

Evaluating Education Models for Early Years at Zoos Victoria



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An Interactive Qualifying Project
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfilment of the requirements for the
degree of Bachelor of Science

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Date:
17 December 2013

Report Submitted to:

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This report represents work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review. For more information about the projects program at WPI, see <http://www.wpi.edu/Academics/Projects>.

Abstract

To assist Zoos Victoria in their goal of creating a new educational program that promotes learning throughout the day, we evaluated the three educational programs currently offered to school groups at the Melbourne Zoo. Through observations, interviews, and surveys we evaluated how well the three models engaged students and encouraged student connections with nature. We determined that the New Model proposed by the zoo effectively engages students, but the older Educator-led Model also engages students and is preferred by teachers and zoo educators. This reticence may reflect in part a lack of familiarity with the New Model and we suggest several recommendations to improve each of these programs in the future.

Acknowledgements

The WPI IQP team, infamously known as ‘The Zoo Crew,’ working at the Melbourne Zoo would like to thank everyone that was involved in helping make this project a success. We’d like to thank our sponsors Cyrelle Field and Donna Livermore for providing us this opportunity to work with this amazing organization and for offering their knowledge, support, and encouragement throughout our entire term in Melbourne. Again, thank you so much for making us feel welcome and part of the team through these last seven weeks.

Additionally, we want to thank the Learning Experiences team at Melbourne Zoo for allowing us observe their programs and always being open to answering our questions. We appreciate them offering their expertise and experience in teaching, which was extremely helpful during this research process. We would like to thank every educator who was involved in the implementation of the New Model. We appreciate you all for accommodating us and doing everything possible to make sure we completed our observations to the highest possible quality. The Learning Experiences Team made us feel at home, allowing us to open up and completely enjoy the experience we have had here. By providing us laughs, trivia, honey comb, and fruit loaf galore, we loved every day at the Zoo. The Zoo has changed our outlook on the conservation messages and made us aware of the changes we will be implementing in our daily lives.

Lastly, we want to thank our WPI professors for your support, encouragement and guidance without which, our project would not have been possible. We’d also like to recognize Professor Golding and Professor Bunting for the help they have provided us with in research, data, organization, and overall refinement of our project. We’d like to acknowledge Professors Golding and Professor Ault for giving us this opportunity to travel to Melbourne, Australia, complete our IQP, and providing us with the knowledge for this project and teamwork skills that we will value for the rest of our lives. We deeply appreciate that you spent the time to review our project work and supported us every step of the way.

Executive Summary

Zoos began simply as venues that showcased animals, but today they focus on aiding in the fight against animal extinction. To further this mission, they have established many educational programs, which give visitors an informative and engaging educational experience. These experiences leave visitors with an appreciation for nature and the knowledge to implement conservation actions. Each year, over 16 million people visit zoos and aquaria in Australasia and Zoos Victoria has over 2 million visitors per year (Zoos Victoria, 2013). Zoos have used many approaches to deliver conservation messages and have found students to be an effective group who will be more likely to change their behaviour than average visitors. Research studies have been conducted showing that visiting zoos can positively affect learning, attitudes, and behaviours.

Zoos Victoria is in the process of establishing a new educational program that will encourage self-directed learning and free play to create a lasting connection with nature. By targeting younger students especially, Zoos Victoria hopes to instil a lifetime appreciation for wildlife and conservation.

The goal of this study was to assess the effectiveness of a new educational delivery model recently deployed at The Royal Melbourne Zoo. The project team identified four objectives necessary to achieve this goal. The project evaluated approaches to the delivery and evaluation of learning experiences at zoos in general; clarified the goals of Zoos Victoria regarding the new educational model; evaluated the new educational delivery model, known as the New Model, in comparison to the other two models at Zoos Victoria, the Educator-led Model and Self-guided Model; and recommended how the new educational model at Zoos Victoria might be improved.

The project involved a mixture of methods including a site visit to another zoo, interviews with zoo educators and school teachers, observations and tests of participating students, and chaperone and parent surveys. The group conducted interviews with the zoo educators to clarify the goals of Zoos Victoria as an organization and the goals of and rationale for the New Model in particular. These interviews gave us insight from the perspectives of the educators who will be teaching the New Model, including the advantages and disadvantages of the three different models offered. We then evaluated the new educational model by comparing

it to the two models already established at the Melbourne Zoo. Our team observed groups of students as they traversed the zoo, recording information about their engagement and time spent at exhibits. We conducted evaluations at the beginning and end of each school visit to gauge any change in student appreciation for nature and to better understand student expectations of the zoo. Additionally, we distributed parent take-home surveys to examine the retention of interest and overall awareness of nature. We also distributed surveys to the chaperones who accompanied the students on their visit to the zoo to examine how they perceived their role. Finally, we interviewed teachers following the visit to the zoo to determine their opinions about expectations for the visit, changes in student learning and behaviour, and the logistics of the visit and program model.

We have drawn a number of conclusions based on our research and evaluation data. Firstly, zoos continually strive to develop better exhibits and programs based on educational research and feedback from school groups and other visitors. Zoos Victoria is experimenting with a New Model to create a full day learning experience. Since the New Model has only been in trial for the past month and is by no means finalized, future additional evaluations will be necessary. Nevertheless, based on the data we collected from 26 school groups, we are able to identify advantages and disadvantages to each of the different programs and how these programs are perceived by zoo educators, teachers, chaperones, and students. The New Model is partially effective in creating a stronger bond with nature than other models. The Educator-led Model is more effective at capturing students' attention and is preferred by teachers and zoo educators for this age group. The Self-guided Model was more effective at creating a lasting connection and increasing student excitement during and after the school visit. Finally, chaperones are an important part of a zoo visit and influence learning outcomes and the overall zoo experience; however, many appear to not recognize their importance or appreciate the powerful role they can play by engaging students in order to enhance their learning.

Since the new model is in its infancy, the Melbourne Zoo will reevaluate the current program and derive a new educational model, which will eventually be offered as an option for schools. Keeping this in mind, we recommend that the Melbourne Zoo make the following changes. We recommend the zoo continues to modify the model delivery and content based on feedback and lessons learned from Zoo Educators and School Teachers. From our experience, it is inordinately difficult to get evaluation feedback from teachers and chaperones. We suggest

the Zoo consider offering incentives in order to increase return rates on surveys. Since data entry and analysis is time consuming, we suggest that the Zoo approach local university or high school students to assist in this process. Once a revised version of the New Model is developed, we recommend that the educators reach out to schools and teachers to better explain the value and virtues of the New Model program, in order to familiarize them with the model and remove inhibitions they may have about signing up for the model.

We further recommend that Zoos Victoria convene a roundtable of educators to solicit feedback on the New Model, and identify problems and solutions. Regarding all three models, we recommend that the Melbourne Zoo develop more supporting materials for schools, teachers, and chaperones to use prior to, during, and after the visit. Our findings suggest that if some teachers and chaperones were better prepared for their visit, the students would likely be more engaged and their quality of their educational experience would improve. In particular, it appears that many chaperones are unclear about their roles and, specifically, need advice about how to engage their student groups more effectively to promote learning. We recommend that the Melbourne Zoo reassess all of the three program models to determine the advantages and disadvantages of each. Finally, we have a set of relatively modest suggestions about how to improve the delivery and quality of school visits based on our observations of the logistical issues that present themselves on a daily basis.

In regards to the visitor's experience at the zoo, we recommend that Zoos Victoria post more comprehensive signage to educate an audience with a wider age range. We further recommend that Zoos Victoria's ticket office post a list of animals which are off exhibit, to be updated daily in order to set realistic expectations for the zoo visit. Additionally, we suggest the Learning Experiences Department remind teachers to travel in smaller groups to support a better visit, provide a list of suggested questions and important facts to the teachers to distribute to the chaperones, and develop a list of suggested paths for school groups to follow to reduce unnecessary walking around the zoo. Finally, we propose that the Learning Experiences Department adapt the New Model for use by older students and standardize evaluation protocols and instruments in order to regularly gather and easily analyse feedback from teachers, chaperones, and students in the future.

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1: Introduction

Zoos are popular destinations that attract a wide variety of people. Each year, over 16 million people visit zoos and aquaria in Australasia, including 12.5 million Australians and New Zealanders. Zoos do much more than simply provide viewing entertainment however; they teach the visitors about the importance of nature and preserving it for future generations. For example, the Australian Zoo Aquarium Association (ZAA) directly supports its members by overseeing more than 100 conservation breeding programs for a range of species, many of which are threatened or endangered.

In spite of these efforts, the number of endangered and extinct species increases annually. For example, the World Wildlife Fund (WWF) estimates that every year between 200 and 10,000 species go extinct (Biological Diversity, 2013). According to the Australian Wildlife Conservancy, Australia has the highest mammal extinction rate in the world and 18 species of Australian mammals have gone extinct in the last 200 years (Australian Bureau of Statistics, 2013). The ZAA notes zoos and aquariums across Australasia are home to more than 200 native species and over 150 exotic species that are included on the International Union for Conservation of Nature's Red List of endangered species (International Union for Conservation of Nature, 2013). Currently, 20% of the remaining Australian mammal species are threatened with extinction. Many zoos have made conservation the keystone of all their activities and the international Aquarium and Zoo Association (AZA) requires its members make conservation an explicit part of their missions in order to be accredited – a dramatic change from prior zoo practices.

From their beginning as venues that showcased exotic animals, zoos have developed into institutions dedicated to saving endangered species and educating visitors about wildlife conservation. Zoos today focus on maintaining their collection of animals, conducting research, developing conservation-based projects, and using this knowledge to educate their visitors. This new focus on conservation education has become a major part of the mission of most zoos. It allows them to tie their animal collections, research, breeding programs, and education together to shed light on the importance of protecting habitats and saving the wildlife around us.

To further their missions for conservation education, zoos have been able to couple specially designed exhibits and supporting programs and materials, which gives visitors an

engaging educational experience. There is a growing body of research supporting the valuable contributions that zoo exhibits and educational programs can make to conservation education (Esson, Francis, & Moss, 2010). Some experts question the short- and long-term educational effectiveness of such programs, however (Marino, Lilienfeld, Malamud, Nobis, & Broglio, 2010). Zoos have used many approaches to deliver their conservation messages through programs and exhibits, yet the public may still not change their behaviour in response to these messages. Consequently, zoo educational departments continuously strive to develop more effective educational models.

Zoos Victoria is in the process of developing a new educational program, which they hope will bring them one step closer to reaching their ultimate goal of becoming, “the world’s leading zoo-based conservation organization, the Australian authority on captive holding and management of native threatened species, and the major facilitator of wildlife knowledge for conservation action” (Zoos Victoria). Zoos Victoria has three learning models that it offers to visiting schools: (1) Educator-led, (2) Self-guided, and (3) the New Model, which is a hybrid of the first two and was designed to allow the student create their own adventure. The Educator-led Model entails a 45 minute lecture by a zoo educator in addition to an excursion through the zoo under the guidance of the school teacher and parent chaperones. The Self-guided visit comprises of an excursion through the zoo under the guidance of a school teacher and parent chaperones. The New Model involves interactions with zoo educators at various points during the visit for brief lectures and educational activities. Under the New Model, the teachers and chaperones are also given additional advice and materials to help them structure their visit to the zoo. The goal of this New Model is to promote learning throughout the entire day, compared to a model where learning takes place in a timed lecture environment or at the discretion of the lead teacher. The zoo wants to compare the three models to determine which is most effective at engaging students and developing a lasting connection with nature.

Through research, observation, and interviews we evaluated the effectiveness of the models, identified the most effective model, and extended suggestions for improvement on all of the models. We observed school groups between the ages of 4 and 8 years, tested them with a pre and post comparative test and conducted a number of surveys and interviews with teachers, zoo experts, chaperones, and parents. Once we collected the data, we developed procedures to evaluate which model was most effective. The evaluation was used to suggest recommendations

to the zoo, allowing them to make informed decisions to further their educational programming for future school groups.

2: Literature Review

Worldwide, over 600 million people visit zoos each year (Gusset & Dick, 2011). Zoos today do much more than entertain visitors, they also maintain animal collections, conduct research, and promote conservation and education to children and adults. Increasingly, zoos have designed their educational efforts to make visitors more aware of the need for conservation and what they can do to protect habitats and promote conservation at the local and global levels. Great importance is given to educating children, as they are most likely to change conservation behaviours after a day at the zoo. Through animal exhibits, in house programs and activities, and community outreach the zoo provides a broad range of programs to educate students. It is for this reason that zoos are working to improve conservation education. Historically, zoos have not always had a conservation education focus, however.

2.1 Mission Statements of Zoos

The original purpose of a zoo was to entertain those who wished to observe animals not naturally present in their daily lives. When the first zoos were founded, more than half of the human population lived in urban centres (Miller & Conway et al., 2004). Zoos, such as Zoos Victoria, typically showcased exotic animals to entertain rather than educate visitors. Zoo also had less concern for the health of the animals both in their care and in the wild. Animals were perceived as inferior to humans and were not well cared for. It was not until animal psychological studies were conducted and evolution developed as a theory that animals were perceived as sentient beings comparable to humans (Stevens & McAlister, 2003). This change in perception spurred protection of exotic animals and conservation became a primary objective of zoos.

With a new perception of animals, zoos began to take on a larger role than providing entertainment to people on weekends (Gusset & Dick, 2011). Concerns over human population increase, endangered animal habitat destruction, and natural resource depletion have led to an increased emphasis on conservation. Research on conservation has increased hand-in-hand with the number of organizations attempting to protect habitats and endangered species worldwide (Gusset & Dick, 2011). In order to get accredited by the AZA (Association of Zoos and Aquariums, 2013), a zoo must have a mission statement that shows a commitment to conservation (Patrick, Matthews, Ayers, & Tunnicliffe, 2007). Patrick found that of the 136 accredited zoos in the United States, 131 zoos mention education, 118 zoos mention

conservation, and 44 zoos mention education in reference to conservation in their mission statements (Patrick & Matthews et al., 2007). Zoos practice conservation when they reintroduce previously injured or specially bred animals into the wild. Zoos can also demonstrate advocacy through local and global programs designed to protect habitats of endangered animals. Although these programs demonstrate advocacy and help further the missions of zoos, they are costly to develop and implement.

As the mission statements of many zoos indicate, one of the primary objectives of today's zoos is to educate visitors about the importance of conservation and to promote long-term action (AZA 2013). This educational function is primarily achieved through school programs, demonstrations, and exhibits of live animals (Ballantyne, Packer, Huges, Dierking, 2007).

Animal demonstrations allow visitors of zoos to experience and appreciate hands-on encounters with nature. These encounters with animals are what influence people the most during their visit to the zoo and are the most likely to cause them to change their attitudes or take long-term action. The appearance of the exhibits also influences the way zoo visitors interpret conservation efforts.

2.2 Zoo Exhibits

Modern zoos present their animal collections in increasingly sophisticated and naturalistic enclosures that are a major improvement from the barren cages of previous decades. Research has shown, that “visitors find realistic or natural enclosures to be more attractive and they will be more apt to spend time observing and learning about the animals which are presented in this manner” (Shettel-Neuber, 1988; Johnston, 1998). In 1998, Johnston surveyed 500 people viewing polar bears at ten exhibits across six different zoos in the United States. He found that “as the naturalism of the exhibits, the size of the exhibit, and the size of the zoo increases, so does that time spent viewing the animals” (Johnston, 1998). Moss, Esson, & Francis describe how zoo exhibits have evolved (2010). Zoos of the late 19th and early 20th centuries displayed first generation exhibits comprised of barren cages, which made no pretence to mimic the animals’ natural environment. The second generation exhibits were designed to appeal more to visitors and to replicate some aspects of the natural habitat of the animal, (e.g., provide swimming and climbing areas), though they are typically made of bare concrete or metal. Today, the most intricate third generation exhibits are designed to mimic the natural habitat of the animals, which appeals both to the animals on display and the visitors observing

them. These enclosures are constructed for the appropriate natural group numbers of the species and have flora and space requirements to meet the needs of the species. Also, the barriers between zoo patrons and animals are designed to encourage audience immersion and promote hands-on education (Esson, Francis and Moss, 2010). Shettel-Neuber distributed questionnaires to about 100 visitors at second and third generation primate exhibits at the San Diego Zoo (1988). She found that more visitors were attracted to the naturalistic exhibits, stayed longer at the exhibits, and expressed a preference for the more naturalistic enclosures (Shettel-Neuber, 1988). Due to this preference for third generation exhibits, many zoos have implemented the third generation exhibits to attract visitors and encourage conservation education. This is a very expensive process and such exhibits will be introduced to most zoos gradually over the next few years.

Third generation exhibits can play a key role in zoo education. With properly outfitted environments that convey the natural habitat of the animal, visitors can learn about where and how the animal lives, as well as its interactions with other animals. “By adopting this approach, the mood of the exhibit can contribute subliminally towards public education and when supported by a number of interpretive elements including signs, sensory experiences, and interactives, the exhibit message can be further consolidated” (Moss & Esson et al., 2010). The coupling of appropriately designed exhibits and supporting materials gives visitors a full educational experience outside of the classroom. For visitors with an interest in animals, well-designed interpretive displays can effectively convey key environmental and conservation messages (Moss & Esson et al., 2010).

2.3 Motivations and Expectations of Zoo Visits

Based on research findings from visitor studies and exhibit evaluations, zoos are trying to design better exhibits and programs that appeal to and attract a wide variety of audiences. By expanding the audience range, zoos have been able to develop programs for visitors to ensure that each visit is beneficial in teaching about conservation. Zoos have conducted many evaluations of exhibits, taken surveys, and conducted research on how to attract audiences with a specific teaching goal in mind. This being said, survey outcomes and feedback have brought changes to the zoo, making changes to the exhibits to further help with teaching goals. These goals connect the programs which are developed at the zoo to each specific exhibit, making the teaching more closely integrated with each animal involved. One of the most important criteria

for these programs are that they are applicable to younger audiences since the majority of visitors to zoos attend as part of a family group or school groups.

People go to zoos for a variety of reasons and use them in different ways. Falk, Reinhard, Vernon, Bronnenkant, Heimlich, and Dean explain that about half of zoo visitors attend with one of five “dominant identity-related motivations,” while the rest have other motivations for their visit (Falk et al., 2007, p. 12). Falk et al. distinguish between five types of visitors based on their dominant motivation: “Explorers” seek to learn more about everything they might encounter at the zoo; “Facilitators” want to learn about others in their tour group as a “social learner;” “Professional/Hobbyists” are interested in being there to apply or further their knowledge, which they are passionate about; “Experience Seekers” attend simply to have said they attended and took part at this famous attraction; and finally “Spiritual Pilgrims” seek a deeper experience. Different individuals and groups have different motivations for visiting, but each expect the experience to help complete their “identity” in some fashion (Falk et al., 2007, p. 12-13). Visitors seek to make a connection between themselves and the animals and zoos try to design exhibits to promote an educational experience that meets each visitor’s expectations.

Zoos design exhibits that cater to different types of audiences, with various knowledge and interest, learning styles, and motivations. For example, for ‘Facilitators,’ zoos need to offer “opportunities for social interaction at exhibits and during programs, such as opportunities to talk with staff” (Falk et al. 2007, p. 12). Parents who attend zoos with children are a primary example of ‘facilitators.’ Parents want the zoo to provide information, activities, and opportunities to support them and their children in this style of facilitated learning within the zoo. Another group, the “Explorers” tend to be interested in new and surprising opportunities such as challenging new information or temporary exhibits (Falk et al., 2007, p. 12). The “Experience Seekers” of the world, look forward to seeing unique programs that will help them learn. This group has the “least knowledge and lowest expectations for their visit,” therefore it is essential for the zoo to offer a program which is different than any other for this group (Falk et al., 2007, p. 13). The zoo must engage the “Professional/Hobbyist” group using themed evenings after closing hours or first-class programs that will allow them to achieve superiority within their personal endeavours. And finally, the “Spiritual” group should have the ability to reflect on their visit. When the zoo appeals to different learning styles, zoos are able to encourage a wider audience to connect with animals.

Numerous research studies have been conducted to analyse how visiting a zoo affects our learning, attitudes, and behaviours. Falk et al. examined visitor learning comprehension a year after visiting a zoo (2007). They found that 61% of all visitors interviewed were able to talk about what they learned from their prior visit and 35% reported that the zoo visit reinforced their, “existing beliefs about conservation, stewardship and love of animals” (Falk et al., 2007, p. 4). Fully, 54% of the respondents said they had an, “elevated awareness of their role in conservation as a direct consequence of their visit” (Falk et al., 2007, p. 4). Conversely, critiques such as Marino et al. counter these results by saying, “with regard to knowledge, however, Falk et al. assessed only what responders said they believed or understood; they administered no direct measures of knowledge” (Marino, Lilienfeld, Malamud, Nobic, & Broglio, 2010). In an effort to improve these statistics, zoos have developed and evaluated different methods intended to encourage conservation education.

2.4 Education at Zoos

Educational programming at zoos occurs outside the classroom in an informal setting. This gives zoos the freedom to conduct learning in less traditional and more progressive ways. Children seek to identify their own space in the adult world as they grow older, and outdoor play allows them to create this space without influencing factors from adults who provide for them (Sobel, 2002). Outdoor play shows children a changing environment that is still inherently natural and allows them to freely play and gain a sense of self-awareness that cannot be acquired through structured play. Because much indoor play (e.g., video games) is structured, children cannot truly engage emotionally to the natural world (Sobel, 2002). Self-directed learning is a new approach that zoos are beginning to incorporate into their educational models. This type of learning places the responsibility of identifying what and how to learn into the hands of the student. By doing so, students tend to engage more with what they are interested in and learn more than in a traditional setting (Elkind, 2006). To promote a stronger connection between young children and nature, zoos are also developing spaces that focus activities on self-directed learning and outdoor play. Through outdoor play, children learn that living things such as plants and animals can change in appearance, but are still the same living thing.

2.5 Conservation Education in Zoos

Young children gain the necessary foundation for future conservation action through nature appreciation. Previously, all ages were taught conservation in the same manner. Students

were told conservation horror stories from distant continents over which they had little or no control (Sobel, 1995). In younger age groups, these messages could be particularly damaging and could even deter them from taking future conservation action. This “doom and gloom” approach may be more effective with older adults, but programs for younger groups should focus on developing an empathetic connection between the child and the natural world. A strong emotional connection can be fostered through play, activities, and encounters with animals (Sobel, 1996).

Educating school groups about conservation is a key function of zoos. The three sites that comprise Zoos Victoria (i.e., The Royal Melbourne Zoo, Healesville Animal Sanctuary, and Werribee Open Range Zoo) attract more than 160,000 school visitors each year and rank second among organizations that educate the most students outside the classroom in the state of Victoria, Australia (Zoos Victoria, 2013). School groups generally consist of a class of students, parent helpers or chaperones, and a teacher that travel to the zoo as a field trip to encourage informal education and hands-on learning outside of the classroom environment. Well executed school trips are important to the conservation education of younger children to encourage appreciation of animals and their habitats (Ettlin, 2009). A well-constructed education curriculum, centred on the school field trip to the zoo, exposes students to the importance of conservation.

Schools are an important audience segment for zoos because they can be used most effectively to promote the conservation goals of zoos. School groups allow the zoo to reach many people at one time. A simple visit to a zoo may be a ‘gateway experience’ that sparks a lifelong passion for some students (Meiers, 2010). These passionate individuals are exposed to exhibits that are designed to resemble the natural habitat of animals, which allows the species to behave more naturally within the zoo environment. These exhibits are designed to “attract the attention of the visitors and stimulate them to read the signage” (Meiers, 2010). Inviting exhibits help visitors to be more motivated and possibly increase their desire to learn more about the animals they are viewing. (Andersen, 2000).

Zoos aim to connect visitors with what they are seeing and experiencing on a new intellectual level, using the signs and exhibits. By allowing the visitors to develop an intellectual and emotional tie to the animals, they are able to understand the main messages when information is presented to them and find new meanings and develop new viewpoints as well.

This helps to ensure that they understand and take home larger messages and may result in a “rich and powerful learning experience” (Mony, 2007).

More developed second and third generation exhibits highlight interactions between animals and patrons. One study showed that visitors who attend talks or demonstrations with live animals are, “more likely to correctly answer questions about the animals and more likely to support conservation activities than those who merely observe the animals in an exhibit” (Swanagan, 2000). Starch surveyed 801 visitors at four different marine parks and aquariums in the United States and found that, “almost all visitors (97%) regarded interacting with and observing animals as both enjoyable and very educational, valuing these interactions most highly as ‘educational tools’” (1998, p. 27). The study showed that the visitors retained information on the animals’ habitats as well as conservation-related aspects and ways to help preserve these animals well-being (Ballantyne & Parker et al., 2007). The study shows that animal encounters are essential for relevant and effective new programs.

While there is a consensus among zoo educators that zoo visits and programs can have substantial educational value, Marino et al. assert that there are few good data demonstrating the impact on knowledge and attitudes about conservation, although their criticism is primarily a methodological critique of the work conducted by Falk et al. in 2007 (2010) .

2.6 Conservation Education for Students at Zoos

Zoos are continually redesigning their educational programming in order to better meet the needs of their audiences, including school groups. Conventional methods regarding environment education in zoo settings assumed that, “simply exposing primary school children to wild animals [would] result in cognitive gain and improved attitudes towards wildlife conservation” (De White & Jacobson, 1994). These ideas have changed, however, and new programming has been developed.

Zoos around the world offer many different educational models to educate school groups. For example, zoos like the Toronto Zoo in Toronto, Canada use full-day workshops in an “indoor space that offers protection from the elements, while boasting unique and amazing animals and plants for you and your students to learn about” (Toronto Zoo., 2013). They offer different grade levels workshops incorporating varied educational topics related to their learning in school. By contrast, the Singapore zoo offers a 45 minute program for school groups with zoo educator in addition to downloadable worksheets targeting particular learning objectives that can

be completed by specific age groups. Objectives for the programs included: “identify the different types of animal homes, learn about the different materials animals use to build their homes, learn why animal homes are fast disappearing and how you can help” (WLR Singapore, 2013). However, in developing countries, the “educational materials, if available, often are designed intuitively and they do not add the effectiveness of print and audio-visual media,” which meets the standard level of the needs of the local teachers and school curriculum (De White & Jacobson, 1994). The zoo must help its residents to aid in their education. Though there are a lot of differences, the methods are overall very similar to the programs offered at Zoos Victoria, showing that there is a similarity with zoo education throughout the world.

In Australia, as part of the AUS-VIC education curriculum, the early years must cover a broad range of science topics. From biological science to nature and development science, to science inquiry, zoos aid in helping to build this vital connection with science and nature. According to the Australian Curriculum Assessment and Reporting Authority (ACARA) website, at the Foundation level students learn about living things and their basic needs such as water and food. Regarding Nature and Development, students learn about exploring and observing the world around them using their senses. The Zoos Victoria is developing new educational programming must reflect the schools’ curriculum, so that the learning that takes place at the zoo mirrors the teachings happening within the classroom.

Each age group has a different experience when they go through the zoo’s learning models and this can depend on background knowledge in science. In general, the younger the student, the less they know about conservation concepts, but targeting young students when they are still developing their value systems may have a greater and longer-lasting impact (Pintrich, 2000). These different models are used to convey the conservation ideas.

The purposes of zoo visits are not only for entertainment, but for informative and educational purposes as well. Schools choose the educational program based on their curriculum requirements and the ages of the students. Teachers are held responsible for organizing and planning the content for field trips to the zoo with input from the zoo educators. While at the zoo, teachers must engage their students to continue learning outside of the classroom. Several authors assert that strong teacher student interaction leads to a positive learning climate, which encourages independent learning (e.g., De Boer, Bosker, & van der Werf, 2010; Jussim & Harber, 2005; Rosenthal, 1994). Students need to be engaged in order to facilitate their learning.

To increase visitor engagement, new learning models must concentrate on making connections to relevant themes that interest students.

2.7 Zoos Victoria Education Models

Zoos use a variety of educational programs to excite interest in conservation.

Educational models or structures are developed in zoos to give visitors a defined program that guides their educational experience. The Zoos Victoria implements three different models with the goal of meeting the different needs and preferences of different teachers and school groups. The three educational experiences that the Zoos Victoria offers are summed up as zoo Educator-led, Self-guided and the New Model. Each model is priced differently and offers different structural components to the zoo visit (Zoos Victoria, 2013).

The Educator-led Model includes a 45 minute education session by one of the zoo educators in a classroom at the zoo. This session is preceded and followed by the teacher from the school leading his class around the zoo and observing animals. The Self-guided Model has no interaction between the school group and the zoo educators. The school group is led around the zoo by their teacher and observes the animals for the duration of their visit. The New Model extends the traditional 45 minute education session from the Educator-led Model throughout the day. The zoo educator meets the school group at the beginning of the day and gives them a 10 minute introduction related to the unit that the class was covering at school. Then the school group is led by their teacher to observe the animals around the zoo, however periodically they stop at activities that are presented at different locations in the zoo. The New Model currently includes two activity stations. One station includes multiple activities and the groups are encouraged to “drop in” for periods of up to 45 minutes. The second station is located in a different part of the zoo and consists of one activity that the students can take up to 15 minutes to complete. At the end of the New Model visit the school group meets with the zoo educators for a final time to reinforce the learning that occurred throughout the day. A summary of the key features of each model is shown in Table 1.

	Educator-led Model	Self-guided Model	New Model
Time Spent with Zoo Educator	45 minutes in a zoo classroom	No interaction	10 minute introduction 45 minute Activity Station 1 15 minute Activity Station 2 15 minute Conclusion
Remaining Time at Zoo	Observing animals led by school teacher or chaperone	Observing animals led by teacher or chaperone	Observing animals led by teacher or chaperone
Notable Experiences	Touching an animal in the classroom		Touching an animal during activities Engaging in hands-on activities

Table 1: Summary of Education Models

Educator-led programs, which are conducted by zoo professionals, are a popular learning method at zoos. The Educator-led program is similar to the Self-guided Model; however it incorporates a lecture component into the visit. The group of students listens to a 45 minute talk given by a zoo professional, which links back to the curriculum of the teacher. According to a study conducted at Zoos Victoria by Dunn, Meyerhoff, Morgan, and Perry, the Educator-led Model proved the least engaging to middle school-aged students, ranging from ages 11-14, and also ranked the lowest of three scores in self-directedness to ‘campaign animals’ (2013). The Educator-led Model proved to be less educational than the other models because of its lengthy discussions at the beginning, so by the time the program had started, there was a drop of interest in learning about conservation.

The most basic of the education models is the *Self-guided* program. In this model, teachers are the leaders of the group. This model relies heavily on teacher preparation, but can have excellent benefits if the teacher effectively incorporates the in-class curriculum and zoo trip together. Teachers are able to bring worksheets in for students to complete and to guide them

toward certain exhibits that the teacher prefers or thinks are more engaging or applicable to a young audience.

The recently developed *New Model* aims to incorporate the conservation message of the zoo by promoting a connection to nature and animals through free play. As previously noted, students of a young age are less likely to respond well to the darker themes that accompany the abstract message of conservation. Instead, it is most beneficial for the student to forge a bond with the animals at the zoo so that once the student is older they are more motivated to take action. The New Model allows the group of students to choose which educational activity they want to play with at various stations throughout the zoo. Because the students are choosing which activity to play with, the connection that is made with nature is stronger than when they have no choice in the activity that they play with (Sobel, 1995).

We focused our research on how well four to eight-year-old students forge a connection between the animals at the zoo depending on the Educational model that the student was exposed to. The old Educator- led and Self-guided Models will be compared to the New Model through observing the interactions and interest of the students, as well as gathering information from the adults who influenced the student's visit to the zoo.

3: Methodology

The goal of this study was to assess the effectiveness of a new educational delivery model recently deployed at the Zoos Victoria. The project team identified four objectives necessary to achieve this goal. The project:

- Evaluated approaches to the delivery and evaluation of learning experiences at zoos;
- Clarified the goals of Zoos Victoria regarding the new educational model;
- Evaluated the new educational delivery model in comparison to the other two models at Zoos Victoria; and,
- Recommended how the new educational model at Zoos Victoria might be improved.

The project involved a mixture of methods including a site visit to another zoo, interviews with zoo education experts, interviews with Zoos Victoria staff, observations and tests of participating students, and surveys of teachers, chaperones and parents. These methods are described in detail below.

3.1 Objective 1: Compare Approaches to Educational Programs in Zoos

To supplement the background research presented in the literature review above, the project team conducted a site visit to the Roger-Williams Park Zoo in Providence, Rhode Island on October 12, 2013. The Roger Williams Zoo offers several different programs to school groups. During the site visit, the team interviewed Christopher Hitchener, the Program Manager of “Our Big Backyard” who was responsible for the development, delivery, and evaluation of education programs and learning spaces. “Our Big Backyard” is an informal learning space that the Roger-Williams Park Zoo uses to build young students’ appreciation with nature. The interview was informal, semi-structured and conducted in person to explore a variety of topics. The interview focused on what programs Hitchener ran and what the advantages and disadvantages of them were. Hitchener also spoke about informal education techniques and the Roger-Williams’ evaluation techniques. (Personal Communication, Christopher Hitchener, Program Manager, Roger-Williams Park Zoo, October 12, 2013).

3.2 Objective 2: Clarify Zoos Victoria Goals

Zoo educators are a key stakeholder in the implementation of the new delivery model. The project team conducted informal, semi-structured interviews with selected zoo educators at the Zoos Victoria at different times between October 27 and December 5, 2013. The zoo

educators interviewed were: Cyrelle Field, Learning Programs Officer, Melanie Treweek, Learning Experience Coordinator, Andrew Eadon, Education Officer, Katrina Fox, Education Officer, Laura Vissaritis, Education Officer, Hilary Hughes, Education Officer, Mark Langdon, Education Officer, Angela Partridge, Education Officer, Jessica Brown, Education Officer and Thomas Colcott, Education Officer. The interviewees were chosen because they are the educators who will be responsible for running the New Model after the trial is complete. From these interviews the team determined the goals of the new educational model and why it is being implemented, lessons the educators learned from their experience with teaching the different models, and challenges or accomplishments of the New Model. The educators were also asked to compare their experiences with the models and to judge their effectiveness based on student engagement and comparisons with any other delivery models the educators used. The interview preamble is attached in Appendix A – Interview Preamble. The team asked permission to interview the educators, took notes, and, after getting verbal consent, began the interviews. One team member both asked the questions and recorded the interviewee’s responses as the interview progressed. Being semi-structured, the interviews did not only address each question outlined in Appendix B – Informal Interview with Zoo Staff, which is a list of suggested questions, but followed the basic structure.

3.3 Objective 3: Evaluate the New Program Delivery Model

In order to evaluate the new education delivery model, the group used a variety of assessment techniques. These techniques included: informal semi-structured phone interviews with teachers, a take-home parent survey, observations of student interest during their visit, tests of students before and after their visit, and chaperone surveys. The school classes surveyed were from a sample of schools which signed up for their desired program (Table 2). All of the techniques were designed to preserve the anonymity of the students and the confidentiality of conversations with participating adults. The group contacted the school groups before their arrival to request consent from the teacher for the school group to participate in the study. The details of the interviews, surveys, and observations are described in the following sections. Table 2 below also outlines the observation schedule the team followed.

Date in November	School	Year	Class Size	Number Observed	Program
11	St. John's School – Clifton Hill	F	31	16	New Model
12	Australian International Academy	YR1	104	8	Educator-led
12	Kingsley Park Primary School	F	65	5	Educator-led
13	Brighton Beach Primary School	F	57	25	New Model
14	Mooroolbark East Primary School	F	80	12	Self-guided
15	Kingsbury Primary School	YR2	20	15	Educator-led
15	St. Elizabeth's School	F	42	8	Self-guided
18	Kew East Primary School	F	80	40	Self-guided
19	Serrell Street Kinder	K	50	8	New Model
20	St. Clare's School – Thomastown West	YR1 and YR2	96	29	New Model
21	Melton West Primary School	F	92	15	Self-guided
21	Templeton Primary School	YR1	90	22	Self-guided
22	St. Augustine's School – Yarraville	YR1 and 2	75	24	Self-guided
25	Harrisfield Kinder	K	37	8	New Model
26	Bellbridge Primary School	F and YR1	160	14	Self-guided
27	Yarralinda School	F, YR1 and YR2	13	13	Educator-led
29	St. Mary's Primary School	YR2	52	22	New Model

Table 2: Summary of Participating Schools

3.3.1 Recruiting Participants

The team was responsible for recruiting participants for the study. We called teachers of school groups that planned to visit the zoo between November 11th and November 29th and asked if they would be willing to participate in a research study with students from WPI. We recruited schools with children in grades Kinder, Foundation (Prep), Year 1, and Year 2, since the zoo had conducted evaluations with older students previously. We selected schools to ensure a mix of grades and program models in the sample. When we called the teacher to request their participation, we explained the plan for the day and provided a brief explanation of the nature and purpose of the study (see Appendix C – Teacher Briefing for a copy of this script).

The members of the team greeted the field trip visitors upon their arrival at the Rail Gate entrance, which is where school groups arrive. To maintain the integrity of the observations during the experiment, the team planned originally not to engage the students, however, after re-

evaluation with the Zoos Victoria staff, we determined that interactions were unavoidable. The sponsor and team agreed to engage the students and conduct a pre-test and activity with the students as well as a post-test, which are detailed in section 3.3.2. At the initial meeting at the beginning of the school visit, we explained the purpose of the study and familiarized the teacher and chaperones with the observations the group would be taking and the questions the group would ask.

3.3.2 Student Pre and Post Test

Before meeting with the sponsor at Zoos Victoria, the group did not plan on directly testing the students. However, after discussing the feasibility and possible benefits of doing so, the group designed pre and post-tests to ask the students upon arrival to the zoo and just before they left the zoo. The pre-test was composed of five simple questions to gauge the students' appreciation for nature and their expectations of the visit. The post test was essentially the same with one additional question asking what the students' favourite part of the day was. The pre and post-tests are included in Appendix D – Student Pre-Test and Appendix E – Student Post-Test respectively. By asking similar questions before and after the visit, the group was able to easily compare their responses. Additionally, the students' first names were recorded to allow for more direct comparisons to their before and after responses. The tests gauged if there was a change in appreciation for nature and what the students enjoyed the most throughout the day.

In addition to the pre and post-test, an activity was conducted when the school group arrived. The activity was used to determine the expectations of the students by asking them to choose the animal they were most looking forward to seeing on their trip. A series of posters with animals on them were placed in a row and students indicated with tally marks which animal they wanted to see most at the zoo. Refer to Figure 1 as an example. By determining the expectations of the students, the group was able to see if their expectations were met and how this influenced the connections they made during their visit.



Figure 1: Example animal expectation activity

3.3.3 Observations of Students and Chaperones

Students' engagement and interest were assessed through observation during the field trip. Also, the level and quality of chaperone involvement was observed. Students were observed as they progressed through the zoo and stopped at different exhibits. They were also observed during the staff-led lectures at the beginning and end of their New Model visit or during their Educator-led Model educator session. The group broke into pairs to observe different chaperone groups or schools during each day of observations. A group size of four to five students per chaperone was expected based on information provided by Zoos Victoria, however was not always the case. Chaperone groups ranged from four to eight students per chaperone and sometimes travelled in school groups of up to 20 students. For group sizes of nine students or below, the team rated observations out of how many students were engaged or excited. For larger groups, the team used a zero to three scale. This zero to three scale was necessary for the larger groups since it would have been challenging to correctly gauge individual students in large groups. The team watched for important behaviours including time spent at exhibits and asking/answering questions as well. A list of actions observed developed by the 2013 Zoos Victoria IQP group and modified by the current team is attached in Appendix F – Observation Criteria (Dunn et al., 2013). The observation criteria were tested by observing student groups at Zoos Victoria prior to the start of the research to gauge how applicable and feasible the measures were. Feedback from zoo staff also influenced the choice and design of observation criteria. Observational data was only gathered in the presence of a teacher or

chaperone of the school group. Chaperones were also monitored for their ability to engage students, particularly in asking and answering questions.

3.3.4 Take-home Surveys to Parents

After discussing with zoo staff, the team implemented a ‘take-home survey’ for parents of participating children as a way to gather information about the student experience. Since many of the students were quite young, this was a more effective way to gather detailed information on their experience. The group acquired permission of the participating school principals and teachers prior to distributing the survey. Sufficient paper copies of the survey were given to teachers in a packet at the conclusion of their visit. The packet included instructions for the teacher, asking them distribute the surveys to the students and collect them two days later. The packet additionally contained chaperone surveys for teachers to distribute to the parents or aids who accompanied the trip. These chaperone surveys are detailed in 3.3.5 Chaperone Surveys. The survey requested the parents to complete and return the copy to the students to hand in to the teacher, who collected the responses and sent them to the group in a pre-addressed, pre-paid envelope. The purpose of this survey was to determine the impact of the experience on the students based on parental feedback about conversations and interactions with their children. This gave key insight into the reactions of the children after visiting the zoo and identified the most pertinent information that students retain and find interesting. The parent survey is included in Appendix G – Parent Survey.

3.3.5 Chaperone Surveys

Chaperones help guide school field trips and are a major influence on the experience of the children. Their primary goal was to assist the teachers in keeping track of a group of students and allow them to have a meaningful educational experience. Thus, chaperones are an integral part of the learning process for students visiting the zoo. The team originally planned to ask chaperones to participate in a brief survey at the completion of their visit to capture any lessons the chaperones have gained and also to determine how they interacted with students throughout the visit. Instead, the team included the chaperone surveys in the packet sent with the teacher for the teacher to distribute to the chaperones. The survey was distributed as a hard copy to the chaperones and was then collected by the teacher and returned with the parent surveys. The Chaperone Survey questions are attached in Appendix H – Chaperone Survey.

3.3.6 Interviews with Teachers

Originally, the group planned to conduct brief, semi-structured informal interviews with the teachers at the end of their zoo visit. After discussion with zoo educators and sponsors, the group instead chose to schedule phone interviews with each teacher at the conclusion of their field trip. Teachers were familiar with their own class of students and were able to gauge how much they learned from the zoo trip. Additionally, teachers gave feedback regarding the logistics of planning and implementing the zoo trip and any associated challenges. These pieces of information gave the team the teacher's perspective of the learning model and gave insight into the education of the students and their engagement. The preamble to this interview was the same as the Zoo Educator preamble and is attached in Appendix I – Teacher Interview. The list of questions is attached in Appendix I – Teacher Interview, which have been modelled after the questions asked by the previous Zoos Victoria IQP group (Dunn et al. 2013) and expanded upon based on feedback from Zoos Victoria staff.

3.3.7 Confidentiality

All interviews and surveys were conducted to ensure confidentiality or anonymity. Interviews were conducted in private and the responses were only shared with the group. The group is familiar with the zoo staff who gave the program, the teachers, and some of the chaperones, but none of these names were presented in the reports and the observations were recorded in an anonymous format. Parental surveys were anonymous and no identifying information was collected. Surveys were organized by school and age group and listed as “[Abbreviated School Name] - Student 1 - Age [#].” The only identifying information recorded were the names of the students so that accurate comparisons could be made in the pre-and post-tests. For this purpose, only the first names were recorded and they were changed from first names to school names and numbers when entered into data collection.

3.3.8 Model Comparison

The group compared student test results, teacher, chaperone, and parental feedback among and between the different programs in order to gauge the preferences for and the effectiveness of the new delivery model. The responses to the surveys and interviews were collated and divided into categories. The categories were chosen based on themes presented in the responses after collection. Observational data was gathered using rating scales and converted into quantitative data. The quantified data was categorized by school, model, and date and included additional information that may have influenced the trip such as if the group was led by

a teacher or chaperone, the weather and any additional notes. Figure 2 is an example of observational data and how it was categorized. The data was recorded by paper and transferred into Excel for storing and analysing. The online statistics tool Vassar Stats was also used to conduct 2-sample T Tests and ANOVA tests. The key variables analysed were all the observations, the appreciation of nature question on the pre and post-test, the excitement rating and what students talked about on the parent survey such as what they enjoyed most during the day.

	A	B	C	D	E	F	G	H	I
1	School Name	Model 2	Model	Teacher/Chaperone	Grade	Date	Weather	Exhibit #	Exhibit
2	Aust. Int.	Other	Face to Face	Teacher	1	11/12/2013	Showers	1	Reptiles
3	Aust. Int.	Other	Face to Face	Teacher	1	11/12/2013	Showers	2	Black + White Colobus
4	Aust. Int.	Other	Face to Face	Teacher	1	11/12/2013	Showers	3	Orang-utan
5	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	1	Peccary
6	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	2	Tapir
7	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	3	Baboon
8	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	4	Bongo
9	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	23	Elephant
10	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	6	Koala
11	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	7	Aviary
12	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	8	Tasmanian Devil
13	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	9	Wombat
14	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	10	Kangaroos/Emus
15	Bellbridge 1	Other	Face to Face	Teacher	P/1	11/26/2013	Hot	11	Otter

Figure 2: Example of observation entry table

3.4 Objective 4: Recommendations

Once the group collected and analysed the data from the students, teachers, zoo educators, and parents, recommendations were given regarding how the zoo should proceed in various areas. These areas included the best practices of zoos worldwide, the educational goals of the conservation mission, and how to improve the deliverables of the program based on responses from teachers, zoo educators, and students.

4: Findings

The findings presented here are a result of direct observations of the students, on-site pre and post-tests, phone interviews conducted with teachers, and gathered packets containing post visit parent surveys and chaperone surveys. We observed 26 groups of students from 17 schools, carried out pre and post-tests with 113 students in those observation groups in total, as well as phone interviews with 12 teachers. We obtained 7 post visit packets from schools representing all three models. Combined, we acquired 15 chaperone surveys and 65 parent surveys. A summary of the packets returned and interviews conducted is included in Table 3. We had received back only 7 packets with parent and chaperone surveys by the time our project was completed. We were more successful in conducting post-visit interviews with teachers that participated in the Educator-led or New Model programs.

School	Packets Received	Teacher Interviews Conducted	Returned # of Chaperone Surveys	Returned # of Parent Surveys
Educator-led				
Australian International Academy	1	1	0	7
Kingsley Park Primary School		1		
Kingsbury Primary School	1	1	3	6
Kew East Primary School	1	1	4	17
Bellbridge Primary School		1		
Yarralinda School		1		
Total	3/6	6/6	7	30
Self-guided				
Mooroolbark East Primary School				
St. Elizabeth's School	1			
Melton West Primary School				
Templeton Primary School	1		1	13
St. Augustine's School – Yarraville		1		
Total	2/5	1/5	1	13
New Model				
St. John's School – Clifton Hill	1	1	4	14
Brighton Beach Primary School		1		
Serrell Street Kinder		1		
St. Clare's School – Thomastown West	1	1	3	8
Harrisfield Kinder		1		
St. Mary's Primary School				
Total	2/6	5/6	7	22
Total	7/17	12/17	15	65

Table 3: Summary of packets received and teacher interviews conducted

The data collected allowed us to determine how effective each delivery model is compared to one another. Each of the following sub-sections on observations, pre and post-tests, parent take-home surveys, chaperone surveys, teacher interviews and educator interviews are organized to give a brief overview of the methods used to collect the data, the limitations of the data, the analyses conducted, and the findings presented.

We quantified Observations to conclude if participation in a specific learning model influenced how engaged the students were at each exhibit. Furthermore, data from all student-based surveys were used to examine behaviour changes, overall experience, and the effectiveness of each model was regarding retention of information and the creation of an appreciation for nature. As a final analysis, the results from the chaperone and teacher responses were used to reveal expectations of their visit experience with their own zoo visit, and for comparison to the New Model versus other models. After acquiring these data, the educator interviews helped to develop overall recommendations to be implemented in the future in hopes of refining the model to ensure that an appreciation for nature is created.

4.1 Observations

The team observed a total of 26 school groups spread out across the Self-guided, Educator-led, and New Model. As each school group walked through the zoo and stopped at different animals, the team recorded a rating of their eye contact, excitement, remarks that were related and unrelated to the exhibit, and any questions they asked. At each exhibit students visited, the team rated the students' eye contact and excitement based on how many students were interested and engaged, and recorded a tally of how many questions or comments students made. In addition to these, the team also recorded the time spent at each exhibit. The purpose of these observations was to see if participation in a specific model influenced engagement at exhibits or how students went through the zoo.

A few constraints were noted as the observations were conducted. Firstly, not all exhibits were open throughout the observation period, which limited the possible exhibits that some groups could view. Specifically, the seals and penguins area was closed for about two weeks and the gorillas' exhibit was shut down for about a week. Also, some influence on observed groups was caused by the team's presence, such as helping student groups with directions, which may have changed their travel time to exhibits. Finally, it was more difficult to record information in larger group sizes, so some comments and questions may have been missed.

Each school group was assigned a score in each of the observation categories for each exhibit that they visited. These scores were calculated by taking the ratings of eye contact, excitement, and tallies of comments and questions then dividing them by the number of students observed in the group. The scores range from 0 to 1 for eye contact and excitement and from 0 to approximately 4 for comments and questions. The student groups that were observed ranged in size from 4 students up to 20 students and these sizes were distributed well across the three learning models. Figure 3 shows that, while the mean scores differ for the three models, the differences are small. To check this we conducted a between groups ANOVA analysis to determine if any differences between models were statistically significant; however, no statistically significant difference between the three models was found.

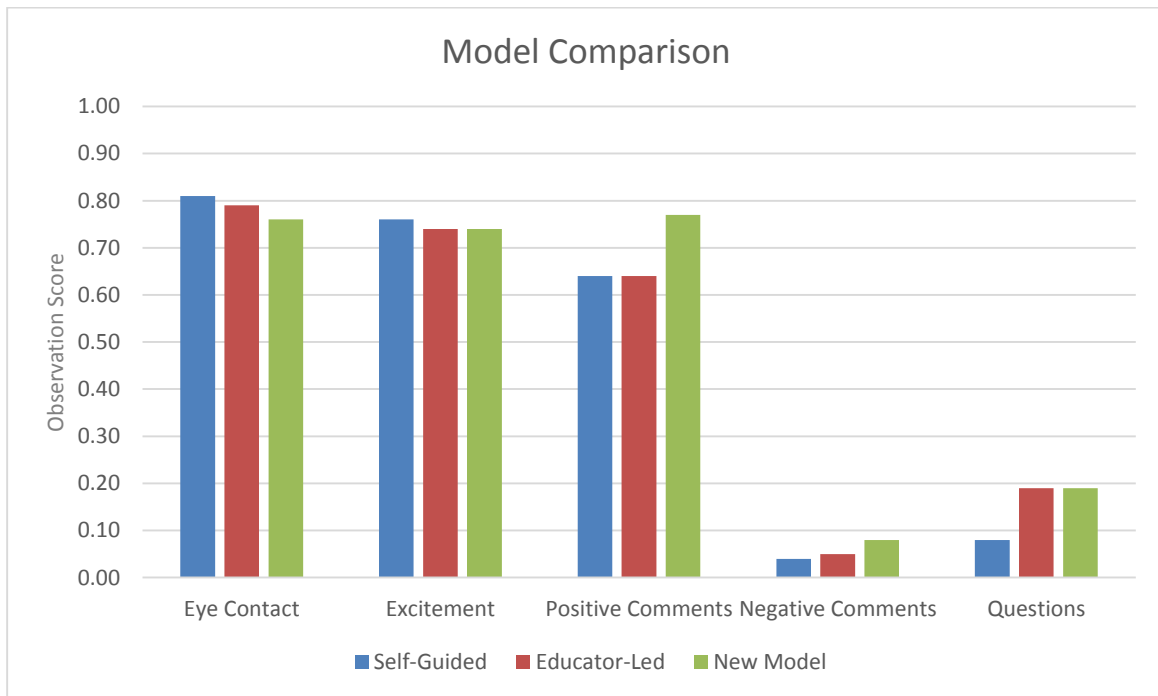


Figure 3: Graph comparing means of each observation category of each exhibit by model

Observation Category	Model		
	Self-guided	Educator-led	New Model
Eye Contact Score	0.81 (0.21) N = 110	0.79 (0.78) N = 79	0.76 (0.27) N = 157
Excitement Score	0.76 (0.24) N = 110	0.74 (0.31) N = 79	0.74 (0.29) N = 157
Positive Comments Score	0.64 (0.60) N = 96	0.64 (0.79) N = 79	0.77 (1.07) N = 157
Negative Comments Score	0.04 (0.09) N = 96	0.05 (0.13) N = 79	0.08 (0.17) N = 157
Questions Score	0.08 (0.17) N = 96	0.19 (0.31) N = 79	0.19 (0.32) N = 157

Table 4: Summary of observation data with means, standard deviation in brackets, and sample size for each category by model

Figure 3 and Table 4 summarize the observation criteria and results across all three models. Although the ANOVA found no significant difference between the three models, we conducted further analysis to compare the difference between the old models and the New Models for the positive comment score since the New Model appears to have a higher rating than the other models, which have equal means for this category. We grouped the data for the old models (Self-guided and Educator-led) and compared the mean positive comments scores for the old and New Models using a between groups t-test. However, the difference was found not to be statistically significant. Although the difference was not significant, we quantified the standardized effect size of the difference between the old models and New Model. The difference was found to be equal to 0.144 standard deviations, which is statistically considered to be a very small difference.

Lastly, the time spent at each exhibit was recorded to determine how long exhibits were able to hold the attention of the students. The average time spent per exhibit is included in Table 5 and indicates that schools that participated in the Educator-led Model spend more time at each exhibit, even if they visited fewer exhibits. A between groups ANOVA test was conducted to determine if the time spent at exhibits differed among the models. We found no significant difference between models. Although the difference was not significant, we quantified the standardized effect size of the difference between the Educator-led and New Model. The difference was found to be equal to 0.22 standard deviations, which is statistically considered to be only a small difference. This indicates that the time spend at exhibits for students of the Educator-led Model was longer than students of the New Model, but the difference was small.

The Educator-led Model held students attention for an average of 3 minutes and 38 seconds. As noted by Balling and Falk, “studies have demonstrated a positive correlation between visitor learning and the time visitors spend in exhibits. Furthermore the use of dwell time to quantify visitor experience remains a widely accepted methodology within the field of visitor studies,” (1980). This supports the traditional Zoos Victoria Educator-led Model as an effective way to encourage the interest of students in exhibits as they progress through the zoo.

Model			
	Self-guided	Educator-led	New Model
Mean Time Spent (sec)	179 (216)	218 (226)	171 (195)
Number of Observations	110	79	157

Table 5: Mean Time Spent at Exhibits with Standard Deviation in brackets and Sample Size by Model

The observation data collected can be summarized by two overall findings. Firstly, there is no significant difference in the rating of questions, comments, or engagement of students between the three models. Additionally, there was a small difference between the times spent at each exhibit for the Educator-led Model compared with the New Model suggesting that the Educator-led Model may promote better connection to the animals.

4.2 Pre and Post-Test

A sample of four to ten students from each school was asked to complete a short, five question pre-test when they entered the zoo. The results of this pre-test were compared to a post-test completed by the same students before they left the zoo. Each question was used to assess the change in opinion of each student on a different matter pertaining to the zoo, animals, and the outdoors. The first question was used to gauge the students’ opinion on the zoo in general, the second on their appreciation for nature, the third on outdoor play, the fourth on indoor play, and the fifth on animal appreciation. Low values for question four indicate that students want to spend less time inside and thus negative scores correspond to positive results. The original questions are attached in Appendix D – Student Pre-Test and Appendix E – Student Post-Test.

A few limitations were noted in the responses recorded for the pre and post-test. As noted in the limitations of the observation findings, some exhibits were closed at various times during the study which removes the possibility of some animals as responses. Also, despite attempting to separate the respondents and discourage them from looking at each other’s tests,

some students were influenced by the answers of others. Additionally, because the tests used a -1, 0, or +1 rating scale to account for the young age of the students, a ceiling effect occurred. This ceiling effect is summarized in Table 6, which shows the number of students who answered with a positive response for both the pre and post-test.

Percent in Highest Category (N=113)	
Q1 Zoo	95%
Q2 Nature	72%
Q3 Outdoors	69%
Q4 Indoors	45%
Q5 Animals	94%

Table 6: Ceiling effect summary with number of students who answered positively on both tests by question

In order to gauge if there were any significant patterns in responses for each question, we conducted a chi-squared analysis. This analysis allowed us to see if one type of response (i.e. negative, neutral or positive) was more likely to be associated with a particular model. For each question we tabulated the number of students whose answer increased, stayed the same or decreased for each of the three models. Table 7 shows the frequency of responses for each question by model, which were used for the chi-squared analysis. The results should be treated with caution, as the numbers in some of the cells are very small, which violates the assumption of the chi-squared test. We conducted separated statistical tests for each of the questions; however, in no case did we find a significant association between the response and the model.

Although the results were not statistically significant, we conducted further examination of the apparent different response pattern in question 3. We found that students who participated in the Self-guided Model were marginally less likely to decrease their responses on question 3 than students of the Educator-led or New Model. This suggests that students who participated in the Educator-led Model or New Model were marginally more likely to decrease in their appreciation for playing outside.

Change in Student Response to Questions by Model			
Question/Model	Negative	Neutral	Positive
Q1 Zoo			
Educator-led	1	32	1
Self-guided	0	21	1
New Model	2	54	1
Q2 Nature			
Educator-led	3	28	3
Self-guided	2	17	3
New Model	2	45	10
Q3 Outdoors			
Educator-led	7	25	2
Self-guided	1	18	3
New Model	11	40	6
Q4 Indoors			
Educator-led	5	21	8
Self-guided	6	13	3
New Model	8	37	12
Q5 Animals			
Educator-led	2	32	0
Self-guided	0	22	0
New Model	3	52	2

Table 7: Number of student positive, neutral, and negative responses from Pre to Post-test by Model

Since student appreciation of nature is a key variable to analyse, further analysis was conducted on question 2. Although the models did not differ significantly on this question, we wanted to quantify the difference between models. A graph of the responses to question 2, which gauged student change in appreciation of nature, for each model are included in Figure 4.

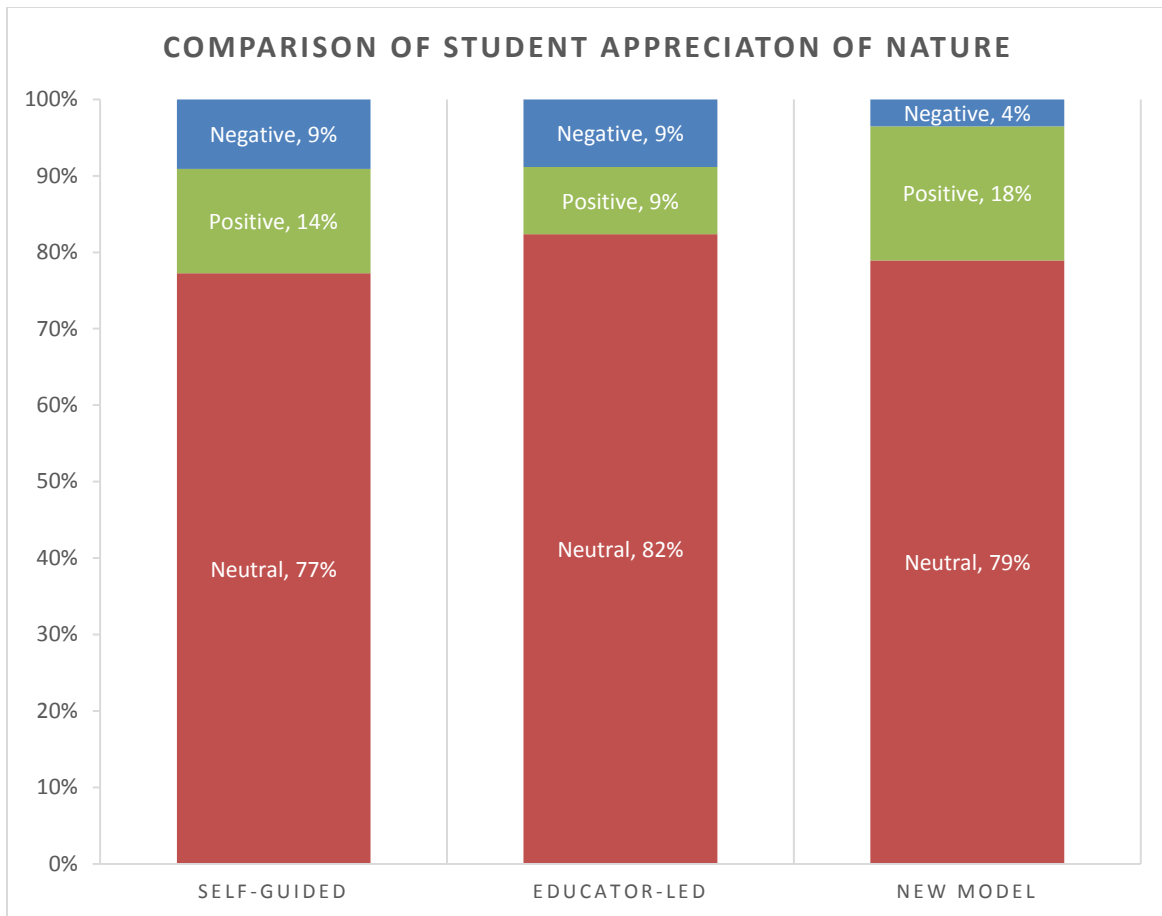


Figure 4: Percentages of student responses that change to appreciation of nature question by model

The average change in responses for each model is also included in Table 8. These values were compared using a between groups ANOVA test and the results were not significant. We then compared the New Model to the Educator-led Model using a between groups t-test. This test yielded a marginally significant result, suggesting that the New Model may be marginally more effective at increasing student appreciation for nature throughout the day than the Educator-led Model. We quantified the standardized effect size of the difference between the Educator-led Model and New Model. The difference was found to be equal to 0.36 standard deviations, which is statistically considered to be a small to medium difference.

Appreciation of Nature			
Mean Change in Q2	Self-guided	Educator-led	New Model
	0.09 (0.61) N= 22	- 0.06 (0.60) N = 34	0.16 (0.59) N = 57

Table 8: Mean, Standard Deviation in parentheses, and Sample Size of Change in Responses for Q2 Appreciation of Nature

The additional question six on the post-test was used to identify what students thought their favourite part of the day was after touring the zoo. By recording this information, the team could recommend areas to run education programs. Also, this question determined which parts of the day were favoured by different learning models. Figure 5 shows a graph of the favourite parts of the day for each learning model. The most popular responses are listed and any animals which were chosen by four or less students were grouped into the “Other” category. Some of the top responses across the three models were seeing animals in general, reptiles, butterflies, and elephants. Also prominent in the Educator-led Model and present in the New Model was touching animals. This response was not found at all in the Self-guided Model because this group did not have the opportunity to touch the animals.

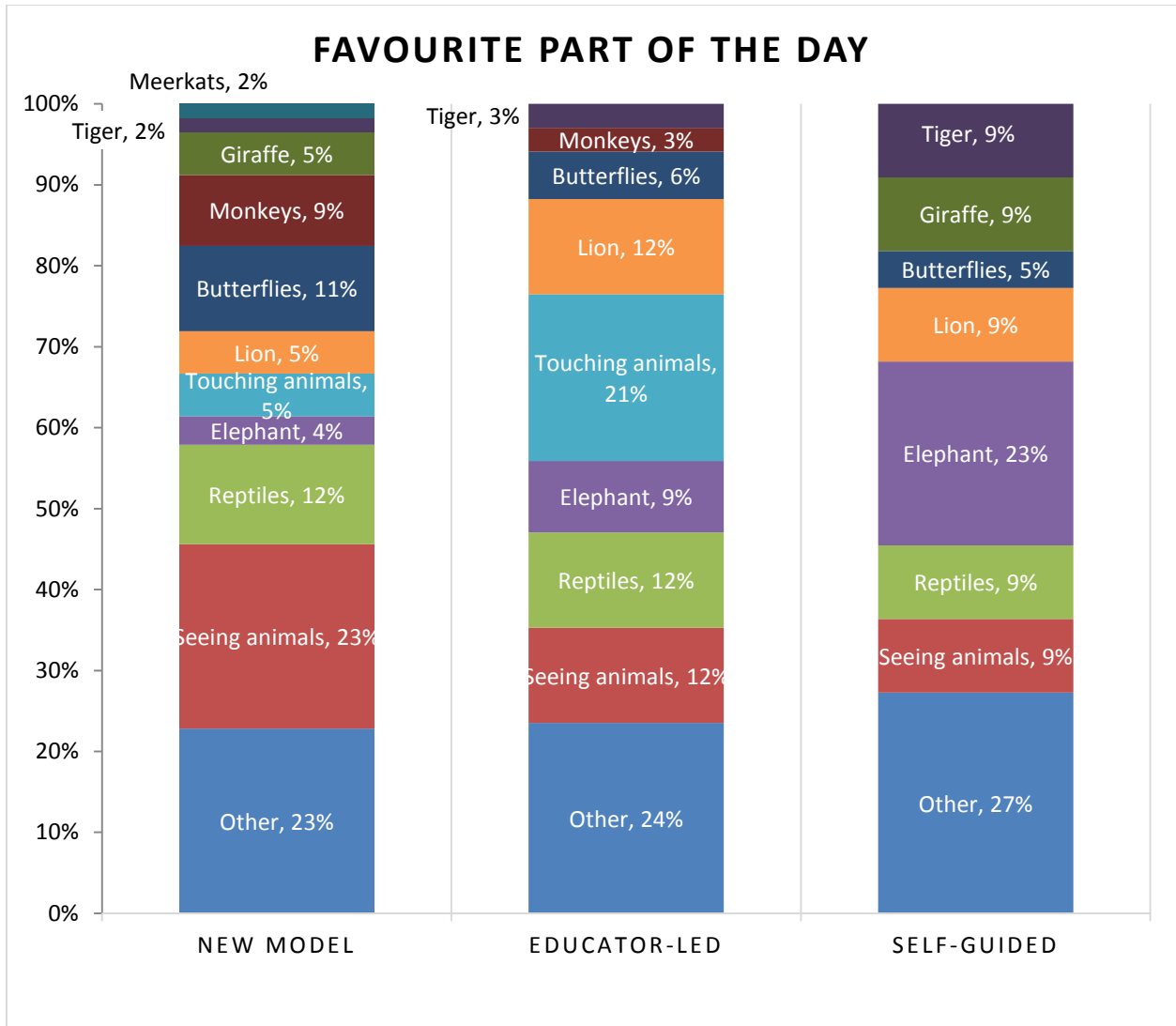


Figure 5: Favourite part of the day as chosen by students

The results of the pre and post-tests indicated that students who participated in the New Model had a marginally higher increase in appreciation of nature than those who participated in the other models, particularly the Educator-led Model. Also, exhibits and areas such as reptiles, butterflies, and elephants, where students favoured, and thus gained, a deeper connection to animals were noted as places to recommend for future educational programs.

4.3 Parent Take-home Surveys

Teachers distributed surveys to students who attended the zoo to take home to their parents. The parent survey asked a series of questions relating to their child's reaction to the zoo visit. The aim of these surveys was to gauge the students' connection with nature based on what

they talked about at home after visiting the zoo. The team was able to compare the student excitement before and after the zoo visit as rated by the parent on a one to five scale, identify what the student talked to their parent about before and after their visit, and what stories or conservation actions the student had spoken about. In general, students talked positively about their visit to the zoo and easily shared stories with their parent regarding the field trip. The responses to the parent surveys were limited due to a time constraint and lack of participation. Seven packets were returned and not all parents from each school participated in the survey. Despite these limitations, enough surveys were returned from each model to compare the three. Table 9 summarizes the responses of students who talked about their zoo visit with their parents. Most students from each model talked to their parents about the field trip; however, only 73% of students from the Educator-led Model did so, as compared to 86% in the New Model and 100% in the Self-guided. A chi-squared test was conducted to determine if there were any significant association between the models and students talking about the zoo visit. This indicated that the Self-guided Model produced a marginally higher “yes” than the other categories. This information suggests that the Self-guided and, to a lesser degree, the New Model develop a more lasting connection than the Educator-led Model.

Model	No	Yes	Total	Percent Yes
Educator-led	8	22	30	73%
Self-guided	0	19	19	100%
New Model	3	19	22	86%
Total	11	60	71	85%

Table 9: Students who talked about their zoo visit

Parents were also asked to rank their child’s excitement before and after their visit. This information shows how each student’s opinion of the zoo and their interest has changed. Table 10 summarizes the results and suggests that students participating in the Self-guided learning model are more excited after visiting the zoo. A between groups ANOVA test was used to determine the significance of the different scores. The results of this analysis were deemed to be statistically insignificant. Further analysis was then conducted to determine the effect size of the difference between the Self-guided Model and respectively the Educator-led Model and New Model. The effect sizes were determined to be 0.49 standard deviations (medium effect) and 0.61 standard deviations (medium to large effect) respectively. These differences did not reach

statistical significant due to the low number of responses in each group. This suggests that Self-guided students enjoyed their visit more and that the visit surpassed their expectations as compared to the students who participated in the other models. Also, this suggests that the Self-guided students were more likely to create a connection with the animals.

Change in Child Excitement			
Model	Self-guided	Educator-led	New Model
Mean (St. Dev.)	0.32 (0.75)	- 0.17 (1.21)	- 0.14 (0.77)
Sample Size	N = 19	N = 30	N = 22

Table 10: Mean change of child excitement with standard deviation in parenthesis by model

The surveys that were filled out by parents portrayed two different trends. The first trend is based on the amount that students talked about their visit to the zoo. From this information, the Self-guided Model appeared to be the most effective model in encouraging connections to animals with the New Model ranking closely behind. Additionally, when asked to rate the excitement of their children, there was a substantial increase between the excitement of the Self-guided students before and after the zoo trip. Both of these findings suggest that the Self-guided trip encourages a stronger connection to nature.

4.4 Chaperone Surveys

Chaperones aid in guiding school field trips and are a major factor when examining the experience of the children. Their primary goal is to assist the teachers in keeping track of a group of students, as well as creating a meaningful educational experience for the students during their visit. Thus, chaperones are an integral part of the learning process for students while visiting the zoo. During the observations of the students throughout the day, the team made note of the chaperones and their interactions with their student group. Chaperones were also monitored for their ability to engage students, particularly in asking and answering questions. In addition to this, after observing their visits at the zoo, we provided the teacher with a packet containing surveys for Chaperones. These responses gave the team an idea about their motivations for volunteering and accompanying the class to the zoo.

After conducting our observations, we recognize that there were limitations to our studies. There was a small sample size for the chaperone-led groups. This was because when we approached teachers about us observing the children, the teachers were more willing to have

us, the researchers, observe teachers as educators rather than the chaperones. Therefore fewer chaperones were observed. This led to an overall small sample size of 11 for the chaperone responses.

One question that provoked a variety of answers from the chaperones pertained to why parents volunteer to help on a zoo trips. Several chaperones (6 out of 11 responses) indicated that the primary reason for volunteering was getting to spend time with their own child and having this experience at the zoo together. While this seems like a plausible response, as Falk mentions, parents who attend zoo visits are a primary example of ‘facilitators’ (2007). By providing such a response for the volunteering, this shows that a number of parent chaperones are unable to see their role as educators for more than just their own child, and suggests a lack of understanding of their impact on a child’s zoo visit. As these parents are in a facilitator role, they want the zoo to provide information, activities, and opportunities to support them and their children in this style of facilitated learning within the zoo. Therefore, out of the nine chaperones that indicated their primary expectation, the answers were categorized as shown in Figure 6, to show that six expected to learn from the visit, four wanted to have fun, and only one indicated they were primarily there to help. Five others recorded other responses such as previous zoo visits or seeing animals in general.

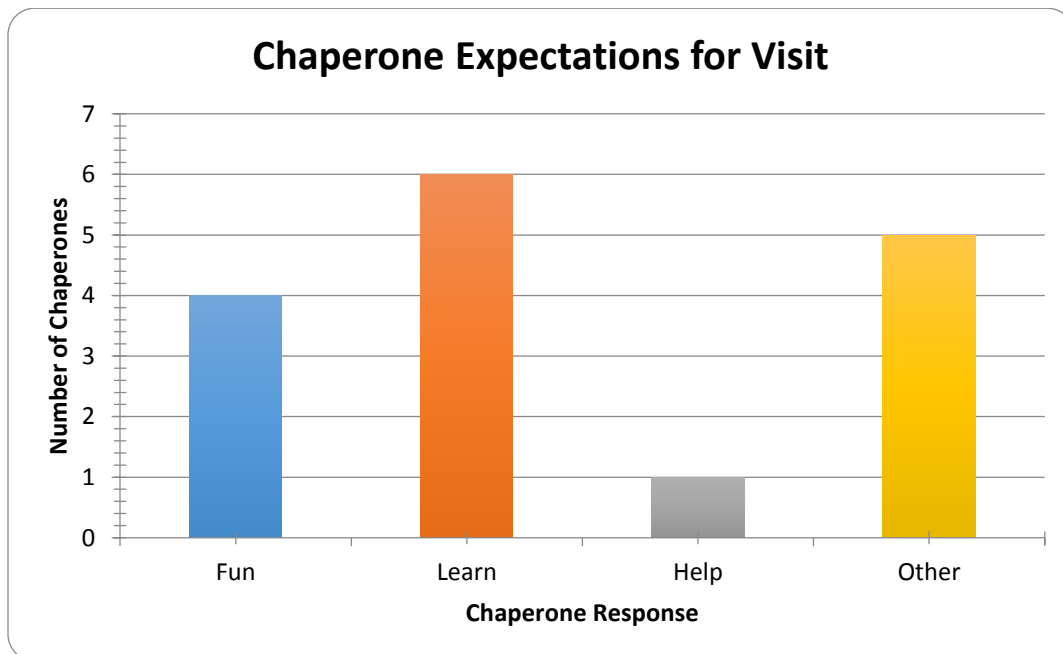


Figure 6: Chaperone’s Expectations of Zoo Visits

Four out of sixteen parent chaperones wanted to simply “have fun” during their school visit to the zoo. This shows that having fun and other personal reasons are expectations for parents visiting the visit. These data show us that out of the 16 responses we received, only six expected that their child would be learning during this visit. This suggests that chaperones have alternative reasons for visiting the zoo with their child that are not aligned with the zoo’s educational goals.

After both observations and survey responses were analysed, the team was able to see that there was a difference in groups led by teachers, compared to those led by chaperones. There were no significant differences between teacher and chaperone groups. We were not able to make any conclusions based on responses due to the small number of response change in the positive and negative directions.

Teachers and educators may expect that primary purpose of parent chaperones is to aid teachers in their visit as well as promote student learning and guide the students’ visit in order to have a meaningful educational experience, However the parents own personal goals may be different, including solely spending time with their own child. Though there are chaperones who try to do what is expected during the visit, some chaperones are unaware of their importance to the visit and how they are needed to aid in the learning process for students while visiting the zoo.

4.5 Teacher Interviews

We conducted interviews with teachers by phone several days after their visit to the zoo to solicit feedback on their visit. We interviewed 12 out of 17 teachers including six teachers that participated in Educator-led programs, one who participated in a Self-guided program, and five that participated in New Model programs. We tried to reach the other five teachers who had participated in programs, but were unable to set up an interview in the time available in spite of repeated requests. The interview questions focused both on how conservation methods were conveyed to the students, the importance of such field trips as a learning experience for students, and the logistics of the day’s schedule.

All 12 of the interviewed teachers believed that visits to the zoo were important educational experiences for their students. Of those twelve, eight elaborated that the opportunity for their students to experience animals outside of the classroom was important to them and three

said that they believed a visit to the zoo was important to develop a more fundamental connection to animals.

When asked if students learned about conservation practices at the zoo, 10 out of the 12 teachers commented that the abstract concept of conservation was too complicated for students of this age (4–8 years) to understand. Three of those ten, however, emphasized that it is more important for students of this age to make an emotional connection to the animals that they were viewing at the zoo and studying in class. This response is consistent with Sobel's theory that young students should not be exposed to doom and gloom conservation education and teachers should instead focus on establishing a connection with animals (Sobel, 1996).

Of the five teacher's whose classes participated in the New Model, two brought their classes to the zoo every year, one is now planning on going to the zoo every year, and two visit the zoo some years. Because two of these teachers have participated in both the Educator-led Model and the New Model, their suggestions for improvement are particularly notable. Both of the two teachers who attend the zoo every year and participated in the New Model commented that, although they liked the hands-on nature of the New Model, they wanted more educational structure, fewer individual activities, and activities that were closer in distance to minimize travel time from activity to activity and to leave more time to see animals. Another teacher who visited the zoo annually with her class declined to participate in the New Model because she thought it would take too much time to attend all of the activities and wanted her class to be exposed to the more formal, lecture-based approach that the Educator-led session provides as opposed to the more play-based learning of the New Model.

4.6: Educator Interviews

Zoos Victoria prides themselves on their conservation-based campaigns and has been focusing on integrating the conservation messages into their educational programs led by very qualified educators. Zoo educators have enormous collective experience delivering the current and previous programs. Given the recent introduction of the New Model, it is important to solicit staff feedback about why it was introduced, how it is working, and where it might be improved.

The Learning and Experience department at Melbourne Zoo contains a total 10 educators and in an attempt to interview all the educators, nine were successfully scheduled. An additional interview was conducted with another staff member, who was an educator at a different zoo in

the past, who played an important role in the development of the New Model and oversaw it through the course of the research team school group observation period. The 10 interviewed educators answered 10 questions and as the interview process progressed, one more question was added. Answers to these questions gave information regarding zoo educator opinions on topics such as the importance of zoo visits, purpose, advantages and disadvantages of the three learning models, and how the New Model would affect the roles of educators and zoo visitation. The full set of questions can be found in Appendix B – Informal Interview with Zoo Staff.

Knowing if the educators think that zoo visits are essential for student education is important. Not surprisingly, all 10 educators believed that zoo visits are a valuable component of the students' education regardless of age because zoo visits re-establish the broken link between natural environment and students, zoos offer resources and information that is not accessible to the students at school such as zoo keepers and educators.

Zoo educators explained that having three models meets the teacher's expectations, such as a structured learning environment, delivery of satisfactory information that meets the school's curriculum, while also catering to the individual style difference. Having three different models expands possibilities for student learning and models choice is important for visiting teachers, however the zoo must also consider the budgetary repercussions of running three models when it comes to supplying resources such as more facilities, staff members and bio facts. Bio facts being the equipment the educators use for visual learning in their class such as animal skulls, body coverings, and materials to build an animal's habitat. All of the educators said they encouraged students to take what they learned from the material in the Educator-led class session and apply it outside the classroom by asking students questions on how they can take action and giving challenges that they carry on for the rest of their trip to the zoo as well as mentioning the zoos conservations campaigns during educator session. However, the educators mentioned that they encourage application of material outside the class session based on the topic that was taught to the students that day which sometimes makes it difficult to have students apply the learned material to the real world. Time constraints also have an impact in whether or not the message of acting reaches the children.

Each model serves a different purpose and each educator has their opinion on which educational model works best for different age groups. For the K-2 student group, seven educators thought the Educator-led Model was more appropriate because students at this age are

accustomed to being inside a classroom and are used to this type of delivery, as well as having hands on interactions with the animals will begin the construction of an appreciation for animals. Although, two found that the New Model worked best because it expands different teaching styles allowing it to reach more students who have their own unique learning styles. One educator was unsure of which model worked best because changes need to be made to all of the models in order to outfit the variety of age groups that come in to the zoo.

For the older age group of students, nine educators found that the New Model would work best because, at this age, students have a better understanding of the information and freedom to explore the zoo for three to four hours, which means more in-depth learning creating opportunities for the students to become more aware about wildlife and care about it. One educator mentioned that the Educator-led Model would be best for young students because in the classroom it is easier to skill out teachers as well as giving in-depth answers to questions the students have.

If the New Model were to be fully implemented there is a chance of model popularity change amongst teachers and students. Five educators feel that the Educator-led will be the most popular while two say the New Model. Yet, three are unsure which may be due to the educators waiting the New Model is fully formed before deciding on an opinion. Also if the New Model were to be implemented, educators feel that school visitation numbers will periodically go down due to the teacher not being familiar with the New Model and it will depend on how it is promoted.

4.6.1 Educator-led

The Educator-led Model is the zoo's original model that has been around for 44 years. From the establishment of this model, its purpose, according to seven of ten interviewed educators, is to have students connect with wildlife and natural places and acting when introduced to conservation campaigns. Based on educator responses, similarities were found between the purpose of this model and the educators' opinion on zoo visits. Educators believe the Educator-led Model can better ensure that the information delivered is current, high quality, and factually accurate compared with some of the information that might be imparted by teachers and chaperones. This is especially the case with the Self-guided visits, where students have no interaction with trained zoo educators. Zoo educators also feel that teachers seem to be more

comfortable with this model because of the classroom setting meaning it is a controlled environment and because sessions are tailored to meet their needs and expectations.

Eight educators mentioned that 45 minutes for one class is typically not enough time to deliver all the information they would like to present in order to fully institute the connection with wildlife. Often pressures of time mean that educators cannot answer all questions that students may have or cannot answer them as fully desired. Educators fear that limited time slots and resources, such as educators and classrooms, may push schools to move from the Educator-led to the Self-guided Model.

While the Educator-led Model has been running for many years, several educators had suggestions for improvements. Educators suggested the model include more student-driven learning, more access to better resources such as facilities, a larger range of lessons, longer classes to strengthen relationships with students and teachers to encourage them to use the educator as a future resource, and to have more lesson-relevant encounters with animals to build a stronger connection to wildlife and the conservation messages.

4.6.2 Self-guided

Due to the lack of interaction with students participating in the Self-guided Model, educators are less familiar with how the model affects a student's visit to the zoo. Of the educators interviewed, eight out of ten said that the purpose of the Self-guided Model is to facilitate teacher's needs while the other two mentioned that this model gives students the ability to choose their own adventure which is valuable if the student knows how to be independent. From a zoo educator's standpoint, this model allows the school to learn by being more flexible with their day, without any time constraints permitting the teacher to adjust their visit according to their curriculum.

However, for the younger age group it is more difficult to learn from this model due to their lack of independent skills. It was found that six out of the ten educators interviewed thought that if an educator was involved by supplying things such as special maps or ideas for group activities, the school will get more out of their visit. This may result in avoiding the delivery of false information that may be presented to the student if an educator is not involved.

Suggested improvements for the Self-guided Model were having more educator involvement, even if it is at the beginning of the day for a short amount of time explaining to

them what the zoo is all about and that it is not simply for entertainment as this may have a great influence on the schools visit.

4.6.3 New Model

The New Model is designed to be a step forward for the zoo into 21st century learning. The New Model has been in trial for three weeks and it has given educators enough time to understand its purpose. Eight out of ten educators thought that the purpose of the New Model was to engage students to explore and build a connection with wildlife by having the entire zoo to as their classroom. This model is more student directed and it gives them an entire day to learn as opposed to sitting down for 45 minutes where engagement levels may not be the same. Four of zoo educators believe that the New Model is an opportunity for the educator to connect with the students because the students and zoo educator meet up more than once throughout the day. The New Model is student driven and learning by playing is part of the educational process. Needless to say, the zoo offers endless opportunities for learning while playing.

Educators had a range of responses when asked what they thought some of the disadvantages to the New Model were. They responded with statements such as the groups are too big and are very hard to connect personally with in addition to them being very hard to control. As mentioned by an educator, K – 2 students are not as independent as older students which may limit what they get out of their trip. Two educators brought up that weather is a huge factor in levels of engagement and participation. All ten of the educators believe that the establishment of the New Model is necessary even though an educator disagrees with the zoo offering the Self-guided Model because they do not see it as very beneficial for the students.

Aspects of the New Model that need improvement, as suggested by educators, are the accessibility of resources, such as facilities and bio facts, improve student interaction by enforcing a small group policy. The educators will have more one-on-one interaction with the students as well and build a relationship with them. Educators would like to see more chaperone and teacher instigation as this will expand the way the student thinks about the activity that he or she is participating in to improve learning and retention, plan the day by taking weather into account which would consist of moving activities around to different parts of the zoo, and give the model more structure and organize it more to appeal more to what teachers like to see. Educators are also concerned that the implementation of the New Model will cause them to move away from being an educator to more of a presenter. However, four educators think that

the New Model will be exciting as this will challenge them to use their creativity skills to design new activities for the different age groups that come to the zoo.

5: Conclusions

The goal of this study was to assess the effectiveness of a new educational delivery model recently deployed at the Zoos Victoria. Surveys, interviews, observations, and student comparative tests supplied us with necessary information to compare student excitement, engagement, and appreciation for nature and logistics of the excursion across all three models. By collating previous research and the findings from these different methods we have determined the following conclusions:

- **Zoos continually strive to develop better exhibits and programs based on educational research and feedback from school groups and other visitors.**

Zoo around the world have continually improved their exhibits and programs. “Zoos have thus transitioned from being exhibitions with exhibits with unique collections to places of learning” (Ballantyne, 2007). Zoos have also progressed from first generation exhibits consisting of metal bars without any relation to the animal’s natural habitat, into second and third generation exhibits which mimic the environment and family structure found in the wild (Shettel-Neuber, 1998). Zoos such as the Toronto and Singapore Zoos use varied and innovative programs to promote conservation education. “By creating interactive exhibits, tours and educational programs that bring people Educator-led Model with living animals, zoos and aquariums profoundly influence their visitors in significant ways” (Falk, 2007, p.5).

- **Zoos Victoria is experimenting with a New Model to create a full day learning experience.**

Zoos Victoria has received strong support for its school programming, but is striving to improve the educational experience and experimenting with a New Model designed to engage the students at multiple points in the day to ensure the entire visit is a learning experience rather than just the initial interaction with zoo educators at the beginning of the Educator-led programs. Interviews with key Zoos Victoria staff have demonstrated a drive to continually improve their educational offerings. There have been no significant changes to the structure of educational programming at the Melbourne Zoo in over 40 years. It is clear that there is progress to be made to better suit modern education principles and curriculums. A future version of the New Model will be the bridge that connects zoo education to 21st Century learning.

- **Since the New Model has been in trial for only one month and is by no means finalized, additional evaluations will be necessary in the future.**

As the Zoos Victoria continues to develop the New Model programming, they will need to make adjustments and reassess the outcomes of the program. The version of the New Model, which we observed, was only a trial run of a new idea for the students in the early year's age group.

- **Based on the data we collected from 26 school groups, we are able to identify advantages and disadvantages of each of the different programs, and how these programs are perceived by zoo educators, teachers, chaperones, and students.**

Although the New Model appears to encourage a stronger connection to nature, the Educator-led Model still engages students more effectively during the day and teachers rely on the dependability of a structured excursion. Results from the pre and post-tests and the parent take-home surveys provide evidence that the New Model develops a bond between young students and the outside world. However, the Educator-led Model appears to be more effective at holding the students' attention throughout the zoo visit, based on time spent, and is preferred by teachers. Teachers appreciate it for its consistency, certainty regarding planning and learning outcomes, and straightforward lecture, followed by a zoo tour. Educators also suggested that the New Model could be more effective for an older age group and needs to be refined before it can be implemented with the younger years. These conclusions are the basis for the recommendations that we have proposed to the Zoos Victoria.

- **The New Model appeared to be slightly more effective in creating a stronger bond with nature than other models.**

The New Model aims to develop a bond between students and the outside world. This objective is supported in the results generated by the pre and post-tests. The New Model was rated the highest in positive change for student appreciation of nature, which was somewhat higher than the two older models. Parents' responses also suggest that a greater bond was created by the New Model compared with the Educator-led Model; however, the Self-guided Model appeared to produce the strongest bond.

- **The Educator-led Model appears to be more effective at capturing students' attention and is preferred by teachers and zoo educators for this age group.**

Although effective in developing a connection to nature, the New Model appeared to be not as effective as the Educator-led Model in holding the attention of students throughout the day and encouraging a positive relationship with teachers who return annually. The Educator-led Model shows a notably longer duration of time spent at exhibits, despite the Self-guided Model allowing more time to view exhibits. We expect time spent to correspond with higher learning and, possibly, a higher connection with nature. Teachers who visit the zoo annually are comfortable and more familiar with planning for the Educator-led Model and appreciate the structure and independence that the model affords the teacher. Additionally, educators believe that the Educator-led Model is best suited to the younger age group and that the New Model will be very effective in teaching older students, once it has been better refined to fit the logistics of a typical school visit to the zoo.

- **Chaperones are an important part of a zoo visit and influence learning outcomes and the overall zoo experience; however, they may not recognize their importance.**

The results of the educator interviews are consistent with the findings from the teacher interviews regarding the role of chaperones during zoo visits. Observations of the school groups and interviews with educators indicate that chaperones play a large role during the zoo excursion. Educators believe that chaperones can be a limitation to the learning and engagement of the students during the day, without proper guidance. This is consistent with the findings from the chaperone survey, which suggest that chaperones' purposes for visiting the zoo can be governed by personal needs and expectations and they may be unaware of the importance of their role during the zoo visit.

- **The Self-guided Model appeared to be more effective at creating a lasting connection and increasing student excitement during and after the school visit.**

Zoo staff know little about the Self-guided Model as they have no interaction with the students or teachers throughout the day. The educators can only make assumptions based on their perceptions. Based on the parent take-home surveys, the Self-guided Model generated more discussion between the students and their parents after their visit to the zoo. Also, students who participated in the model were generally more excited after visiting the zoo than before, indicating that the visit surpassed their expectations and enjoyed it even more.

6: Recommendations

Since the New Model is in its infancy, the Melbourne Zoo will reevaluate the current program and derive a new educational model, which will eventually be offered as an option for schools. Keeping this in mind, we recommend that the Melbourne Zoo:

- **Strive to gather additional feedback from teachers, chaperones, and zoo educators.**

From our experience it is inordinately difficult to get evaluation feedback from teachers and chaperones. We suggest the Zoo consider offering incentives in order to increase return rates on survey packets. By gathering information from adults involved in every aspect of the models, we are able to see what improvements are needed. Due to busy school schedules, it can be difficult for teachers to give feedback on their experience at the zoo. By offering school teachers an incentive, they may be more inclined to return the evaluation materials. For example, the zoo could offer a discounted school trip to the schools or teachers if they return completed packets at a faster rate.

- **Approach local university or high school students to assist in the data entry and analysis process.**

After collecting packets and feedback, the zoo does not have the resources to input data and analyse it to obtain valid conclusions. The Zoo could partner with a local high school or university as a community service project to gain the necessary volunteers to complete this analysis.

- **Reach out to schools and teachers to better explain the value and virtues of the New Model program.**

Once a revised version of the New Model is developed, we recommend that the educators familiarize teachers with the model to remove inhibitions they may have about signing up for a new education model. By reaching out to schools and teachers personally, the zoo can better explain the value that the New Model has over other models. This personal contact will encourage teachers to sign up for this new model, as the Educator-led Model is phased out of the offered models at the zoo.

- **Convene a roundtable of Zoos Victoria educators to solicit feedback on the New Model and identify problems and solutions to continuously improve the model.**

We recommend a department meeting be held to receive feedback from the educators who teach the different models every day in order to discuss the problems which have been encountered with the current New Model and possible solutions to these problems. This will provide educators with a forum to speak about their concerns and to acquire insight into their perspective of a future version of the New Model. We were limited by time from analysing all variables pertaining to the study and this discussion will facilitate continued improvements to the New Model.

Regarding all three models, we recommend that:

- **The Melbourne Zoo develop more supporting materials for schools, teachers, and chaperones to use prior to, during, and after the visit.**

Our findings suggest that if some teachers and chaperones are better prepared for their visit, the students are more likely to be engaged and their quality of their educational experience would also improve. By developing a system of materials that teachers can obtain prior to, during, and after their visits, De White notes that, “systematic classroom preparation and reinforcement provided by informed teachers seem to be essential for improving cognitive achievement and attitude from a field trip to the zoo” (De White, 1994). She also suggests that zoos can have a positive impact on environmental education by, “engaging in effective curriculum design and developing pre- and post-trip materials.” By providing reinforcing materials for after zoo visits, learning will continue after the students leave the zoo and will help to create a lasting connection with nature.

- **The Learning Experiences Department provide advice and a list of suggested questions and important facts to the teachers to distribute to the chaperones.**

The conclusions from this report demonstrate that chaperones are unclear about their roles in the visit to the zoo. Chaperones play a large role in the success of the school visit, and, in particular, need advice about how to engage their student groups more effectively to promote learning. Indeed, “observations of different groups from the same schools showed that students could have vastly different experiences with the same worksheet, depending on the support of the accompanying adult” (Kisiel, 2003). In order to support chaperones to help students learn the most they can at a day at the zoo, we recommend that the educators at the zoo provide a

handout with tips and suggested questions for chaperones to engage students. Included on this handout will also be basic knowledge of the animals that don't appear on signs at the exhibits to encourage chaperones to share correct and meaningful information with their student group. By providing this knowledge to the chaperones, it is easier for them to play a positive role in the students' visit to the zoo.

- **The Learning Experiences Department be more involved with Self-guided visits.**

We recommend that the Learning Experiences Department integrate an educator into the students' day at the beginning of the excursion with a brief talk of why zoos are not only for entertainment and supply the students with a special map that contains challenge questions and activities that can be accomplished during their zoo trip. The goal of this interaction is to increase the students' understanding of the zoo and connection with nature.

We also recommend that the zoo provide teachers with, and encourage them to use, online materials to add structure and educational value to a Self-guided visit, without using extra educator resources. In addition, these materials will encourage chaperone-student interaction to increase student engagement while at the zoo.

- **The Zoo continue to improve the Educator-led Model**

As the New Model continues to be developed, the Educator-led Model will still be the main model offered by the zoo. We recommend that the zoo increase the resources for educators to use for their class sessions. These resources include improved facilities, varied lessons, new bio facts such as skulls, body coverings, and other educational props, and professional development sessions to continue learning among the educators.

We also recommend a wider range of animal encounters that are relevant to the material discussed in class. These encounters will encourage a stronger connection with the animal and nature. Finally, we recommend a forum be created to give students the opportunity to ask questions that were not addressed in the educator session.

In regards to the visitors' experience at the zoo, we recommend the following changes to be employed in order to create a more engaging and enjoyable experience:

- **Zoos Victoria post more comprehensive signage to educate an audience with a wider age range.**

Chaperones and some teachers who visit the zoo can be uneducated in facts that they present to the students. Using factors described by Berlo, the "best" channel for a message is a

sign and our findings indicate that signage may be the primary channel for key conservation messages (1960). Studies also show that “signage is the most effective channel for communicating cognitive messages to visitors at zoos,” thus showing how significant signs are to the guests excursion to the zoo (Mony, 2007). More colourful and prevalent signs at exhibits will catch the eyes of more visitors. These signs can educate the visitors on a wider variety of subjects without the interaction of zoo personnel.

- **Zoos Victoria ticket office post a list of animals which are off exhibit to be updated daily.**

Prior to a zoo excursion, many children look forward to seeing a specific animal or exhibit. Upon their arrival to the zoo, if this specific animal is unavailable for viewing, a sense of disappointment may come over the student, which creates a negative experience overall. This negative connotation can be avoided by setting standards that there are animals that cannot be seen on the visit today, yet can be viewed at a future date. Not only does this lessen the negative impact of a closed exhibit, but it also encourages the student to return to the zoo at a later date.

- **The Learning Experiences Department remind teachers to travel in smaller groups to support a better visit.**

Teachers of students in this age group are currently recommended by the zoo to travel around the zoo in groups with a ratio of five students to one adult. We recommend that the large class group divides into many smaller groups each led by one of the chaperones. Ridgway notes that crowding at exhibits detracts from an experience at the zoo (Ridgway, Livingston, and Smith, 2005). This is an especially prevalent problem because the viewing area for young students is already smaller than for adults due to their size. Smaller groups mean fewer students crowding the exhibits trying to all see the same animal at once.

A smaller group is also more agile and flexible than a larger group. Michie notes that a smaller group is better able to respond to the expectations and problems of individual members of the group. Small groups also are better able to make time for hands-on experiences (1995). These hands on experiences are necessary because our team found that that the students remember and comment on their hands-on experience of touching the animals more than simply seeing the animals.

- **The Learning Experiences Department develop a list of suggested paths for school groups to follow to reduce unnecessary walking around the zoo.**

Teacher interviews revealed that, as many teachers are not familiar with the zoo, they are more prone to getting lost, which requires more time spent walking and less time spent making a connection to the animals. We recommend that The Learning Experiences Department base these suggested paths off of different animal groups that relate to what the group is learning in class at the zoo. For example, collections of African Animals or a tour that exposes the students to different body coverings such as fur, feathers, scales, and skin.

The zoo is organized in loops that make it difficult for school groups to get back to the entrance to leave for the day and to meet with other sections of their group. Interviewed teachers who participated in the New Model were concerned that they had to quickly move from one part of the zoo to another to be on time for activities and that they had to miss many animals along the way. The addition of suggested paths that allow school groups to see many animals will help groups arrive at classes on time, relieve stress from visiting teachers, and ensure that the students see many animals in their day, which would help them to make a greater connection to the animals.

We recommend that time estimates are given for the paths that are suggested by the zoo educators and the loops that currently exist in the zoo. This will allow teachers to plan their visit to the zoo ahead of time and ensure that the students are seeing as many animals as possible on their visit to the zoo.

- **The Learning Experiences Department adapt the New Model for use by older students.**

The basis of the New Model is to allow the students to engage in self-directed play, which is not feasible for a younger age group because the adults guiding them on the visit to the zoo are in control of where and when they move in the zoo. Teachers have commented that they usually take young students, such as Foundation Year students, to the zoo at the end of the school year so that they have had time to develop important skills such as listening to the teacher, walking together in a group, and socializing with their peers. Older students have already developed these skills so they are more suited to the independence that the New Model encourages. Additionally, zoo educators have noted that teachers might like to use the New

Model to encourage leadership skills among their students, making a trip to the zoo more valuable than the conventional field trip.

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Appendices

Appendix A – Interview Preamble

Good Morning/Afternoon/Evening. (Each group member gives their name in the form I'm _____, I'm _____...). We are a group of students from Worcester Polytechnic Institute working with Zoos Victoria on evaluating education models. In order to fully assess the educational models we need to understand your experience of with them. Your inputs will help us determine their effectiveness and make recommendation for the future and will be kept strictly confidential. Your responses are invaluable and we respect and appreciate the time given to us, this won't take more than half an hour. If you have any questions or doubts, do not hesitate to ask at any time. With your permission, we will be recording this conversation, shall we begin?

Appendix B – Informal Interview with Zoo Staff

1. Do you feel that the zoo visits are a valuable component of the students' education (K-2)?
 - a. Why or why not?
2. What do you feel is the purpose or message of the three learning models?
 - a. Self-guided:
Educator-led:
New Model:
3. What are the advantages and disadvantages of each delivery model?
4. Which model do you feel is more effective or valuable for the age group that we are working with? Why?
 - a. How about older students?
5. Why does the Zoo offer 3 learning models? Does it need to have 3 models? Why?
 - a. Is the New Model necessary? Why or why not?
6. Do you encourage students to take what they learned in Zoo School and apply it outside the classroom? If so, how?
7. If the New Model were to become permanent, which model do you think would be the most popular? Why do you think so?
8. (Educator-led or New Model) Overall, what level of interest do you feel that K-2 students express during their session in Educator-led or at the activities in the New Model? Please rate their interest on the following scale:

Least Interested	1	2	3	4	5	Most Interested
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9. What parts of the three models need some improvement? Why? How?
 - Self-guided:
 - Educator-led:
 - New Model:
10. How do you believe the New Model will affect your position as an educator?
11. If the New Model would be implemented, do you think fewer schools would attend the zoo?

Appendix C – Teacher Briefing

To whom it may concern,

We are a group of four university students from the United States. We are working with Zoos Victoria to evaluate the educational models that they use to teach students who visit the Melbourne Zoo on field trips.

The study would begin when your school group arrives at the zoo. We will greet your group as they arrive and conduct a short survey with a group of five students. After the survey, your school group will go about their trip to the zoo as planned, but we will be observing one or two of the groups as they travel through the zoo. We are interested in learning which exhibits are most interesting to the students and how they learn from the teaching model that they are participating in. At the end of the visit we will conduct a short post visit survey with the same group of five students.

Following the visit we would like to send some surveys home for the teacher to distribute to the chaperones who accompanied the students on the trip as well as the parents of the students. These surveys will be in a prepaid envelope that we will ask for the teacher to send back to us with the completed surveys inside. We will also set up a brief phone interview with the teacher who led the visit to gather their feedback.

We would like to stress that the visit to the zoo will remain unchanged. We will be as unobtrusive as possible and will never be alone with the students.

Thank you for considering participating in our research study. If you have any questions, feel free to contact us by email or at 9285-9477.

Cheers,
Jose Andrade
Kathleen Bowe
Patrick Thomas
Aubrie Vannasse

Appendix D – Student Pre-Test

Name: _____

1. How do you feel about your visit to the zoo?



2. How do you feel about the outside world?



3. How do you feel about playing outside?



4. How do you feel about playing inside?



5. How do you feel about meeting animals?



Appendix E – Student Post-Test

Name: _____

1. How did you feel about your visit to the zoo?



2. How do you feel about the outside world?



3. Do you want to play more outside after today?



4. Do you want to play more inside after today?



5. How did you feel about seeing animals today?



6. What has been your favourite part of the day?

Appendix F – Observation Criteria

Exhibit #

Questions

Eye Contact (# of kids)

Excitement (# of kids)

Conversing with peers positively

Conversing with peers negatively

Time Spent

Appendix G – Parent Survey

Please answer the following questions regarding your child’s trip to the zoo.

How many times has your child visited Zoos Victoria in the past 2 years?

- __ times with parents/family
- __ times with school
- __ times with other (e.g., friends)

How excited was your child before going to the zoo this time?

Least Excited 1 2 3 4 5 Most Excited

After this visit?

Least Excited 1 2 3 4 5 Most Excited

What did they talk about before? _____ After?

What stories did the student share after this visit?

Did they draw any pictures related to their visit? If yes, of what?

Did they mention conservation? If so, in what way? (Did they use the word conservation and/or talk about conservation ideas?)

What did they like most about their visit?

What did they dislike about their visit?

What is your child’s gender? M / F Age? _____

Thank you for your time, if you have any questions regarding this research please contact Zoos Victoria Learning Experience on 9340 2778 Please have your child return this survey to the teacher that accompanied them on this visit.

Appendix H – Chaperone Survey

Please fill out the following survey in regards to your visit to the zoo.

1. How many times have you visited the zoo in the last five years? _____
2. What made you decide to chaperone? _____

3. What were your expectations when visiting the zoo? _____

4. Do you feel that Zoo visits are a valuable component of the students' education? _____
Why? _____

5. (If participated in Educator-led or New Model) how useful was the education session that your class was exposed to? _____
 - a. What changes would you make to the session? _____

6. Did you learn anything about conservation during your visit? _____

7. Are you planning on making a behavioural change to further conservation? _____
 - a. If so, what actions are you planning on taking? _____

8. How satisfied were you with the educational program?
Least Satisfied 1 2 3 4 5 Most Satisfied
9. What would you like to see changed in the zoo visit? _____

Appendix I – Teacher Interview

1. Are zoo visits a regular part of your educational routine?
2. How many times do you attend the zoo in a year? With classes? Without?
3. Do you feel that the zoo visits are a valuable component of the students' education?
 - a. Why or why not?
4. What conservation themes did you teach in the classroom before the class's zoo visit?
 - a. At what point in this unit were you at when you visited the zoo?
5. What factors do you take into consideration when you schedule a zoo trip?
 - a. Curriculum? Time of year? Conservation focus?
6. What level of interest did students express in the conservation campaign (gorilla, orang-utan, seal, platypus, or wombat) following your visit to the zoo? Please rate their interest on the following scale:

Least Interested	1	2	3	4	5	Most Interested
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7. Has your student's understanding of conservation changed following the visit to the Zoo?
8. What did you expect your students to learn on their visit to the Zoo?
 - a. Were these expectations met?
9. Have your students participated in any of the behavioural actions they learnt about during their Zoo visit?
 - a. Was this an individual action or a class activity?
 - b. What activities have they participated in?
10. (If exposed to Educator-led or New Model) how useful was the information session that your class was exposed to?
 - a. Do you have any suggestions for changes to be made to the education sessions?