors are fundamental to zoos and aquariums and their influence has led to a research area devoted to understanding their behavior. One area of interest has been to examine how impactful a zoo exhibit is on the casual visitor. The Association for Zoos and Aquariums (AZA) claims that zoo visitors will be inspired to make lifestyle changes and contribute to conservation efforts after seeing animals up close at their facilities (Hancocks, 2012). However, the evidence to support these claims is lacking. The majority of research on this topic has examined the effects of signs near exhibits displaying information about the animal and its conservation. Unfortunately, it seems that many visitors do not pay much attention to this type of information. For example, Churchman (1985) found that only 13% of the visitors to a tiger exhibit read the informational sign. While research has indicated that features such as letter size and pictures can increase the number of people who read the signs, it seems that the most important feature of an animal exhibit is its level of interaction or engagement with the visitor (Arndt, Screven, Benusa, & Bishop, 1993; Bitgood, Patterson, & Benefield, 1986). This engagement can come in many different forms such as training demonstrations, Q&A with a docent, interactive displays such as a computerized informational game, or live research. As researchers, it is that last one that interests us the most.

Animal behavior and cognition research is inherently accessible and appealing to the public, and so the opportunity to observe such research has the potential to engage zoo visitors in a very unique and positive way. To date, there have only been a handful of studies examining whether such an experience inspires zoo visitors more than normal signage. For example, a recent study examined the effect of various types of educational information on visitor behavior at a primate center (Bowler, Buchanan-Smith, & Whiten, 2012). Specifically, they found that viewing live, active science increased dwell time and visitor engagement when compared to videos on a loop and videos with a menu system. There is a need for further examination of whether observing scientific research at a zoo can increase the public's engagement with the species and ultimately increase their interest in wildlife conservation. Most zoo mission statements include something about inspiring guests to support conservation and so we believe animal facilities, even those reluctant to do research, would be interested in this line of investigation.

Enriching Animals and Guests: A Case Study

In an effort to examine visitor behavior, provide research opportunities to a large number of students, and expose the general public to animal research, we designed and executed a multi-institutional project examining the effect of engaging animals with environmental enrichment on visitor dwell time. We will detail the methodology here in an effort to inspire other researchers to execute similar projects at other facilities. We will focus on the educational aspects of the project in this paper as data are forthcoming. The project was

executed at two facilities (The Florida Aquarium, Tampa, FL; The Maritime Aquarium, Norwalk, CT). The stakeholders at the facilities were interested in the project as it would serve as enrichment for the animals, potentially increase visitor engagement, and help to better understand their visitors' behaviors.

Specifically, the project examined whether guest behavior at an exhibit changes when there was an active research session taking place or not. The active research in this case was an experimenter (with the help of aquarium guests) presenting animals with environmental enrichment at the exhibit windows on the guest side of the habitat. Several animal exhibits were utilized allowing for a range of different animals to be studied, including lemurs, otters, turtles, meerkats, and harbor seals. These particular exhibits were chosen because they each had a large viewing window, which could be utilized for displaying enrichment items from the guest side. A research trial required a total of three experimenters and a willing aquarium guest or guests. Generally, experimenter 1 was responsible for engaging the aquarium guests with enrichment items and answering questions. Experimenter 2 was responsible for recording the type of enrichment used and the behavior of the animals. Experimenter 3 was responsible for recording the behavior of the guests at the exhibit. All experimenters were trained undergraduates.

Student recruitment. Students were recruited in a number of ways including emails sent to pre-existing groups of students interested in participating in comparative psychology research. The students from Sacred Heart University responded to an announcement for Psychology majors about research offered as a Capstone in Psychology course. Most of the students were psychology majors, but the project also attracted students from other majors including marine science, environmental studies, and biology. The majority of the students who participated were at or above the sophomore level. Some students were encouraged to gain research experience based on their career goals during academic advising/mentoring and sought out the project. After the project began, the PIs were approached by newly interested students due to word-of-mouth. All of the students at Sacred Heart and several of the students at Eckerd elected to earn course credit for their participation. When course credit was awarded, the students were required to include additional academic components (e.g., a research paper, written reflections, presentation of poster at an Academic Festival).

During an individual semester, the student research team was divided into pairs of students and assigned a particular day of the week to conduct the research. With travel time, a research session would require approximately 3-4 hours of the students' day. This permitted the students to work around their weekly schedule of classes, and some student pairs went over the weekends. Travel to and from the facilities was a minor obstacle. Travel time from the schools to the respective aquariums was approximately 30 minutes. Since students were paired for research sessions, carpooling was utilized. Carpooling also permitted the students without a car to participate. At Eckerd there is club for students interested in comparative psychology research. This club provided gas money to students participating in the research (although, not all students took advantage of this perk). At Sacred Heart University, the Psychology Department was able to reimburse the carpool driver for mileage.

The principal investigators' time was dedicated to initial recruitment of the interested students. Once a group of potential students was identified, the PIs held an introductory research meeting (approximately one hour). This initial meeting introduced the students to each other and set the foundation for the research question. During the meeting, the students determined how the team would be divided into pairs, and which pair was assigned to the specific days/times. After the first semester, a student who worked on the project the previous semester would attend this initial meeting to talk about his/her experience on the project and provide useful advice or tips. The PIs then had 1-2 follow-up meetings with the research teams for more detailed training (also approximately one hour).

General procedure. At the start of a research trial, experimenters 1 and 2 stood next to an animal exhibit with a crate of pre-approved enrichment items that could be presented at the viewing window (e.g., window clings, a hand-held mirror, sticky balls, markers). Experimenter 1, the enrichment facilitator, would approach guests and ask them if they would like to assist with an enrichment project. The experimenter would briefly explain that the research project was to investigate which type of enrichment would elicit the most behaviors from the animals. Experimenter 2, the data recorder, was introduced to the aquarium guest as the person recording the behavior of the animal. The participating guest was allowed to use the chosen enrichment item by placing the item up to the window and trying to engage the animals' attention. In view of the participant, experimenter 2 held a clipboard with a datasheet and recorded the enrichment chosen and the reaction (or lack of reaction) by the exhibit animal(s). Therefore, experimenter 2 served as the live, in action research component. During the enrichment sessions, a third experimenter was unobtrusively observing the behavior of the non-participating guests (aquarium visitors who were walking or standing near the exhibit, but not participating in the enrichment activity). This researcher collected data on his/her cell phone using the Numbers App, so not to influence the behavior of the guests. Data recorded included overall dwell time and whether or not the guests read signage, asked questions, or took photos. Each enrichment session was matched with a session observing guest behavior during normal viewing times (no enrichment).

Outcomes

Overall, the project was a success in many ways. For the purposes of this paper, we will be focusing on the following outcomes: 1) benefits to the undergraduate students, 2) benefits to the facility, and 3) benefits to the field of comparative psychology.

Benefits to students. As Abramson (2015) points out in his article, the opportunities for students to pursue comparative psychology are limited at the undergraduate level. Our project provided an extensive experiential learning process for our students. Enrichment and visitor behavior are both research topics that are very straightforward and accessible to undergraduates, even those with no prior research experience. Through this research project, all of our students were able to familiarize themselves with primary literature searches, experimental design, and ethogram development before collecting any data themselves. The students were also able to gain important hands-on research experience by serving as experimenters. All of the students were cross-trained and were able to serve as all three types of experimenter (enrichment facilitator, data recorder, and unobtrusive observer). Therefore, each student developed their skills in observing animals, observing humans, random sampling, utilizing ethograms, subjective rating, administering enrichment, clandestine research, and engaging with guests. Furthermore, the students were involved in developing innovative data collection techniques (i.e., using smartphones while unobtrusively observing visitors at the aquarium). The students also utilized their critical thinking and flexible thinking skills when faced with obstacles, such as unresponsive animals or overly enthusiastic schoolchildren. The students also gained experience working with aquarium staff, including animal husbandry teams. Learning the ins and outs of a zoological facility provided these students with invaluable knowledge related to careers in this field. The students also needed to be proficient and knowledgeable about the field of comparative psychology, for example understanding and being able to explain to aquarium visitors topics such as mirror self-recognition abilities, familiar versus novel object discrimination, and play (specifically object play) in non-human species. Finally, the students were able to fine-tune their public speaking skills, which is an important part of many jobs.

Overall, the students saw their work on this project to be very valuable. It provided them with an opportunity to experience both the joys and frustrations of research. A total of 14 students participated in this study over four different semesters (two years). Additionally, the enrichment and visitor behavior research was simple enough procedurally to allow for the more experienced undergraduate research assistants to help train new students to work on the project each semester. This provided leadership experience for the undergraduates interested in going on to graduate school or a career in comparative psychology. A couple of students took on the leadership role as the “research team coordinator”. These students were responsible for helping to train new undergraduate research assistants as experimenters, coordinating with the aquarium staff and the group of research students regarding scheduling for the enrichment sessions, and organizing and collating all of the data collected. Additionally, one of the students who worked with us on this study applied for and received an internal university undergraduate research grant for her work on this project.

Many of the students have continued to pursue their interests in comparative psychology and credit this research experience as being very influential. One student noted that “by helping with the study I gained the necessary hands-on research experience I needed to be a confident research assistant. I learned how to properly observe and record data, which is a key factor in any study.” This student went on to serve as an Animal Research Intern at Busch Gardens Tampa Bay where she helped design and execute research with giraffes, elephants, and insectivores. Students also credited their experience with affecting their view of the role of zoos and aquarium. One student wrote: “This project made me think critically about how animals in human care can be impacted by guests. It was the first time I deeply considered how guests can engage animals as well as be engaged by animals (both positively and negatively). These discoveries have been important for me to keep in mind as I have worked on other research and have impacted how I speak with and relay information to guests/zoo visitors. Observing people as they viewed animal exhibits also showed me the huge impact that a human interpreter/trainer can have on a visit to a zoo or aquarium. The project also got me very interested in learning more about how some animals can be engaged without direct contact.” This particular student is currently an Animal Behavior Research Assistant at Disney’s Animal Kingdom. She assists the Science Operations team with behavioral data collection and analyses for a number of different species.

Some of the other current jobs of our past research assistants include: Animal Care Specialist at The Green Planet, Deckhand Educator with World Ocean School, dog trainer at PetSmart, Research intern at a dolphin research facility, and husbandry staff at SeaWorld. In addition, some of the students have continued their academic pursuits in graduate school using this invaluable research experience as a stepping stone in the application process for a Master’s or Ph.D. program in Psychology.

Benefits to the facility. As staff at zoos and aquariums are often over-extended with their various duties, it was a benefit to have additional enrichment being presented to the animals as part of this study. Our data indicated that the guest enrichment at the windows was effective at engaging the animals. Furthermore, we were able to share with the facilities which enrichment items elicited the most interest from the animals. For example, the window clings were especially effective in eliciting an interactive behavior at the windows with the turtles, and the otters and meerkats were especially intrigued by the mirror. During these enrichment activities, these species stayed and interacted for longer durations and had higher subjective ratings of perceived interest. This information was useful to the animal care staff. Furthermore, this project provided the aquariums with information about the behavior of their visitors. As we collected data during both enrichment and non-enrichment sessions, we were able to provide the facility with information about how visitors normally engaged with the exhibits, and if having enrichment sessions changed their behaviors. The most important outcome was the increase in the visitors’ dwell time at an exhibit where active research was taking place. This also led to an increase in other visitor behaviors such as asking questions about the species. The facilities can

use this information when planning future interactive exhibits. Of course, more research is needed to determine whether increased dwell time translates to a lasting change in attitudes or an increase in conservation-related behaviors.

Benefits to the field of comparative psychology. Based on our findings, when enrichment research was taking place in view of the general public, the aquarium visitors increased engagement with exhibit. When the visitors stay longer it can lead to an increased opportunity for education. Regardless of whether or not the visitors asked questions for that trial, if they appeared interested and observed the enrichment research, then the experimenters had an audience to explain further about animal cognitive abilities. For example, when using a mirror as an enrichment device the experimenters would always explain to the visitors the concept of mirror self-recognition. The experimenters would first explain Gallup's (1970) mark test and research findings with chimpanzees and relate the development of this ability to human children of about two years of age to make the topic relatable to visitors. Then the experimenter would discuss what the field of comparative psychology knows about self-awareness research from several species, that is, monkeys attacking mirrors as if it was a conspecific threat (Gallup, 1977) to other species recognizing oneself using the mark test: dolphins (Reiss & Marino, 2001), elephants (Plotnik, deWaal, & Reiss, 2006), and magpies (Prior, Swartz, & Güntürkün, 2008). This information was prepared by the experimenter based on questions that visitors may have related to the enrichment, and it often elicited further questions or discussion with visitors.

Harley, Fellner, and Stamper (2010) have been engaging the public with dolphin research demonstrations for many years at Disney's Living Seas. They found that guests remain at the exhibit for four times longer when a research demonstration is occurring than when not. Alba, Leighty, Courte, Grand, & Bettinger (2017) also suggested enhanced visitor learning opportunities occurred while box turtle color discrimination task research was taking place on exhibit in view of the public. The opportunity to engage the general public on facts and current research in comparative psychology is an exciting and possibly underutilized resource. Often the visitors of aquariums and zoos are families with children or larger groups of school-aged children on field trips with camps or schools. Therefore, this type of enrichment research with visitor interaction would provide a unique experience for younger aquarium guests. In our experience, it was often the school groups or the families with young children who were most interested in participating at the windows with enrichment. The children were very enthusiastic about *helping* with research and seemed excited for the opportunity to *play* with the animals in an approved way at the windows. In addition, the school groups/families with children tended to stay longer at the exhibit when enrichment research was taking place. Also, the chaperones asked more questions as a way to educate the children. We hope that the children who participated in our enrichment sessions came away with a deeper understanding and interest in animal behavior.

Conclusion

The purpose of this paper was to describe a research project that can potentially be completed at any type of animal facility, and engage a large number of undergraduates in the research process. Most animal facilities are invested in their guest experience and the welfare of their animals, and this enrichment project meets both of these criteria. It provides the facility with information about the experience of their visitors and a way to potentially increase guest interaction with an exhibit. Furthermore, utilizing enrichment with students provides the facility with an extra opportunity to offer enrichment to their animals without keepers or animal caretakers present. Even if a facility is not open to the enrichment aspect of this project, examining visitor behavior is still worthwhile to both the facility and the undergraduates. For example, most animal facilities have a daily schedule where certain species are highlighted with a feeding or training session. It would be

helpful to know whether these sessions affect visitor behavior in any way. Often, the facilities do not have the staff available to examine this question, and so utilizing undergraduates would be an ideal solution while also affording a unique research experience for the undergraduate student. We would like to encourage relationships between zoos/aquariums and local colleges/universities. In his recent book, *Professor in the Zoo*, Terry Maple (2016) testifies about these relationships: “Once mutual benefits are explored by academic and zoo leaders, partnership is relatively easy to implement. To make it happen, both sides must acknowledge the value that each partner brings” (Maple, p. 90). It has been our experience that these relationships provide bidirectional benefits, enriching both the students’ education and the facilities’ work.

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